

**GEOLOGIC AND HYDROLOGIC SITING REPORT - ADDENDUM
 FGD SCRUBBER RESIDUE DISPOSAL SITE
 BELEWS CREEK STEAM STATION
 3195 PINE HALL ROAD
 BELEWS CREEK, NORTH CAROLINA
 S&ME Project 1054-04-955**

Carmen Johnson
 Fac/Perm/Co ID# 85-05
 Date 5/11/12
 Doc ID#
 DIN



Prepared For:



A Duke Energy Company
 526 South Church Street
 Charlotte, North Carolina 28202

Prepared By:



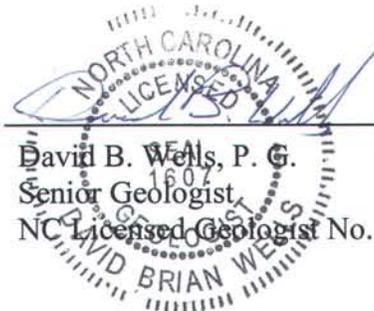
3118 Spring Forest Road
 Raleigh, North Carolina 27616

APPROVED
 DIVISION OF WASTE MANAGEMENT
 SOLID WASTE SECTION
 DATE 6/29/2006 BY JAD
 PERMIT # 85-05
 PTC ATTACH 1, DOC #10
 RALEIGH CENTRAL FILE COPY

December 12, 2005



Samuel P. Watts, P. G.
 Environmental Department Manager
 NC Licensed Geologist No. 1806



David B. Wells, P. G.
 Senior Geologist
 NC Licensed Geologist No. 1607

Senior Reviewed by: Wes Lowder, P. E., Senior Consultant



Duke Power
526 South Church St.
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Mailing Address:
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Charlotte, NC 28201

December 13, 2005

North Carolina Department of Environment and Natural Resources
Division of Waste Management
Solid Waste Section
401 Oberlin Road - Suite 150
Raleigh, NC 27605

Attention: Mr. Brian Wootton
Hydrogeologist, Solid Waste Section

Subject: Duke Power – Belews Creek Steam Station
Craig Road FGD Scrubber Residue Landfill Application
Response to November 3, 2005 Comments

Dear Mr. Wootton:

Attached are two copies of a response prepared by S&ME on behalf of Duke Power to your November 3, 2005 comments on the revised Site Geologic and Hydrologic Siting Report submitted for the Belews Creek Steam Station Craig Road FGD Scrubber Landfill project.

We hope that this information addresses your concerns. As discussed in previous conversations, Duke Power is concerned with the project schedule and looks forward to a prompt response. If you have any additional comments or concerns, please feel free to contact me at (704) 382-7161.

Sincerely,

Patrick J. McCabe, PE
Environmental Support

cc: Geoff Little



Duke Power
526 South Church St.
Charlotte, NC 28202

Mailing Address:
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December 8, 2005

North Carolina Department of Environment and Natural Resources
Division of Waste Management
Solid Waste Section
401 Oberlin Road - Suite 150
Raleigh, NC 27605



Attention: Mr. Brian Wootton, Hydrogeologist
Solid Waste Section

Subject: Duke Power – Belews Creek Steam Station
Craig Road FGD Scrubber Residue Landfill Application
Response to November 11, 2005 Additional Review Comments #3

Dear Mr. Wootton:

As requested in your November 11, 2005 letter, Duke Power is providing additional information regarding the groundwater computer modeling for the Craig Road FGD Scrubber Landfill project. The HELP model in support of this project was prepared by Chas. H. Sells, Inc. The fate and transport model (HYDRUS and MYGRT) was prepared by Environmental Systems and Technologies (ES&T). The following sections have been prepared in response to your comments:

HELP Model

In the HELP model, the user can utilize default soil properties for soils and geosynthetics, or can enter user-defined properties for materials. The default material types are assigned texture numbers 1 through 42. User-defined textures are numbered 43 and up. In the HELP analyses for the Belews Creek FGD landfill, user-defined properties are used for site soils and for the gypsum residue material (Material Textures 44, 60, 62, and 63). As described below, the basis for these properties is described in Appendix A of the CPA (Section 3.0 HELP Model Inputs – Soil and FGD Residue Properties).

Material Texture Number	Description of Material	Location in Appendix A – CPA HELP Report
44	Gypsum Residue	Section 3.2 Properties for Gypsum Layer (page 9 of 24) explains the basis for these properties. Values used in HELP are found in Table 3-7.
60	Soil Below Lower HPDE Liner	Section 3.4 Properties for Soil Layer Beneath the Landfill (page 11 of 24). Values used in HELP are found in Table 3-11. Tables 3-8, 3-9 and 3-10 present information used in developing these properties.
62	Lower Vegetative Layer	Section 3.1 Properties for Vegetative Layer (pages 4 – 8 of 24). Tables 3-2, 3-3, 3-4, and 3-5.
63	Upper Vegetative Layer	Section 3.1 Properties for Vegetative Layer (pages 4 – 8 of 24). Tables 3-2, 3-3, and 3-4.

For Material Texture 61, non-default properties were initially established for the geonet layer which overlays the LLDPE cover. Later, the properties for this layer were changed to match the default values used in HELP for the geonet drainage layer. However, the Material Texture Number was inadvertently left unchanged. The properties for Material Texture 61 are the same as those for Material Texture 34, a default material for a "Drainage Net", as found in Table 4 of the User's Guide for Version 3 of the HELP Model.

Your November 11th letter also mentions a Material Texture 81. There is no Material Texture 81 used in the HELP analyses.

HYDRUS and MYGRT Models

In response to your request for additional detail on the model inputs and outputs, Duke Power and ES&T have enclosed a CD-ROM containing a total of 23 Adobe Acrobat files which provide the following information:

- Summary table of model input data.
- Screen captures for HYDRUS model.
- Screen captures for MYGRT model.
- HYDRUS model output tables for individual constituents.

For space reasons, these modeling files have been zipped. Please contact us if you need assistance in opening or interpreting any of the files.

We hope that this information addresses your concerns. If you have any additional comments or concerns, please feel free to contact me at (704) 382-7161.

Sincerely,



Patrick J. McCabe, PE
Environmental Support



Duke Energy Corporation
526 South Church St.
Charlotte, NC 28202

April 25, 2006

Mailing Address:
PO Box 1006
Charlotte, NC 28201-1006

RECEIVED
N.C. Dept. of ENR

APR 26 2006

Winston-Salem
Regional Office

NC Department of Environment and Natural Resources
Division of Waste Management
Solid Waste Section
401 Oberlin Road - Suite 150
Raleigh, NC 27605

Attention: Mr. Tim Jewitt
Permitting Engineer, Solid Waste Section

Subject: Duke Power – Belews Creek Steam Station
FGD Scrubber Residue Landfill
Submittal of Application Documents

Dear Mr. Jewitt:

Duke Power is herein submitting two (2) copies of the following documents in support of the proposed Belews Creek Flue Gas Desulfurization (FGD) landfill.

- **Addendum 2 - Geologic and Hydrologic Siting Report** – Addendum 2 for the Geologic and Hydrologic Siting Report (S&ME –April 17, 2006) was revised based on DENR review comments dated September 28, 2005 and December 12, 2005 as well as a meeting with DENR representatives on January 6, 2006. This addendum includes supplemental information on the facility boundary, a narrative on the absence of diabase dikes, and additional site characterization and ground water information.
- **Revision 1 - Construction Plan Application** – Revision 1 for the Construction Plan Application (Chas. H. Sells – April 19, 2006) contains supplemental information including the addition of a geosynthetic clay liner, a minor shift in the footprint on the northern boundary of the landfill, and addition of a secondary liner/leak detection system on the stormwater/leachate basin.

I will be in contact within the next week to review the status of the application review and to answer any additional questions you may have. If you have any immediate concerns or would like to arrange a meeting to discuss this submittal, please feel free to contact me at (704) 382-7161

Sincerely,

Patrick J. McCabe, PE
Environmental Support

cc: Brian Wootton, DENR (w/ 1 copy)

Contents

**GEOLOGIC AND HYDROLOGIC SITING REPORT - ADDENDUM
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3195 PINE HALL ROAD
BELEWS CREEK, NORTH CAROLINA
S&ME Project 1054-04-955**

Prepared For:



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526 South Church Street
Charlotte, North Carolina 28202

Prepared By:

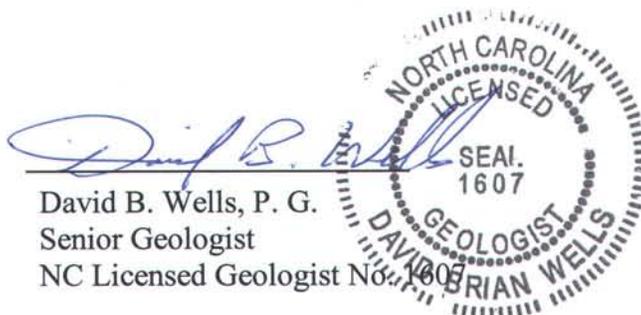


3118 Spring Forest Road
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December 12, 2005



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David B. Wells, P. G.
Senior Geologist
NC Licensed Geologist No. 1607

Senior Reviewed by: Wes Lowder, P. E., Senior Consultant



December 12, 2005

Mr. Patrick J. McCabe, PE
Mail Code EC13K
Duke Power PC & EHS
526 South Church Street
Charlotte, North Carolina 28202-1802

RE: Comments to Revised Site Geologic and Hydrologic Siting Report
Duke Power FGD Scrubber Landfill
Belews Creek Steam Station
S&ME Project No. 1054-04-955

Dear Mr. McCabe:

S&ME, Inc. (S&ME) is pleased to submit this response to NCDENR comments on the revised *Site Geologic and Hydrologic Siting Report* dated September 28, 2005 for the Belews Creek Steam Station (BCSS) Landfill. This response was prepared in general accordance with the scope of work described in S&ME Proposal P3762-05V.

Project Background

On February 21, 2005, S&ME submitted to Duke Energy a copy of the *Geologic and Hydrologic Siting Report* for the proposed flue gas desulfurization (FGD) Scrubber Residue Landfill at the BCSS located in Stokes County, North Carolina. The siting exploration was based on the conceptual design of the landfill provided by Duke Energy, and was prepared in accordance with requirements of the North Carolina Administrative Code (NCAC) T15A .0504(1)(c), *Application Requirements for Sanitary Landfills*. Duke Energy submitted the report to the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM), Solid Waste Section (Section) as Volume 2 of the Site Suitability Application. Section comments on the Site Suitability Application were summarized in a letter from Mr. Brian Wootton to Mr. Allen Stowe on April 29, 2005.

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S&ME's *Geologic and Hydrologic Siting Report* was revised September 28, 2005 and re-submitted by Duke Energy to the Section as Volume 2 of the Site Suitability Application. Section comments on the revised Site Suitability Application were summarized in a letter from Mr. Brian Wootton to Mr. Pat McCabe on November 3, 2005. S&ME has prepared the following responses to the Section comments.

Volume I of 11 S&ME - Geologic and Hydrologic Siting Report
Pages 3,4 of Volume I - Section 2.2 - Project Site Conditions
Appendix I - Potable Wells Well Construction and Abandonment Records
Figure 2 - Landfill Area Site Plan

Pages 3 and 4 state in part: "Two abandoned water supply wells and a well house were identified along the southern side of the site. The abandoned water supply wells are believed to have been installed in the mid 1970's to service a construction camp utilized during construction of the BCSS. The abandoned wells have not been surveyed. No well completion information is available for these wells. During the initial phase of the siting study, two operating potable wells were identified adjacent to the proposed landfill along Craig Road. These wells were 405 and 900 feet deep and provided the potable water for the BCSS. In March 2003, BCSS was connected to a municipal water line from the City of Winston Salem and the potable wells were abandoned. Well construction and well abandonment records for these two potable wells and one of the old potable wells are included in Appendix I".

SWS Response: According to North Carolina Well Construction Standards, 15A NCAC 2C .0113, well(s) no longer in use shall be abandoned (sealed) correctly in order the well(s) are not a source or channel of contamination. The fourth well (the abandoned well that does not have a well abandonment record associated with it) needs to be inspected for proper abandonment criteria that meets 15A NCAC 2C .0113. If the well was abandoned incorrectly, then re abandonment procedures shall be implemented that adhere to 15A NCAC 2C .0113. If re abandonment procedures are necessary, submit a report/record after completion to the SWS.

S&ME Response: Visually, from the surface, it appears that the fourth potable well has been filled with cement grouted to the surface; however, at this time, no well abandonment record can be located. Duke Power will continue to try to locate the well abandonment record and provide a copy to the Section. If no abandonment records can be located, this well will be properly abandoned to meet the requirements of 15A NCAC 2C .0113 as part of the landfill construction and a copy of the formal abandonment record will be supplied to the Section.

Volume I of It S&ME - Geologic and Hydrologic Siting Report
Page 7 of Volume I - Section 3.1.1 Soil Test Borings and Rock Coring

Page 7 states in part: "Borings BC 12A, BC 12B, BC 14A, and BC 23 were drilled to evaluate groundwater conditions at the saprolite, PWR, bedrock contact". "No monitor wells were constructed in these borings. Following evaluation of groundwater conditions at these locations, the borings were abandoned. "

SWS Response: How were these borings abandoned (sealed)? Submit well abandonment records according to 15A NCAC 2C .0114 (b)(2).

S&ME Response: S&ME discussed the documentation of exploratory boring abandonment in telephone conversations and in a meeting with Section representatives Brian Wootton and Bobby Lufty. The result of the conversations was that the boring logs for abandoned exploratory borings would show the grouted interval of the boring upon completion. According to Section representatives, the grout interval on the boring log was sufficient documentation for exploratory boring abandonment. S&ME has attached copies of the boring logs for borings BC-12A, BC12B, BC-14A and BC-23 with the grout intervals noted for the Section.

Volume I of 11 S&ME- Geologic and Hydrologic Siting Report
Volume II of 11 S&ME- Geologic and Hydrologic Siting Report
Page 9 of Volume I - Section 3.1.1 Soil Test Borings and Rock Coring
Figures 3, 4, 5, 6, 7, 8, 9, 10, 11 Cross Sections
Appendix II (Volume II) - Boring Logs

SWS Response:

It has always been the SWS policy that auger refusal is indicative of top of rock and lithologic materials with blow counts of 100 per foot or greater (by use of Standard Penetration Test according to American Standard Testing Methods (ASTM) D 1586) is indicative of partially weathered rock (PWR).

Some of the Cross Sections in the Study depict units of partially weathered rock (PWR) where there should be bedrock (auger refusal) when compared to cross referenced boring log profiles. Listed below are some of the discrepancies:

<i>Cross Section</i>		<i>Cross Section</i>	<i>Boring log profile</i>
<i>Drawing' #</i>	<i>Boring Log #</i>	<i>Depth to</i>	<i>Depth to</i>
		<i>Top of Rock, bls</i>	<i>(Auger Refusal) bls</i>
*H-H' #11	BC-3	54.5 feet	38.0 feet
*H-H' #11	BC-5	53.5 feet	46.0 feet
*A-A' #4	BC-8	Top of rock not depicted	25.2 feet
*A-A' #4	BC-9	24 feet	13.8 feet
*B-B' #5	BC-10	41.5 feet	38.5 feet

S&ME Response: S&ME has reviewed the boring logs and rock core documentation for locations where the Section comments were made concerning discrepancies of the top elevation

of bedrock. Copies of new rock core photographs for the borings in question are attached for review. The following discussion is provided as explanation to the plotted elevation of bedrock.

Boring BC-3

The review of boring log and rock core documentation for boring BC-3 indicate that the boring penetrated highly weathered highly fractured schist and quartz granite. Auger refusal was noted at a depth of 38 feet. The material encountered in the core runs was more typical of PWR due to recovery percentages less than 50 percent and the degree of weathering observed in the recovered sample. See the photograph of rock core sampled from BC-3 attached. Despite the depth to auger refusal noted in boring BC-3, it is S&ME's opinion that the boring terminated in PWR rather than in bedrock.

Boring BC-3A

The review of boring log BC-3A indicated that auger refusal was encountered at a depth of 40.8 feet. The rock core documentation indicated that the boring penetrated fractured quartz gneiss with mud and rock fragments that recovered 73 percent and had an RQD of only 26 percent in core run 1. However, core run 2 penetrated highly weathered highly fractured rock that was more typical of PWR due to the degree of weathering and reduced rock-like properties observed in the recovered sample. A tricone roller bit and wash drilling technique was used to advance the boring from a depth of 51.3 to 53.8 feet. A split-spoon sample was taken from 53.8 to 54.0 feet that recovered 2.5 inches for 50 blows. The third core run from 54 to 61.3 in boring BC-3A recovered 63 percent with a RQD of 60 percent. The rock core was described as quartz gneiss that was moderately fractured. The auger refusal at 40.8 appears to have been a rock ledge that lay over highly weathered material more typical of PWR rather than in bedrock. See the attached photographs of the three boxes of rock core sampled from BC-3A. It is S&ME's opinion that the bedrock at the boring BC-3A is at the start of the third rock core run at a depth of 54 feet. The top of rock on cross sections D-D' and H-H' at Boring BC-3A is drawn at a depth of 54 feet.

Boring BC-5

The review of boring log BC-5 indicated that auger refusal was encountered at a depth of 46 feet. The boring was terminated at a depth of 46 feet. The top of bedrock on cross section C-C' was

drawn at the depth of the auger refusal depth since no additional information was collected below the depth of 46 feet at this boring location. The top of bedrock drawn on cross section H-H' at the same BC-5 boring location was shown to be greater than 46 feet. Since no additional information was available below the depth of 46 feet, the top of bedrock was revised on cross section H-H' to match the top of bedrock elevation shown on cross section C-C'.

Boring BC-8

The review of boring log BC-8 indicated that auger refusal was encountered at a depth of 25.2 feet. The first core run was advanced to a depth of 29.7 feet where the core barrel was blocked with sediment from highly weathered and highly fractured material. The review of the core sample recovered indicated that light gray granite gneiss lay over highly weathered brown micaceous schist that weathered to a sandy silt material. The second core run from 29.7 to 34.7 also encountered the highly weathered micaceous unit. A tricone roller bit and wash drilling technique was used to advance the boring from a depth of 34.7 to 37.5 feet. The third core run from 37.5 to 43.5 in boring BC-8 recovered 30 percent with a RQD of 0 percent. The rock core was described as a medium brown and light to medium gray quartz gneiss that was highly fractured. Samples of the core material could be broken easily with finger pressure. See the attached photograph of rock core sampled from BC-8. Based on review of the boring log and core samples, the auger refusal noted on the boring log at 25.2 feet is not representative of the top of bedrock. The description of partially weathered rock applies to the last core sample run based on the low recovery, RQD values and poor rock quality observed. The top of rock drawn on cross section A-A' at BC-8 is not confirmed, therefore it is not shown.

Boring BC-9

The review of boring log BC-9 indicated that auger refusal was encountered at a depth of 13.8 feet. The review of the boring log and core sample documentation indicate that the top of rock is at 13.8 feet and the top of rock elevation depicted on cross sections A-A' and F-F' is revised from 24 feet to 13.8 feet accordingly. See the attached photographs of the two boxes of rock core sampled from BC-9.

Boring BC-10

The review of boring log BC-10 indicated that auger refusal was encountered at a depth of 38.5 feet. The review of the boring log and core sample documentation indicate that the top of rock is at 38.5 feet and the top of rock elevation depicted on cross section B-B' is revised from 41.5 to 38.5 accordingly. See the photograph of rock core sampled from BC-10 attached.

SWS Comment

According to the cross section profiles and ground water data submitted, the potentiometric water table surface (taken 10/27/2004) exists at some locations in bedrock. The figures and supporting data also depict estimated average seasonal high ground water surface. The SWS would also like to know the elevation of the estimated average seasonal low ground water table at the piezometer locations. Please provide updated tables (and cross sections) depicting the average seasonal low ground water table.

If there are significant areas of the proposed site that have groundwater located mostly in bedrock, additional characterization of bedrock hydrology may be necessary in order to design an effective ground water monitoring system. In order to better understand the fracture flow regime of this site, a ground water pumping test maybe necessary to determine possible fracture patterns, preferential flow paths, and hydraulic characteristics of the bedrock aquifer.

S&ME Response: The Estimated Seasonal Low Groundwater (ESLG) elevations were calculated by the same methods described in the September 28, 2005 *Geologic and Hydrologic Siting Report* for calculating the Estimated Seasonal High Groundwater (ESHG). The depth-to-water at the proposed FGD Scrubber Landfill site has been characterized by 18 rounds of water level measurements taken at monitor wells BC-1 through BC-14 from November 11, 2003 through October 10, 2004. The ESLG elevations at the proposed FGD Scrubber Landfill at Belews Creek were projected by applying statistical analysis of hydrological data from on-site monitor wells installed during the first phase of drilling (BC-1 through BC-14) at the proposed FGD Scrubber Landfill and monitor wells (MW-1 through MW-5) at the neighboring Pine Hall Road ash landfill. The following procedures describe the application of the statistical analyses and extrapolation of the results to develop projected ESLG elevations at Belews Creek.

S&ME reviewed 15 years of hydrological data from monitor wells MW-1 through MW-5 located at the Pine Hall Road Landfill which had up to 27 data points. The number of data points from monitor wells BC-1 through BC-14 located at the proposed FGD Scrubber Landfill ranged from 12 to 18 rounds of water level measurements over the past two years. The quantity of water level data

from these wells was sufficient to perform statistical predictions at the upper 90th, 95th and 99th percent confidence level (%CL). There were insufficient data to perform a similar statistical prediction for monitor wells BC-14 through BC-23 at the proposed FGD Scrubber Landfill as these wells had only two groundwater elevation data points collected from each well. The projected 90%, 95% and 99% CL were calculated for water levels from monitor wells where there were a sufficient quantity of data points using the following formula (Steel and Torrie, 1980).

$$P \left[Y \leq \bar{Y} t_{\alpha} \sqrt{s^2 \left(\frac{n+1}{n} \right)} \right] = 0.90 \text{ or } 0.95 \text{ or } 0.99$$

where;

P = probability that $Y \leq \bar{Y} t_{\alpha} \sqrt{s^2 \left(\frac{n+1}{n} \right)}$ is below the 90th, 95th and 99th percentile

Y = projected water level

\bar{Y} = Sample population mean of water levels

t_{α} = t-statistic at either the 90th, 95th, and 99th percent confidence level with $n-1$ degrees of freedom.

s^2 = sample population variance of the water levels

n = number of water level measurements in a well.

The application of this equation uses the Students T-distribution which takes into account that the prediction of the next measured water level will be within a certain level at the 95% CL. The equation is based on a sample mean instead of the true population mean, which is unknown. The appropriate variance to the next predicted water level measurement value in any one monitor well is the sum of the variances of the observed sample mean of water levels measured plus a random component.

Time series graphs of the data for the Pine Hall Road monitor wells (MW-1 through MW-5) and the FGD Scrubber Landfill monitor wells (BC-1 through BC-14) are presented graphically in the Appendix. The time series graphs provided a means review of the data sets subjectively so that the appropriate CL for the data set could be selected. The analysis of the graphs determined that an excessive number of measured water levels exceeded the 90% CL water level and the 99% CL water level provided an elevation that appeared too conservative for projecting the ESHG

elevations. Thus, the 95% CL level was selected to project the high water elevation. After calculating the 95% CL on water levels at both landfills and reviewing the time series graphs, S&ME applied the same three step process used in the September 28, 2005 *Geologic and Hydrologic Siting Report* to predict the ESHG elevations to predict the ESLG at the Scrubber Landfill.

After several iterations of groundwater potentiometric maps, S&ME selected the ESLG elevations that appeared to best represent the physical and hydrogeologic characteristics at the Scrubber Landfill site. The ESLG elevation at each well (BC-1 through BC-23A) was developed based on selecting the lowest elevation between the ESLG using the modification numbers from the Pine Hall Road Landfill monitor wells and ESLG using the modification factor, and the predicted 95% CL, for wells BC-1 through BC-14 at the Scrubber Landfill. The resulting ESLG elevations for the Scrubber Landfill wells (BC-1 through BC-23A) are summarized on Table 1. Figure 33A presents a potentiometric map of the ESLG that appears to correlate with the ground surface topography, screened lithology, and the potentiometric map of water levels measured on October 27, 2004. The resulting ESLG is also presented on the lithologic and hydrologic cross-sections included in the Attachment.

Volume I of II S&ME - Geologic and Hydrologic Siting Report
Page 38 of Volume I - Section 5.2.1 - Monitor Well Network
Appendix II Boring Logs

SWS Response: Existing monitor wells, BC-15 and BC-20 may be invalid for ground water quality monitoring purposes if water levels continue to be above the well screens. According to the boring logs for these wells, the water level symbols depict water level readings (24 hours after well completion), above the well screens. In most situations for ground water quality sampling purposes, the ground water monitoring well screens should bracket the water table. These subject wells may have to be abandoned or not used for monitoring ground water parameters, depending on subsequent water level data results. Please submit any recent groundwater level data, since 10/27/04 for these two (2) wells. If no data is available, then measure, record, and submit water level results from these wells.

S&ME Response: Groundwater levels taken at monitor wells BC-15 and BC-20 from October 6, 2004 through November 15, 2005 are summarized on Table 2, and graphically displayed on time-series graphs included in the Appendix. The well screen elevations are also shown on Table 2 and on the time-series graphs. Monitor wells BC-15 and BC-20 should be abandoned and should not be used as part of the water quality monitoring network. To complete the monitoring network, two

new wells (BC-26 and BC-27) should be installed in close proximity to the abandoned BC-15 and BC-20. The locations of the existing monitor wells and the proposed monitor wells are shown on Figure 31A.

CLOSING

S&ME hopes that the above information addresses your comments to the Revised Geologic and Hydrogeologic Siting Report. Should you have any questions regarding this letter, please call us at (919) 872-2660.

Sincerely,

S&ME, Inc.



Samuel P. Watts, P.G.
Environmental Department Manager



David B. Wells, P.G.
Senior Geologist



Wes Lowder, P.E.
Vice President/Senior Reviewer

Attachments:

Revised Figures (3A-11A, 23A-31A, and 33A)
Exploratory Boring Abandonment Records
Boring Logs for Top of Rock Discussion
Rock Core Photographs
Tables
Graphs

ATTACHMENTS

Appendix

**EXPLORATORY BORING
ABANDONMENT RECORDS**

BORING LOG BC-12A

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: J. Drummond
 DATE DRILLED: 11/22/2002
 BORING DEPTH (ft): 48

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: CME-45
 TOP OF CASING ELEVATION (ft):
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	S-1	0.0-5.0	-	-	-	-	ML	▨	(LITHOLOGY TAKEN FROM BC-12) Orange brown micaceous fine sandy clayey SILT, slightly moist.	Protective Casing Dia: N/A Type: N/A Interval: N/A	▨	-
	SS-1	1.0-2.5	3-2-3	5	6	6						
-	ST-1	3.0-5.0	-	-	-	-	ML	▨	Orange brown to light brown very micaceous SILT and fine to coarse SAND, slightly moist.	Riser Casing Dia: N/A Type: N/A Interval: N/A	▨	-
	SS-2	3.5-5.0	4-7-10	17	18	18						
5	S-2	5.0-15.0	-	-	-	-	ML	▨	Tan orange and white micaceous sandy SILT (saprolite), dry, crumbly.	Grout Type: Portland Interval: 0.0 - 48.0 ft.	▨	-
-	SS-3	6.0-7.5	4-5-7	12	18	18						
-	SS-4	8.5-10.0	4-5-11	16	18	18	ML	▨	Light tan brown micaceous sandy clayey SILT w/quartzite rock fragments (saprolite), dry, crumbly.	Seal Type: N/A Interval: N/A	▨	-
-	SS-5	13.5-15.0	12-15-16	31	18	18						
15	S-3	15.0-25.0	-	-	-	-	ML	▨	Light brown, white, and light yellowish brown micaceous SILT and fine to coarse SAND (saprolite), dry, crumbly.	Filterpack Type: N/A Interval: N/A	▨	-
-	SS-6	18.5-20.0	8-9-11	20	18	18						
20	SS-7	23.5-25.0	25-18-15	33	18	18	ML	▨	Orange brown and light yellowish brown micaceous SILT and fine to coarse SAND (saprolite), dry, crumbly.	Screen Dia: N/A Type: N/A Interval: N/A	▨	-
-	S-4	25.0-35.0	-	-	-	-						
-	ST-2	27.0-28.7	-	-	-	-	ML	▨			▨	-
-	SS-8	28.5-30.0	10-11-12	23	18	18						
30	SS-9	33.5-35.0	12-15-16	31	18	18	ML	▨			▨	-

NOTES

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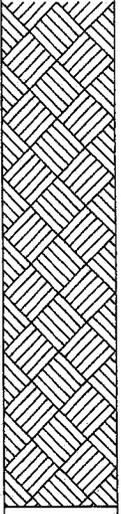
1. ▽ = Water Level At Termination of Boring
2. ▼ = Water Level After 24 Hours

S&ME
 ENVIRONMENTAL SERVICES
 ENGINEERING • TESTING
 3118 Spring Forest Road
 Raleigh, NC 27616

BORING LOG BC-12A

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1264-02-576**
 LOGGED BY: **J. Drummond**
 DATE DRILLED: **11/22/2002**
 BORING DEPTH (ft): **48**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **4 1/4" H.S.A.**
 DRILL RIG: **CME-45**
 TOP OF CASING ELEVATION (ft):
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information									Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS						
-	S-5	35.0-45.0	-						Light brown and orange brown micaceous HARD WEATHERED ROCK samples as SILT and fine to coarse SAND w/quartzite rock fragments (gneissic saprolite), dry.	Protective Casing Dia: N/A Type: N/A Interval: N/A Riser Casing Dia: N/A Type: N/A Interval: N/A Grout Type: Portland Interval: 0.0 - 48.0 ft.		-	
-	SS-10	38.5-39.0	50/6-	100	18		SC					-	
40	SS-11	43.5-44.0	38-50/.45-	100	6		SC					-	
-	S-6	45.0-55.0	-										Light brown, light yellowish brown, and white micaceous HARD WEATHERED ROCK samples as SILT and fine to coarse SAND w/quartzite rock fragments (gneissic saprolite), dry. Fractures at 50.7' : 40 51.6' : 40 Auger refusal at 48.0 ft. Boring terminated at 48.0 ft.
45								-					

NOTES

SS = Split Spoon Sample
 ST = Shelby Tube Sample
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BORING LOG BC-12B

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: J. Drummond
 DATE DRILLED: 11/22/2002
 BORING DEPTH (ft): 52.2

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: CME-45
 TOP OF CASING ELEVATION (ft):
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information									Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS						
-	S-1	0.0-5.0	-						ML	(LITHOLOGY TAKEN FROM BC-12) Orange brown micaceous fine sandy clayey SILT, slightly moist.	Protective Casing Dia: N/A Type: N/A Interval: N/A		
-	SS-1	1.0-2.5	3-2-3	5	6					Orange brown to light brown very micaceous SILT and fine to coarse SAND, slightly moist.			
-	ST-1	3.0-5.0	-						ML	Tan orange and white micaceous sandy SILT (saprolite), dry, crumbly.	Riser Casing Dia: N/A Type: N/A Interval: N/A		
-	SS-2	3.5-5.0	4-7-10	17	18								
5	S-2	5.0-15.0	-						ML	Grout Type: Portland Interval: 0.0 - 52.2 ft.			
-	SS-3	6.0-7.5	4-5-7	12	18								
-		SS-4	8.5-10.0	4-5-11	16	18			ML	Seal Type: N/A Interval: N/A			
-		SS-5	13.5-15.0	12-15-16	31	18							
15	S-3	15.0-25.0	-						ML	Filterpack Type: N/A Interval: N/A			
-		SS-6	18.5-20.0	8-9-11	20	18							
20		SS-7	23.5-25.0	25-18-15	33	18			ML	Screen Dia: N/A Type: N/A Interval: N/A			
-		SS-8	28.5-30.0	10-11-12	23	18							
25	S-4	25.0-35.0	-						ML	Light tan brown micaceous sandy clayey SILT w/quartzite rock fragments (saprolite), dry, crumbly.			
-		SS-9	33.5-35.0	12-15-16	31	18							
-	ST-2	27.0-28.7	-						ML	Light brown, white, and light yellowish brown micaceous SILT and fine to coarse SAND (saprolite), dry, crumbly.			
-		SS-8	28.5-30.0	10-11-12	23	18							
30		SS-9	33.5-35.0	12-15-16	31	18			ML	Orange brown and light yellowish brown micaceous SILT and fine to coarse SAND (saprolite), dry, crumbly.			
-		SS-9	33.5-35.0	12-15-16	31	18							

NOTES

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 R = Core Run
 RS = Rock Sample
 REC = Rock Core Recovery
 RQD = Rock Quality Designation

1. ∇ = Water Level At Termination of Boring
2. ▼ = Water Level After 24 Hours

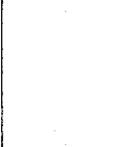


3118 Spring Forest Road
Raleigh, NC 27616

BORING LOG BC-12B

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1264-02-576**
 LOGGED BY: **J. Drummond**
 DATE DRILLED: **11/22/2002**
 BORING DEPTH (ft): **52.2**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **4 1/4" H.S.A.**
 DRILL RIG: **CME-45**
 TOP OF CASING ELEVATION (ft):
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)				
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS									
-	S-5	35.0-45.0	-						Light brown and orange brown micaceous HARD WEATHERED ROCK samples as SILT and fine to coarse SAND w/quartzite rock fragments (gneissic saprolite), dry.	Protective Casing Dia: N/A Type: N/A Interval: N/A		-				
-	SS-10	38.5-39.0	50/6--	100	18		SC					40				
-	SS-11	43.5-44.0	38-50/.45-	100	6		SC					-				
45	S-6	45.0-55.0	-										Light brown, light yellowish brown, and white micaceous HARD WEATHERED ROCK samples as SILT and fine to coarse SAND w/quartzite rock fragments (gneissic saprolite), dry. Fractures at 50.7' : 40 51.6' : 40	Grout Type: Portland Interval: 0.0 - 52.2 ft.		-
-	SS-12	48.5-48.53	50/.45--	100	0		SC									45
50									Auger refusal at 52.2 ft. Boring terminated at 52.2 ft.	Seal Type: N/A Interval: N/A		-				
										Filterpack Type: N/A Interval: N/A		-				
										Screen Dia: N/A Type: N/A Interval: N/A		-				

NOTES

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BORING LOG BC-14A

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: J. Drummond
 DATE DRILLED: 11/22/2002
 BORING DEPTH (ft): 20.5

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: CME-45
 TOP OF CASING ELEVATION (ft):
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC): 18.9

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	SS-1	1.0-2.5	4-2-3	5	30			(LITHOLOGY TAKEN FROM BC-14) Orange brown micaceous SILT and fine SAND, slightly moist.	Protective Casing Dia: N/A Type: N/A Interval: N/A		-	
-	SS-2	3.5-5.0	3-4-6	10	18			Orange brown mottled black micaceous SILT and fine to coarse SAND, slightly moist.	Riser Casing Dia: N/A Type: N/A Interval: N/A		-	
5	S-1	5.0-10.0	-	-	-			Orange brown and light orange micaceous SILT, trace fine to coarse Sand, slightly moist.	Grout Type: Portland Interval: 0.0 - 20.5 ft.		-	
-	ST-1	5.0-7.0	-	-	-						-	
-	SS-3	6.0-7.5	5-7-13	20	18			Light orange micaceous soft weathered rock samples as SILT and fine to coarse SAND w/quartzite rock fragments (gneissic saprolite), dry, crumbly.	Seal Type: N/A Interval: N/A		-	
-	SS-4	8.5-10.0	11-18-23	41	18			Light orange micaceous HARD WEATHERED ROCK samples as SILT and fine to coarse SAND w/quartzite rock fragments (gneissic saprolite), dry, crumbly.	Filterpack Type: N/A Interval: N/A		-	
10	S-2	10.0-15.0	-	-	-					-		
-	SS-5	13.5-13.5	50/25-	100	0.25			Auger refusal at 20.5 ft. Boring terminated at 20.5 ft.	Screen Dia: N/A Type: N/A Interval: N/A	-		
15	SS-6	18.5-19.0	50/6-	100	6					-		
20												

NOTES

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BORING LOG BC-23

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1054-04-955**
 LOGGED BY: **L. Ennis**
 DATE DRILLED: **9/2/2004**
 BORING DEPTH (ft): **88.6**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **4 1/4" H.S.A.**
 DRILL RIG: **CME-550X**
 TOP OF CASING ELEVATION (ft):
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information									Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS						
-									TOPSOIL	Orange/Yellow brown silty SAND, dry	Protective Casing		-
-	S-1	1-6	-				SC-SM				Dia: Type: Interval:		-
5	SS-1	3.5-4.5	38-50/6-	88	7				Light tan/ yellow orange silty clayey SAND with rock fragments, micaceous SAPROLITE, moist at 13.5	Riser Casing	Dia: Type: Interval:		-
10	SS-2	8.5-9.5	30-50/6-	80	10					Grout	Type: Portland Interval: 0.0 - 89.6		-
15	SS-3	13.5-15	7-8-8	16	12				Light red brown sandy silt SAPROLITE, with visible micaceous layering, moist	Seal	Type: Interval:		-
20	SS-4	18.5-19.9	28-41-50/5	91	16					Filterpack	Type: Interval:		-
25	SS-5	23.5-25	12-15-15	30	17					Screen	Dia: Type: Interval:		-
30	SS-6	28.5-30	7-11-11	22	18							-	
	SS-7	33.5-35	11-21-24	45	13				Pink and light tan/white silt SAPROLITE, with micaceous layering, moist			-	

NOTES

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 Raleigh, NC 27616

BORING LOG BC-23

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1054-04-955**
 LOGGED BY: **L. Ennis**
 DATE DRILLED: **9/2/2004**
 BORING DEPTH (ft): **88.6**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **4 1/4" H.S.A.**
 DRILL RIG: **CME-550X**
 TOP OF CASING ELEVATION (ft):
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
38.5-39.4	SS-8	38.5-39.4	22-50/5"	72	11			Medium red brown fine sandy silt SAPROLITE, with micaceous layering, moist (continued)	Protective Casing Dia: Type: Interval:			
43.5-45	SS-9	43.5-45	11-21-26	47	15			Pink/red and gray sandy silt SAPROLITE, with micaceous layering, moist	Riser Casing Dia: Type: Interval:			
48.5-49.4	SS-10	48.5-49.4	31-50/5"	81	11				Grout Type: Portland Interval: 0.0 - 89.6			
53.5-54.5	SS-11	53.5-54.5	32-50/6-	82	12				Seal Type: Interval:			
58.5-60	SS-12	58.5-60	19-18-27	45	10				Filterpack Type: Interval:			
63.5-64.9	SS-13	63.5-64.9	22-47-50/4.5"	97			SC	Olive gray micaceous sandy silt SAPROLITE with visible layering, moist	Screen Dia: Type: Interval:			
68.5-69	SS-14	68.5-69	50/6--	100				Tan brown micaceous clayey SAND PWR, moist				

NOTES

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 Raleigh, NC 27616

BORING LOG BC-23

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1054-04-955**
 LOGGED BY: **L. Ennis**
 DATE DRILLED: **9/2/2004**
 BORING DEPTH (ft): **88.6**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **4 1/4" H.S.A.**
 DRILL RIG: **CME-550X**
 TOP OF CASING ELEVATION (ft):
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
75	SS-15	73.5-73.8	50/3.5"--					[Symbol]	Tan brown micaceous clayey SAND PWR, moist (continued)	Protective Casing Dia: Type: Interval:	[Well Construction Graphic]	75
									Yellow orange silty SAND PWR, no layering, dry	Riser Casing Dia: Type: Interval:		75
80	SS-16	78.5-78.9	50/4"--							Grout Type: Portland Interval: 0.0 - 89.6		80
										Seal Type: Interval:		80
85	SS-17	83.5-83.8	50/3.5"--							Filterpack Type: Interval:		85
										Screen Dia: Type: Interval:	85	
	SS-18	88.5-88.6	50/1"--								88.5	
									Auger Refusal at 88.6 ft.		88.6	

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Raleigh, NC 27616

BORING LOGS FOR TOP OF ROCK

DISCUSSION

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: S. Watts
 DATE DRILLED: 11/12/2002
 DRILLING DEPTH (ft): 48

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: Mobile B-57
 TOP OF CASING ELEVATION (ft): 844.84
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	S-1	0.0-10.0	-	12	12		CL	Reddish brown silty CLAY, slightly plastic, moist.	Protective Casing Dia: 4.0 in. Type: Stick-Up Interval: 2.50 ft.		-	
-	SS-1	0.5-2.0	7-6-6					Light red to pink micaceous very fine sandy silty CLAY w/relict structures visible (saprolite).				- 840
5	SS-2	3.5-5.0	9-14-15	29	12				Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 33.0 ft.		-	
-	SS-3	8.5-10.0	11-12-13	25	10			Light red to pink micaceous very fine sandy SILT w/layering visible (saprolite).	Grout Type: Portland Cement Interval: 0.0 - 27.0 ft.			- 835
10	S-2	10.0-20.0	-						Seal Type: Bentonite Chips Interval: 27.0 - 31.0 ft.		-	
-	SS-4	13.5-15.0	14-16-20	36	8			Light red to pink very fine silty SAND w/Mg staining along relict fractures and quartz and biotite crystals (saprolite), crumbly, dry.	Filterpack Type: Filter Sand #2 Interval: 31.0 - 48.0 ft.			- 830
15	SS-5	18.5-19.8	36-28-50/4	100	12		ML	Moderate tan red to moderate reddish brown micaceous clayey sandy SILT w/dark brown and pale yellow orange streaks (saprolite), crumbly, dry.	Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 33.0 - 48.0 ft.		-	
20	S-3	20.0-30.0	-									- 825
25	SS-6	23.5-23.75	50/3-	100	3						-	
-	SS-7	28.5-30.0	16-15-14	29	8			White silty SAND, mineral rich layer (feldspar/albite).	- 820			
30	S-4	30.0-40.0	-					Moderate red to light red micaceous silty fine SAND w/layering and rock fragments (PWR), crumbly, dry.		- 815		
-	SS-8	33.5-33.75	50/3-	100	3						-	

NOTES

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 Raleigh, NC 27616

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: S. Watts
 DATE DRILLED: 11/12/2002
 DRILLING DEPTH (ft): 48

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: Mobile B-57
 TOP OF CASING ELEVATION (ft): 844.84
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
38.0 - 43.0	R-1	38.0-43.0	-	24	0			Moderate red to light red micaceous silty fine SAND (PWR) w/granitic rock fragments and layering. Auger refusal at 38.0 ft. (continued)	Protective Casing Dia: 4.0 in. Type: Stick-Up Interval: 2.50 ft.		805	
43.0 - 48.0	R-2	43.0-48.0	-	27	0			Highly weathered and highly fractured interlayered SCHIST and Quartz GRANITE. REC = 40% RQD = 0%	Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 33.0 ft.		800	
									Highly weathered and highly fractured interlayered SCHIST and Quartz GRANITE. REC = 45% RQD = 0%	Grout Type: Portland Cement Interval: 0.0 - 27.0 ft.		
									Boring terminated at 48.0 ft.	Seal Type: Bentonite Chips Interval: 27.0 - 31.0 ft.		
										Filterpack Type: Filter Sand #2 Interval: 31.0 - 48.0 ft.		
										Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 33.0 - 48.0 ft.		

NOTES

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PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: W. Mize
 DATE DRILLED: 11/26/2002
 DRILLING DEPTH (ft): 71.3

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: Mobile B-57
 TOP OF CASING ELEVATION (ft): 844.17
 WATER LEVEL TOB (ft bgs): 54.17
 WATER LEVEL 24 HRS (ft bTOC): 70.92

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	S-1	0.0-10.0	-	12	12		CL	(LITHOLOGY 0-40.8 FT TAKEN FROM BC-3) Reddish brown silty CLAY, slightly plastic, moist. Light red to pink micaceous very fine sandy silty CLAY w/relict structures visible (saprolite).	Protective Casing Dia: 4.0 in. Type: Stick-Up Interval: 1.83 ft.		-	
		SS-1	0.5-2.0	7-6-6								
5		SS-2	3.5-5.0	9-14-15	29	12		Light red to pink micaceous very fine sandy SILT w/layering visible (saprolite).	Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 46.3 ft.		- 839	
		SS-3	8.5-10.0	11-12-13	25	10						
10		S-2	10.0-20.0	-				Light red to pink very fine silty SAND w/Mg staining along relict fractures and quartz and biotite crystals (saprolite), crumbly, dry.	Grout Type: Portland Cement Interval: 0.0 - 34.0 ft.		- 834	
		SS-4	13.5-15.0	14-16-20	36	8						
15		SS-5	18.5-19.8	36-28-50/4	100	12	ML	Moderate tan red to moderate reddish brown micaceous clayey sandy SILT w/dark brown and pale yellow orange streaks (saprolite), crumbly, dry.	Seal Type: Bentonite Chips Interval: 34.0 - 40.0 ft.		- 829	
		S-3	20.0-30.0	-								
20		SS-6	23.5-23.75	50/3-	100	3		White silty SAND, mineral rich layer (feldspar/albite). Moderate red to light red micaceous silty fine SAND w/layering and rock fragments (PWR), crumbly, dry.	Filterpack Type: Filter Sand #2 Interval: 40.0 - 71.3 ft.		- 824	
		SS-7	28.5-30.0	16-15-14	29	8						
25									Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 46.3 - 71.3 ft.		- 819	
		SS-8	33.5-33.75	50/3-	100	3						
30		S-4	30.0-40.0	-								- 814

NOTES

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- ST = Shelby Tube Sample
- B = Bulk Sample
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1. ∇ = Water Level At Termination of Boring
2. ▼ = Water Level After 24 Hours



S&ME
 ENVIRONMENTAL SERVICES
 ENGINEERING • TESTING

3118 Spring Forest Road
 Raleigh, NC 27616

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: W. Mize
 DATE DRILLED: 11/26/2002
 DRILLING DEPTH (ft): 71.3

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: Mobile B-57
 TOP OF CASING ELEVATION (ft): 844.17
 WATER LEVEL TOB (ft bgs): 54.17
 WATER LEVEL 24 HRS (ft bTOC): 70.92

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
40 -	R-1	40.8-46.3	-		48	26		Moderate red to light red micaceous silty fine SAND w/granitic rock fragments and layering (PWR). Auger refusal at 40.8 ft. (continued)	Protective Casing Dia: 4.0 in. Type: Stick-Up Interval: 1.83 ft.		- 804	
45 -	R-2	46.3-51.3	-		39	0		Light gray, white, and medium brown micaceous medium to coarse Quartz Gneiss w/mud and rock fragments, high angle fractures. (PWR) -Roller Cone from 51.3 - 53.8 ft-bgs -Split Spoon from 53.8 - 54.0 ft-bgs Run 1 REC = 73% RQD = 26% Run 2 REC = 65% RQD = 0%	Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 46.3 ft. Grout Type: Portland Cement Interval: 0.0 - 34.0 ft.		- 799	
50 -	RC-1	51.3-53.8	-						Seal Type: Bentonite Chips Interval: 34.0 - 40.0 ft.		- 794	
55 -	SS-1 R-3	53.8-54.0 54.0-61.3	50/2.5-- --	100	2.5 54	60		Gray and white micaceous moderately fractured medium to coarse Quartz GNEISS. REC = 63% RQD = 60%	Filterpack Type: Filter Sand #2 Interval: 40.0 - 71.3 ft.		- 789	
60 -	R-4	61.3-71.3	-		78	56		Dark brown, dark gray, and white micaceous very fractured medium to coarse Quartz GNEISS w/high angle at 63.8 ft. REC = 65% RQD = 56%	Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 46.3 - 71.3 ft.		- 784	
65 -											- 779	

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ENVIRONMENTAL SERVICES
 ENGINEERING • TESTING
 3118 Spring Forest Road
 Raleigh, NC 27616

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: W. Mize
 DATE DRILLED: 11/26/2002
 DRILLING DEPTH (ft): 71.3

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: Mobile B-57
 TOP OF CASING ELEVATION (ft): 844.17
 WATER LEVEL TOB (ft bgs): 54.17
 WATER LEVEL 24 HRS (ft bTOC): 70.92

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-									Boring terminated at 71.3 ft.	Protective Casing Dia: 4.0 in. Type: Stick-Up Interval: 1.83 ft.		-
										Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 46.3 ft.		
										Grout Type: Portland Cement Interval: 0.0 - 34.0 ft.		
										Seal Type: Bentonite Chips Interval: 34.0 - 40.0 ft.		
										Filterpack Type: Filter Sand #2 Interval: 40.0 - 71.3 ft.		
										Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 46.3 - 71.3 ft.		

NOTES

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 ENVIRONMENTAL SERVICES
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 3118 Spring Forest Road
 Raleigh, NC 27616

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: J. Drummond
 DATE DRILLED: 11/19/2002
 DRILLING DEPTH (ft): 46

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: CME-45
 TOP OF CASING ELEVATION (ft): 819.96
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	S-1	1.0-10.0	-	-	-	-	-		White and light yellowish brown micaceous SILT and coarse SAND w/rock fragments (saprolite), dry.	Protective Casing Dia: 4.0 in. Type: Stick-Up Interval: 1.83 ft.		815
-	SS-1	1.5-3.0	4-28-45	73	18	-	-					
-	ST-1	3.0-4.3	-	-	-	-	-		Dark brown micaceous SOFT WEATHERED ROCK samples as SILT and fine to coarse SAND, dry. (saprolite)	Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 31.0 ft.		810
-	SS-2	3.5-5.0	32-40-46	86	18	-	-					
5	SS-3	5.5-7.0	8-9-8	17	18	-	-		White, light yellowish brown, dark brown, and medium gray micaceous SILT and fine to coarse SAND, dry. (saprolite)	Grout Type: Portland Cement Interval: 0.0 - 25.0 ft.		805
-	SS-4	8.5-10.0	8-7-10	17	18	-	-					
10	S-2	10.0-20.0	-	-	-	-	-		Light yellowish brown and white micaceous SILT and coarse SAND, dry, crumbly. (saprolite)	Seal Type: Bentonite Chips Interval: 25.0 - 29.0 ft.		800
-	SS-5	13.5-15.0	6-7-9	16	18	-	-					
15	SS-6	18.5-20.0	11-12-12	24	5	-	-		Light brown, medium brown, orange brown, black, and white micaceous SILT and fine to coarse SAND, slightly moist. (saprolite)	Filterpack Type: Filter Sand #2 Interval: 29.0 - 46.0 ft.		795
20	S-3	20.0-30.0	-	-	-	-	-					
-	SS-7	20.5-21.0	6-8-15	23	5	-	-		Medium to dark brown and orange brown micaceous SILT and fine to coarse SAND, slightly moist. (saprolite)	Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 31.0 - 46.0 ft.		790
-	SS-8	28.5-30.0	8-11-12	23	5	-	-					
30	S-4	30.0-40.0	-	-	-	-	-		Medium to dark brown and orange brown micaceous SILT and fine to coarse SAND, slightly moist. (saprolite)	Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 31.0 - 46.0 ft.		790
-	SS-9	33.5-35.0	7-9-12	21	5	-	-					

NOTES

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S&ME

ENVIRONMENTAL SERVICES
 ENGINEERING • TESTING
 3118 Spring Forest Road
 Raleigh, NC 27616

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: J. Drummond
 DATE DRILLED: 11/19/2002
 DRILLING DEPTH (ft): 46

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: CME-45
 TOP OF CASING ELEVATION (ft): 819.96
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC):

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
0 - 38.5	SS-10	38.5-40.0	21-15-16	31	5			Light yellowish brown, medium gray, and white micaceous SILT and fine to coarse SAND w/quartzite rock fragments, slightly moist. (saprolite)	Protective Casing Dia: 4.0 in. Type: Stick-Up Interval: 1.83 ft.		780	
38.5 - 40.0	S-5	40.0-50.0	-					Medium brown, medium gray, orange brown, and white micaceous SILT and fine to coarse SAND, slightly moist. (saprolite)	Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 31.0 ft.		775	
40.0 - 43.5									Grout Type: Portland Cement Interval: 0.0 - 25.0 ft.			
43.5 - 45.0	SS-11	43.5-45.0	12-28-30	58	5			Auger Refusal - Boring terminated at 46.0 ft.	Seal Type: Bentonite Chips Interval: 25.0 - 29.0 ft. Filterpack Type: Filter Sand #2 Interval: 29.0 - 46.0 ft. Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 31.0 - 46.0 ft.			

NOTES

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3118 Spring Forest Road
 Raleigh, NC 27616

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: S. Watts
 DATE DRILLED: 11/26/2002
 DRILLING DEPTH (ft): 43.5

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: Mobile B-57
 TOP OF CASING ELEVATION (ft): 764.24
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC): 33.98

BC-8

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	S-1	0.0-10.0	-	-	-	-	ML	Tan brown slightly micaceous fine sandy clayey SILT w/biotite and hornblende, layering visible, slightly moist. (saprolite)	Protective Casing Dia: 4.0 in. Type: Stick-Up Interval: 1.83 ft.		-	
5	SS-1	3.5-5.0	4-9-11	20	14	-			Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 28 ft.		-759	
10	SS-2	8.5-10.0	6-7-10	17	12	-		Moderate yellow brown to dark yellowish orange slightly micaceous very fine sandy SILT w/Mg staining along high angle fractures in soil, layering visible, slightly moist. Auger refusal at 25.2 ft. (saprolite)	Grout Type: Portland Cement Interval: 0.0 - 22.0 ft.		-754	
10	S-2	10.0-20.0	-	-	-	-			Seal Type: Bentonite Chips Interval: 22.0 - 25.0 ft.		-749	
15	SS-3	13.5-15.0	5-6-7	13	8	-			Filterpack Type: Filter Sand #2 Interval: 25.0 - 43.5 ft.		-744	
20	SS-4	18.5-18.54	50/5-	100	0	-		Tan orange brown PWR at 18.5 ft.	Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 28 - 43 ft.		-739	
25	S-3	20.0-25.0	-	-	-	-					-734	
25	R-1	25.2-29.7	-	-	35	0		Light to medium gray micaceous highly weathered Quartz GNEISS, highly fractured. (PWR) REC = 65% RQD = 0%			-734	
30	R-2	29.7-34.7	-	-	26	0		Light to medium gray micaceous coarse weathered Quartz GNEISS, highly fractured, sandy silt fillings within fractures. (PWR) REC = 42% RQD = 0% Wash boring with tri-cone roller bit 34.7-37.5 ft.			-734	

NOTES

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1. ∇ = Water Level At Termination of Boring
 2. ▼ = Water Level After 24 Hours

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: S. Watts
 DATE DRILLED: 11/26/2002
 DRING DEPTH (ft): 43.5

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: Mobile B-57
 TOP OF CASING ELEVATION (ft): 764.24
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC): 33.98

32-8

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
40	R-3	37.5-43.37	--		22	0		Wash boring with tri-cone roller bit 34.7-37.5 ft. (continued)	Protective Casing Dia: 4.0 in. Type: Stick-Up Interval: 1.83 ft.		- 724	
								Light to medium gray, medium brown micaceous coarse weathered Quartz GNEISS, highly fractured, layers of saprolite. (PWR) REC = 30% RQD = 0%	Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 28 ft.			
								Boring terminated at 43.5 ft.	Grout Type: Portland Cement Interval: 0.0 - 22.0 ft.			
									Seal Type: Bentonite Chips Interval: 22.0 - 25.0 ft.			
									Filterpack Type: Filter Sand #2 Interval: 25.0 - 43.5 ft.			
									Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 28 - 43 ft.			

NOTES

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S&ME
 ENVIRONMENTAL SERVICES
 ENGINEERING - TESTING
 3118 Spring Forest Road
 Raleigh, NC 27616

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1264-02-576**
 LOGGED BY: **S. Watts**
 DATE DRILLED: **11/21/2002**
 DRILLING DEPTH (ft): **28.8**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **4 1/4" H.S.A.**
 DRILL RIG: **Mobile B-57**
 TOP OF CASING ELEVATION (ft): **775.54**
 WATER LEVEL TOB (ft bgs):
 WATER LEVEL 24 HRS (ft bTOC): **21.5**

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	S-1	0.0-10.0	--	100	2		SC-SM	Crush and run GRAVEL (geotextile fabric).	Protective Casing Dia: 8.0 in. Type: Flush Interval:		-	
-	SS-1	0.0-0.4	50/5--				ML					
-								Tan sandy clayey SILT, PWR w/Mg staining along high angle fractures and weathered granite and quartz fragments, relict structures visible, crumbly. Auger refusal at 13.8 ft.	Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 13.8 ft.		-771	
5	SS-2	3.5-3.9	50/5--	100	2							
-								Medium gray, tan, white, black micaceous weathered Quartz GNEISS, highly fractured, sandy silt fillings located within fractures. (PWR) REC = 57% RQD = 0%	Grout Type: Portland Cement Interval: 0.0 - 6.5 ft.		-766	
10	SS-3	8.5-8.9	50/5--	100	2							
-								Gray green, medium brown, white, tan micaceous weathered Quartz GNEISS. Highly fractured, saprolite located at 19.5 ft. (PWR) REC = 88% RQD = 0%	Seal Type: Bentonite Chips Interval: 6.5 - 12.5 ft.		-761	
15	SS-4	13.5-13.54	50/5--	100	0	0						
-	R-1	13.8-18.8	--		34	0		Light to medium gray, dark red, black, white, tan micaceous weathered Quartz GNEISS, moderately fractured. Highly fractured from 26.8 - 28.8 ft. REC = 82% RQD = 22% Fracture at 26.50' : 80	Filterpack Type: Filter Sand #2 Interval: 12.5 - 28.8 ft.		-756	
-	R-2	18.8-23.8	--		53	0						
20								Boring terminated at 28.8 ft.	Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 13.8 - 28.8 ft.		-751	
25	R-3	23.8-28.8	--		49	22						

NOTES

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S&ME
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 3118 Spring Forest Road
 Raleigh, NC 27616

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1264-02-576
 LOGGED BY: J. Zschiedrich
 DATE DRILLED: 11/20/2002
 DRILLING DEPTH (ft): 47.5

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 4 1/4" H.S.A.
 DRILL RIG: Mobile B-57
 TOP OF CASING ELEVATION (ft): 784.07
 WATER LEVEL TOB (ft bgs): 33.77
 WATER LEVEL 24 HRS (ft bTOC): 28.21

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	S-1	1.0-10.0	-					SM	Crush and run gravel	Protective Casing Dia: 4.0 in. Type: Stick-Up Interval: 2.23 ft.	-	-
-	SS-1	1.0-2.5	5-7-10	17	12				Yellow clayey silty SAND w/some trace of gravel, some Mg staining with thin visible layers, slightly moist.			
-	SS-2	3.5-5.0	11-16-24	40	10			MH	Yellow clayey silty SAND w/some trace of gravel, some quartzite and some Mg staining with thin visible layers, slightly moist.	Riser Casing Dia: 2.0 in. Type: Sch 40 PVC Interval: 0.0 - 31.5 ft.	-	-
5	SS-3	6.0-7.5	15-20-23	43	11				Yellow and tan brown sandy clayey SILT w/some quartz fragments and Mg/Fe staining and layers, moist. (saprolite)			
-	SS-4	8.5-10.0	16-23-36	59	9			MH	Dark brown to orange micaceous SILT (mica semischist), moderately soft. (saprolite)	Grout Type: Portland Cement Interval: 0.0 - 26.5 ft.	-	-
10	S-2	10.0-20.0	-						Light brown fine SAND w/quartz and mica fragments, dry. (saprolite)			
-	ST-1	12.0-14.0	-					ML	Tan clayey fine sandy SILT, dry. (saprolite)	Seal Type: Bentonite Chips Interval: 26.5 - 30.5 ft.	-	-
-	SS-5	13.5-15.0	6-7-11	18	13				Red and brown micaceous sandy SILT, slightly moist. (saprolite)			
-	SS-6	18.5-20.0	44-41-37	78	8			ML	Reddish brown and gray Partially Weathered ROCK (Mica Schist), moist. Auger refusal at 38.5 ft.	Filterpack Type: Filter Sand #2 Interval: 30.5 - 47.5 ft.	-	-
20	S-3	20.0-30.0	-						Reddish brown and gray Partially Weathered ROCK (Mica Schist), moist. Auger refusal at 38.5 ft.			
-	SS-7	23.5-25.0	40-34-16	50	14			SC	Reddish brown and gray Partially Weathered ROCK (Mica Schist), moist. Auger refusal at 38.5 ft.	Screen Dia: 2.0 in. Type: Sch 40 PVC Interval: 31.5 - 46.5 ft.	-	-
25	SS-8	28.5-28.6	50/4.4-		2				Reddish brown and gray Partially Weathered ROCK (Mica Schist), moist. Auger refusal at 38.5 ft.			
30	S-4	30.0-38.5	-					SC	Reddish brown and gray Partially Weathered ROCK (Mica Schist), moist. Auger refusal at 38.5 ft.		-	-
-	SS-9	33.5-33.53	50/35-	100	0				Reddish brown and gray Partially Weathered ROCK (Mica Schist), moist. Auger refusal at 38.5 ft.			

NOTES

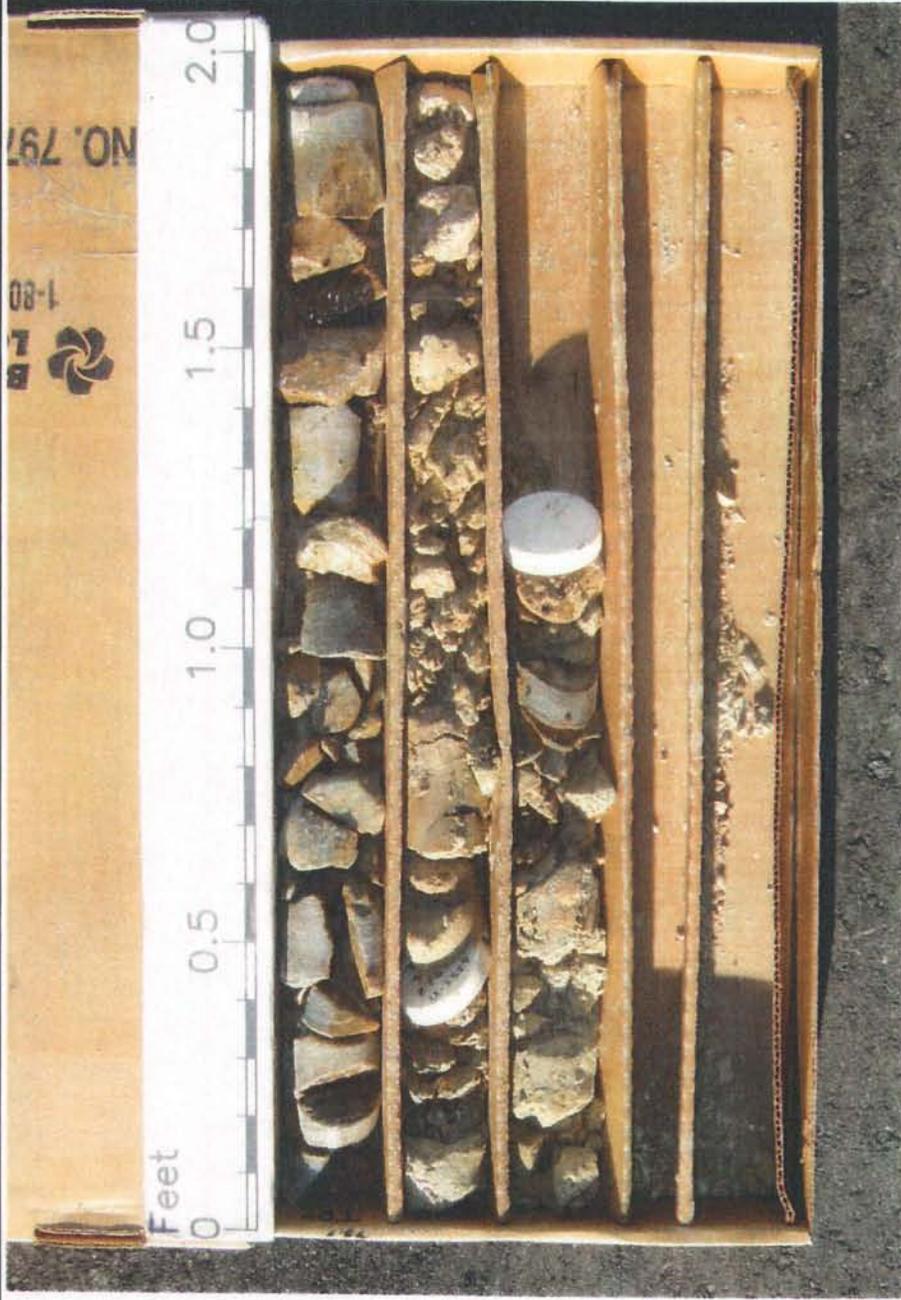
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S&ME
 ENVIRONMENTAL SERVICES
 ENGINEERING • TESTING
 3118 Spring Forest Road
 Raleigh, NC 27616

ROCK CORE PHOTOGRAPHS



Run 1 (38.0 - 43.0')

Recovery: 2.0'

RQD: 0%

Rock Type: Interlayered

Schist and Quartz
PWR

Run 2 (43.0 - 48.0')

Recovery: 2.25'

RQD: 0%

Rock Type: Interlayered

Schist and Quartz
PWR

FGD Scrubber Landfill

Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Boring: BC-3

Sample Depth: 38.0 - 48.0'

Box: 1 of 1



Run 1 (40.8 - 46.3')

Recovery: 4.0'

RQD: 26%

Rock Type: Quartz Gneiss
PWR

Run 2 (46.3 - 51.3')

Recovery: 3.3'

RQD: 0%

Rock Type: Quartz Gneiss
PWR

Tricone Wash Drill (51.3 - 53.8')

Recovery: NA

RQD: NA

Rock Type: Quartz Gneiss
PWR

Splitspoon Sample (53.8 - 54.0')

Recovery: 2.5"

RQD: NA

Rock Type: Quartz Gneiss
PWR

FGD Scrubber Landfill

Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Boring: BC-3A

Sample Depth: 40.8 - 51.3'

Box: 1 of 3

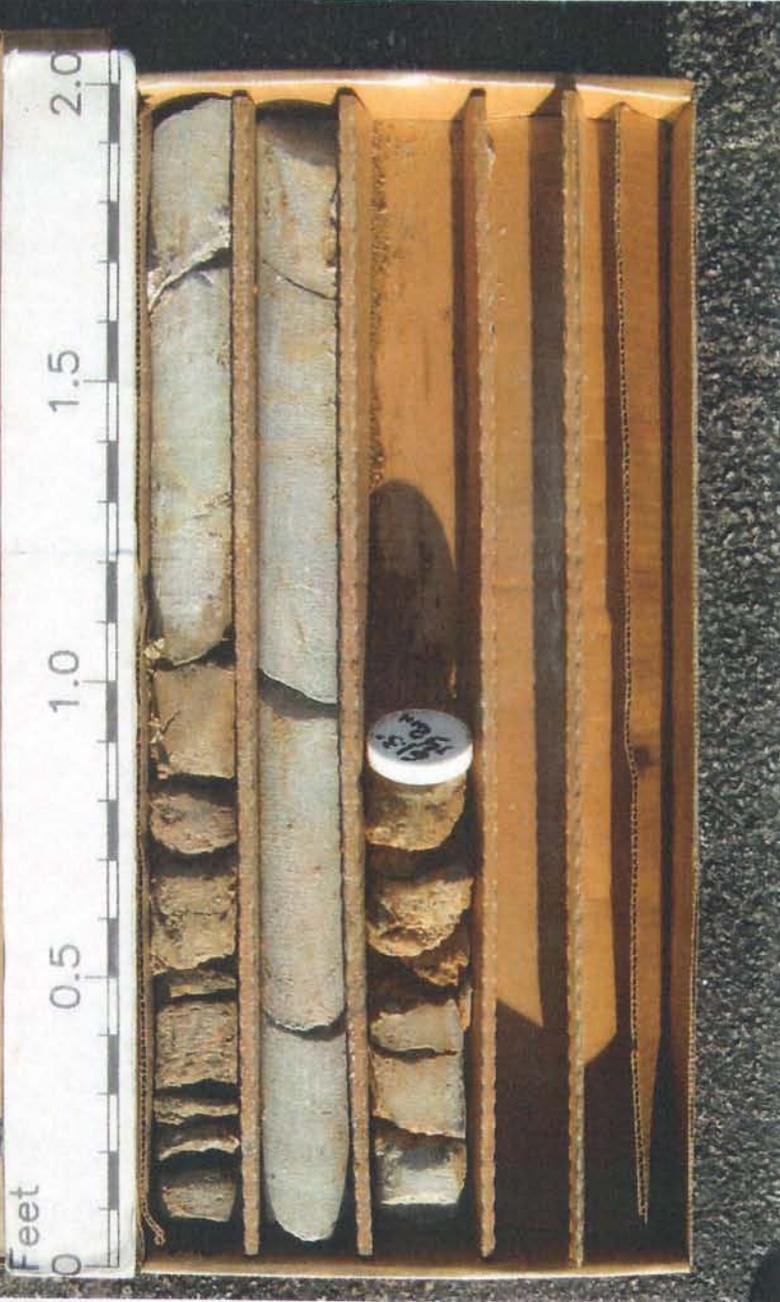
RT
YEAR
8740
NQ TOP

Run 3 (54.0 - 61.3')

Recovery: 4.5'

RQD: 60%

Rock Type: Quartz Gneiss
PWR



FGD Scrubber Landfill

Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Boring:

BC-3A

Sample Depth:

54.0 - 61.3'

Box:

2 of 3



Run 4 (61.3 - 71.3')

Recovery: 6.5'

RQD: 56%

Rock Type: Quartz Gneiss

FGD Scrubber Landfill
Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Boring: BC-3A
Sample Depth: 61.3 - 71.3'
Box: 3 of 3



Run 1 (25.2 - 29.7')

Recovery: 2.9'

RQD: 0%

Rock Type: Quartz Gneiss
PWR

Run 2 (29.7 - 34.7')

Recovery: 2.1'

RQD: 0%

Rock Type: Quartz Gneiss
PWR

Tricone Wash Drill (34.7 - 37.5')

Recovery: NA

RQD: NA

Rock Type: Quartz Gneiss
PWR

Run 3 (37.5 - 43.5')

Recovery: 1.8'

RQD: 0%

Rock Type: Quartz Gneiss
PWR

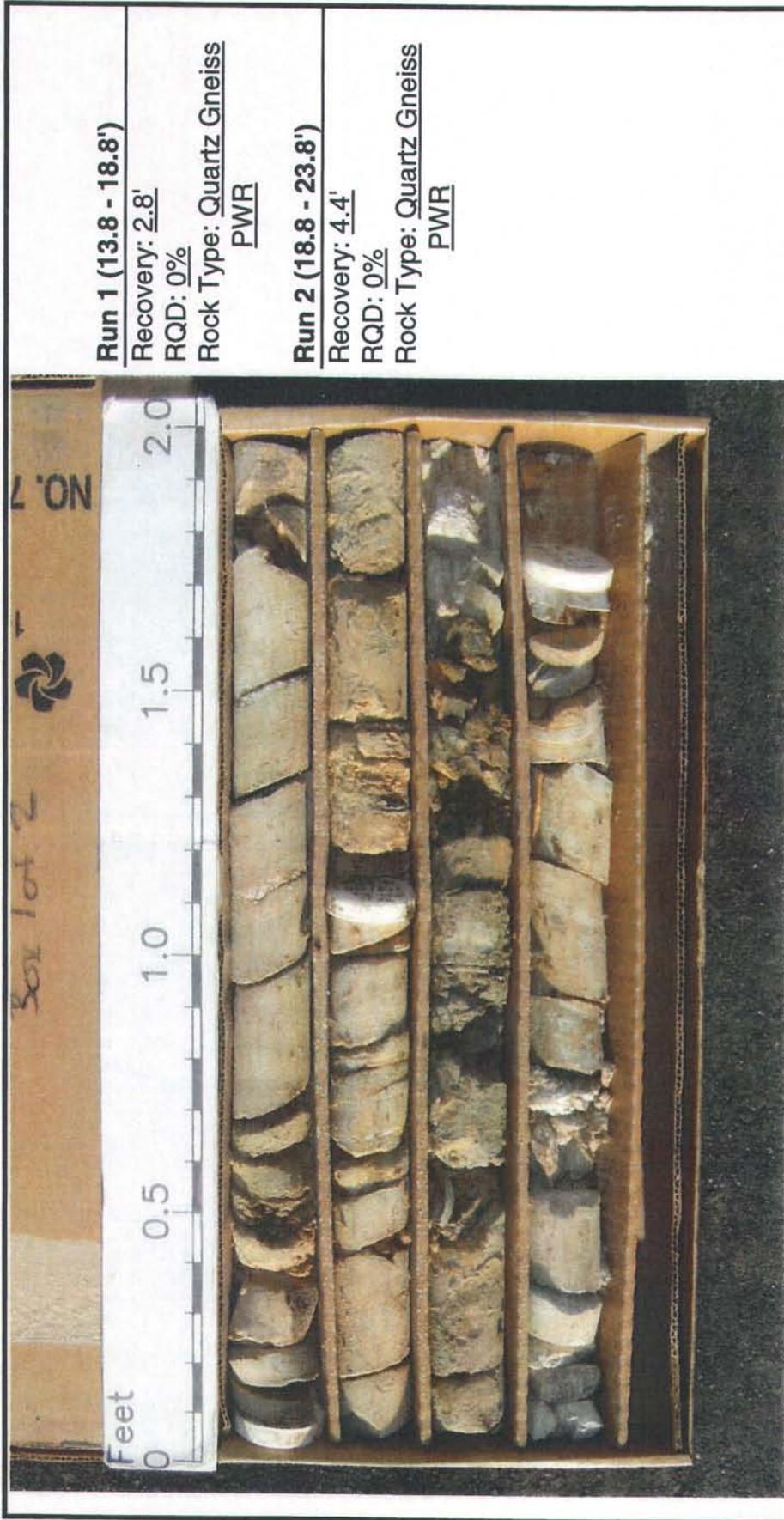
FGD Scrubber Landfill

Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Boring: BC-8

Sample Depth: 25.2 - 43.5'

Box: 1 of 1



Run 1 (13.8 - 18.8')

Recovery: 2.8'

RQD: 0%

Rock Type: Quartz Gneiss
PWR

Run 2 (18.8 - 23.8')

Recovery: 4.4'

RQD: 0%

Rock Type: Quartz Gneiss
PWR

FGD Scrubber Landfill

Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Boring: BC-9

Sample Depth: 13.8 - 23.8'

Box: 1 of 2

RT
YEAR
8740
NQ TO



Run 3 (23.8 - 28.8')

Recovery: 4.1'

RQD: 22%

Rock Type: Quartz Gneiss
PWR

FGD Scrubber Landfill

Duke Power - Belews Creek Steam Station

Belews Creek, Stokes County, North Carolina

S&ME Project No. 1054-04-955

Boring: BC-9

Sample Depth: 23.8 - 28.8'

Box: 2 of 2



Run 1 (38.5 - 47.5')

Recovery: 8.6'

RQD: 34%

Rock Type: Mica Schist

FGD Scrubber Landfill

Duke Power - Belews Creek Steam Station

Belews Creek, Stokes County, North Carolina

S&ME Project No. 1054-04-955

Boring:

BC-10

Sample Depth:

38.5 - 47.5'

Box:

1 of 1

TABLES

ESTIMATED SEASONAL LOW GROUNDWATER ELEVATIONS

**MONITORING WELL GROUNDWATER DEPTHS AND
ELEVATIONS (BC-15 AND BC-20)**

Table 1
Estimated Seasonal Low Groundwater Elevations
Belews Creek Scrubber Residue Landfill
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Monitor Well	Ground Surface	Groundwater Elevation (10/27/2004)	Estimated Seasonal Low Groundwater Elevation
BC-1	758.10	746.41	740.30
BC-2	764.74	748.93	747.20
BC-4	811.99	760.67	755.67
BC-6	800.74	762.47	755.58
BC-7	775.86	736.41	733.71
BC-8	762.41	734.11	727.87
BC-9	775.54	756.66	750.65
BC-10	781.84	757.48	750.48
BC-11	785.15	750.32	742.87
BC-12	802.91	755.02	745.50
BC-14	757.23	743.98	736.98
BC-15	760.53	736.40	729.40
BC-16	833.77	762.47	755.47
BC-17	823.66	766.95	759.95
BC-18	780.97	757.63	751.63
BC-19	813.09	775.81	768.81
BC-20	754.58	743.23	741.73
BC-21	753.42	746.07	744.57
BC-22	762.58	761.19	756.69
BC-23A	862.56	782.43	776.43

Notes:
 Monitor wells BC-3A, BC-5, and BC-13 were dry on 10/27/04.

Table 2
Monitoring Well Groundwater Depths and Elevations
Proposed FGD Scrubber Residue Landfill
Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Well ID	Ground Surface Elevation (ft AMSL)	TOC Elevation (ft AMSL)	Screened Interval (ft bgs)	10/6/2004 Static Water (ft AMSL)	10/27/2004 Static Water (ft AMSL)	12/16/2004 Static Water (ft AMSL)	1/26/2005 Static Water (ft AMSL)	2/17/2005 Static Water (ft AMSL)	3/28/2005 Static Water (ft AMSL)	4/11/2005 Static Water (ft AMSL)	5/25/2005 Static Water (ft AMSL)	6/21/2005 Static Water (ft AMSL)	6/26/2005 Static Water (ft AMSL)	8/18/2005 Static Water (ft AMSL)	11/15/2005 Static Water (ft AMSL)
BC-15	760.53	762.26	28.4 - 43.4	736.55	736.40	736.78	736.88	736.93	737.44	737.44	737.21	737.04	736.98	737.04	736.73
BC-20	754.58	757.22	11.6 - 21.6	744.43	743.23	745.84	745.42	745.86	747.28	747.37	745.54	745.24	744.24	744.48	742.25

Notes:

TOC = top of casing

ft AMSL = feet above mean sea level

ft bTOC = feet below top of casing

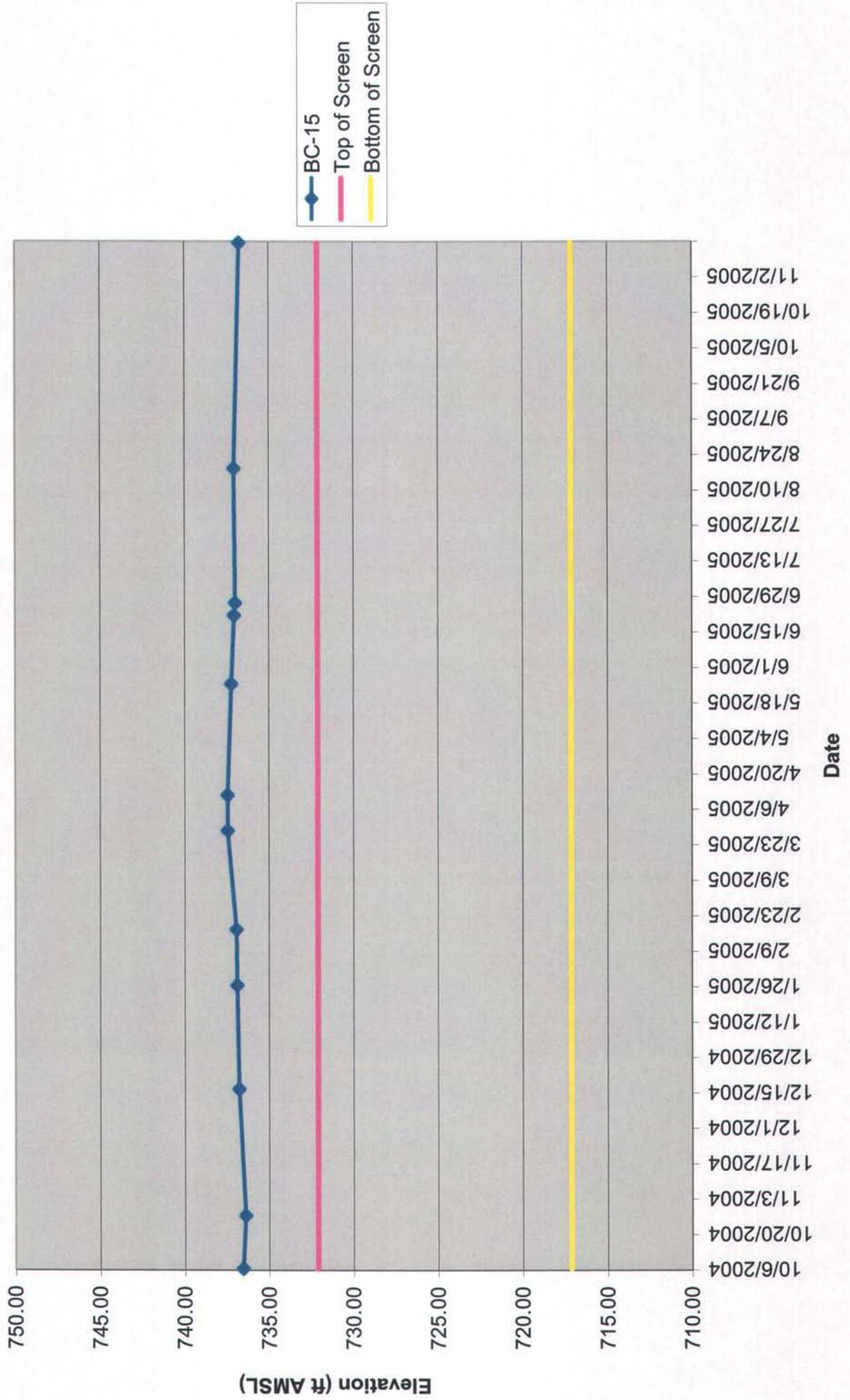
TOC (top of casing) and ground surface elevations from the survey relative to mean sea level, provided by Duke Energy.

GRAPHS

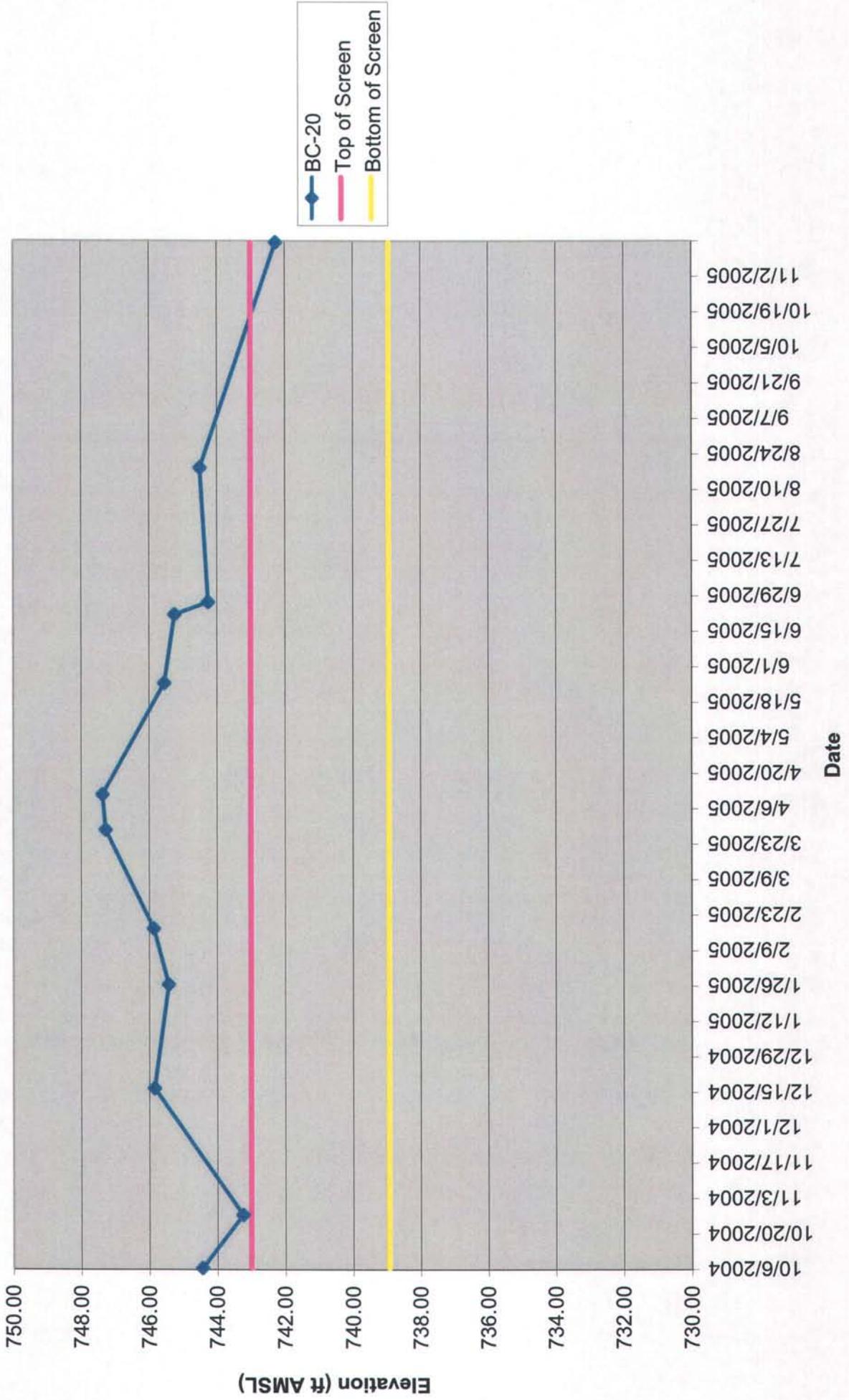
BC-15 STATIC WATER LEVELS

BC-20 STATIC WATER LEVELS

BC-15 Static Water Levels
Belews Creek FGD Scrubber Landfill
S&ME Project 1054-04-955



**BC-20 Static Water Levels
Belews Creek FGD Scrubber Landfill
S&ME Project 1054-04-955**



REVISED FIGURES (Under Seperate
Cover)

ADDENDUM 2
GEOLOGIC AND HYDROLOGIC SITING REPORT
FGD SCRUBBER RESIDUE DISPOSAL SITE
BELEWS CREEK STEAM STATION
3195 PINE HALL ROAD
BELEWS CREEK, NORTH CAROLINA
S&ME Project 1054-04-955

Carmen Johnson
Doc ID#
85-05 5/11/12
Fac/Prj

Prepared For:

**Duke Power**SM
A Duke Energy Company
526 South Church Street
Charlotte, North Carolina 28202

Prepared By:

**S&ME**

3118 Spring Forest Road
Raleigh, North Carolina 27616

April 17, 2006



Samuel P. Watts

Samuel P. Watts, P.G.
Project Geologist
NC Licensed Geologist No. 1806

Senior Reviewed by: Ernest F. Parker, P.E., P.G., Senior Consultant



APPROVED
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION
DATE 6/29/2006 BY TAG
PERMIT # 85-05
PTC ATTACH 1, DOC # 11
RALEIGH CENTRAL FILE
COPY



Duke Energy Corporation
526 South Church St.
Charlotte, NC 28202

Mailing Address:
PO Box 1006
Charlotte, NC 28201-1006

June 22, 2006

NC Department of Environment and Natural Resources
Division of Waste Management
585 Waughtown Street
Winston-Salem, NC 27107

Attention: Mr. Tim Jewett
Permitting Engineer, Solid Waste Section

Subject: Belews Creek Steam Station - FGD Landfill
Submittal of Supplemental Site Suitability Documents



Dear Mr. Jewett:

As requested in your June 16, 2006 e-mail, Duke Energy is herein submitting two (2) copies of the following documents and correspondence in support of the site suitability determination for the proposed Belews Creek Flue Gas Desulfurization (FGD) landfill.

- Preconstruction Notification (PCN) application and additional information in support of the proposed wetlands activities at the project site. We have also provided copies of the August 11, 2005 cover letters submitting the PCN application to the US Army Corps of Engineers and DENR - Division of Water Quality.
- An e-mail response dated June 2, 2006 from the US Army Corps of Engineers documenting their approval of the project effective September 26, 2005.
- The September 28, 2005 response from the DENR – Division of Water Quality granting approval of the 401 Water Quality Certification.
- The May 13, 2005 response from the US Fish and Wildlife Service on the Biological Investigation conducted at the project site.
- Copy of the deed for the FGD landfill project site (for future recording purposes).

If you require any additional documentation or have any additional questions or concerns, please feel free to contact me at (704) 382-7161

Sincerely,

Patrick J. McCabe, PE
Manager - Environmental Field Support

cc: Ed Mussler, DENR (w/ 1 copy)
Brian Wootton, DENR (w/ 1 copy)

**Preconstruction Notification Application
and Supplemental Information**

August 11, 2005 Cover Letter to the US Army Corps of Engineers

**August 11, 2005 Cover Letter to DENR –
Division of Water Quality**

Office Use Only:

Form Version March 05

USACE Action ID No. _____

DWQ No. _____

(If any particular item is not applicable to this project, please enter "Not Applicable" or "N/A".)

I. Processing

1. Check all of the approval(s) requested for this project:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Section 404 Permit | <input type="checkbox"/> Riparian or Watershed Buffer Rules |
| <input type="checkbox"/> Section 10 Permit | <input checked="" type="checkbox"/> Isolated Wetland Permit from DWQ |
| <input checked="" type="checkbox"/> 401 Water Quality Certification | <input type="checkbox"/> Express 401 Water Quality Certification |

2. Nationwide, Regional or General Permit Number(s) Requested: NWP 39

3. If this notification is solely a courtesy copy because written approval for the 401 Certification is not required, check here:

4. If payment into the North Carolina Ecosystem Enhancement Program (NCEEP) is proposed for mitigation of impacts, attach the acceptance letter from NCEEP, complete section VIII, and check here: X, if required

5. If your project is located in any of North Carolina's twenty coastal counties (listed on page 4), and the project is within a North Carolina Division of Coastal Management Area of Environmental Concern (see the top of page 2 for further details), check here:

II. Applicant Information

1. Owner/Applicant Information

Name: Ron Lewis

Mailing Address: Duke Energy Corporation

Mailcode 13K, P.O. Box 1006

Charlotte, NC 28201-1006

Telephone Number: (980) 373-5710

Fax Number: 704-382-6240

E-mail Address: relewis1@duke-energy.com

2. Agent/Consultant Information (A signed and dated copy of the Agent Authorization letter must be attached if the Agent has signatory authority for the owner/applicant.)

Name: _____

Company Affiliation: _____

Mailing Address: _____

Telephone Number: _____

Fax Number: _____

E-mail Address: _____

III. Project Information

Attach a **vicinity map** clearly showing the location of the property with respect to local landmarks such as towns, rivers, and roads. Also provide a detailed **site plan** showing property boundaries and development plans in relation to surrounding properties. Both the vicinity map and site plan must include a scale and north arrow. The specific footprints of all buildings, impervious surfaces, or other facilities must be included. If possible, the maps and plans should include the appropriate USGS Topographic Quad Map and NRCS Soil Survey with the property boundaries outlined. Plan drawings, or other maps may be included at the applicant's discretion, so long as the property is clearly defined. For administrative and distribution purposes, the USACE requires information to be submitted on sheets no larger than 11 by 17-inch format; however, DWQ may accept paperwork of any size. DWQ prefers full-size construction drawings rather than a sequential sheet version of the full-size plans. If full-size plans are reduced to a small scale such that the final version is illegible, the applicant will be informed that the project has been placed on hold until decipherable maps are provided.

1. Name of project: Belews Creek Steam Station Flue Gas Desulfurization System
2. T.I.P. Project Number or State Project Number (NCDOT Only): _____
3. Property Identification Number (Tax PIN): Tax Parcel Number 6982-00-64-2716
4. Location
County: Stokes Nearest Town: Walnut Cove
Subdivision name (include phase/lot number): _____
Directions to site (include road numbers/names, landmarks, etc.): I-40 Business through Winston-Salem; Hwy. 158-N to Belews Creek Rd; left (NE) on Belews Creek Rd. to Hwy 65; left (NW) on Hwy 65 to Pine Hall Road; right (NE) on Pine Hall Rd. to Belews Creek Steam Station entrance.
5. Site coordinates (For linear projects, such as a road or utility line, attach a sheet that separately lists the coordinates for each crossing of a distinct waterbody.)
Decimal Degrees (6 digits minimum): 036° 16' 41.8" °N 080° 03' 29.3" °W
6. Property size (acres): 500+ acres
7. Name of nearest receiving body of water: Belews Lake
8. River Basin: Dan River
(Note – this must be one of North Carolina's seventeen designated major river basins. The River Basin map is available at [http://h2o.enr.state.nc.us/admin/maps/.](http://h2o.enr.state.nc.us/admin/maps/))
9. Describe the existing conditions on the site and general land use in the vicinity of the project at the time of this application: The site is used for the production of electricity, using coal.

Areas not used to support energy facilities are generally managed forests adjacent to a cooling reservoir.

10. Describe the overall project in detail, including the type of equipment to be used: A Flue Gas Desulfurization System must be installed at Belews Creek Steam Station to comply with the new Clean Smokestacks Legislation. This involves construction of structures to inject limestone into new emission stacks, and landfilling the byproduct gypsum. A new rail line is required to deliver and off-load limestone to the facility.

11. Explain the purpose of the proposed work: Enhance emissions from the facility to meet the new Clean Smokestacks Legislation in NC

IV. Prior Project History

If jurisdictional determinations and/or permits have been requested and/or obtained for this project (including all prior phases of the same subdivision) in the past, please explain. Include the USACE Action ID Number, DWQ Project Number, application date, and date permits and certifications were issued or withdrawn. Provide photocopies of previously issued permits, certifications or other useful information. Describe previously approved wetland, stream and buffer impacts, along with associated mitigation (where applicable). If this is a NCDOT project, list and describe permits issued for prior segments of the same T.I.P. project, along with construction schedules. Belews Creek Steam Station and supporting facilities were constructed in late 1960's-early 1970's. A cooling reservoir and an ash basin were constructed in Belews Creek basin associated with the plant. Facilities were constructed prior to the Clean Water Act. No known 404 permits have been obtained for existing facilities, except for one associated with rerouting the ash basin discharge from Belews Lake to the Dan River, associated with selenium toxicity in Belews Lake

V. Future Project Plans

Are any future permit requests anticipated for this project? If so, describe the anticipated work, and provide justification for the exclusion of this work from the current application.

No

VI. Proposed Impacts to Waters of the United States/Waters of the State

It is the applicant's (or agent's) responsibility to determine, delineate and map all impacts to wetlands, open water, and stream channels associated with the project. Each impact must be listed separately in the tables below (e.g., culvert installation should be listed separately from riprap dissipater pads). Be sure to indicate if an impact is temporary. All proposed impacts, permanent and temporary, must be listed, and must be labeled and clearly identifiable on an accompanying site plan. All wetlands and waters, and all streams (intermittent and perennial) should be shown on a delineation map, whether or not impacts are proposed to these systems. Wetland and stream evaluation and delineation forms should be included as appropriate. Photographs may be included at the applicant's discretion. If this proposed impact is strictly for

wetland or stream mitigation, list and describe the impact in Section VIII below. If additional space is needed for listing or description, please attach a separate sheet.

1. Provide a written description of the proposed impacts: Impacts are associated with construction of a railroad spur to provide limestone to a flue gas desulfurization system to enhance air quality emissions from Belews Creek Steam Station to meet the Clean Smokestacks Legislation in NC. Also, stockpiling and landfilling of the waste product (gypsum) is necessary.
2. Individually list wetland impacts. Types of impacts include, but are not limited to mechanized clearing, grading, fill, excavation, flooding, ditching/drainage, etc. For dams, separately list impacts due to both structure and flooding.

Wetland Impact Site Number (indicate on map)	Type of Impact	Type of Wetland (e.g., forested, marsh, herbaceous, bog, etc.)	Located within 100-year Floodplain (yes/no)	Distance to Nearest Stream (linear feet)	Area of Impact (acres)
Isolated Pond #2	None	Pond/Past Sediment Basin	No	Fed by Channel #2	0.06
Isolated #3	None	Manmade ditch-Herbaceous	No	Isolated	0.02
Isolated #4	Toe of Landfill	Manmade-Blocked Manmade Drainage; Herbaceous	No	Isolated	0.07
Jurisdictional #5	None	Blocked drainage associated with electric R/W-Herbaceous	No	At head of Unimportant Aquatic Function Channel #5	0.33
Isolated #6	Railroad Line	Blocked Drainage in Pine Plantation-Forested	No	Isolated	0.08
Jurisdictional #7	None	Blocked channel-Forested	No	Instream of Unimportant Aquatic Function #7	0.14
Isolated #8	Sediment Basin	Blocked drainage in Electric R/W-Scrub-shrub	No	Isolated	0.09
Jurisdictional #11	None	Backwater of Belews Lake-Scrub-shrub	Unknown	Connected to Belews Lake	0.05
Total Wetland Impact (acres)					Isolated= 0.24

3. List the total acreage (estimated) of all existing wetlands on the property: 1.19acres
4. Individually list all intermittent and perennial stream impacts. Be sure to identify temporary impacts. Stream impacts include, but are not limited to placement of fill or culverts, dam construction, flooding, relocation, stabilization activities (e.g., cement walls, rip-rap, crib walls, gabions, etc.), excavation, ditching/straightening, etc. If stream relocation is proposed,

plans and profiles showing the linear footprint for both the original and relocated streams must be included. To calculate acreage, multiply length X width, then divide by 43,560.

Stream Impact Number* (indicate on map)	Stream Name	Type of Impact	Perennial or Intermittent?	Average Stream Width Before Impact	Impact Length (linear feet)	Area of Impact (acres)
UAFC #2	Unnamed	None	Intermittent	0.5	0	0
UAFC #5	Unnamed	None	Intermittent	1.5	0	0
UAFC #5A	Unnamed	Railroad Line	Intermittent	1	44	0.001
Perennial #5B	Unnamed	Railroad Line	Perennial	2.5	114	0.007
UAFC #6	Unnamed	Sediment Basin for Landfill	Intermittent	2	300	0.01
UAFC #7	Unnamed	none	Intermittent	1.5	0	0
UAFC #8	Unnamed	Sediment Basin for Stockpile	Intermittent	1.5	73	0.003
UAFC #9	Unnamed	Sediment Basin for Stockpile	Intermittent	1.5	192	0.007
Total Stream Impact (by length and acreage)					UAFC- 609 ft Perennial- 114 ft	0.028 acres

*UAFC-Unimportant Aquatic Function Channel

5. Individually list all open water impacts (including lakes, ponds, estuaries, sounds, Atlantic Ocean and any other water of the U.S.). Open water impacts include, but are not limited to fill, excavation, dredging, flooding, drainage, bulkheads, etc.

Open Water Impact Site Number (indicate on map)	Name of Waterbody (if applicable)	Type of Impact	Type of Waterbody (lake, pond, estuary, sound, bay, ocean, etc.)	Area of Impact (acres)
None				
Total Open Water Impact (acres)				0

6. List the cumulative impact to all Waters of the U.S. resulting from the project:

Stream Impact (acres):	0.03
Wetland Impact (acres):	0.24
Open Water Impact (acres):	0
Total Impact to Waters of the U.S. (acres)	0.27
Total Stream Impact, Unimportant Aquatic Function	609
Total Stream Impact, Perennial (linear feet):	114

7. Isolated Waters

Do any isolated waters exist on the property? Yes No

Describe all impacts to isolated waters, and include the type of water (wetland or stream) and the size of the proposed impact (acres or linear feet). Please note that this section only applies to waters that have specifically been determined to be isolated by the USACE.

Identified in 4 above. Use of Isolated Wetlands #4 (landfill 0.07 ac.), #6 (rail line 0.08 ac.), and #8 (sediment basin 0.09 ac.).

8. Pond Creation

If construction of a pond is proposed, associated wetland and stream impacts should be included above in the wetland and stream impact sections. Also, the proposed pond should be described here and illustrated on any maps included with this application.

Pond to be created in (check all that apply): uplands stream wetlands
Describe the method of construction (e.g., dam/embankment, excavation, installation of draw-down valve or spillway, etc.): _____

Proposed use or purpose of pond (e.g., livestock watering, irrigation, aesthetic, trout pond, local stormwater requirement, etc.): _____

Current land use in the vicinity of the pond: _____

Size of watershed draining to pond: _____ Expected pond surface area: _____

VII. Impact Justification (Avoidance and Minimization)

Specifically describe measures taken to avoid the proposed impacts. It may be useful to provide information related to site constraints such as topography, building ordinances, accessibility, and financial viability of the project. The applicant may attach drawings of alternative, lower-impact site layouts, and explain why these design options were not feasible. Also discuss how impacts were minimized once the desired site plan was developed. If applicable, discuss construction techniques to be followed during construction to reduce impacts. Feasible areas for facility expansion for the flue gas desulfurization system for the Belews Creek Steam Station were investigated for protected species, waters and wetlands (see Figure 1), then construction planning for proposed new stacks, stockpile areas, a railroad spur, and landfills began in conjunction with the biological inventory. Critical constraints were 1) having stacks proximal to the existing plant, 2) having a rail spur of sufficient length to deliver limestone to the site, and 3) having sufficient landfill and stockpile capabilities for waste gypsum. The flue gas desulfurization will require large amounts of landfill and stockpile capabilities over the life of the facility. Use of ravines and headwater drains minimize total land disturbances because of their increased storage capabilities. Those ravines and headwater drains closest to the facility greatly reduce hauling costs. All practical options were considered to avoid impacts to wetland and channels. All wetlands on the site were man-induced and the result of blocked drainages from roads or rerouting of water around past construction yards that were initially developed during construction of the facility in the late 1960's and early 1970's, and periodically reused; they are therefore near past construction sites. Duke was able to avoid impacts to several wetlands (#3, #5, #8, major portion of #8, and #11) and a pond (#2), but the proximity of wetlands to existing construction yards and the plant, made it difficult to avoid impacts to all wetlands.

VIII. Mitigation

DWQ - In accordance with 15A NCAC 2H .0500, mitigation may be required by the NC Division of Water Quality for projects involving greater than or equal to one acre of impacts to freshwater wetlands or greater than or equal to 150 linear feet of total impacts to perennial streams.

USACE – In accordance with the Final Notice of Issuance and Modification of Nationwide Permits, published in the Federal Register on January 15, 2002, mitigation will be required when necessary to ensure that adverse effects to the aquatic environment are minimal. Factors including size and type of proposed impact and function and relative value of the impacted aquatic resource will be considered in determining acceptability of appropriate and practicable mitigation as proposed. Examples of mitigation that may be appropriate and practicable include, but are not limited to: reducing the size of the project; establishing and maintaining wetland and/or upland vegetated buffers to protect open waters such as streams; and replacing losses of aquatic resource functions and values by creating, restoring, enhancing, or preserving similar functions and values, preferable in the same watershed.

If mitigation is required for this project, a copy of the mitigation plan must be attached in order for USACE or DWQ to consider the application complete for processing. Any application lacking a required mitigation plan or NCEEP concurrence shall be placed on hold as incomplete. An applicant may also choose to review the current guidelines for stream restoration in DWQ's Draft Technical Guide for Stream Work in North Carolina, available at <http://h2o.enr.state.nc.us/ncwetlands/strmgide.html>.

1. Provide a brief description of the proposed mitigation plan. The description should provide as much information as possible, including, but not limited to: site location (attach directions and/or map, if offsite), affected stream and river basin, type and amount (acreage/linear feet) of mitigation proposed (restoration, enhancement, creation, or preservation), a plan view, preservation mechanism (e.g., deed restrictions, conservation easement, etc.), and a description of the current site conditions and proposed method of construction. Please attach a separate sheet if more space is needed.

No mitigation is proposed as mitigation planning has reduced perennial stream impacts to 114 feet and wetland impacts to 0.28 acres of isolated wetlands, below the threshold required for mitigation. No perennial or unimportant aquatic function intermittent channels contain a diverse macroinvertebrate community and none contain fish. Wetlands on the site are the result of past rerouting of water around construction yards, to sediment basins, or the result of blocked drainages from past excavation or access road development. Substantial cuts and fills occurred on site during initial construction. Should it be determined that mitigation is proposed for the proposed actions, Duke would choose to use the NC Ecosystem Enhancement Program to satisfy its mitigation requirement.

2. Mitigation may also be made by payment into the North Carolina Ecosystem Enhancement Program (NCEEP). Please note it is the applicant's responsibility to contact the NCEEP at (919) 715-0476 to determine availability, and written approval from the NCEEP indicating that they are will to accept payment for the mitigation must be attached to this form. For

additional information regarding the application process for the NCEEP, check the NCEEP website at <http://h2o.enr.state.nc.us/wrp/index.htm>. If use of the NCEEP is proposed, please check the appropriate box on page five and provide the following information:

Amount of stream mitigation requested (linear feet): _____
 Amount of buffer mitigation requested (square feet): _____
 Amount of Riparian wetland mitigation requested (acres): _____
 Amount of Non-riparian wetland mitigation requested (acres): _____
 Amount of Coastal wetland mitigation requested (acres): _____

IX. Environmental Documentation (required by DWQ)

1. Does the project involve an expenditure of public (federal/state/local) funds or the use of public (federal/state) land? Yes No
2. If yes, does the project require preparation of an environmental document pursuant to the requirements of the National or North Carolina Environmental Policy Act (NEPA/SEPA)?
 Note: If you are not sure whether a NEPA/SEPA document is required, call the SEPA coordinator at (919) 733-5083 to review current thresholds for environmental documentation.
 Yes No
3. If yes, has the document review been finalized by the State Clearinghouse? If so, please attach a copy of the NEPA or SEPA final approval letter. Yes No

X. Proposed Impacts on Riparian and Watershed Buffers (required by DWQ)

It is the applicant's (or agent's) responsibility to determine, delineate and map all impacts to required state and local buffers associated with the project. The applicant must also provide justification for these impacts in Section VII above. All proposed impacts must be listed herein, and must be clearly identifiable on the accompanying site plan. All buffers must be shown on a map, whether or not impacts are proposed to the buffers. Correspondence from the DWQ Regional Office may be included as appropriate. Photographs may also be included at the applicant's discretion.

1. Will the project impact protected riparian buffers identified within 15A NCAC 2B .0233 (Neuse), 15A NCAC 2B .0259 (Tar-Pamlico), 15A NCAC 02B .0243 (Catawba) 15A NCAC 2B .0250 (Randleman Rules and Water Supply Buffer Requirements), or other (please identify _____)? Yes No
2. If "yes", identify the square feet and acreage of impact to each zone of the riparian buffers. If buffer mitigation is required calculate the required amount of mitigation by applying the buffer multipliers.

Zone*	Impact (square feet)	Multiplier	Required Mitigation
1		3 (2 for Catawba)	

2		1.5	
Total			

* Zone 1 extends out 30 feet perpendicular from the top of the near bank of channel; Zone 2 extends an additional 20 feet from the edge of Zone 1.

3. If buffer mitigation is required, please discuss what type of mitigation is proposed (i.e., Donation of Property, Riparian Buffer Restoration / Enhancement, or Payment into the Riparian Buffer Restoration Fund). Please attach all appropriate information as identified within 15A NCAC 2B .0242 or .0244, or .0260. _____

XI. Stormwater (required by DWQ)

Describe impervious acreage (existing and proposed) versus total acreage on the site. Discuss stormwater controls proposed in order to protect surface waters and wetlands downstream from the property. If percent impervious surface exceeds 20%, please provide calculations demonstrating total proposed impervious level. Other than buildings, no impervious additions proposed

XII. Sewage Disposal (required by DWQ)

Clearly detail the ultimate treatment methods and disposition (non-discharge or discharge) of wastewater generated from the proposed project, or available capacity of the subject facility. Modification of the existing treatment system NPDES permit NC0024406 has been approved for the additional FGD effluent and wastestreams

XIII. Violations (required by DWQ)

Is this site in violation of DWQ Wetland Rules (15A NCAC 2H .0500) or any Buffer Rules?
 Yes No X

Is this an after-the-fact permit application? Yes No X

XIV. Cumulative Impacts (required by DWQ)

Will this project (based on past and reasonably anticipated future impacts) result in additional development, which could impact nearby downstream water quality? Yes No X
 If yes, please submit a qualitative or quantitative cumulative impact analysis in accordance with the most recent North Carolina Division of Water Quality policy posted on our website at <http://h2o.enr.state.nc.us/ncwetlands>. If no, please provide a short narrative description: Project is required to meet clean air legislation by enhancing air emission from the electric generating facility, which should have no impact on additional development.

XV. Other Circumstances (Optional):

It is the applicant's responsibility to submit the application sufficiently in advance of desired construction dates to allow processing time for these permits. However, an applicant may choose to list constraints associated with construction or sequencing that may impose limits on work schedules (e.g., draw-down schedules for lakes, dates associated with Endangered and Threatened Species, accessibility problems, or other issues outside of the applicant's control).

Site contains no endangered or threatened species with written concurrence from the US Fish and Wildlife Service; there are no outstanding issues with then National Historic Preservation Act supported by written concurrence from NC Department of Cultural Resources.

Original signed by Ron Lewis

August 11, 2005

Applicant/Agent's Signature

Date

(Agent's signature is valid only if an authorization letter from the applicant is provided.)

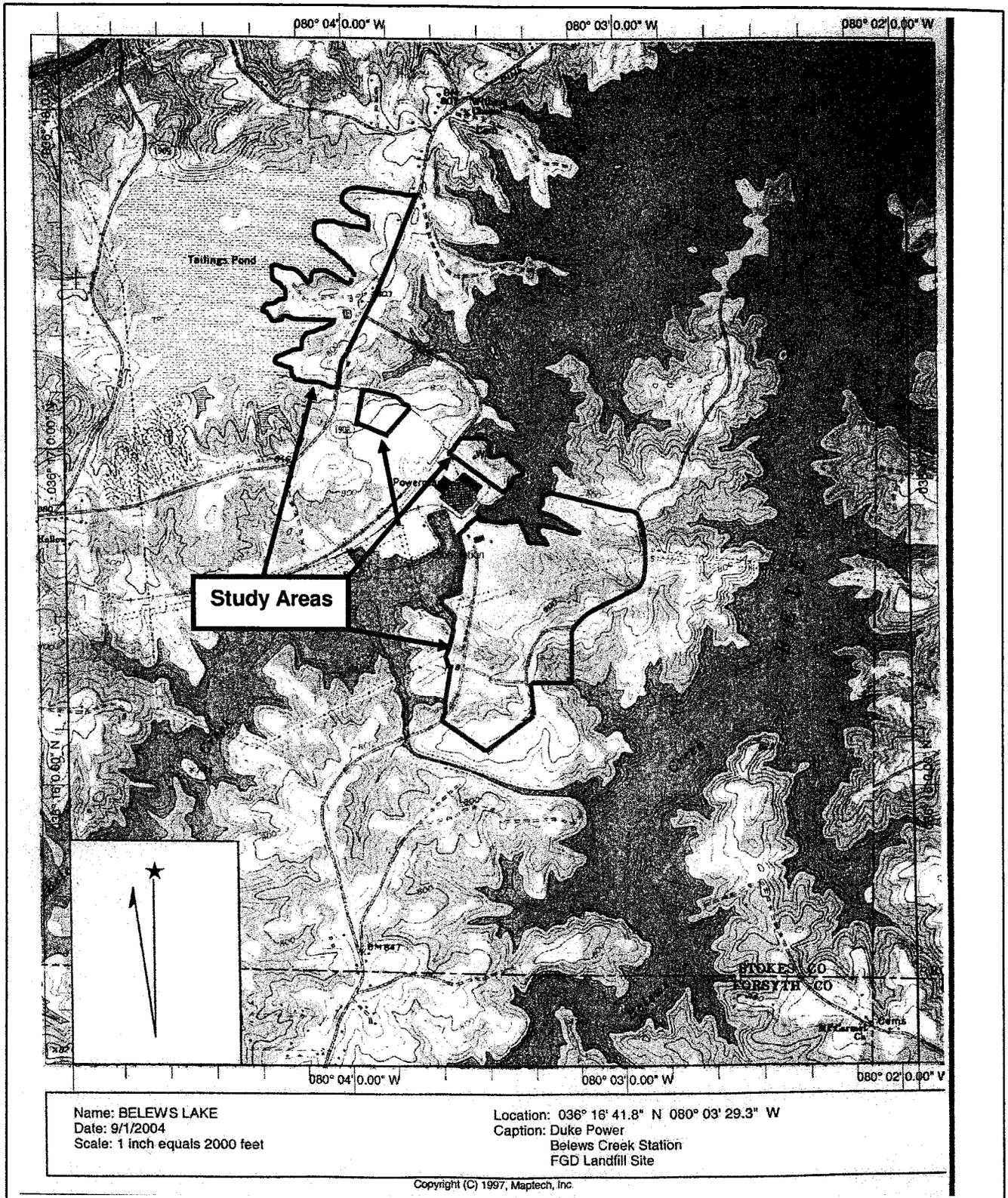


Figure 1. Portion of the Belews Lake USGS 7.5 minute map, showing the approximate boundary of the study area for facility expansions associated with the installation of a Flue Gas Desulfurization System at Belews Creek Steam Station in Stokes County, NC.

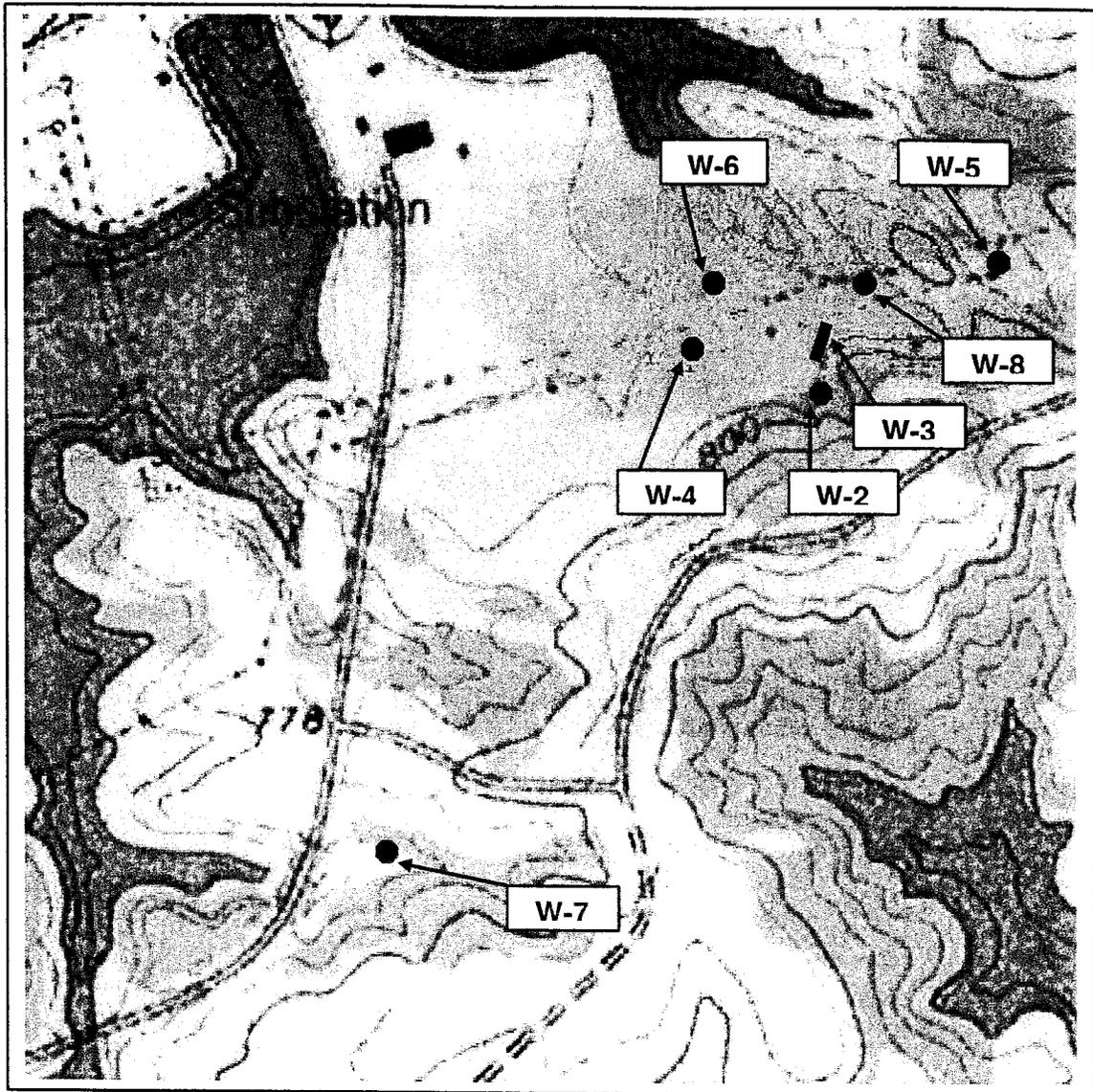


Figure 2. Approximate locations of wetlands in the study area for facility expansion associated with the installation of a Flue Gas Desulfurization System at Belews Creek Steam Station found to be under the jurisdiction of USACE or NCDENR. Wetlands labeled in red are under the USACE jurisdiction and those labeled in green are isolated and under NCDENR jurisdiction.

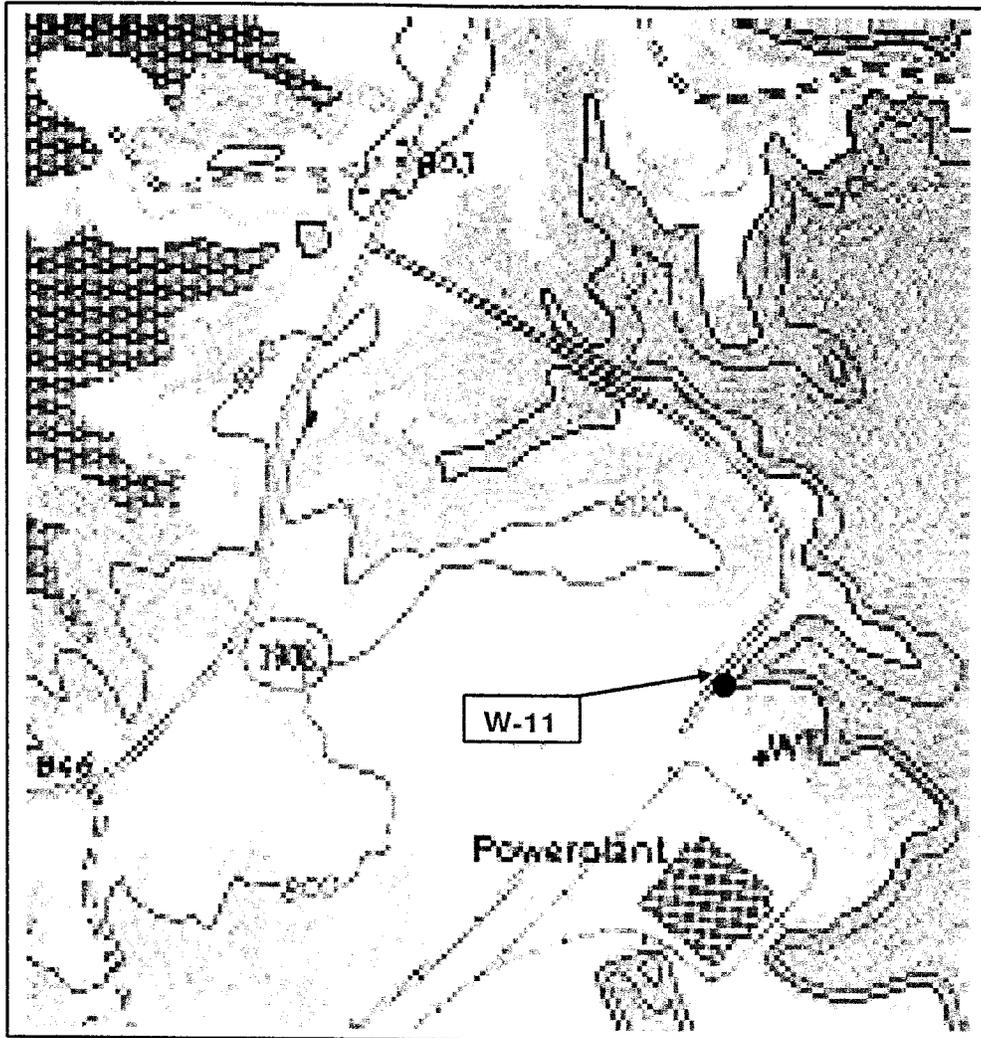


Figure 3. An additional wetland (USACE jurisdiction) in the study area for facility expansion associated with the installation of a Flue Gas Desulfurization System at Belevs Creek Steam Station found to be under the jurisdiction of USACE.

Table 1. Summary characteristics of areas investigated for jurisdictional wetlands.

Plot Number	Associated Water	Vegetation	Soils	Hydrology	Jurisdictional Wetland	Jurisdiction/ Size
W-2	Ditch-Diversion / Unimportant Channel S-2	No	Yes	Yes	Isolated Surface Water Pond and Past Sediment Basin	NC DENR 0.06 ac.
W-3	Ditch-Diversion	Yes	Yes	Yes	Isolated Wetland and former diversion ditch	NC DENR 0.02 ac.
W-4	Ditch-Diversion/Blocked Drainage	Yes	Yes	Yes	Isolated Wetland formed from rerouting an old access road	NC DENR 0.28 ac.
W-5	Upland drainage	Yes	Yes	Yes	Yes, formed from grading associated with old access road	USACE 0.33 ac.
W-6	Ditch-Diversion/Blocked Drainage	Yes	Yes	Yes	Isolated Wetland formed from past use as a sediment basin	NC DENR 0.08 ac
W-7	Unimportant Channel S-7	Yes	Yes	Yes	Yes formed from extensive up-channel erosion	USACE 0.14
W-8	Ephemeral Channel	Yes	Yes	Yes	Isolated Wetland formed from grading associated an old access road	NC DENR 0.09 ac.
W-11	Stormwater Drain to Lake/ Belews Lake	Yes	Yes	Yes	Yes	USACE 0.05 ac.

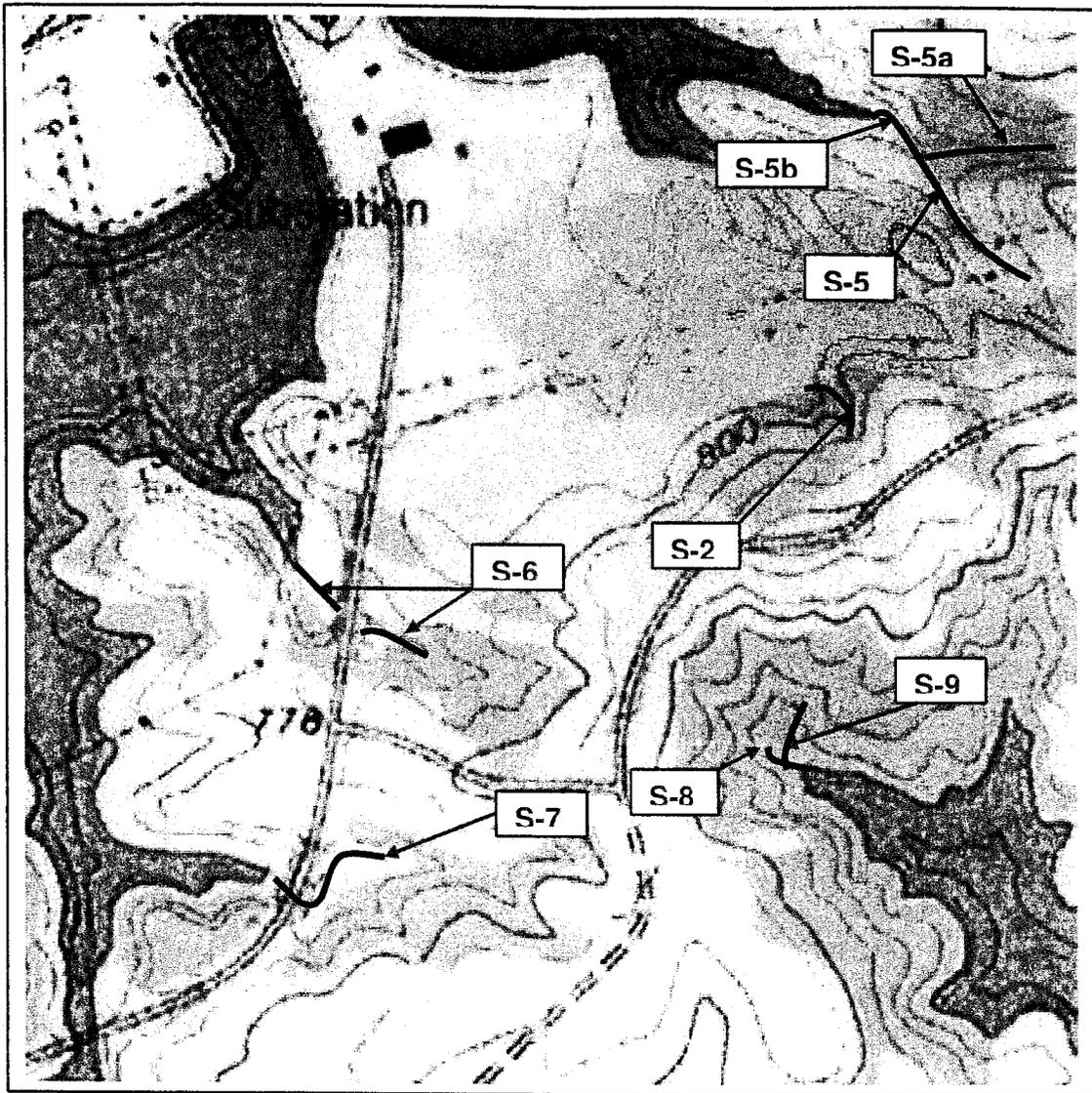


Figure 4. Approximate locations of channels investigated in the study area for facility expansion associated with the installation of a Flue Gas Desulfurization System at Belews Creek Steam Station. Channels labeled in red have unimportant aquatic function; channel 5B is perennial.

Table 2. Summary characteristics of channels investigated for jurisdictional status.

Waters	Status	Jurisdictional Distance
S-2	Unimportant Aquatic Function Channel	62 feet
S-5	Unimportant Aquatic Function Channel	662 feet
S-5a	Unimportant Aquatic Function Channel	375 feet
S-5b	Perennial Channel	150 feet
S-6 Above Rd.	Unimportant Aquatic Function Channel	300 feet
S-6 Below Rd.	Unimportant Aquatic Function Channel	187 feet
S-7	Unimportant Aquatic Function Channel	409 feet
S-8	Unimportant Aquatic Function Channel	73 feet
S-9	Unimportant Aquatic Function Channel	192 feet

August 11, 2005

Mr. Eric Alsmeyer
Raleigh Regulatory Field Office
US Army Corps Of Engineers
6508 Falls of the Neuse Road
Suite 120
Raleigh, NC 27615

Subject: Belews Creek Steam Station
404 Permitting for Flue Gas Desulfurization

Dear Mr. Alsmeyer:

Thank you for your assistance with delineation of the wetland areas associated with the construction of a Flue Gas Desulfurization System at Belews Creek Steam Station in Stokes County, NC. Based on review of the surveyed areas, the proposed activities will require filling of 0.24 acres of isolated wetlands, 609 feet of unimportant aquatic function channels, and disturbing 114 feet of perennial channel for culvert installation. Attached is a Preconstruction Notification and supporting information for proposed activities. Pending your approval and certification of delineated wetlands, Duke Power proposes to do this work under Nationwide Permit 39. No mitigation is proposed for this work.

Your review and response within the next 30 days is requested, as construction activities are on-going to meet the air emission control target dates. If you have any questions or need additional information, please contact me at (980) 373-5710.

Sincerely,

Original signed by Ron Lewis

Ron Lewis
Scientist, Environmental Support



"Brown, Thomas L SAW"
<Thomas.L.Brown@saw02.us
ace.army.mil>

06/02/2006 02:54 PM

To <relewis1@duke-energy.com>

cc

bcc

Subject Duke Power, Belews Creek Steam Station, 200521427

Mr. Ron Lewis:

Due to workload and staffing constraints, we were unable to provide timely formal written verification for impacts proposed in your preconstruction notification application (PCN) received in our office on August 12, 2005. General Condition number 13, which lists the notification requirements for nationwide permits, states that "the prospective permittee shall not begin the activity unless 45 days have passed from the District Engineer's receipt of the complete notification and the prospective permittee has not received written notice from the District or Division Engineer." Accordingly, on September 26, 2005 Duke Power was authorized to conduct the work associated with the construction of a Flue Gas Desulfurization System at Belews Creek Stream Station, in Stokes County, NC, under nationwide permit number(s) 39, as proposed in the permit application. I have attached a copy of the applicable permit conditions. The expiration date for the permit authorization is March 18, 2007.

Please note that your work is authorized by the above referenced permit provided it is accomplished in strict accordance with the permit conditions and your submitted plans. Any violation of the conditions or deviation from your submitted plans may subject the permittee to a stop work order, a restoration order and/or appropriate legal action.

Also note that your work is authorized until the NWP is modified, reissued, or revoked. All of the existing NWPs are scheduled to be modified, reissued, or revoked prior to March 18, 2007. It is incumbent upon you to remain informed of changes to the NWPs. We will issue a public notice when the NWPs are reissued. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant nationwide permit is modified or revoked, you will have twelve (12) months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this nationwide permit. If, prior to the expiration date identified below, the nationwide permit authorization is reissued and/or modified, this verification will remain valid until the expiration date identified below, provided it complies with all new and/or modified terms and conditions. The District Engineer may, at any time, exercise his discretionary authority to modify, suspend, or revoke a case specific activity's authorization under any NWP.

Please let me know if you have any questions regarding this verification, or any of the conditions of the permit. To request a formal authorization with a signature, please reply to this e-mail or call Thomas Brown at telephone (919) 876-8441, ext 22.

Thank you,

Eric Alsmeyer
Project Manager

*US Army Corps of Engineers
Raleigh Regulatory Field Office
Tel: (919) 876-8441, ext 23
Fax: (919) 876-5823*



nw39v1.pdf

**September 28, 2005 Response from DENR –
Division of Water Quality**



Michael F. Easley, Governor
 William G. Ross Jr., Secretary
 North Carolina Department of Environment and Natural Resources
 Alan W. Klimck, P.E. Director
 Division of Water Quality

September 8, 2005
 DWQ# 05-1549
 Stokes County

Mr. Ron Lewis
 Duke Energy Corporation
 Mail Code 13K, P. O. Box 1006
 Charlotte, NC 28201-1006

APPROVAL of 401 Water Quality Certification with Additional Conditions

Dear Mr. Lewis:

Duke Energy Corporation has our approval, in accordance with the attached conditions, to place permanent fill in 114 linear feet of perennial stream and in 609 linear feet of intermittent stream in order to construct a railroad spur line to provide limestone to a flue gas desulfurization system at the Belews Creek Steam Station, located on Pine Hall Road near Walnut Cove in Stokes County, as described in your application received by the Division of Water Quality (DWQ) on August 30, 2005. After reviewing your application, we have determined that this fill is covered by General Water Quality Certification Number 3402, which can be viewed on our web site at <http://h2o.enr.state.nc.us/ncwetlands>. This Certification allows you to use Nationwide Permit Number 39 when it is issued by the U.S. Army Corps of Engineers. In addition, you should secure any other applicable federal, state or local permits before you proceed with your project, including (but not limited to) those required by Sediment and Erosion Control, Non-Discharge, and Water Supply Watershed regulations.

This approval is only valid for the purpose and design that you described in your application. If you change your project, you must notify us in writing and you may be required to send us a new application for a new certification. If the property is sold, the new owner must be given a copy of the Permit and approval letter and is thereby responsible for complying with all conditions. If total wetland fills for this project (now or in the future) exceed one acre, compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h). **For this approval to be valid, you must follow the conditions listed in the attached certification, as well as the additional conditions listed below:**

1. The following impacts are hereby approved as long as all other specific and general conditions of this Certification are met. No other impacts, including incidental impacts, are approved:

	Amount Approved	Plan Location or Reference
Streams	723 linear feet	Streams as depicted on the "Wetland Survey for Belews Creek Steam Station" (Sheets 1 & 2) and on Figure 4 of the application attachment titled "Supporting Information"



North Carolina Division of Water Quality
 Wetlands Certification Unit
 Customer Service Number: 1-877-623-6748
 1650 Mail Service Center
 2321 Crabtree Blvd.
 Raleigh, NC 27699-1650
 Raleigh, NC 27604-2260
 Phone (919) 733-1786 FAX (919) 733-2496
 Internet <http://h2o.enr.state.nc.us/ncwetlands>

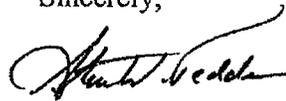
2. Appropriate sediment and erosion control measures which equal or exceed those outlined in the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual* or the *North Carolina Surface Mining Manual* (available from the Division of Land Resources at NCDENR regional offices or the central office), whichever is more appropriate, shall be designed, installed and maintained properly to assure compliance at all times with the North Carolina water quality standards that are applicable to Class C, waters as described in *15A NCAC 02B .0211 Fresh Surface Water Quality Standards For Class C Waters*. Such measures must equal or exceed the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*. These measures must be maintained on all construction sites, borrow sites, and waste pile (spoil) sites, including contractor owned and leased borrow pits, which are associated with this project.
3. Sediment and erosion control measures shall not be placed in wetlands or waters to the maximum extent practicable. If placement of sediment and erosion control measures in wetlands or waters is unavoidable, they shall be removed and the natural grade restored within six months of the date that the project is completed or, if applicable, within six months of the date that the project is released by the North Carolina Division of Land Resources.
4. No waste, spoil, solids, or fill of any kind shall occur in wetlands, waters, or riparian areas beyond the footprint of the impacts depicted in the Pre-Construction Notification. All construction activities, including the design, installation, operation, and maintenance of sediment and erosion control "Best Management Practices" shall be performed so that no violations of state water quality standards, statutes, or rules occur.
5. Where riprap is required for energy dissipation and scour protection, it shall be limited to the minimum dimensions specified by appropriate engineering calculations. Riprap may only be used below the normal high water level. The original grade and elevation of the stream's cross-section must be maintained. Riprap placed in the stream bottom must be inserted into the bottom matrix to a depth sufficient to provide the thickness of riprap required for scour protection. The elevation of the stream bottom must not be increased by the placement of riprap. Placement of riprap must not result in destabilization of the streambed or banks upstream or downstream.
6. Energy dissipation and sheet flow must be provided for all discharges of stormwater before such discharges reach stream channels or wetlands.
7. All construction activities associated with this project shall minimize built-upon surface area, direct stormwater runoff away from surface waters, and incorporate best management practices to minimize water quality impacts. If concrete is used with any fill material, it shall not be allowed to come in contact with surface waters until it has cured. If any stormwater must be collected for discharge into a stream channel, it shall not enter the stream as a point source, but shall be slowed and discharged as sheet flow prior to entering the riparian buffer on either side of the stream.
8. Upon completion of the project, the Applicant shall complete and return the enclosed "Certificate of Completion" form to notify NCDWQ when all work included in the §401 Certification has been finished. This certificate should be sent to the 401/Wetlands Unit of the NC Division of Water Quality at the address listed on the form. *Along with the Certificate of Completion form, please send photographs upstream and downstream of each culvert site to document correct installation.*

Mr. Ron Lewis
Page 3, DWQ# 1549
September 8, 2005

If you do not accept any of the conditions of this certification, you may ask for an adjudicatory hearing. You must act within 60 days of the date that you receive this letter. To ask for a hearing, send a written petition which conforms to Chapter 150B of the North Carolina General Statutes to the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, N.C. 27699-6714. This certification and its conditions are final and binding unless you ask for a hearing.

This letter completes the review of the Division of Water Quality under Section 401 of the Clean Water Act. If you have any questions, please telephone Daryl Lamb in the DWQ Winston-Salem Regional Office at 336-771-4600 or Cyndi Karoly in the Central Office in Raleigh 919-733-9721.

Sincerely,



Alan W. Klimek, P.E.



AWK/cdl

Attachments

cc: Eric Alsmeyer, U. S. Army Corps of Engineers, Raleigh Regulatory Field Office
Winston-Salem DWQ Regional Office
Central Files
Wetlands/401 File Copy
Robert Siler, Environmental Resources of the Carolinas, 7550 Forest Oak Drive, Denver, NC 28037-8224

Certificate of Completion

DWQ Project No.: _____

County: _____

Applicant: _____

Project Name: _____

Date of Issuance of 401 Water Quality Certification: _____

Upon completion of all work approved within the 401 Water Quality Certification and Buffer Rules, and any subsequent modifications, the applicant is required to return this certificate to the 401/Wetlands Unit, North Carolina Division of Water Quality, 1621 Mail Service Center, Raleigh, NC, 27699-1621. This form may be returned to DWQ by the applicant, the applicant's authorized agent, or the project engineer. It is not necessary to send certificates from all of these.

Applicant's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____

Date: _____

Agent's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____

Date: _____

If this project was designed by a Certified Professional

I, _____, as a duly registered Professional _____ (i.e., Engineer, Landscape Architect, Surveyor, etc.) in the State of North Carolina, having been authorized to observe (periodically, weekly, full time) the construction of the project, for the Permittee hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____

Registration No.: _____

Date: _____

WQC #3402

**GENERAL CERTIFICATION FOR PROJECTS ELIGIBLE
FOR CORPS OF ENGINEERS NATIONWIDE PERMIT NUMBERS 18 (MINOR DISCHARGES),
39 (RESIDENTIAL, COMMERCIAL AND INSTITUTIONAL DEVELOPMENTS),
41 (RESHAPING EXISTING DRAINAGE DITCHES), 42 (RECREATIONAL FACILITIES),
43 (STORMWATER MANAGEMENT FACILITIES) AND 44 (MINING ACTIVITIES),
AND RIPARIAN AREA PROTECTION RULES (BUFFER RULES)**

This General Certification is issued in conformity with the requirements of Section 401, Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality (DWQ) Regulations in 15A NCAC 2H, Section .0500 and 15A NCAC 2B .0200 for the discharge of fill material to waters and adjacent wetland areas or to wetland areas that are not a part of the surface tributary system to interstate waters or navigable waters of the United States (i.e., isolated wetlands) as described in 33 CFR 330 Appendix A (B) (18, 39, 41, 42, 43 and 44) of the Corps of Engineers regulations (i.e., Nationwide Permit No. 39) and for the Riparian Area Protection Rules (Buffer Rules) in 15A NCAC 2B .0200. This Certification replaces Water Quality Certification Numbers 3106 and 3108 issued on February 11, 1997, and Water Quality Certification Number 3287 issued on June 1, 2000 and Water Quality Certification Number 3362 issued March 18, 2002. This WQC is rescinded when the Corps of Engineers re-authorizes Nationwide Permits 18, 39, 41, 42, 43 or 44 or when deemed appropriate by the Director of DWQ.

The State of North Carolina certifies that the specified category of activity will not violate applicable portions of Sections 301, 302, 303, 306 and 307 of the Public Laws 92-500 and 95-217 if conducted in accordance with the conditions hereinafter set forth.

Conditions of Certification:

1. Enumerating and Reporting of Impacts:

- Streams - Impacts to streams as determined by the Division of Water Quality shall be measured as length of the centerline of the normal flow channel. Permanent and/or temporary stream impacts shall be enumerated on the entire project for all impacts regardless of which 404 Nationwide Permits are used. Stream relocations and stream bed and/or bank hardening are considered to be permanent stream impacts. Any activity that results in a loss of use of stream functions including but not limited to filling, relocating, flooding, excavation, dredging and complete shading shall be considered stream impacts. Enumeration of impacts to streams shall include streams enclosed by bottomless culverts, bottomless arches or other spanning structures when a 404 Permit is used anywhere in a project unless the entire structure (including construction impacts) spans the entire bed and both banks of the stream, is only used for a road, driveway or path crossing, and is not mitered to follow the stream pattern. Impacts for dam footprints and flooding will count toward the threshold for stream impacts, but flooding upstream of the dam will not (as long as no filling, excavation, relocation or other modification of the existing stream dimension, pattern or profile occurs) count towards mitigation requirements. Any filling, excavation, relocation or other modification of the existing stream (other than flooding) must re-establish the same dimensions, patterns and profiles of the existing channel (or those of a stable reference reach if the existing channel is unstable) to the maximum extent practical.
- Wetlands - Impacts to wetlands as determined by the Division of Water Quality shall be measured as area. Permanent and/or temporary wetland impacts shall be enumerated on the entire project for all impacts regardless of which 404 Nationwide Permits are used. Any activity that results in a loss of use of wetland functions including but not limited to filling, excavating, draining, and flooding shall be considered wetland impacts. Enumeration of impacts to wetlands shall include activities that change the hydrology of a wetland when a 404 Permit is used anywhere in a project.

WQC #3402

- Lakes and Ponds – Impacts to waters other than streams and wetlands as determined by the Division of Water Quality shall be measured as area. Permanent and/or temporary water impacts shall be enumerated on the entire project for all impacts proposed regardless of which 404 Nationwide Permits are used. Any activity that results in a loss of use of aquatic functions including but not limited to filling and dredging shall be considered waters impacts.

Application Thresholds - Stream, wetland and water impacts that exceed any of the thresholds below require a complete application and written concurrence to use this Certification:

- Total stream impacts of greater or equal to 150 cumulative feet of stream length for the entire project require written notification to and approval by the Division of Water Quality, and/or
 - Impacts to waters of equal to or greater than 1/3 of an acre require written notification to and approval by the Division of Water Quality, and/or
 - Wetland impacts of greater or equal to 1/3 of an acre east of I-95 and 1/10 of an acre west of I-95 require written notification to and approval by the Division of Water Quality except as specified below. Any impacts to wetlands adjacent to waters designated as ORW, SA, WS-I, WS-II or Trout or are designated as a North Carolina or National Wild and Scenic River and wetlands classified as SWL and/or UWL as well as wetlands described in 15A NCAC 2H .0506 (e) require a complete application and written concurrence from the Division of Water Quality to use this Certification. These thresholds apply for the entire project regardless of the number of Nationwide Permits applicable to the Certification that are issued by the USACE for the project;
 - Written notification to DWQ is required for all applications that propose to use Nationwide Permit 18. This notification requirement will be satisfied by providing two (2) copies of the PCN form to DWQ at the same time that the PCN form is sent to the US Army Corps of Engineers. A formal application and fee is not required unless DWQ decides that an Individual Certification will be required for the project. In this case, the applicant will be notified in writing from DWQ within 30 days of the receipt of the written notification.
 - Proposed fill or substantial modification of any amount of wetlands classified in accordance with 15A NCAC 2B .0101(e)(7) as Unique Wetlands (UWL) shall require written concurrence from the Division of Water Quality;
2. Impacts to any stream length in the Neuse, Tar-Pamlico or Randleman River Basins (or any other major river basins with Riparian Area Protection Rules [Buffer Rules] in effect at the time of application) requires written concurrence for this Certification from DWQ in accordance with 15A NCAC 2B.0200. Activities listed as "exempt" from these rules do not need to apply for written concurrence under this Certification. New development activities located in the protected 50-foot wide riparian areas (whether jurisdictional wetlands or not) within the Neuse and Tar-Pamlico River Basins shall be limited to "uses" identified within and constructed in accordance with 15A NCAC 2B .0200. All new development shall be located, designed, constructed, and maintained to have minimal disturbance to protect water quality to the maximum extent practicable through the use of best management practices;
 3. Irrespective of other application thresholds in this General Certification, all impacts to perennial waters and their associated buffers require written approval from DWQ since such impacts are allowable as provided in 15A NCAC 2B. 0212 (WS-I), 2B .0213 (WS-II), 2B .0214 (WS-III) and 2B .0215 (WS-IV). Only water dependent activities, public projects and structures with diminimus increases in impervious surfaces will be allowed as outlined in those rules. All other activities require a variance from the delegated local government and/or the NC Environmental Management Commission before the 401 Water Quality Certification can be processed. In addition, a 30 foot wide vegetative buffer for low density development or a 100 foot wide vegetative buffer for high density development

WQC #3402

must be maintained adjacent to all perennial waters except for allowances as provided under the Water Supply Watershed Protection Rules. For the purposes of this condition, perennial waters are defined as those shown as perennial waters on the most recent USGS 1:24,000 topographic map or as otherwise determined by local government studies;

4. Additional site-specific stormwater management requirements may be added to this Certification at DWQ's discretion on a case by case basis for projects that have or are anticipated to have impervious cover of greater than 30 percent. Site-specific stormwater management shall be designed to remove 85% TSS according to the latest version of DWQ's Stormwater Best Management Practices manual at a minimum.

Additionally, in watersheds within one mile and draining to 303(d) listed waters, as well as watersheds that are classified as nutrient sensitive waters (NSW), water supply waters (WS), trout waters (Tr), high quality waters (HQW), and outstanding resource waters (ORW), the Division shall require that extended detention wetlands, bio-retention areas, and ponds followed by forested filter strips (designed according to latest version of the NC DENR Stormwater Best Management Practices Manual) be constructed as part of the stormwater management plan when a site-specific stormwater management plan is required.

For streams classified as Water Supply, High Quality Waters and Outstanding Resource Waters, post-construction, on-site stormwater management shall be required as appropriate and as outlined in 15A NCAC 2B .0104(m) and 2H .1000 to .1007, respectively, in addition to that required in this General Certification.

Alternative designs may be requested by the applicant and will be reviewed on a case-by-case basis by the Division of Water Quality.

Approval of stormwater management plans by the Division of Water Quality's other existing state stormwater programs including appropriate local programs are sufficient to satisfy this Condition as long as the stormwater management plans meet or exceed the design requirements specified in this condition. This condition applies unless more stringent requirements are in effect from other state water quality programs.

- Unless specified otherwise in the approval letter, the final, written stormwater management plan shall be approved in writing by the Division of Water Quality's Wetlands Unit before the impacts specified in this Certification occur.
 - The facilities must be designed to treat the runoff from the entire project, unless otherwise explicitly approved by the Division of Water Quality.
 - Also, before any permanent building or other structure is occupied at the subject site, the facilities (as approved by the Wetlands Unit) shall be constructed and operational, and the stormwater management plan (as approved by the Wetlands Unit) shall be implemented.
 - The structural stormwater practices as approved by the Wetlands Unit as well as drainage patterns must be maintained in perpetuity.
 - No changes to the structural stormwater practices shall be made without written authorization from the Division of Water Quality.
5. Compensatory stream mitigation shall be required at a 1:1 ratio for not only perennial but also intermittent stream impacts that require application to DWQ in watersheds classified as ORW, HQW, Tr, WS-I and WS-II unless the project is a linear, publicly-funded transportation project, which has a 150-foot per-stream impact allowance;
 6. In accordance with North Carolina General Statute Section 143-215.3D(e), any application for a 401 Water Quality Certification must include the appropriate fee. If a

WQC #3402

project also requires a CAMA Permit, one payment to both agencies shall be submitted and will be the higher of the two fees;

7. In accordance with 15A NCAC 2H .0506 (h) compensatory mitigation may be required for impacts to 150 linear feet or more of streams and/or one acre or more of wetlands for an entire project. For linear public transportation projects, impacts equal to or exceeding 150 feet per stream may require mitigation. In addition, buffer mitigation may be required for any project with Riparian Area Protection Rules (Buffer Rules) in effect at the time of application for buffer impacts resulting from activities classified as "allowable with mitigation" within the "Table of Uses" section of the Buffer Rules or require a variance under the Buffer Rules. A determination of buffer, wetland and stream mitigation requirements shall be made for any Certification for this Nationwide Permit. The most current design and monitoring protocols from DWQ shall be followed and written plans submitted for DWQ approval as required in those protocols. When compensatory mitigation is required for a project, the mitigation plans must be approved by DWQ in writing before the impacts approved by the Certification occur, unless otherwise specified in the approval letter. The mitigation plan must be implemented and/or constructed before any permanent building or structure on site is occupied. In the case of public road projects, the mitigation plan must be implemented before the road is opened to the travelling public. Please note that if a stream relocation is conducted as a stream restoration as defined in *The Internal Technical Guide for Stream Work in North Carolina*, April 2001, the restored length can be used as compensatory mitigation for the impacts resulting from the relocation;
8. For any project involving re-alignment of streams, a stream relocation plan must be included with the 401 application for written DWQ approval. Relocated stream designs should include the same dimensions, patterns and profiles as the existing channel (or a stable reference reach if the existing channel is unstable), to the maximum extent practical. The new channel should be constructed in the dry and water shall not be turned into the new channel until the banks are stabilized. Vegetation used for bank stabilization shall be limited to native woody species, and should include establishment of a 30 foot wide wooded and an adjacent 20 foot wide vegetated buffer on both sides of the relocated channel to the maximum extent practical. A transitional phase incorporating coir fiber and seedling establishment is allowable. Also, rip-rap, A-Jacks, concrete, gabions or other hard structures may be allowed if it is necessary to maintain the physical integrity of the stream, but the applicant must provide written justification and any calculations used to determine the extent of rip-rap coverage requested. If suitable stream mitigation is not practical on-site, then stream impact will need to be mitigated elsewhere. Please note that if a stream relocation is conducted as a stream restoration as defined in *The Internal Technical Guide for Stream Work in North Carolina*, April 2001, the restored length can be used as compensatory mitigation for the impacts resulting from the relocation;
9. Placement of culverts and other structures in waters, streams, and wetlands must be placed below the elevation of the streambed to allow low flow passage of water and aquatic life unless it can be shown to DWQ that providing passage would be impractical. Design and placement of culverts including open bottom or bottomless arch culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in aggradation, degradation or significant changes in hydrology of wetlands or stream beds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium shall be maintained if requested to do so in writing by DWQ. Additionally, when roadways, causeways or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges must be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in aggradation, degradation or significant changes in hydrology of streams or wetlands;

WQC #3402

10. That appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the "North Carolina Sediment and Erosion Control Planning and Design Manual" or the "North Carolina Surface Mining Manual" whichever is more appropriate (available from the Division of Land Resources (DLR) in the DENR Regional or Central Offices) shall be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to assure compliance with the appropriate turbidity water quality standard;
11. All sediment and erosion control measures placed in wetlands and waters shall be removed and the original grade restored within two months after the Division of Land Resources has released the project;
12. That additional site-specific conditions may be added to projects proposed under this Certification in order to ensure compliance with all applicable water quality and effluent standards;
13. Measures shall be taken to prevent live or fresh concrete from coming into contact with waters of the state until the concrete has hardened;
14. If an environmental document is required, this Certification is not valid until a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) is issued by the State Clearinghouse;
15. If this Certification is used to access building sites, all lots owned by the applicant must be buildable without additional fill beyond that explicitly allowed under other General Certifications. The applicant is required to provide evidence that the lots are buildable without requiring additional impacts to wetlands, waters or buffers if required to do so in writing by DWQ. For road construction purposes, this Certification shall only be utilized from natural high ground to natural high ground;
16. Deed notifications or similar mechanisms shall be placed on all lots with remaining jurisdictional wetlands and waters or areas within 50 feet of all streams and ponds. These mechanisms shall be put in place within 30 days of the date of issuance of the 401 Certification letter or the issuance of the 404 Permit (whichever is later). A sample deed notification format can be downloaded from the 401/Wetlands Unit web site at <http://h2o.enr.state.nc.us/ncwetlands> . DWQ shall be sent copies of all deed restrictions applied to these lots;
17. When written concurrence is required, the applicant is required to use the most recent version of the Certification of Completion form to notify DWQ when all work included in the 401 Certification has been completed;
18. Concurrence from DWQ that this Certification applies to an individual project shall expire three years from the date of the cover letter from DWQ or on the same day as the expiration date of the corresponding Nationwide Permit 18, 39, 41, 42, 43 or 44, whichever is sooner.

WQC #3402

Non-compliance with or violation of the conditions herein set forth by a specific fill project may result in revocation of this Certification for the project and may also result in criminal and/or civil penalties.

The Director of the North Carolina Division of Water Quality may require submission of a formal application for Individual Certification for any project in this category of activity that requires written concurrence under this certification, if it is determined that the project is likely to have a significant adverse effect upon water quality or degrade the waters so that existing uses of the wetland or downstream waters are precluded.

Public hearings may be held for specific applications or group of applications prior to a Certification decision if deemed in the public's best interest by the Director of the North Carolina Division of Water Quality.

Effective date: March 2003

DIVISION OF WATER QUALITY

By

Alan W. Klimek, P.E.

Director

WQC # 3402

May 13, 2005 Response from US Fish and Wildlife Service



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Asheville Field Office
160 Zillicoa Street
Asheville, North Carolina 28801

May 13, 2005

Mr. Ron Lewis, Senior Scientist
Environmental Support
Duke Power
EC11E/P.O. Box 1006
Charlotte, North Carolina 28201-1006

Dear Mr. Lewis:

Subject: Belews Creek Steam Station - Flue Gas Desulfurization System, Stokes County, North Carolina

In your letter dated March 17, 2005, you requested our comments with regard to the subject project. The following comments are provided in accordance with the provisions of the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667e), and Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act).

Endangered Species. According to our records and a review of the information you provided, no listed species or their habitats occur on the site. We concur with your determination that the proposed project will not affect endangered or threatened species and their habitats. Therefore, we believe the requirements under Section 7 of the Act are fulfilled. However, obligations under Section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

Storm Water. Loss of riparian buffers and inadequately controlled storm-water run-off from developed areas are major factors resulting in the degradation and loss of aquatic resources. Accordingly, we recommend that you develop and implement an adequate storm-water-control and -treatment plan and that undisturbed riparian buffers (natural vegetation) be maintained and/or reestablished along any perennial and intermittent streams on the site. Vegetated riparian buffers serve as filters for contaminants, lessen storm-water velocities, provide thermal cover, and protect stream-bank stability.

Erosion Control. Given the proximity of the project to aquatic environments, we want to emphasize that stringent measures to control sediment and erosion should be implemented prior to any ground disturbance and should be maintained throughout project construction.

Recommendations to Mitigate for Unavoidable Impacts to Streams and Wetlands. We recommend that any mitigation plan for this project include the restoration of comparable wetlands and streams at a ratio of at least 2:1. We need to review a complete mitigation plan in order to provide detailed comments. A mitigation plan should include a description of the site of any mitigation, a detailed wetland restoration or creation plan, the goals and objectives, and an assessment of the probability of success. A complete plan should include a specific description of the manner in which the proposed mitigation will offset any permitted impacts, including those to fish and wildlife resources in the permit area. Timeliness of the completed restoration/creation efforts should be considered relative to the proposed impacts. A regular monitoring plan should be included in any restoration plan.

The following are additional mitigation recommendations:

1. Riparian vegetation should include sedges, grasses, and rushes, as well as native woody species. Exotic vegetation should be screened from any plant material. Large woody species will provide thermal cover and deep bank-stabilizing root systems along the restored stream channel.
2. Stream channel design should mimic slope, riffle slope, pool slope, valley slope, meander geometry, sinuosity, cross-sectional dimensions, entrenchment ratio, bed material (pebble count), and bank-full discharge of a nearby reference reach of stable stream of the same classification (Rosgen 1996). We would like to review the final design of the stream and/or wetland restoration of any proposed mitigation.
3. Monitoring should continue for at least 5 years following wetland or stream construction. Annual reports should be submitted to the resource agencies. Resource agencies should be notified of problems with success or function of the stream or wetland mitigation within 30 days of detection.
4. An appropriate regional conservation organization should hold title to deed restrictions on the mitigation site(s). The title to the conservation easement should be conveyed along with an endowment for future monitoring, management, and any contingencies to ensure success of the mitigation. The endowment should also make provision for any required periodic legal filing.

Thank you for allowing us to comment on this project. Please contact Mr. Mark Cantrell of our staff at 828/258-3939, Ext. 227, if you have any questions. In any future correspondence concerning this project, please reference our Log Number 4-2-05-148.

Sincerely,



Brian P. Cole
Field Supervisor

APPROVED BY STOKES COUNTY ASSESSOR

[Signature]

Book Page
0526 0237

FILED
STOKES COUNTY NC
02/17/2005 12:06 PM
KATHY YOUNG
Register Of Deeds

Document #
0001114

No Taxable Consideration

Site No. 007310
Land Unit No. 0045983
Project No. 007310-200627

Excise Tax \$

Recording Time, Book and Page

Tax Lot No.: _____ Parcel Identifier No. _____
Verified by _____ County on _____ day of _____, 2005
by _____

Mail after recording to: _____

This instrument was prepared by: Karol P. Mack, Associate General Counsel, Duke Energy Corporation

Brief description for the Index: 264.794 acres, Stokes County

NORTH CAROLINA NON-WARRANTY DEED

THIS DEED made as of this _____ day of _____, 2005, by and between

GRANTOR	GRANTEE
DUKE ENERGY CORPORATION (formerly known as Duke Power Company) P.O. Box 1007 Charlotte, North Carolina 28201-1007	DUKE ENERGY CORPORATION P.O. Box 1007 Charlotte, North Carolina 28201-1007

007310
0045983
1 a 007310 - 200627

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the Stokes County, North Carolina, and the property ("Property") more particularly described as follows

All of that certain 264.794 acres shown on plat entitled "Duke Energy Corporation Recombination Plat Belews Creek Steam Station Scrubber Residue Landfill Property," Map No. 007310-200349 (sheets 1 and 2) and recorded in Book 8 at Page 10,11, in the Office of the Register of Deeds for Stokes County (the "Registry").

The sole purpose of this deed is to recombine into one tract the Property described hereinabove which contains 264.794 acres.

The property hereinabove described was acquired by Grantor by instrument recorded in Deed Book 190 at Page 411, and Deed Book 188 at Page 283.

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

The Grantor makes no warranty, express or implied, as to title to the property hereinabove described.

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be here unto affixed by authority of its Board of Directors, the day and year first above written.

DUKE ENERGY CORPORATION

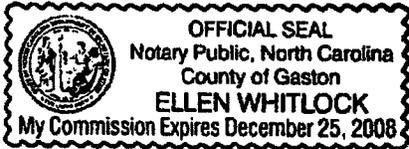
By: George W. Christian, Jr.
Name: George W. Christian, Jr.
Title: Manager, Real Estate Acquisitions and Valuations

STATE OF NORTH CAROLINA
COUNTY OF MECKLENBURG

I, Ellen Whitlock, a Notary Public for the above State and County, hereby certify that George W. Christian, Jr. personally appeared before me this day and acknowledged that he is Manager, Real Estate Acquisitions and Valuations, of Duke Energy Corporation, a North Carolina corporation, and that he, as Manager, being authorized to do so, executed the foregoing on behalf of the corporation.

WITNESS my hand and Notarial Seal, this the 8th day of Feb., 2005.

[SEAL]



Ellen Whitlock
Notary Public

My Commission Expires: 12-25-2008

The foregoing Certificate(s) of Ellen Whitlock, NP of Gaston Co., NC

is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on first page hereof.

Kathy Young REGISTER OF DEEDS FOR Stokes COUNTY
By Jim Overholt Deputy/Assistant-Register of Deeds.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the Stokes County, North Carolina, and the property ("Property") more particularly described as follows

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IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be here unto affixed by authority of its Board of Directors, the day and year first above written.

DUKE ENERGY CORPORATION

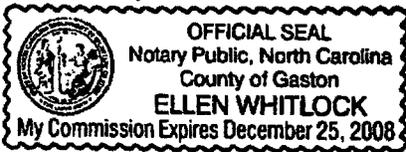
By: [Signature]
Name: George W. Christian, Jr.
Title: Manager, Real Estate Acquisitions and Valuations

STATE OF NORTH CAROLINA
COUNTY OF MECKLENBURG

I, Ellen Whitlock, a Notary Public for the above State and County, hereby certify that George W. Christian, Jr. personally appeared before me this day and acknowledged that he is Manager, Real Estate Acquisitions and Valuations, of Duke Energy Corporation, a North Carolina corporation, and that he, as Manager, being authorized to do so, executed the foregoing on behalf of the corporation.

WITNESS my hand and Notarial Seal, this the 8th day of Feb., 2005.

[SEAL]



[Signature]
Notary Public

My Commission Expires: 12-25-2008

The foregoing Certificate(s) of Ellen Whitlock, NP of Gaston Co., NC

is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on first page hereof.

Kathy Young REGISTER OF DEEDS FOR Stokes COUNTY
By [Signature] Deputy/Assistant-Register of Deeds.

DUKE ENERGY CORPORATION
ASSISTANT SECRETARY CERTIFICATE

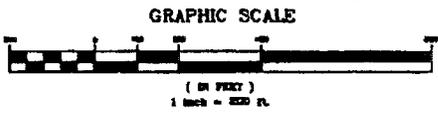
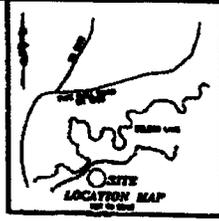
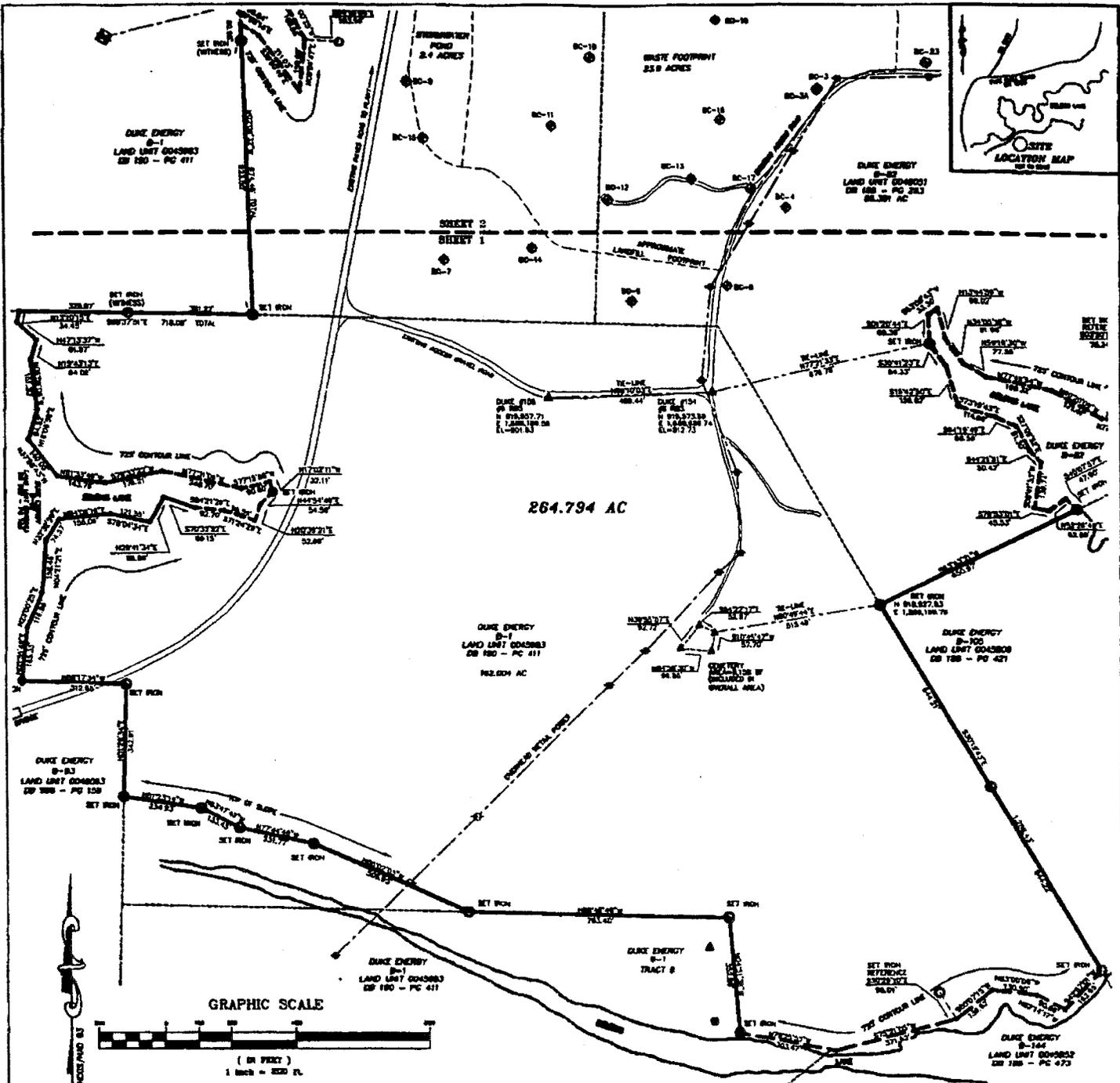
I, Sue C. Harrington, Assistant Secretary of Duke Energy Corporation, do hereby certify that the Board of Directors of Duke Energy Corporation on February 24, 2004, approved and adopted the Approval of Business Transactions Policy Statement, which provides in relevant part that any member of the Expanded Executive Committee of Duke Energy Corporation may approve, or delegate the authority to approve, business transactions (including acquisitions and divestitures) involving amounts of \$15 million or less.

I further certify that on August 12, 2004, A. R. Mullinax was a member of the Expanded Executive Committee of Duke Energy Corporation, who, on that date and pursuant to the authority granted by the Approval of Business Transactions Policy Statement, delegated to Donald H. Steele, III, Vice President, Corporate Services, the authority to approve building rents in amounts up to \$5,000,000; land acquisitions and divestitures in amounts up to \$5,000,000 and building and building equipment projects in amounts up to \$5,000,000, which authority includes the authorization to execute any contract, lease, deed, easements, rights of way or other instruments related to the authorized transaction; and subsequently, on November 2, 2004, Donald H. Steele, III, in accordance with the Delegation of Authority - Duke Energy Business Services, delegated to George W. Christian, Jr., Manager, Real Estate Acquisitions and Valuations, the authority to approve building rents in amounts up to \$750,000; land acquisitions and divestitures in amounts up to \$750,000 and building and building equipment projects in amounts up to \$750,000, which authority includes the authorization to execute any contract, lease, deed, easements, rights of way or other instruments related to the authorized transaction.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Corporate Seal of said Duke Energy Corporation this 20th day of January, 2005.



Sue C. Harrington
Assistant Secretary



MONITORING WELLS (OCTOBER 2004)

WELL#	N	E	TOP OF COVER D.L.	GROUND D.L.
DC-02	020237.0	020238.0	792.50	792.8
DC-03	020238.0	020239.0	824.50	823.7
DC-11	020240.0	020241.0	824.50	823.7
DC-16	020241.0	020242.0	782.50	782.8
DC-18	020242.0	020243.0	824.50	823.7
DC-19	020243.0	020244.0	824.50	823.7
DC-20	020244.0	020245.0	824.50	823.7
DC-21	020245.0	020246.0	824.50	823.7
DC-22	020246.0	020247.0	824.50	823.7
DC-23	020247.0	020248.0	824.50	823.7

MONITORING WELL LOCATIONS SUPPLIED BY DUKE ENERGY

WELL#	N	E	TOP OF COVER D.L.	GROUND D.L.
DC-01	020235.0	020236.0	782.50	782.1
DC-02	020237.0	020238.0	782.50	782.8
DC-03	020238.0	020239.0	824.50	823.7
DC-04	020239.0	020240.0	824.50	823.7
DC-05	020240.0	020241.0	824.50	823.7
DC-06	020241.0	020242.0	824.50	823.7
DC-07	020242.0	020243.0	824.50	823.7
DC-08	020243.0	020244.0	824.50	823.7
DC-09	020244.0	020245.0	824.50	823.7
DC-10	020245.0	020246.0	824.50	823.7
DC-11	020246.0	020247.0	824.50	823.7
DC-12	020247.0	020248.0	824.50	823.7
DC-13	020248.0	020249.0	824.50	823.7
DC-14	020249.0	020250.0	824.50	823.7

- NOTES:
- SURVEYED & MAPPED FOR DUKE ENERGY CORPORATION
 - ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES UNLESS OTHERWISE NOTED
 - AREA BY COORDINATE COMPUTATION
 - PROPERTY SUBJECT TO ANY VALID & ENFORCEABLE EASEMENTS, RESTRICTIONS & RIGHTS OF WAY OF RECORD
 - SURVEY IS BASED ON PHYSICAL EVIDENCE AND EXISTING MONUMENTS FOUND DURING THE SURVEY.
 - A MINIMAL SEARCH WAS MADE FOR THOSE OLD CORNERS ALONG THE EXTENSION OF THIS BOUNDARY MAP BUT MOST OR ALL OLD CORNERS WERE FOUND TO BE DESTROYED BY CLEARING OR GRADING OPERATIONS.
 - ROADS SHOWN HEREON ARE FROM AERIAL MAPPING PROVIDED BY DUKE ENERGY.
 - THE PREVIOUS OWNER PARCEL LINES SHOWN HEREON ARE APPROXIMATE ONLY, BASED ON A MAP ENTITLED "TOWNSHIP CREDIT DECREE" 1989 BY DUKE ENERGY AND THEREFORE THE LAND UNIT PARCEL AREAS AS SHOWN HEREON ARE ALSO APPROXIMATE.
 - THE "725' CONTOUR LINE" SHOWN HEREON AS SOLID LINES WERE DERIVED BY DIRECT FIELD DATA AND THE DASHED LINES ARE FROM AERIAL MAPPING SUPPLIED BY DUKE ENERGY.
 - HORIZONTAL & VERTICAL DATA BASED ON INFORMATION PROVIDED BY DUKE ENERGY AS SHOWN AND NOTED HEREON. ROAD/RAIL 63 & ROAD 68
 - CRANE ROAD (ON 2042) RIGHT-OF-WAY ABANDONED BY DEED BY LETTER DATED NOVEMBER 20, 1978.



- LEGEND
- LINES SURVEYED
 - - - LINES NOT SURVEYED
 - OLD INTERIOR LINE
 - 725' CONTOUR LINE
 - FOUND STONE
 - FOUND IRON PIPE
 - FOUND WOOD PIPE
 - MONITORING WELL
 - METAL
 - METAL POWER POLE
 - TRANSMISSION TOWER

Regional Land Surveyors, Inc.
 8642 WEST MARKET STREET, SUITE 100
 WEDDERSBORO, NORTH CAROLINA 27409
 TELEPHONE (336) 845-9425

SHEET 1 of 2

FOR SOURCE OF THIS DATA:

DC 187-PG 147	DC 188-PG 283
DC 187-PG 272	DC 188-PG 421
DC 187-PG 280	DC 188-PG 430
DC 187-PG 500	DC 188-PG 611
DC 187-PG 502	
DC 187-PG 684	

DUKE ENERGY CORPORATION
RECOMMENDATION FLAT
BEAVER CREEK STRAIN STATION
SCHUBBER RESIDUE LANDFILL PROPERTY
 SAURATOWN TOWNSHIP
 STOKES COUNTY, NORTH CAROLINA

BOOK: 815 02220
 DATE: 10/21/04
 SCALE: 1" = 500'
 SITE: 00730

DRAWN BY: BENNETT
 DATE: 10/21/04
 S.D.P.: 11/05/04
 MAP: 00730-2003-08

Duke Energy

400 S. TRYON STREET
 PO BOX 10077
 CHARLOTTE, N.C. 28202-1007
 TELEPHONE NO. (704) 382-8888

200622

Contents



April 17, 2006

Mr. Richard E. Baker Jr., P.E., PMP
Duke Power FGD Program
Mail Code: EC11Y
526 South Church Street
Charlotte, NC 28201-1802

RE: Addendum 2 - Site Geologic and Hydrologic Siting Report
Duke Power FGD Scrubber Residue Landfill
Belews Creek Steam Station
S&ME Project No. 1054-04-955

Dear Mr. Baker:

S&ME, Inc. (S&ME) is pleased to submit this Addendum Report in response to NCDENR comments on the revised *Site Geologic and Hydrologic Siting Report*, dated September 28, 2005 and the *Site Geologic and Hydrologic Siting Report - Addendum*, dated December 12, 2005 for the Belews Creek Steam Station FGD Scrubber Landfill. This report is in response to comments received from representatives of NCDENR in our meeting on January 6, 2006 and was prepared in general accordance with the scope of work described in S&ME Proposal P3889-06V.

Additional borings/wells have been installed at the site to characterize the subsurface conditions within the revised boundaries of the facility. The subsurface conditions have been described and hydraulic conductivity values have been calculated for the subsurface materials. Revised site plans and geologic cross-sections have been developed to supplement the geologic/hydrogeologic model of the site. The geologic/hydrogeologic conditions encountered at the site during the performance of the recent subsurface investigation, and presented in this addendum report, are consistent with the characteristics of the conceptual model developed for the site during S&ME's previous subsurface investigations at the site.

S&ME appreciates this opportunity to be of service to you and Duke Energy. We trust this information is responsive to your needs at this time. Should you have any questions regarding this addendum report, please call us at (919) 872-2660.

Sincerely,
S&ME, Inc.

Samuel P. Watts, P.G.
Project Manager

Ernest F. Parker, R.E., P.G.
Senior Consultant

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- Appendix III - Hydraulic Conductivity Test Data
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1.0 Project Background

Duke Power's Belews Creek Steam Station (BCSS) is located east of N.C. State Road SR 1908 (Pine Hall Road), north of N.C. Highway 65, and west N.C. State Road SR 2042, at 3915 Pine Hall Road in Belews Creek, Stokes County, North Carolina. Figure 1 shows the site area as portrayed on the Belews Lake, North Carolina USGS 7.5-minute quadrangle with the proposed landfill construction area superimposed onto the drawing. As evident from this map, noteworthy facility features include Belews Lake to the northeast and southwest of the power facility, Belews Creek southeast of the power facility, and Pine Hall Road and the current fly ash landfill northwest of the facility.

Within the BCSS facility, Duke Power selected a 23.9 acre tract as Phase 1 of the proposed flue gas desulphurization (FGD) Scrubber Residue Landfill (landfill). Phases 2 and 3 may be developed adjacent to Phase 1 area sometime in the future. This report presents additional information to support the siting evaluation for Phase 1 of the proposed landfill. This area, represented on Figure 2, is located approximately 1.1 miles southeast of the intersection of Pine Hall Road and the main entrance to the Duke Power BCSS. The site is bordered to the south and east by a dirt road (Egypt Road), to the north by an open field and overhead power lines, and to the west by Craig Road.

On February 21, 2005, S&ME submitted to Duke Energy a copy of the *Geologic and Hydrologic Siting Report* for the landfill at the BCSS. The siting exploration was based on the conceptual design of the landfill provided by Duke Energy, and was prepared in accordance with requirements of the North Carolina Administrative Code (NCAC) T15A .0504(1)(c), *Application Requirements for Sanitary Landfills*. Duke Energy submitted the report to the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM), Solid Waste Section (Section) as Volume 2 of the Site Suitability Application. Section comments on the Site Suitability Application were summarized in a letter from Mr. Brian Wootton to Mr. Allen Stowe on April 29, 2005.

S&ME's *Geologic and Hydrologic Siting Report* was revised September 28, 2005 and re-submitted by Duke Energy to the Section as Volume 2 of the Site Suitability Application. Section comments on the revised Site Suitability Application were summarized in a letter from Mr. Brian Wootton to Mr. Pat McCabe on November 3, 2005. S&ME prepared an addendum report in response to the Section comments titled *Geologic And Hydrologic Siting Report – Addendum, FGD Scrubber Residue Disposal Site, Belews Creek Steam Station*, dated December 12, 2005.

Additional comments were received from representatives of the Section in a meeting between representatives of Duke, S&ME, and the Section on January 6, 2006. To address these comments, additional borings/wells have been installed at the site to further characterize the subsurface conditions within the facility boundaries. The subsurface conditions have been described and hydraulic conductivity values have been calculated for the subsurface materials. Revised site plans and geologic cross-sections have been developed that form the basis of the geologic/hydrogeologic model of the site. The geologic/hydrogeologic conditions at the site are consistent with the characteristics of the conceptual model developed for the Piedmont region and for the site during S&ME's previous subsurface assessments at the site.

2.0 Comments Received from NCDENR-DWM, Solid Waste Section

Section Comment – Revise the interpretation of the Top of Bedrock at BC-8 to be consistent with the definition used by the Sections. Auger refusal should be interpreted to be Top of Rock.

S&ME Response - The review of boring log BC-8 indicated that auger refusal was encountered at a depth of 25.2 feet below ground surface (bgs). The top of rock drawn on cross section A-A' at BC-8 (Figure 5) and Table 1 has been revised to at depth of 25.2 feet bgs.

Section Comment – Define the boundaries of the Solid Waste "Facility" and characterize the facility as necessary to meet the requirements North Carolina Administrative Code (NCAC) T15A .0504(1)(c), *Application Requirements for Sanitary Landfills*.

S&ME Response - Figure 2 depicts the facility boundaries of the proposed FGD Scrubber Residue Landfill. Additional borings, wells, water level measurements and hydraulic testing were completed to further characterize the area within the facility boundaries. Section 3.0 discusses the implementation of and findings from the siting study activities.

Section Comment – Add grid nodes to the facility location plan drawing.

S&ME Response - The Landfill Area Site Plan (Figure 2) depicts the facility overlain by a grid with labeled coordinates. Coordinates are in the North Carolina State Plane, NAD83 datum.

Section Comment – Provide a narrative on the absence of diabase dikes in the location of the proposed solid waste facility.

S&ME Response - Based on the a review of *Geologic Map of the East Half of the Winston-Salem Quadrangle, 1975* (USGS MAP I-709-B) diabase dikes occur in the vicinity of the Belews Creek Steam Station property, however, the dikes that have been recorded are located within the Triassic rift basin that trends southwest-northeast through the southeastern portion of Stokes County, just north of the Belews Creek Steam Station. Diabase dikes are common within the Triassic basin; however, the Belews Creek Steam Station property is located within the Milton Belt which is distinguished from the Charlotte Belt by a decreased percentage of intrusive rocks (Horton, 1911).

S&ME has also performed site characterization at the nearby Craig Road Ash Landfill. This landfill is on the BCSS site, approximately 1,800 feet southwest of the FGD Scrubber Residue Landfill. As previously discussed in S&ME's report for the Craig Road Ash Landfill titled *Supplemental Data*, dated July 1, 2005, S&ME had subcontracted Schnabel Engineering to perform a geomagnetic survey along two "Lines" across the site to assess the potential for diabase dikes in the area of the proposed landfill. Based on Schnabel's Report, there were several areas along the "Lines" that have the potential to be dikes. However, based on the borings that were performed in the areas of the anomalies for Line 1 (OW-1B-42, OW-1B-44 and B-1B-45A) and Line 2 (OW-1B-46), it is unlikely that dikes are causing the anomalies. Based on S&ME's borings at the nearby Craig Road Ash Landfill and at the FGD Scrubber Residue Landfill, and

several other studies conducted previously throughout the BCSS facility, we have identified no evidence of dikes within the proposed landfill area or on the Station property.

S&ME will observe the subsurface materials encountered during construction of the landfill for evidence of dikes. If dikes are identified below the proposed cell, they will be noted in our Geologic Report during construction. If modifications to the water quality monitoring plan are needed, they will be made at that time.

3.0 Additional Siting Study Field Activities

3.1 Soil Test Borings and Rock Coring

Figure 2 depicts the facility boundaries of the proposed FGD Scrubber Residue Landfill. Additional borings, wells, water level measurements and hydraulic testing were completed to further characterize the area within the facility boundaries.

To further evaluate subsurface characteristics in the outside of the proposed footprint of the landfill, but within the facility, S&ME established, and representatives from NCDENR concurred with, four additional drilling locations designated BC-25 through BC-28. The drilling locations were generally distributed around the outside of the proposed landfill footprint and outside the landfill boundary ranging from 125 to 200 feet from the landfill limit (considering some of the previously installed monitoring wells).

The soil test borings were conducted to refusal using hollow-stem auger and split-spoon sampling techniques. The initial indication of the depth to groundwater was also noted and used to indicate the depth for constructing the groundwater monitoring wells. At refusal, a monitor well was constructed at boring BC-25. At borings BC-26A and BC-27A, no monitor wells were constructed in these borings. Following evaluation of groundwater conditions at these locations, the borings were abandoned. The drill rig was then off-set within a few feet of the exploratory boring and a well was constructed in a second boring to intersect the upper-most water bearing zone. The boring in which the well was constructed was given the original designation (e.g. BC-

26) and the exploratory boring was given the alternate designation (e.g., BC-26A). The locations of the actual borings, as established by surveying and/or field measurements after subsequent monitoring well installations, are shown on Figure 2. Initial measurements at BC-28 indicated that the water table surface had not been encountered prior to auger refusal. BC-28 was then extended by rock coring techniques to the termination depth. Upon completion of a core run, the coring tools were removed from the borehole and the rock sample was recovered from the core barrel. Water used to cool/flush the diamond bit during the coring process was either bailed from the core hole and the water level was monitored. When a sufficient water column (e.g., 5-foot) returned into the core hole, the coring was terminated for subsequent groundwater monitor well construction.

The list of monitor wells and their construction details is summarized in Table 1. Boring logs presenting detailed descriptions of the subsurface information from BC-25, BC-26, BC-27, and BC-28 are included in Appendix I. Photographs documenting the rock core samples collected at BC-28 are also included in Appendix I. S&ME discussed the documentation of exploratory boring abandonment in telephone conversations and in a meeting with Section representatives Brian Wootton and Bobby Lutfy. The result of the conversations was that the boring logs for abandoned exploratory borings would show the grouted interval of the boring upon completion. According to Section representatives, the grout interval on the boring log was sufficient documentation for exploratory boring abandonment. S&ME has also provided copies of the boring logs for borings BC-26A and BC-27A with the grout intervals noted:

3.2 Groundwater Monitoring Well Installations

Monitor wells were installed in the four new borings (BC-25, BC-26, BC-27, and BC-28) to allow further evaluation of groundwater conditions at these locations.

Groundwater monitor wells were constructed of Schedule 40 PVC well casing and screen with flush-jointed threaded connections. Monitor wells were constructed with two-inch inside diameter (I.D.) PVC. The well screens were constructed with a slot size of 0.01 inch and were 15

feet in length. Upon placement of the well screen and riser casing into the bore/core hole, S&ME placed a manufactured No.2 filter sand in boring annulus to a height of 2 feet above the screen interval. An annular seal of bentonite chips was placed above the sand pack and allowed to hydrate a minimum of four hours. Portland cement grout was tremmied into the borehole annulus from the top of the bentonite to the ground surface. A locking above-grade steel protective casing, set into a concrete pad, was installed at each monitor well. Upon completion of the monitor wells, an identification plate showing the drilling contractor and well construction information specified by Rule 2C was affixed to each well. Monitor well construction details are presented on the boring logs included in Appendix I and on the completed and signed Well Construction Records (form GW-1 REV. 07/2001) included in Appendix II. A summary of the well construction details is also provided in Table 1.

Following installation of the groundwater monitoring wells, Duke Energy contracted Chas. H. Sells, Inc. (registered NC licensed surveyors) to survey the installed monitor well locations (relative to N.C. State Plane northing and easting), the top-of-casing (TOC) and of the adjacent ground surface elevation, for record and use in groundwater movement evaluations. The following locations and elevations were measured for the four new wells:

Well ID	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation
BC-25	921072.84	1687799.83	745.96	748.01
BC-26	920714.41	1687664.57	747.21	749.32
BC-27	920416.05	1687651.57	761.92	763.96
BC-28	919788.85	1688743.22	816.02	818.09

Notes:

Northing/Easting Datum = NAD 83

Vertical Datum = NGVD 29 Feet AMSL

Units = US Survey Feet

S&ME personnel developed the monitor wells BC-25, BC-26, BC-27, and BC-28 by using a surge block to vigorously surge the water in the monitor well and then removing water within the well by pumping/bailing water.

3.3 Water Level Measurements

Water level measurements were obtained from each borehole/monitor well location during monitor well installation, development, and during hydraulic conductivity testing. On February 27, 2006, a complete round of stabilized water level measurements were obtained at the four new wells (BC-25, BC-26, BC-27, and BC-28) and at the previously installed monitor wells BC-1 through BC-23A. These measurements are summarized in Table 2, showing the well survey information, the water level measurements, and the resulting potentiometric surface elevations computed by subtracting the water level measurements from the top-of-casing surveyed elevations. The water level measurements collected on February 27, 2006 were used in preparing the potentiometric surface map (Figure 3).

3.4 Hydraulic Conductivity Testing

On February 27, 2006, S&ME conducted in-situ hydraulic conductivity tests at BC-25, BC-26, BC-27, and BC-28 to estimate the hydraulic conductivity in the aquifer material near each well. Prior to performing the tests, the monitor wells were opened and allowed to equilibrate. The water level in each well was measured to the nearest 0.01 foot using a decontaminated water level probe. This reading was used as the initial reading for the tests. Rising head or falling head tests were performed in the wells by installing a pressure transducer equipped with a data recorder into each well. After obtaining an initial water level reading, the static water level within the well was lowered by pumping or bailing for the rising head test until the well was relatively dry. The water level in the well was monitored with the pressure transducer as the water returned to static conditions. After reaching static condition, the tests were repeated in wells BC-25 and BC-27. Copies of the hydraulic conductivity test data are included in Appendix III.

The hydraulic testing data were transferred to a computer where the recovery data were imported into AQTESOLV® for Windows software for graphical evaluation. The reduced slug test data were analyzed using the Bouwer and Rice technique in the AQTESOLV® program. The

Bouwer and Rice technique makes a variety of simplifying assumptions in the evaluation of slug test data. These include the assumptions that the aquifer in question is homogeneous, isotropic, and extends infinitely in the horizontal direction (Dawson and Istock, 1991; Bouwer and Rice, 1976 and 1989). Table 3 presents the resulting hydraulic conductivity calculations. Copies of the hydraulic conductivity test data, the test point assumptions used and analysis are included in Appendix III.

4.0 Findings from Additional Characterization

4.1 Lithology

To further characterize the findings of the subsurface information, lithologic cross-sections were constructed crossing the site at multiple vectors (Figure 4). Of the four borings, three of the borings (BC-25, BC-27 and BC-28) were located near cross-sections previously presented in S&ME's Geologic and Hydrologic Siting Report and Geologic And Hydrologic Siting Report – Addendum. Subsurface conditions observed at these three locations were added to the lithologic cross-sections depicting the site conditions were prepared and presented on Figures 5 through 7. The cross-sections are generalized representations of the overall conditions and typically do not include the subtleties of each particular boring, or the actual subsurface conditions that exist between boring locations. They are beneficial in presenting an overall understanding of subsurface conditions. A brief discussion of the generalized subsurface materials is provided below.

Fill: Fill is defined as areas in which the natural soils have been altered by earth moving operations or areas where non-native soils have been emplaced. Fill material was encountered at three of the four boring locations (BC-25, BC-26, and BC-27) from the ground surface to depths ranging from 3.5 to 28.5 feet bgs.

Residuum: Residuum consists of highly weathered, unconsolidated material that retains none to very little of the physical characteristics of the parent bedrock. Residuum was encountered at one of the four boring locations (BC-28) from the ground surface to a depth of 5.0 feet bgs. The residuum is generally comprised of silt with variable amounts of clay and sand.

Saprolite: Saprolite is the product of weathered bedrock and usually retains some to much of the observable structure of the parent bedrock. The saprolitic soils encountered

were generally comprised of sandy silt and silty sand, transitioning to larger size sand grains and even gravel size particles with depth. Saprolitic soils were encountered at depths ranging from 6.0 feet below the ground surface to 28.5 feet bgs, and ranged in thickness from only a few feet to approximately 55 feet at BC-28.

Partially Weathered Rock (PWR): PWR is defined as a transitional material ranging between very dense soil and soft weathered rock, exhibiting a standard penetration resistance ("N" value) in excess of 100 blows per foot. Rock cores collected from PWR had low Rock Quality Designation (RQD), typically 0-25%. The PWR at the BCSS was sampled as silty fine to coarse sand with varying gravel content, and varied in thickness from only a few feet to as much as 14.5 feet at BC-25.

Bedrock: Bedrock is the consolidated parent material of soil in the Piedmont Geologic Province, exhibiting little to no weathering. As noted, auger refusal (interpreted to be bedrock) was encountered at depths ranging from 23.0 to 55.0 feet bgs. Of the four new wells, BC-28 was the only location where bedrock core samples were collected. The bedrock core sample collected at BC-28 was from 55 to 60 feet bgs, and was classified as quartzofeldspathic gneiss, with some quartz biotite gneiss and varying amounts of other index minerals such as garnet and muscovite. Horizontal to high-angle fractures are present throughout the core sample. Recovery for the core sample was 97% with a rock quality designation (RQD) of 56%. Chemical weathering was evident in some fractures in the form of browned biotite, alteration of biotite to chlorite (chloritization), yellowed quartz grains, and blackened garnets.

The geologic/lithologic conditions encountered at the site during the performance of the recent subsurface investigation, are consistent with the geologic characteristics of the Piedmont region of North Carolina and with the conceptual model developed for the site during S&ME's previous subsurface assessments at the site.

4.2 Groundwater Occurrence

Groundwater was encountered in the unconsolidated residuum/saprolite at BC-26 and BC-27 at approximately 12, and 30 feet bgs, respectively. Groundwater was encountered near the interface of PWR and bedrock or in the upper fractured bedrock at BC-25 and BC-28 at approximately 11 and 51 feet bgs, respectively. At some locations, groundwater levels rose higher than the elevation (and lithologic unit) at which it was initially encountered. The long-term groundwater elevations, which represent "head potential" or "potentiometric head" at each well, are summarized on Table 2.

The groundwater elevations, were evaluated by mathematically calculating the individual points of equi-potential between pairs of wells and then drawing the equi-potential lines across and adjacent to the proposed footprint. The resulting potentiometric groundwater surface, or groundwater table, as measured at the site on February 27, 2006, is depicted on Figure 3. Groundwater flow will occur from locations of higher head potential to locations of lower head potential. Accordingly, based on Figure 3, groundwater flow appears to be flowing in a west-northwest direction toward the lake. The equi-potential lines generally mimic the ground surface topography of the site. This flow direction is consistent with previous groundwater flow directions measured at the site. The resulting potentiometric groundwater surface is also presented on the lithologic and hydrologic cross-sections included in the Attachment (Figures 5 through 7).

4.3 Hydraulic Conductivity

The hydraulic testing data were transferred to a computer where the recovery data were imported into AQTESOLV® for Windows software for graphical evaluation. The reduced slug test data were analyzed using the Bouwer and Rice technique in the AQTESOLV® program. The Bouwer and Rice technique makes a variety of simplifying assumptions in the evaluation of slug test data. These include the assumptions that the aquifer in question is homogeneous, isotropic, and extends infinitely in the horizontal direction (Dawson and Istock, 1991; Bouwer and Rice, 1976 and 1989). Average hydraulic conductivity values calculated from slug test data for monitoring wells BC-25, BC-26, BC-27, and, BC-28 were 6.17×10^{-4} cm/sec, 3.69×10^{-4} cm/sec, 5.39×10^{-4} cm/sec and 1.19×10^{-5} cm/sec, respectively. These hydraulic conductivity values are consistent with previous values measured at the site. Table 3 presents the resulting hydraulic conductivity calculations. Copies of the hydraulic conductivity test data, the test point assumptions used and analysis are included in Appendix III.

4.4 Estimated Seasonal High Groundwater

S&ME previously presented an estimated seasonal high groundwater (ESHG) surface for the site

in the *Geologic and Hydrologic Siting Report*, dated February 21, 2005. At the time S&ME previously predicted the ESHG, the depth-to-water at the proposed FGD Landfill site had been characterized by 18 rounds of water levels measured taken at monitor wells BC-1 through BC-14 from November 11, 2003 through October 27, 2004 and two rounds of water levels taken at BC-15 through BC-23A taken on October 6, 2004 and October 27, 2004 (Table 2).

Since that time, Duke and S&ME have continued to collect depth-to-water measurements at the site approximately once a month. S&ME reviewed the additional water levels measured at the FGD Landfill, and with the exception of BC-17, which showed declining water level elevations, most of the wells at the proposed FGD Landfill site showed a rise in water levels from October 2004 to February 2006. To take into account the apparent rise in the elevation of the groundwater surface at the site, S&ME predicted a new ESHG level for the FGD Landfill site, using the additional depth-to-water measurements. The following procedures describe the application of the statistical analyses used to develop a predicted ESHG at the proposed landfill site.

The number of data points from monitor wells BC-1 through BC-14 located at the proposed FGD Landfill ranged from 29 to 32 rounds of water level measurements over the past three and a half years (November 25, 2002 through March 15, 2006). The number of data points from monitor wells BC-15 through BC-23A ranged from 15 to 16 rounds of water level measurements over the past 16 months (October 6, 2004 through March 15, 2006). The quantity of water level data from these wells was sufficient to perform statistical predictions at the upper 95th, 99th and 99.5th percent confidence level (%CL). There were insufficient data to perform a similar statistical prediction for the four new monitor wells (BC-25, BC-26, BC-27, and BC-28) at the proposed FGD Landfill as these wells had only two groundwater elevation data points collected from each well. The projected 95%, 99% and 99.5%.CL were calculated for water levels from monitor wells where there were a sufficient quantity of data points using the following formula (Steel and Torrie, 1980).

$$P \left[Y \leq \bar{Y} t_{\alpha} \sqrt{s^2 \left(\frac{n+1}{n} \right)} \right] = 0.90 \text{ or } 0.95 \text{ or } 0.99$$

where;

$P = \text{probability that } Y \leq \bar{Y} + t_{\alpha} \sqrt{s^2 \left(\frac{n+1}{n} \right)}$ is below the 90th, 95th and 99th percentile

$Y = \text{projected water level}$

$\bar{Y} = \text{Sample population mean of water levels}$

$t_{\alpha} = \text{t-statistic at either the 95}^{\text{th}}, 99^{\text{th}}, \text{ and } 99.5^{\text{th}} \text{ percent confidence level with } n-1$
degrees of freedom.

$s^2 = \text{sample population variance of the water levels}$

$n = \text{number of water level measurements in a well.}$

The application of this equation uses the Students T-distribution which takes into account that the prediction of the next measured water level will be within a certain level at the 95% CL. The equation is based on a sample mean instead of the true population mean, which is unknown. The appropriate variance to the next predicted water level measurement value in any one monitor well is the sum of the variances of the observed sample mean of water levels measured plus a random component.

Time series graphs of the data for the FGD Landfill monitor wells (BC-1 through BC-23A) are presented graphically in Appendix IV. The time series graphs provided a means review of the data sets subjectively so that the appropriate CL for the data set could be selected. The analysis of the graphs determined that the wells could be divided into three distinct sets for evaluation and predicting the ESHG elevations. For monitor wells BC-1 through BC-14, the data sets showed that enough depth-to-water data had been collected over the past three and a half years to demonstrate that typical seasonal variability in water levels would still be below the 95% CL, and the 99% CL water level provided an elevation that appeared too conservative for projecting the ESHG elevations. Thus, the 95% CL level was selected to project the ESHG elevations for BC-1 through BC-14.

For monitor wells BC-15 through BC-23A, the data sets showed a number of measured water levels exceeded the 95% CL water level. Because water levels in these wells had only been characterized by 16 months of data, a subjective review of the data did not indicate whether or not typical seasonal variations in water level elevations would exceed the projected 95% CL. For monitor wells BC-15 through BC-23A, the data sets showed that depth-to-water data collected

over the past 16 months were below the 99% CL, thus the 99% CL level was selected to project the ESHG elevations for most of the monitor wells BC-15 through BC-23A (except three wells).

Exceptions to using the 99% CL to project the ESHG elevations in the second set of monitor wells were BC-16, BC-19, and BC-23A. Water levels observed over time at most of the wells at the FGD Landfill showed some seasonal rise and fall in elevation, however, water levels observed at BC-16, BC-19, and BC-23A over the 16 months from October 6, 2004 through March 15, 2006 only showed a continued increase. The latest water level measurements taken at these wells were above the 95% CL, and trending upward toward the 99% CL level. For these reasons, after subjectively reviewing the data sets, it was decided to use the 99.5% CL, as an even more conservative prediction of the ESHG in these three wells.

The resulting ESHG elevations for the wells at the FGD Landfill are summarized on Table 1. Figure 8 presents a potentiometric map of the ESHG that appears to correlate with the ground surface topography, screened lithology, and the potentiometric map of water levels measured on February 27, 2006. The resulting ESLG is also presented on the lithologic and hydrologic cross-sections included in the report (Figures 5 through 7).

TABLES

Table 3

**Hydraulic Conductivity Values From Slug Tests
Proposed FGD Scrubber Residue Landfill
Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project 1054-04-955**

Well ID	Monitor Well* Average Hydraulic Conductivity (cm/sec)	Lithologic Units Screened
BC-25	6.17E-04	Saprolite, PWR
BC-26	3.69E-04	Residuum, Saprolite
BC-27	5.39E-04	Residuum, Saprolite
BC-28	1.19E-05	Saprolite, PWR and Fractured Bedrock

Notes:

* Average calculated as the geometric mean.

cm/sec = centimeters per second

Slug test data analyzed using Bouwer and Rice technique and AQTESOLV® for Windows software for graphical evaluation

Table 1
Monitoring Well Construction Details
Proposed FGD Scrubber Residue Landfill
Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

BORING/ WELL ID	GROUND SURFACE ELEVATION (ft- msl)	TOP OF CASING ELEVATION (ft- msl)	DEPTH TO WATER (ft-bgs)	SOIL TEST BORING DEPTH (ft-bgs)	ROCK CORING DEPTH (ft-bgs)	TOTAL BORING DEPTH (ft-bgs)	GROUT INTERVAL (ft- bgs)	BENTONITE SEAL INTERVAL (ft-bgs)	SAND PACK INTERVAL (ft- bgs)	SCREENED INTERVAL (ft-bgs)	LITHOLOGIC UNITS SCREENED
BC-1	758.1	760.35	14.29	0 - 10.5	10.5 - 21.0	21.0	0.0 - 2.0	2.0 - 4.0	4.0 - 21.0	5.0 - 20.0	PWR and Fractured Bedrock
BC-2	764.74	766.99	16.97	0 - 43.5	-	43.5	0.0 - 18.0	18.0 - 23.0	23.0 - 42.2	27.2 - 42.2	Partially Weathered Rock
BC-3	842.34	844.84	-	0.0 - 38.0	38.0 - 48.0	48.0	0.0 - 27.0	27.0 - 31.0	31.0 - 48.0	33.0 - 48.0	Saprolite and Partially Weathered Rock
BC-3A	842.34	844.17	70.92	0.0 - 40.8	40.8 - 71.3	71.3	0.0 - 34.0	34.0 - 40.0	40.0 - 71.3	46.3 - 71.3	PWR and Fractured Bedrock
BC-4	811.99	813.74	54.71	0.0 - 50.0	50.0 - 62.0	62.0	0.0 - 38.5	38.5 - 45.0	45.0 - 62.0	47.0 - 62.0	PWR and Fractured Bedrock
BC-5	818.13	819.96	-	0.0 - 46.0	-	46.0	0.0 - 25.0	25.0 - 29.0	29.0 - 46.0	31.0 - 46.0	Saprolite
BC-6	800.74	802.16	37.79	0.0 - 28.5	28.5 - 38.5	38.5	0.0 - 18.8	18.8 - 23.5	23.5 - 38.5	23.5 - 38.5	Saprolite, PWR, and Bedrock
BC-7	775.86	777.8	41.57	0.0 - 36.3	36.3 - 52.3	52.3	0.0 - 31.5	31.5 - 36.0	36.0 - 52.3	37.3 - 52.3	Fractured Bedrock
BC-8	762.41	764.24	33.98	0.0 - 25.2	25.2 - 43.5	43.5	0.0 - 22.0	22.0 - 25.0	25.0 - 43.5	28.0 - 43.0	Partially Weathered Rock
BC-9	773.54	775.54	21.5	0.0 - 13.8	13.8 - 28.8	28.8	0.0 - 6.5	6.5 - 12.5	12.5 - 28.8	13.8 - 28.8	PWR and Fractured Bedrock
BC-10	781.84	784.07	28.21	0.0 - 38.5	38.5 - 47.5	47.5	0.0 - 26.5	26.5 - 30.5	30.5 - 47.5	31.5 - 46.5	PWR and Fractured Bedrock
BC-11	785.15	786.85	41.02	0.0 - 67.9	-	67.9	0.0 - 41.0	41.0 - 47.0	47.0 - 67.9	51.5 - 66.5	Partially Weathered Rock
BC-12	802.91	804.62	56.25	0.0 - 62.8	62.8 - 76.8	76.8	0.0 - 56.5	56.5 - 60.0	60.0 - 76.8	61.8 - 76.8	PWR and Fractured Bedrock
BC-13	812.06	813.56	-	0.0 - 25.0	25.0 - 45.0	45.0	0.0 - 18.0	18.0 - 22.0	22.0 - 45.0	23.3 - 43.3	PWR and Fractured Bedrock
BC-14	757.23	758.86	16.16	0.0 - 21.8	21.8 - 31.4	31.4	0.0 - 12.4	12.4 - 15.4	15.4 - 31.4	16.02 - 31.02	PWR and Fractured Bedrock
BC-15	760.53	762.26	26.14	0.0 - 43.4	-	43.4	0.0 - 24.0	24.0 - 26.0	26.0 - 43.4	28.4 - 43.4	Saprolite
BC-16	833.77	835.65	73.8	0.0 - 68.2	68.3 - 106.4	106.4	0.0 - 90.5	90.5 - 93.0	93.0 - 106.0	96.0 - 106.0	Fractured Bedrock
BC-17	823.66	825.49	56.0	0.0 - 45.4	49.2-71.1	71.1	0.0 - 47.5	47.5 - 49.0	49.0 - 70.8	60.8 - 70.8	Fractured Bedrock
BC-18	780.97	783.74	22.4	0.0 - 38.3	-	38.3	0.0 - 22.0	22.0 - 25.5	25.5 - 38.1	27.8 - 37.8	Partially Weathered Rock
BC-19	813.09	814.81	52	0.0 - 57.2	-	57.2	0.0 - 41.0	41.0 - 42.6	42.6 - 56.0	46.0 - 56.0	Saprolite and Partially Weathered Rock
BC-20	754.58	757.22	11.2	0.0 - 18.6	-	21.9	0.0 - 7.3	7.3 - 9.6	9.6 - 21.6	11.6 - 21.6	Saprolite and Partially Weathered Rock
BC-21	753.42	756.69	7.7	0.0 - 14.2	-	14.2	0.0 - 1.3	1.3 - 3.0	3.0 - 13.9	3.9 - 13.9	Residuum and Saprolite
BC-22	762.58	764.53	1.5	0.0 - 13.0	-	13.0	0.0 - 1.0	1.0 - 2.0	2.0 - 13.0	3.0 - 13.0	Residuum and Saprolite
BC-23A	862.56	863.79	81.42	0.0 - 88.6	84.6 - 102.7	102.7	0.0 - 72.1	72.1 - 74.0	74.0 - 101.7	76.7 - 101.7	PWR and Fractured Bedrock
BC-25	745.96	748.01	11.71	0 - 18.83	-	23.0	0.0 - 1.3	1.3 - 4.6	4.6 - 21.5	6.5 - 21.5	Saprolite, PWR
BC-26	747.21	749.32	12.52	0 - 33.90	-	37.0	0.0 - 3.8	3.8 - 4.8	4.8 - 22.0	7.0 - 22.0	Residuum, Saprolite
BC-27	761.92	763.96	30.55	0.0 - 48.70	-	50.3	0.0 - 16.2	16.2 - 18.8	18.8 - 36.0	21.0 - 36.0	Residuum, Saprolite
BC-28	816.02	818.09	51.08	0.0 - 53.60	55.0 - 60.0	60.0	0.0 - 40.2	40.2 - 41.2	41.2 - 58.2	43.2 - 58.2	Saprolite, PWR and Fractured Bedrock

Notes:
1) TOC (top of casing) and ground surface elevations from the survey relative to mean sea level, provided by Duke Energy.
2) Water level measurements were taken 24 hours following the well completion.
3) Ground surface elevation was estimated using a topographic map.
ft-msl: Feet above mean sea level
ft-bgs: Feet below ground surface
PWR: Partially weathered rock

Table 2
Monitoring Well Groundwater Depths and Elevations
Proposed FGD Scrubber Residue Landfill
Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Well ID	TOC Elevation (ft AMSL)	11/25/2002 Static Water (ft AMSL)	12/9/2002 Static Water (ft AMSL)	12/19/2002 Static Water (ft AMSL)	2/2/2003 Static Water (ft AMSL)	2/26/2003 Static Water (ft AMSL)	3/24/2003 Static Water (ft AMSL)	3/28/2003 Static Water (ft AMSL)	4/28/2003 Static Water (ft AMSL)
BC-1	760.35	742.83	740.44	743.81	741.09	745.22	752.12	NM	748.75
BC-2	766.99	747.42	747.32	747.77	748.39	748.89	749.8	749.74	750.69
BC-3	844.84	dry	dry	dry	dry	dry	dry	dry	dry
BC-3A	844.17	774.33	771.44	771.42	771.25	771.28	771.3	771.39	771.28
BC-4	813.74	757.02	757.22	757.28	756.94	756.96	756.83	756.9	757.11
BC-5	819.96	dry	dry	dry	771.98	772.03	771.97	dry	772.11
BC-6	802.16	767.69	762.92	762.95	762.8	762.79	762.7	762.73	762.82
BC-7	777.80	733.41	733.29	734.29	734.71	735.29	736.01	735.93	736.69
BC-8	764.24	728.16	728.06	728.43	729.35	729.73	730.97	731.12	733.29
BC-9	775.54	749.52	751.86	752.04	753.3	753.64	755.32	NM	757.94
BC-10	784.07	753.09	753.29	753.63	754.38	754.81	756.07	756.32	758.46
BC-11	786.85	743.66	743.68	744.13	744.73	745.16	745.98	746.17	747.78
BC-12	804.62	749.46	749.72	746.66	746.71	747.1	748.23	748.49	750.79
BC-13	813.56	dry	dry	dry	dry	dry	dry	dry	dry
BC-14	758.86	740.28	739.91	741.07	741.04	742.11	743.07	743.08	744.34
BC-15	762.26	-	-	-	-	-	-	-	-
BC-16	835.65	-	-	-	-	-	-	-	-
BC-17	825.49	-	-	-	-	-	-	-	-
BC-18	783.74	-	-	-	-	-	-	-	-
BC-19	814.81	-	-	-	-	-	-	-	-
BC-20	757.22	-	-	-	-	-	-	-	-
BC-21	756.69	-	-	-	-	-	-	-	-
BC-22	764.53	-	-	-	-	-	-	-	-
BC-23A	863.79	-	-	-	-	-	-	-	-
BC-25	748.01	-	-	-	-	-	-	-	-
BC-26	749.32	-	-	-	-	-	-	-	-
BC-27	763.96	-	-	-	-	-	-	-	-
BC-28	818.09	-	-	-	-	-	-	-	-

Notes:
 TOC = top of casing
 ft AMSL = feet above mean sea level
 ft bTOC = feet below top of casing
 NM = not measured (well damaged)
 - = not measured (well not installed)

1) BC-1 through BC-23A: TOC elevations relative to mean sea level, provided by Duke Energy.
 BC-25 through BC-28 TOC elevations relative to mean sea level provided by Chas. H. Sells, Inc.

Table 2 (cont'd)
Monitoring Well Groundwater Elevations
Proposed FGD Scrubber Residue Landfill
Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Well ID	TOC Elevation (ft AMSL)	5/27/2003 Static Water (ft AMSL)	6/25/2003 Static Water (ft AMSL)	8/25/2003 Static Water (ft AMSL)	11/21/2003 Static Water (ft AMSL)	2/19/2004 Static Water (ft AMSL)	5/13/2004 Static Water (ft AMSL)	6/22/2004 Static Water (ft AMSL)	7/22/2004 Static Water (ft AMSL)
BC-1	760.35	751.51	749.2	748.19	744.05	747.05	746.43	745.53	745.08
BC-2	766.99	750.8	751.45	751.45	749.93	749.9	749.57	749.24	748.96
BC-3	844.84	dry	dry	NM	dry	dry	dry	dry	dry
BC-3A	844.17	771.25	771.19	771.17	771.23	771.32	771.14	771.1	771.18
BC-4	813.74	757.19	757.32	NM	759	759.86	760.34	760.5	760.62
BC-5	819.96	772.04	772.02	772.03	772.15	772.25	772.17	772.06	772.03
BC-6	802.16	762.24	762.75	762.78	762.9	762.88	762.77	762.66	762.58
BC-7	777.80	736.86	736.89	737.3	737.24	737.29	737.09	736.77	736.46
BC-8	764.24	733.48	733.97	734.41	732.96	733.83	734.4	733.78	733.53
BC-9	775.54	758.48	760.15	760.38	757.74	757.52	757.79	757.37	757.02
BC-10	784.07	759.05	760.13	760.52	759.11	758.68	758.59	758.19	757.91
BC-11	786.85	748.81	749.84	751.27	751.17	750.92	751.07	751.01	750.81
BC-12	804.62	752.06	753.1	754.7	756.07	756.26	756.26	756.13	755.75
BC-13	813.56	dry	dry	NM	dry	dry	dry	dry	dry
BC-14	758.86	744.59	744.66	744.67	744.54	744.56	744.58	744.34	744.15
BC-15	762.26	-	-	-	-	-	-	-	-
BC-16	835.65	-	-	-	-	-	-	-	-
BC-17	825.49	-	-	-	-	-	-	-	-
BC-18	783.74	-	-	-	-	-	-	-	-
BC-19	814.81	-	-	-	-	-	-	-	-
BC-20	757.22	-	-	-	-	-	-	-	-
BC-21	756.69	-	-	-	-	-	-	-	-
BC-22	764.53	-	-	-	-	-	-	-	-
BC-23A	863.79	-	-	-	-	-	-	-	-
BC-25	748.01	-	-	-	-	-	-	-	-
BC-26	749.32	-	-	-	-	-	-	-	-
BC-27	763.96	-	-	-	-	-	-	-	-
BC-28	818.09	-	-	-	-	-	-	-	-

Notes:
 TOC = top of casing
 ft AMSL = feet above mean sea level
 ft bTOC = feet below top of casing
 NM = not measured (well damaged)
 - = not measured (well not installed)

1) BC-1 through BC-23A: TOC elevations relative to mean sea level, provided by Duke Energy.
 BC-25 through BC-28 TOC elevations relative to mean sea level provided by Chas. H. Sells, Inc.

Table 2 (cont'd)
 Monitoring Well Groundwater Elevations
 Proposed FGD Scrubber Residue Landfill
 Duke Power - Belews Creek Steam Station
 Belews Creek, Stokes County, North Carolina
 S&ME Project No. 1054-04-955

Well ID	TOC Elevation (ft AMSL)	8/18/2004 Static Water (ft AMSL)	10/6/2004 Static Water (ft AMSL)	10/27/2004 Static Water (ft AMSL)	11/18/2005 Static Water (ft AMSL)	12/16/2004 Static Water (ft AMSL)	1/24/2005 Static Water (ft AMSL)	2/17/2005 Static Water (ft AMSL)	3/28/2005 Static Water (ft AMSL)
BC-1	760.35	749.14	749.43	746.41	747.49	751.21	748.60	748.23	751.44
BC-2	766.99	748.72	748.95	748.93	748.97	749.53	749.88	750.07	750.72
BC-3	844.84	dry	dry	dry	dry	dry	dry	dry	dry
BC-3A	844.17	771.14	771.18	771.08	770.95	771.02	770.94	770.82	dry
BC-4	813.74	760.34	760.72	760.67	760.71	760.58	760.44	760.47	760.6
BC-5	819.96	772.17	dry	dry	772.06	772.05	772.01	772.05	772.06
BC-6	802.16	762.77	dry	762.47	762.46	762.44	762.36	762.39	762.37
BC-7	777.80	737.09	736.53	736.41	736.49	736.67	736.56	736.67	737.17
BC-8	764.24	734.4	734.02	734.11	734.08	734.5	734.72	734.84	735.1
BC-9	775.54	757.79	756.93	756.66	756.64	757.37	757.77	757.99	759.18
BC-10	784.07	758.59	757.42	757.48	757.3	757.53	758.26	758.36	759.45
BC-11	786.85	751.07	750.29	750.32	750.31	750.24	750.48	750.75	751.33
BC-12	804.62	756.26	754.92	755.02	755.05	754.69	754.89	755.1	755.59
BC-13	813.56	dry	dry	dry	dry	dry	dry	dry	dry
BC-14	758.86	744.58	744.1	743.98	744.01	744.14	744.17	744.3	744.86
BC-15	762.26	-	736.55	736.4	736.4	736.78	736.88	736.93	737.44
BC-16	835.65	-	762.36	762.47	762.41	762.39	762.68	762.77	763.21
BC-17	825.49	-	766.58	766.95	766.89	766.78	766.61	766.51	766.51
BC-18	783.74	-	757.68	757.63	757.62	757.86	758.33	758.58	759.62
BC-19	814.81	-	775.46	775.81	775.73	775.58	775.85	776.16	776.69
BC-20	757.22	-	744.43	743.23	743.72	745.84	745.42	745.86	747.28
BC-21	756.69	-	746.16	746.07	746.2	746.83	747.06	747.27	747.93
BC-22	764.53	-	761.56	761.19	761.74	762.03	761.75	762.06	762.76
BC-23A	863.79	-	782.36	782.43	782.47	782.55	782.73	782.73	783.1
BC-25	748.01	-	-	-	-	-	-	-	-
BC-26	749.32	-	-	-	-	-	-	-	-
BC-27	763.96	-	-	-	-	-	-	-	-
BC-28	818.09	-	-	-	-	-	-	-	-

Notes:
 TOC = top of casing
 ft AMSL = feet above mean sea level
 ft bTOC = feet below top of casing
 NM = not measured (well damaged)
 - = not measured (well not installed)

1) BC-1 through BC-23A: TOC elevations relative to mean sea level, provided by Duke Energy.
 BC-25 through BC-28 TOC elevations relative to mean sea level provided by Chas. H. Stells, Inc.

Table 2 (cont'd)
Monitoring Well Groundwater Elevations
Proposed FGD Scrubber Residue Landfill
Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Well ID	TOC Elevation (ft AMSL)	4/11/2005 Static Water (ft AMSL)	5/25/2005 Static Water (ft AMSL)	6/21/2005 Static Water (ft AMSL)	7/26/2005 Static Water (ft AMSL)	8/18/2005 Static Water (ft AMSL)	11/15/2005 Static Water (ft AMSL)	2/13/2006 Static Water (ft AMSL)	2/27/2006 Static Water (ft AMSL)
BC-1	760.35	750.31	747.99	748.46	748.15	751.94	745.50	750.15	748.70
BC-2	766.99	750.89	750.64	750.5	749.98	749.86	748.54	750.70	751.14
BC-3	844.84	dry	dry	dry	dry	dry	dry	dry	dry
BC-3A	844.17	dry	dry	dry	dry	dry	dry	dry	dry
BC-4	813.74	760.42	760.52	760.58	760.66	760.6	760.28	NM	757.49
BC-5	819.96	772.06	772.05	772.01	772.06	772.06	dry	772.06	dry
BC-6	802.16	762.39	762.38	762.32	762.38	762.36	762.33	NM	NM
BC-7	777.80	737.02	736.82	736.62	736.45	736.45	736.32	737.41	738.66
BC-8	764.24	735.25	735.25	735.06	735.05	735.21	735.17	736.33	736.51
BC-9	775.54	759.55	759.39	759.75	759.04	758.86	757.78	760.41	758.34
BC-10	784.07	759.79	760.12	760.22	759.98	759.89	758.8	760.83	761.94
BC-11	786.85	751.16	751.5	751.65	751.9	751.98	751.65	752.22	750.65
BC-12	804.62	755.46	755.79	755.83	756.02	756.05	756.09	756.59	756.91
BC-13	813.56	dry	dry	dry	dry	dry	dry	dry	dry
BC-14	758.86	744.59	744.5	744.4	744.32	744.31	744.04	NM	744.93
BC-15	762.26	737.44	737.21	737.04	736.98	737.04	736.73	737.74	737.93
BC-16	835.65	763.11	763.60	763.68	764.01	764.12	764.36	765.12	765.27
BC-17	825.49	766.61	764.87	764.74	764.86	764.86	765.01	764.98	764.66
BC-18	783.74	759.64	760.06	760.23	760.11	757	759.05	761.01	760.97
BC-19	814.81	776.8	777.17	777.51	778.13	778.54	779.52	780.38	780.79
BC-20	757.22	747.37	745.54	745.24	744.24	744.48	742.25	746.60	746.48
BC-21	756.69	747.93	747.26	746.97	746.42	746.46	745.04	748.25	747.92
BC-22	764.53	761.84	761.70	761.33	761.08	762.28	761.65	762.39	761.58
BC-23A	863.79	782.94	783.21	783.33	783.55	783.63	784.23	784.96	783.96
BC-25	748.01	-	-	-	-	-	-	-	734.30
BC-26	749.32	-	-	-	-	-	-	-	734.80
BC-27	763.96	-	-	-	-	-	-	-	731.41
BC-28	818.09	-	-	-	-	-	-	-	765.01

Notes:
 TOC = top of casing
 ft AMSL = feet above mean sea level
 ft bTOC = feet below top of casing
 NM = not measured (well damaged)
 - = not measured (well not installed)

1) BC-1 through BC-23A: TOC elevations relative to mean sea level, provided by Duke Energy.
 BC-25 through BC-28 TOC elevations relative to mean sea level provided by Chas. H. Sells, Inc.

Table 4
Estimated Seasonal High Groundwater Elevations
Belews Creek Scrubber Residue Landfill
Duke Energy - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project No. 1054-04-955

Monitor Well	Ground Surface Elevation (ft-AMSL)	Groundwater Elevation (ft-AMSL - 2/27/2006)	Estimated Seasonal High Groundwater Elevation (ft-AMSL)
BC-1	758.10	748.70	752.88
BC-2	764.74	751.14	751.56
BC-4	811.99	757.49	761.99
BC-6	800.74	NM	764.45
BC-7	775.86	738.66	738.50
BC-8	762.41	736.51	737.47
BC-9	775.54	758.34	761.66
BC-10	781.84	761.94	761.95
BC-11	785.15	750.65	754.16
BC-12	802.91	756.91	759.40
BC-14	757.23	744.93	746.12
BC-15	760.53	737.93	738.25
BC-16	833.77	765.27	766.06
BC-17	823.66	764.66	768.39
BC-18	780.97	760.97	762.55
BC-19	813.09	780.79	782.10
BC-20	754.58	746.48	748.98
BC-21	753.42	747.92	749.19
BC-22	762.58	761.58	762.96
BC-23A	862.56	783.96	785.71

Notes:

- 1) NM = Not Measured
- 2) NC = Not Calculated
- 3) -- = No Proposed Change to Groundsurface Grade Elevation
- 4) Estimated Seasonal High Groundwater (ESHG) was predicted in February 2006 using the 95%, 99%, and 99.5% UCL. The methods used to predict the ESHG are described in Addendum 2 - Geologic and Hydrologic Siting Report.

FIGURES

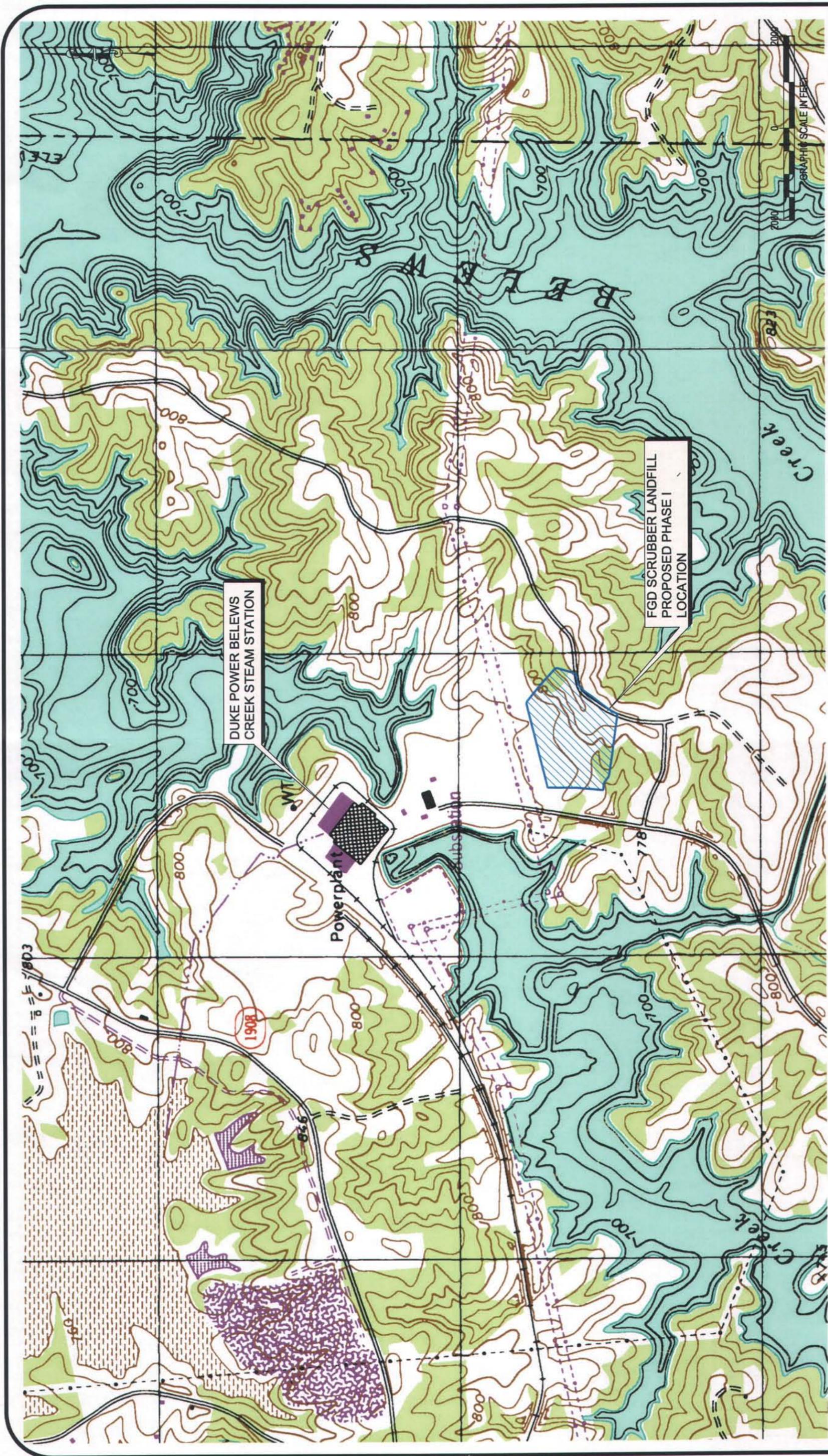


FIGURE NO.

1

VICINITY MAP
 DUKE POWER BELEWS CREEK STEAM STATION
 ADDENDUM 2
 FGD SCRUBBER RESIDUE DISPOSAL STATION
 BELEWS CREEK, NORTH CAROLINA

3118 SPRING FOREST ROAD
 RALEIGH, N.C. 27616
 PH. 919-872-2660
 FAX. 919-720-9827
 WWW.SMEINC.COM



DATE: MARCH 2006
 DRAWN BY: JCJ
 CHECKED BY:

SCALE: 1" = 1,000'
 PROJECT NO. 1054-04-955

Drawings Under Seperate Cover

APPENDIX I
BORING LOGS
AND
PHOTOGRAPHS OF ROCK CORES

BORING LOG BC-25

SHEET 1 OF 1

PROJECT: Duke Power-Belews Creek
 LOCATION: Belews Creek, NC
 PROJECT NO.: 1054-04-955
 LOGGED BY: L. Ennis
 DATE DRILLED: 2/21/2006
 BORING DEPTH (ft): 23

DRILLING CONTRACTOR: S&ME, Inc.
 DRILLING METHOD: 3-1/4" HSA
 DRILL RIG: Diedrich D-50
 TOP OF CASING ELEVATION (ft): 748.01
 WATER LEVEL TOB (ft bgs): 18.5
 WATER LEVEL 24 HRS (ft bTOC): 13.71

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)	
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS						
0 -	SS-1	1.0-2.5	5-7-9	16	6			[Cross-hatch symbol]	Brown/gray/white sand, silty, GRAVEL (Fill)	Protective Casing Dia: 4.0 in. Type: Stickup Interval: 2.05	[Cross-hatch symbol]	-	
5 -	SS-2	3.5-5.0	19-37-50	87	12			[Horizontal line symbol]	Gray brown layered micaceous sandy SILT (Saprolite)		Riser Casing Dia: 2.0 in. Type: PVC Interval: 0.0 - 6.5	[Horizontal line symbol]	- 743
10 -	SS-3	6.0-7.5	18-17-26	43	13			[Dotted symbol]	Gray/pink/white micaceous feldspathic silty SAND (Saprolite) with layering and orange oxidation	Grout Type: Portland Interval: 0.0 - 1.3		[Dotted symbol]	- 738
15 -	SS-4	8.5-9.0	-50/6"-	50	4			[Wavy line symbol]	Gray/pink/white micaceous feldspathic silty SAND (PWR) with layering and orange oxidation. Wet at 18.5'			Seal Type: Bentonite Interval: 1.3 - 4.6	[Wavy line symbol]
20 -	SS-5	13.5-13.75	-50/3"-	50	1			[Wavy line symbol]		Filterpack Type: Sand Interval: 4.6 - 21.5			[Wavy line symbol]
	SS-6	18.5-18.83	-50/4"-	50	2			[Wavy line symbol]				Screen Dia: 2" Type: Schedule 40 PVC Interval: 6.5 - 21.5	[Wavy line symbol]
								[Wavy line symbol]	Auger Refusal at 23.0				[Wavy line symbol]
									Boring terminated at a depth of 23.0 feet.			-	

NOTES

SS = Split Spoon Sample
 ST = Shelby Tube Sample
 S = Bulk Sample
 R = Core Run
 RS = Rock Sample
 REC = Rock Core Recovery
 RQD = Rock Quality Designation

1. ▽ = Water Level At Termination of Boring
2. ▼ = Water Level After 24 Hours



S&ME
 ENVIRONMENTAL SERVICES
 ENGINEERING • TESTING
 3118 Spring Forest Road
 Raleigh, NC 27616

BORING LOG BC-26

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1054-04-955**
 LOGGED BY: **S. Watts**
 DATE DRILLED: **2/17/2006**
 BORING DEPTH (ft): **37**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **3-1/4" HSA**
 DRILL RIG: **CME-750**
 TOP OF CASING ELEVATION (ft): **749.32**
 WATER LEVEL TOB (ft bgs): **25**
 WATER LEVEL 24 HRS (ft bTOC): **14.52**

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	SS-1	1.0 - 2.5	4-8-11	19	16			(LITHOLOGY TAKEN FROM BC-26A) Dark gray brown SILT with bits of wood and rock fragments, structure appears disturbed. (Fill), dry	Protective Casing Dia: 4.0 in. Type: Stickup Interval: 2.11 ft.	[Symbol]	- 744	
-	SS-2	3.5 - 5.0	8-6-4	10	12							Dark gray brown sandy SILT with rock fragments <1/2" (Fill), slightly moist
5 -	SS-3	6.0 - 7.5	6-4-6	10	12			Light brown to orange brown SILT with very fine mica. Structures visible (Saprolite), slightly moist	Grout Type: Portland Interval: 0.0 - 3.8	[Symbol]	- 734	
-	SS-4	8.5 - 10.0	2-3-4	7	12			Medium brown fine silty SAND (Saprolite), moist and loose				Seal Type: Bentonite Interval: 3.8 - 4.8
10 -	SS-5	13.5 - 15.0	2-5-12	17	16			Medium gray to light brown silty SAND. Fragments of weathered rock, biotite and mica flakes, with orange and white streaks (Saprolite), moist and loose	Filterpack Type: Sand Interval: 4.8 - 22.0	[Symbol]	- 724	
15 -	SS-6	18.5 - 20.0	14-19-21	40	18			Medium gray brown silty SAND with fragments of weathered rock with orange and white streaks (Saprolite), moist and loose				Screen Dia: 2" Type: Schedule 40 PVC Interval: 7.0 22.0
20 -	SS-7	23.5 - 25.0	6-10-17	27	16			Medium gray to light brown silty SAND, with weathered rock fragments (Saprolite), moist and loose, cuttings wet at 25'	[Symbol]	[Symbol]	- 719	
25 -	SS-8	28.5 - 30.0	18-25-44	69	12			Medium gray brown with red and white stripes, gravelly, silty SAND, (Saprolite) dense and slightly moist				[Symbol]
30 -	SS-9	33.5 - 33.9	-50/5"-	100	5					[Symbol]	[Symbol]	

NOTES

- SS = Split Spoon Sample
- ST = Shelby Tube Sample
- S = Bulk Sample
- R = Core Run
- RS = Rock Sample
- REC = Rock Core Recovery
- RQD = Rock Quality Designation

- 1. ∇ = Water Level At Termination of Boring
- 2. ▼ = Water Level After 24 Hours

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BORING LOG BC-26

SHEET 2 OF 2

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1054-04-955**
 LOGGED BY: **S. Watts**
 DATE DRILLED: **2/17/2006**
 BORING DEPTH (ft): **37**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **3-1/4" HSA**
 DRILL RIG: **CME-750**
 TOP OF CASING ELEVATION (ft): **749.32**
 WATER LEVEL TOB (ft bgs): **25**
 WATER LEVEL 24 HRS (ft bTOC): **14.52**

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-		37.0	-50/0"	100	0				Medium gray brown with red and white stripes, gravelly, silty SAND (PWR), dense and slightly moist <i>(continued)</i> Auger Refusal at 37.0' Boring terminated at a depth of 37.0 feet.	Protective Casing Dia: 4.0 in. Type: Stickup Interval: 2.11 ft. Riser Casing Dia: 2.0 in. Type: PVC Interval: 0.0 - 7.0 Grout Type: Portland Interval: 0.0 - 3.8 Seal Type: Bentonite Interval: 3.8 - 4.8 Filterpack Type: Sand Interval: 4.8 - 22.0 Screen Dia: 2" Type: Schedule 40 PVC Interval: 7.0 - 22.0		-

NOTES

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BORING LOG BC-26A

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1054-04-955**
 LOGGED BY: **S. Watts**
 DATE DRILLED: **2/17/2006**
 BORING DEPTH (ft): **37**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **3-1/4" HSA**
 DRILL RIG: **CME-750**
 TOP OF CASING ELEVATION (ft): **749.32**
 WATER LEVEL TOB (ft bgs): **25**
 WATER LEVEL 24 HRS (ft bTOC): **14.52**

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	SS-1	1.0 - 2.5	4-8-11	19	16			(LITHOLOGY TAKEN FROM BC-26A) Dark gray brown SILT with bits of wood and rock fragments, structure appears disturbed. (Fill), dry	Protective Casing Dia: Type: Interval:	[Cross-hatch pattern]	-	
-	SS-2	3.5 - 5.0	8-6-4	10	12						Dark gray brown sandy SILT with rock fragments <1/2" (Fill), slightly moist	Riser Casing Dia: Type: Interval:
5	SS-3	6.0 - 7.5	6-4-6	10	12			Light brown to orange brown SILT with very fine mica. Structures visible (Saprolite), slightly moist	Grout Type: Interval:	[Vertical lines pattern]	-	
-	SS-4	8.5 - 10.0	2-3-4	7	12			Medium brown fine silty SAND (Saprolite), moist and loose			Seal Type: Interval:	[Horizontal lines pattern]
10	SS-5	13.5 - 15.0	2-5-12	17	16			Medium gray to light brown silty SAND. Fragments of weathered rock, biotite and mica flakes, with orange and white streaks (Saprolite), moist and loose	Filterpack Type: Interval:	[Dotted pattern]	-	
15	SS-6	18.5 - 20.0	14-19-21	40	18			Medium gray brown silty SAND with fragments of weathered rock with orange and white streaks (Saprolite), moist and loose			Screen Dia: Type: Interval:	[Diagonal lines pattern]
20	SS-7	23.5 - 25.0	6-10-17	27	16			Medium gray to light brown silty SAND, with weathered rock fragments (Saprolite), moist and loose, cuttings wet at 25'	Screen Dia: Type: Interval:	[Dotted pattern]	-	
25	SS-8	28.5 - 30.0	18-25-44	69	12			Medium gray brown with red and white stripes, gravelly, silty SAND, (Saprolite) dense and slightly moist			[Diagonal lines pattern]	[Diagonal lines pattern]
30	SS-9	33.5 - 33.9	-50/5"	50	5					[Vertical lines pattern]	[Diagonal lines pattern]	- 719

NOTES
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 RS = Rock Sample
 REC = Rock Core Recovery
 RQD = Rock Quality Designation

1. ∇ = Water Level At Termination of Boring
2. ▼ = Water Level After 24 Hours



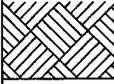
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BORING LOG BC-26A

SHEET 2 OF 2

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1054-04-955**
 LOGGED BY: **S. Watts**
 DATE DRILLED: **2/17/2006**
 BORING DEPTH (ft): **37**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **3-1/4" HSA**
 DRILL RIG: **CME-750**
 TOP OF CASING ELEVATION (ft): **749.32**
 WATER LEVEL TOB (ft bgs): **25**
 WATER LEVEL 24 HRS (ft bTOC): **14.52**

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-		37.0	-50/0"	50	0				Medium gray brown with red and white stripes, gravelly, silty SAND (PWR), dense and slightly moist (<i>continued</i>) Auger Refusal at 37.0' Boring terminated at a depth of 37.0 feet.	Protective Casing Dia: Type: Interval:		-
									Riser Casing Dia: Type: Interval:			
									Grout Type: Interval:			
									Seal Type: Interval:			
									Filterpack Type: Interval:			
									Screen Dia: Type: Interval:			

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BORING LOG BC-27

PROJECT: Duke Power-Belews Creek
LOCATION: Belews Creek, NC
PROJECT NO.: 1054-04-955
LOGGED BY: L. Ennis
DATE DRILLED: 2/20/2006
BORING DEPTH (ft): 50.3

DRILLING CONTRACTOR: S&ME, Inc.
DRILLING METHOD: 3-1/4" HSA
DRILL RIG: CME-750
TOP OF CASING ELEVATION (ft): 763.96
WATER LEVEL TOB (ft bgs): 28.5
WATER LEVEL 24 HRS (ft bTOC): 32.55

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	SS-1	1.0 - 2.5	2-2-5	7	13			(LITHOLOGY TAKEN FROM BC-27A) Red brown very fine sandy clayey SILT, with rock fragments and roots (Fill)	Protective Casing Dia: 4.0 in. Type: Stickup Interval: 2.03	[Symbol]	-	
-	SS-2	3.5 - 5.0	8-8-9	17	16						- 759	
5 -	SS-3	6.0 - 7.5	5-7-10	17	18				Orange tan brown very fine sandy clayey SILT, with rock fragments and roots (Fill), slightly moist at 6.0'	Riser Casing Dia: 2.0 in. Type: PVC Interval: 0.0 - 21.0	[Symbol]	-
-	SS-4	8.5 - 10.0	5-6-9	15	18							- 754
10 -									Red brown very fine sandy clayey SILT, FILL with rock fragments and roots	Grout Type: Portland Interval: 0.0 - 16.2	[Symbol]	-
-	SS-5	13.5 - 15.0	6-7-9	16	13							- 749
15 -									Tan brown slightly clayey SILT, micaceous, moist, some relict layering (Fill)	Seal Type: Bentonite Interval: 16.2 - 18.8	[Symbol]	-
-	SS-6	18.5 - 20.0	9-8-9	17	15							- 744
20 -									Tan brown slightly sandy SILT (Fill) Rock fragments at 19.0'	Screen Dia: 2" Type: Schedule 40 PVC Interval: 21.0 - 36.0	[Symbol]	-
-	SS-7	23.5 - 25.0	7-9-10	19	17			- 739				
25 -								Red brown silty very fine SAND with slight clay layering, micaceous (Fill) Rock fragments at 24.5'		[Symbol]	-	
-	SS-8	28.5 - 30.0	3-3-3	6	12						- 734	
30 -								Red brown and gray very fine SAND, wet with quartz fragments (Fill). Clayey layering from 28.5 - 29.0'.		[Symbol]	-	
-	SS-9	33.5 - 35.0	3-5-5	10	15						-	
								Gray Brown very fine SAND (Saprolite), saturated		[Symbol]	-	

NOTES

SS = Split Spoon Sample
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 REC = Rock Core Recovery
 RQD = Rock Quality Designation

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BORING LOG BC-27

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1054-04-955**
 LOGGED BY: **L. Ennis**
 DATE DRILLED: **2/20/2006**
 BORING DEPTH (ft): **50.3**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **3-1/4" HSA**
 DRILL RIG: **CME-750**
 TOP OF CASING ELEVATION (ft): **763.96**
 WATER LEVEL TOB (ft bgs): **28.5**
 WATER LEVEL 24 HRS (ft bTOC): **32.55**

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-								▽	Gray Brown very fine SAND (Saprolite), saturated (<i>continued</i>)	Protective Casing Dia: 4.0 in. Type: Stickup Interval: 2.03	▬	-
-	SS-10	38.5 - 39.5	37-50/6"	87	8			▽			-	-
40								▬	White very fine SAND (PWR), saturated	Riser Casing Dia: 2.0 in. Type: PVC Interval: 0.0 - 21.0	▬	-
-	SS-11	43.5 - 43.8	-50/4"	50	1			▽			-	-
45								▬	Quartzite, (PWR) Auger Refusal at 50.3'	Grout Type: Portland Interval: 0.0 - 16.2	▬	-
-	SS-12	48.5 - 48.7	-50/2"	50	0.5			▽			-	-
50								▬	Boring terminated at a depth of 50.3 feet.	Seal Type: Bentonite Interval: 16.2 - 18.8	▬	-
-								▽			-	-
								▬	Boring terminated at a depth of 50.3 feet.	Filterpack Type: Sand Interval: 18.8 - 36.0	▬	-
								▽			-	-
								▬	Boring terminated at a depth of 50.3 feet.	Screen Dia: 2" Type: Schedule 40 PVC Interval: 21.0 - 36.0	▬	-
								▽			-	-

NOTES

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BORING LOG BC-27A

PROJECT: Duke Power-Belews Creek
LOCATION: Belews Creek, NC
PROJECT NO.: 1054-04-955
LOGGED BY: L. Ennis
DATE DRILLED: 2/20/2006
BORING DEPTH (ft): 50.3

DRILLING CONTRACTOR: S&ME, Inc.
DRILLING METHOD: 3-1/4" HSA
DRILL RIG: CME-750
TOP OF CASING ELEVATION (ft): 763.96
WATER LEVEL TOB (ft bgs): 28.5
WATER LEVEL 24 HRS (ft bTOC): 32.55

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-								[Cross-hatch symbol]	(LITHOLOGY TAKEN FROM BC-27A) Red brown very fine sandy clayey SILT, with rock fragments and roots (Fill)	Protective Casing Dia: Type: Interval:	[Cross-hatch symbol]	-
5								[Cross-hatch symbol]	Orange tan brown very fine sandy clayey SILT, with rock fragments and roots (Fill), slightly moist at 6.0'	Riser Casing Dia: Type: Interval:	[Cross-hatch symbol]	-759
10								[Cross-hatch symbol]	Red brown very fine sandy clayey SILT, FILL with rock fragments and roots	Grout Type: Interval:	[Cross-hatch symbol]	-754
15								[Cross-hatch symbol]	Tan brown slightly clayey SILT, micaceous, moist, some relict layering (Fill)	Seal Type: Interval:	[Cross-hatch symbol]	-749
20								[Cross-hatch symbol]	Tan brown slightly sandy SILT (Fill) Rock fragments at 19.0'	Filterpack Type: Interval:	[Cross-hatch symbol]	-744
25								[Cross-hatch symbol]	Red brown silty very fine SAND with slight clay layering, micaceous (Fill) Rock fragments at 24.5'	Screen Dia: Type: Interval:	[Cross-hatch symbol]	-739
30								[Dotted symbol]	Red brown and gray very fine SAND, wet with quartz fragments (Fill). Clayey layering from 28.5 - 29.0'.		[Cross-hatch symbol]	-734
-								[Dotted symbol]	Gray Brown very fine SAND (Saprolite), saturated		[Cross-hatch symbol]	-

NOTES

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- ST = Shelby Tube Sample
- S = Bulk Sample
- R = Core Run
- RS = Rock Sample
- REC = Rock Core Recovery
- RQD = Rock Quality Designation

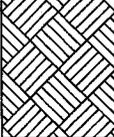
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- 2. ▼ = Water Level After 24 Hours

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BORING LOG BC-27A

PROJECT: Duke Power-Belews Creek
LOCATION: Belews Creek, NC
PROJECT NO.: 1054-04-955
LOGGED BY: L. Ennis
DATE DRILLED: 2/20/2006
BORING DEPTH (ft): 50.3

DRILLING CONTRACTOR: S&ME, Inc.
DRILLING METHOD: 3-1/4" HSA
DRILL RIG: CME-750
TOP OF CASING ELEVATION (ft): 763.96
WATER LEVEL TOB (ft bgs): 28.5
WATER LEVEL 24 HRS (ft bTOC): 32.55

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-									Gray Brown very fine SAND (Saprolite), saturated (continued)	Protective Casing Dia: Type: Interval:		-
40									White very fine SAND (PWR), saturated	Riser Casing Dia: Type: Interval:		- 724
45										Grout Type: Interval:		- 719
50									Quartzite, (PWR) Auger Refusal at 50.3'	Seal Type: Interval:		- 714
									Boring terminated at a depth of 50.3 feet.	Filterpack Type: Interval:		
										Screen Dia: Type: Interval:		

NOTES

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BORING LOG BC-28

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1054-04-955**
 LOGGED BY: **L. Ennis**
 DATE DRILLED: **2/15/2006**
 BORING DEPTH (ft): **60**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **3-1/4" HSA**
 DRILL RIG: **CME-750**
 TOP OF CASING ELEVATION (ft): **818.09**
 WATER LEVEL TOB (ft bgs): **52**
 WATER LEVEL 24 HRS (ft bTOC): **53.08**

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
-	SS-1	1.0 - 2.5	4-7-12	19	12			[Symbol: Red brown clayey sandy SILT]	Red brown clayey sandy SILT	Protective Casing Dia: 4.0 in. Type: Stickup Interval: 2.07	[Symbol: Protective Casing]	-
-	SS-2	3.5 - 5.0	7-9-10	19	18							- 813
5								[Symbol: Orange red brown silty fine SAND]	Orange red brown silty fine SAND	Riser Casing Dia: 2.0 in. Type: PVC Interval: 0.0 - 43.2	[Symbol: Riser Casing]	-
-	SS-3	6.0 - 7.5	8-7-9	16	12							- 808
	SS-4	8.5 - 10.0	4-6-8	14	6			[Symbol: Tan very fine sandy SILT (Saprolite)]	Tan very fine sandy SILT (Saprolite)	Grout Type: Portland Interval: 0.0 - 40.2	[Symbol: Grout]	-
10												- 803
	SS-5	13.5 - 15.0	3-4-6	10	16			[Symbol: Red brown very fine silty SAND, (Saprolite) with some relict layering and black oxidation]	Red brown very fine silty SAND, (Saprolite) with some relict layering and black oxidation	Seal Type: Bentonite Interval: 40.2 - 41.2	[Symbol: Seal]	-
15												- 798
	SS-6	18.5 - 20.0	5-5-8	13	16			[Symbol: Gray tan very silty very fine SAND, (Saprolite) with some relict layering, moist, feldspathic and micaceous]	Gray tan very silty very fine SAND, (Saprolite) with some relict layering, moist, feldspathic and micaceous	Screen Dia: 2" Type: Schedule 40 PVC Interval: 43.2 - 58.20	[Symbol: Screen]	-
20												- 793
	SS-7	23.5 - 25.0	4-4-7	11	4			[Symbol: White and gray brown very fine silty SAND, (Saprolite)]	White and gray brown very fine silty SAND, (Saprolite)		[Symbol: Sand]	-
25												- 788
	SS-8	28.5 - 30.0	7-10-13	23	15			[Symbol: White and light gray very fine silty SAND (Saprolite) with some relict structures]	White and light gray very fine silty SAND (Saprolite) with some relict structures		[Symbol: Sand]	-
30												-
	SS-9	33.5 - 35.0	8-12-15	27	14			[Symbol: Gray tan very fine silty SAND (Saprolite) with some relict structures]	Gray tan very fine silty SAND (Saprolite) with some relict structures		[Symbol: Sand]	-

NOTES

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BORING LOG BC-28

PROJECT: **Duke Power-Belews Creek**
 LOCATION: **Belews Creek, NC**
 PROJECT NO.: **1054-04-955**
 LOGGED BY: **L. Ennis**
 DATE DRILLED: **2/15/2006**
 BORING DEPTH (ft): **60**

DRILLING CONTRACTOR: **S&ME, Inc.**
 DRILLING METHOD: **3-1/4" HSA**
 DRILL RIG: **CME-750**
 TOP OF CASING ELEVATION (ft): **818.09**
 WATER LEVEL TOB (ft bgs): **52**
 WATER LEVEL 24 HRS (ft bTOC): **53.08**

Sample Information								Symbol	Field Description & Remarks	Well Construction Details	Well Construction Graphic	Elevation (feet)
Depth (feet)	Sample Number	Sample Interval (feet)	Blows per 6 inches	SPT (N-Value)	Recovery (inches)	Rock RQD (%)	Lab USCS					
0 - 38.5	SS-10	38.5 - 40.0	10-15-14	29	14			[Symbol: Dotted]	Gray tan very fine silty SAND (Saprolite) with some relict structures <i>(continued)</i>	Protective Casing Dia: 4.0 in. Type: Stickup Interval: 2.07	[Symbol: Diagonal Hatching]	778
38.5 - 43.5	SS-11	43.5 - 45.0	7-8-11	19	12			[Symbol: Dotted]	Gray tan very fine silty SAND (Saprolite) with some relict structures, micaceous, moist at 43.5'	Riser Casing Dia: 2.0 in. Type: PVC Interval: 0.0 - 43.2	[Symbol: Diagonal Hatching]	773
43.5 - 48.5	SS-12	48.5 - 50.0	11-15-36	51	15			[Symbol: Dotted]		Grout Type: Portland Interval: 0.0 - 40.2	[Symbol: Horizontal Hatching]	768
48.5 - 53.5		53.5 - 53.6	-50/1"-	50	1			[Symbol: Dotted]		Seal Type: Bentonite Interval: 40.2 - 41.2	[Symbol: Horizontal Hatching]	763
53.5 - 55.0	R-1	55.0 - 60.0	-		97	56		[Symbol: Wavy]	White/gray PWR Auger Refusal at 55.0'	Screen Dia: 2" Type: Schedule 40 PVC Interval: 43.2 - 58.20	[Symbol: Vertical Hatching]	758
55.0 - 60.0								[Symbol: Wavy]	White and gray biotite quartz gneiss with garnets REC = 97% RQD = 56%		[Symbol: Vertical Hatching]	
Note: Bore for well obstructed at 58.3 feet. Well set at 58.3 feet. Boring terminated at a depth of 60.0'												

NOTES

SS = Split Spoon Sample
 ST = Shelby Tube Sample
 S = Bulk Sample
 R = Core Run
 RS = Rock Sample
 REC = Rock Core Recovery
 RQD = Rock Quality Designation

1. ▽ = Water Level At Termination of Boring
2. ▼ = Water Level After 24 Hours



S&ME
 ENVIRONMENTAL SERVICES
 ENGINEERING • TESTING
 3118 Spring Forest Road
 Raleigh, NC 27616



Recovery: 4.8'

RQD: 56%

Rock Type: Biotite Quartz
Gneiss

FGD Scrubber Landfill

Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina

S&ME Project No. 1054-04-955

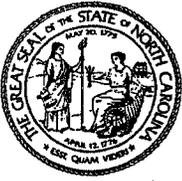
Boring: BC-28

Sample Depth: 55.0 - 60.0

Box: 1 of 1

APPENDIX II

WELL CONSTRUCTION RECORDS



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3323

1. WELL CONTRACTOR:
Thomas Jason White
 Well Contractor (Individual) Name
S+M E Inc.
 Well Contractor Company Name
 STREET ADDRESS 3109 Spring Forest Rd
Raleigh NC 27658
 City or Town State Zip Code
(919) 872-2666
 Area code- Phone number

2. WELL INFORMATION:
 SITE WELL ID #(if applicable) 13C-25
 STATE WELL PERMIT #(if applicable) _____
 DWQ or OTHER PERMIT #(if applicable) _____

WELL USE (Check Applicable Box) Monitoring Municipal/Public
 Industrial/Commercial Agricultural Recovery Injection
 Irrigation Other (list use) _____
 DATE DRILLED 2/21/06
 TIME COMPLETED 11:00 AM AM PM

3. WELL LOCATION:
 CITY: Raleighs Creek COUNTY Stokes

 (Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridge Other _____
 (check appropriate box)

LATITUDE 3 _____
 LONGITUDE _____
 Latitude/longitude source: GPS Topographic map
 (location of well must be shown on a USGS topo map and attached to this form if not using GPS)

4. FACILITY - is the name of the business where the well is located.
 FACILITY ID #(if applicable) _____
 NAME OF FACILITY _____
 STREET ADDRESS _____

 City or Town State Zip Code
 CONTACT PERSON _____
 MAILING ADDRESS _____

 City or Town State Zip Code

 Area code - Phone number

5. WELL DETAILS:
 a. TOTAL DEPTH: 21.5
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: 11.3 FT.
 (Use "+" if Above Top of Casing)

d. TOP OF CASING IS 2.0 FT. Above Land Surface*
 *Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): _____ **METHOD OF TEST** _____

f. DISINFECTION: Type _____ Amount _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

6. CASING: _____ Thickness/Weight _____

From	To	Depth	Diameter	Material
From <u>0.0</u>	To <u>6.5</u>	Ft. <u>2"</u>		<u>PVC</u>
From _____	To _____	Ft. _____		_____
From _____	To _____	Ft. _____		_____

7. GROUT: _____

From	To	Depth	Material	Method
From <u>1.3</u>	To <u>0.0</u>	Ft. <u>Portland</u>		<u>Tremie</u>
From _____	To _____	Ft. _____		_____
From _____	To _____	Ft. _____		_____

8. SCREEN: _____

From	To	Depth	Diameter	Slot Size	Material
From <u>21.5</u>	To <u>6.5</u>	Ft. <u>2</u>	in. <u>0.10</u>	in. <u>PVC</u>	
From _____	To _____	Ft. _____	in. _____	in. _____	
From _____	To _____	Ft. _____	in. _____	in. _____	

9. SAND/GRAVEL PACK: _____

From	To	Depth	Size	Material
From <u>21.5</u>	To <u>4.5</u>	Ft. <u>#2</u>		<u>Sort</u>
From _____	To _____	Ft. _____		_____
From _____	To _____	Ft. _____		_____

10. DRILLING LOG

From	To	Formation Description
<u>1.0 - 3.0</u>		<u>Brn/Gr/white sand silt gravel (fill)</u>
<u>3.0 - 6.0</u>		<u>Coarse Fine Sand</u>
<u>6.0 - 23.0</u>		<u>Gr/blk/white micaceous silt sand / PWR / SAP</u>
_____		_____
_____		_____
_____		_____
_____		_____
_____		_____
_____		_____
_____		_____
_____		_____
_____		_____

11. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.
Thomas J. White 2-24-06
 SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE
Thomas J. White
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3323

1. WELL CONTRACTOR:

Thomas S. White
Well Contractor (Individual) Name

Same Inc
Well Contractor Company Name

STREET ADDRESS 5109 Spring Forest Rd

Raleigh NC 27658
City or Town State Zip Code

(919) 872-2660
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) BC-27

STATE WELL PERMIT #(if applicable)

DWQ or OTHER PERMIT #(if applicable)

WELL USE (Check Applicable Box) Monitoring Municipal/Public

Industrial/Commercial Agricultural Recovery Injection

Irrigation Other (list use)

DATE DRILLED 2-21-06

TIME COMPLETED 12:00 AM PM

3. WELL LOCATION:

CITY: Belews Creek COUNTY Stokes

(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

Slope Valley Flat Ridge Other
(check appropriate box)

LATITUDE 3

LONGITUDE

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: GPS Topographic map

(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

4. FACILITY- is the name of the business where the well is located.

FACILITY ID #(if applicable)

NAME OF FACILITY

STREET ADDRESS

City or Town State Zip Code

CONTACT PERSON

MAILING ADDRESS

City or Town State Zip Code

Area code - Phone number

5. WELL DETAILS:

a. TOTAL DEPTH: 36.0

b. DOES WELL REPLACE EXISTING WELL? YES NO

c. WATER LEVEL Below Top of Casing: 28 FT.
(Use "+" if Above Top of Casing)

d. TOP OF CASING IS 2 FT. Above Land Surface*

*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): METHOD OF TEST

f. DISINFECTION: Type Amount

g. WATER ZONES (depth):

From To From To

From To From To

From To From To

6. CASING: Depth Diameter Thickness/Weight Material

From 0.0 To 21.0 Ft. 2" PVC

From To Ft.

From To Ft.

7. GROUT: Depth Material Method

From 16.2 To 0.0 Ft. Portland Tremic

From To Ft.

From To Ft.

8. SCREEN: Depth Diameter Slot Size Material

From 36.0 To 21 Ft. 2 in. 10 in. PVC

From To Ft. in. in.

From To Ft. in. in.

9. SAND/GRAVEL PACK: Depth Size Material

From 36.0 To 18.0 Ft. 2 Sand

From To Ft.

From To Ft.

10. DRILLING LOG From To Formation Description

0 - 10 CL Ben Fi Sand S.H

10 - 20 fg slightly clay S.H

20 - 33 CL WCA S.H Fi Sand

33 - 36 Coq White Fine Sand

11. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Thomas S. White 2-24-06
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

Thomas S. White
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center - Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b Rev. 7/05



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 3323

1. WELL CONTRACTOR:

Thomas J. White
Well Contractor (Individual) Name

Some Inc.
Well Contractor Company Name

STREET ADDRESS 3108 Spring Forest Rd.

Raleigh NC 27658
City of Town State Zip Code

(919) 872-2666
Area code- Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) BC-28

STATE WELL PERMIT #(if applicable) _____

DWQ or OTHER PERMIT #(if applicable) _____

WELL USE (Check Applicable Box) Monitoring Municipal/Public

Industrial/Commercial Agricultural Recovery Injection

Irrigation Other (list use) _____

DATE DRILLED 2-17-06

TIME COMPLETED 12:00 AM PM

3. WELL LOCATION:

CITY: Belews Creek COUNTY Stokes

(Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

Slope Valley Flat Ridge Other _____
(check appropriate box)

LATITUDE 3 _____

LONGITUDE _____

May be in degrees, minutes, seconds or in a decimal format

Latitude/longitude source: GPS Topographic map
(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

4. FACILITY- is the name of the business where the well is located.

FACILITY ID #(if applicable) _____

NAME OF FACILITY _____

STREET ADDRESS _____

City or Town State Zip Code

CONTACT PERSON _____

MAILING ADDRESS _____

City or Town State Zip Code

Area code - Phone number

5. WELL DETAILS:

a. TOTAL DEPTH: 60 FT

b. DOES WELL REPLACE EXISTING WELL? YES NO

c. WATER LEVEL Below Top of Casing: 52.0 FT.
(Use "+" if Above Top of Casing)

d. TOP OF CASING IS 2.0 FT. Above Land Surface*

*Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): _____ METHOD OF TEST _____

f. DISINFECTION: Type _____ Amount _____

g. WATER ZONES (depth):

From _____ To _____ From _____ To _____

From _____ To _____ From _____ To _____

From _____ To _____ From _____ To _____

6. CASING:

Depth Diameter Thickness/ Material
From 0 To 45 Ft. 2 _____ PVC

From _____ To _____ Ft. _____ _____

From _____ To _____ Ft. _____ _____

7. GROUT:

Depth Material Method
From 0 To 50.0 Ft. Portland Tremic

From _____ To _____ Ft. _____ _____

From _____ To _____ Ft. _____ _____

8. SCREEN:

Depth Diameter Slot Size Material
From 60.0 To 45.0 Ft. 2 in. 1/8 in. PVC

From _____ To _____ Ft. _____ in. _____ in. _____

From _____ To _____ Ft. _____ in. _____ in. _____

9. SAND/GRAVEL PACK:

Depth Size Material
From 60.0 To 43.0 Ft. #2 Sand

From _____ To _____ Ft. _____ _____

From _____ To _____ Ft. _____ _____

10. DRILLING LOG

From	To	Formation Description
<u>0-4'</u>		<u>Rd-brn clay ss Si</u>
<u>4-5</u>		<u>gn rd brn Si F1S2</u>
<u>5-8.5</u>		<u>tan mica Si ss</u>
<u>8.5-17.0</u>		<u>rd brown fi Si ss</u>
<u>17.0-23.0</u>		<u>white grey fi Si ss</u>
<u>33.0-55.0</u>		<u>grey tan fi Si ss</u>
<u>55.0-60.0</u>		<u>white grey coarse Gravel</u>

11. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Thomas J. White 2-24-06
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

Thomas J. White
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

APPENDIX III

HYDRAULIC CONDUCTIVITY TEST DATA

Aquifer Test Assumptions / Hydraulic Conductivity Values
Proposed FGD Scrubber Residue Landfill
Duke Power - Belews Creek Steam Station
Belews Creek, Stokes County, North Carolina
S&ME Project 1054-04-955

Boring ID		BC-25	BC-26	BC-27	BC-28
TOC Elevation	(ft AMSL)	748.01	749.32	763.96	818.09
TOG Elevation	(ft AMSL)	745.96	747.21	761.92	816.02
Stick Up	(ft)	2.05	2.11	2.04	2.07

Total Depth	(ft bgs)	21.5	22	36	58.23
Screened Interval	(ft bgs)	6.5 - 21.5	7.0 - 22.0	21.0 - 36.0	43.2 - 58.2
Screen Length	(ft)	15	15	15	15

Casing In Rock?	Y/N	N	N	N	Y
Auger Refusal	(ft bgs)	23	37	50.3	55

Depth to Water (2/27/06)	(ft bTOC)	13.71	14.52	32.55	53.08
--------------------------	-----------	-------	-------	-------	-------

Depth to Top of Screen	(ft bTOC)	8.55	9.11	23.04	27.8
Depth to Bottom of Screen	(ft bTOC)	23.55	24.11	38.04	60.30
r, Well Casing Radius	(ft)	0.0833	0.0833	0.0833	0.0833
R, Borehole Radius	(ft)	0.3542	0.3542	0.3542	0.3542
R, Core Hole Radius	(ft)				
Description of Borehole r/ Core Hole Radius Depths		21.5' of 0.3542'	22.0' of 0.3542'	36.0' of 0.3542'	55.0' of 0.3542' 5.0' of 0.125

Aquifer Test Input Values

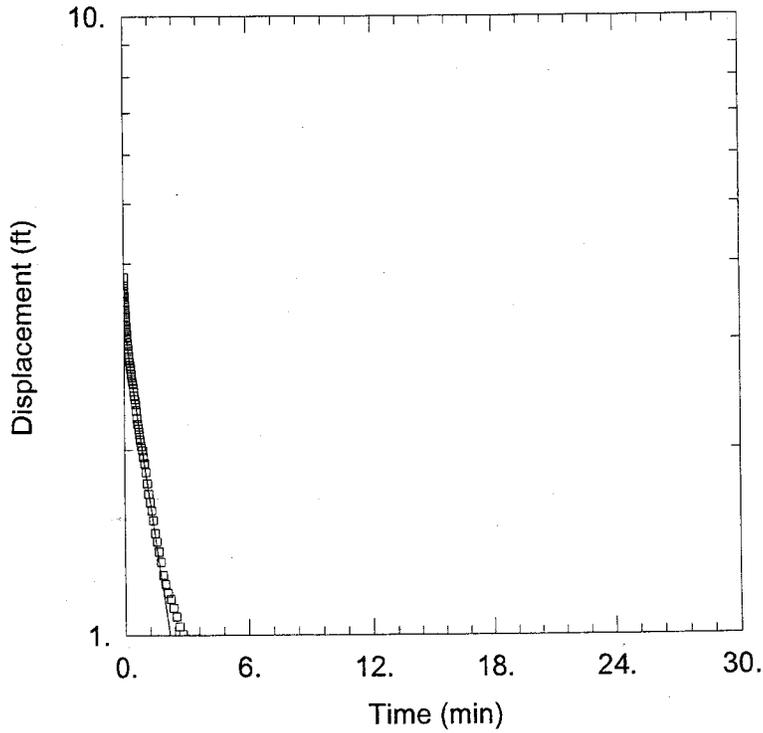
b					
Ft of Standing Water	(ft)	9.84	9.59	5.49	7.22

D					
Aquifer Thickness	(ft)	100	65	65	100

K					
Hydraulic Conductivity (Test #1)	(cm/sec)	8.46E-04	3.69E-04	5.41E-04	1.19E-05
Hydraulic Conductivity (Test #2)	(cm/sec)	4.50E-04	--	5.36E-04	--
Hydraulic Conductivity (Test #3)	(cm/sec)	--	--	--	--
**Avg. Hydraulic Conductivity	(cm/sec)	6.17E-04	3.69E-04	5.39E-04	1.19E-05

Notes:

- * = The water level is above the screened interval.
- ** = Average calculated as the geometric mean.



WELL TEST ANALYSIS

Data Set: S:\...\BC-25-T-1R.aqt
 Date: 03/13/06

Time: 17:33:30

AQUIFER DATA

Saturated Thickness: 100. ft

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (BC-25 T-1)

Initial Displacement: 3.8 ft
 Total Well Penetration Depth: 9.84 ft
 Casing Radius: 0.0833 ft

Static Water Column Height: 9.84 ft
 Screen Length: 15. ft
 Wellbore Radius: 0.3542 ft
 Gravel Pack Porosity: 0.3

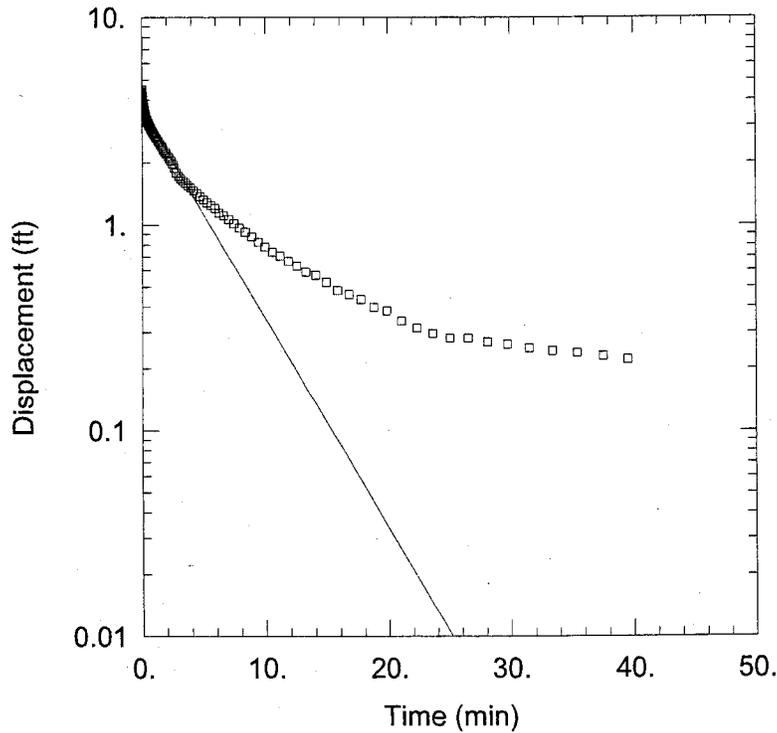
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K =$ 0.001664 ft/min

$y_0 =$ 3.194 ft



BC-26-T-1 SLUG

Data Set: S:\...\BC-26 T-1.aqt
 Date: 03/13/06

Time: 17:16:24

PROJECT INFORMATION

Company: S&ME, Inc.
 Client: Duke Power
 Project: 1054-04-955
 Location: Belews Creek
 Test Well: BC-26-T-1
 Test Date: 2-27-06

AQUIFER DATA

Saturated Thickness: 65. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BC-26 T-1)

Initial Displacement: 4.5 ft
 Total Well Penetration Depth: 9.59 ft
 Casing Radius: 0.0833 ft

Static Water Column Height: 9.59 ft
 Screen Length: 15. ft
 Wellbore Radius: 0.3542 ft
 Gravel Pack Porosity: 0.3

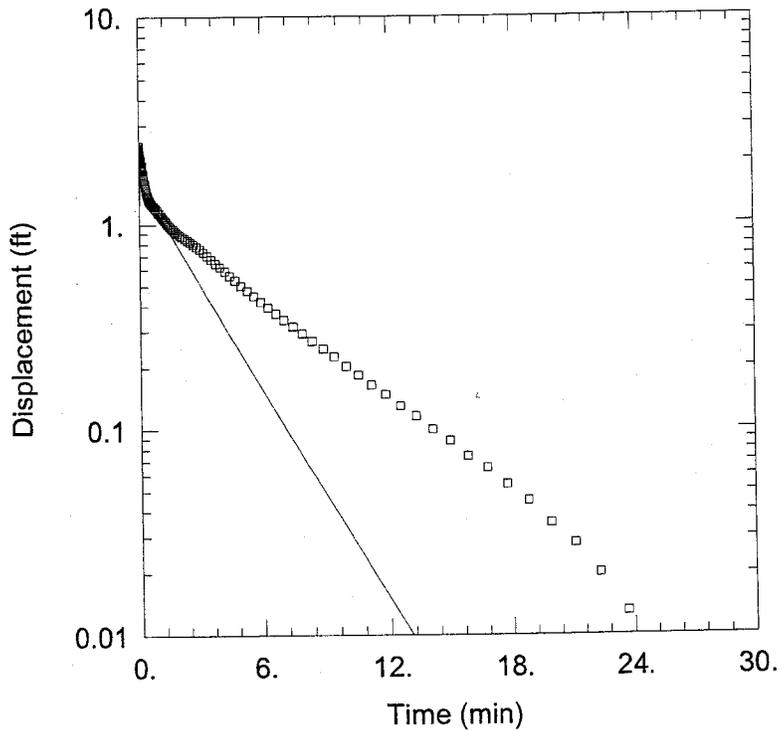
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.0007272 ft/min

y0 = 3.61 ft



BC-27-T-2 SLUG

Data Set: S:\...\BC-27 T-2.aqt
 Date: 03/13/06

Time: 17:26:43

PROJECT INFORMATION

Company: S&ME, Inc.
 Client: Duke Power
 Project: 1054-04-955
 Location: Belews Creek
 Test Well: BC-27-T-2
 Test Date: 2-27-06

AQUIFER DATA

Saturated Thickness: 65 ft

Anisotropy Ratio (K_z/K_r): 1

WELL DATA (BC-27 T-2)

Initial Displacement: 2.4 ft
 Total Well Penetration Depth: 5.49 ft
 Casing Radius: 0.0833 ft

Static Water Column Height: 5.49 ft
 Screen Length: 15 ft
 Wellbore Radius: 0.3542 ft
 Gravel Pack Porosity: 0.3

SOLUTION

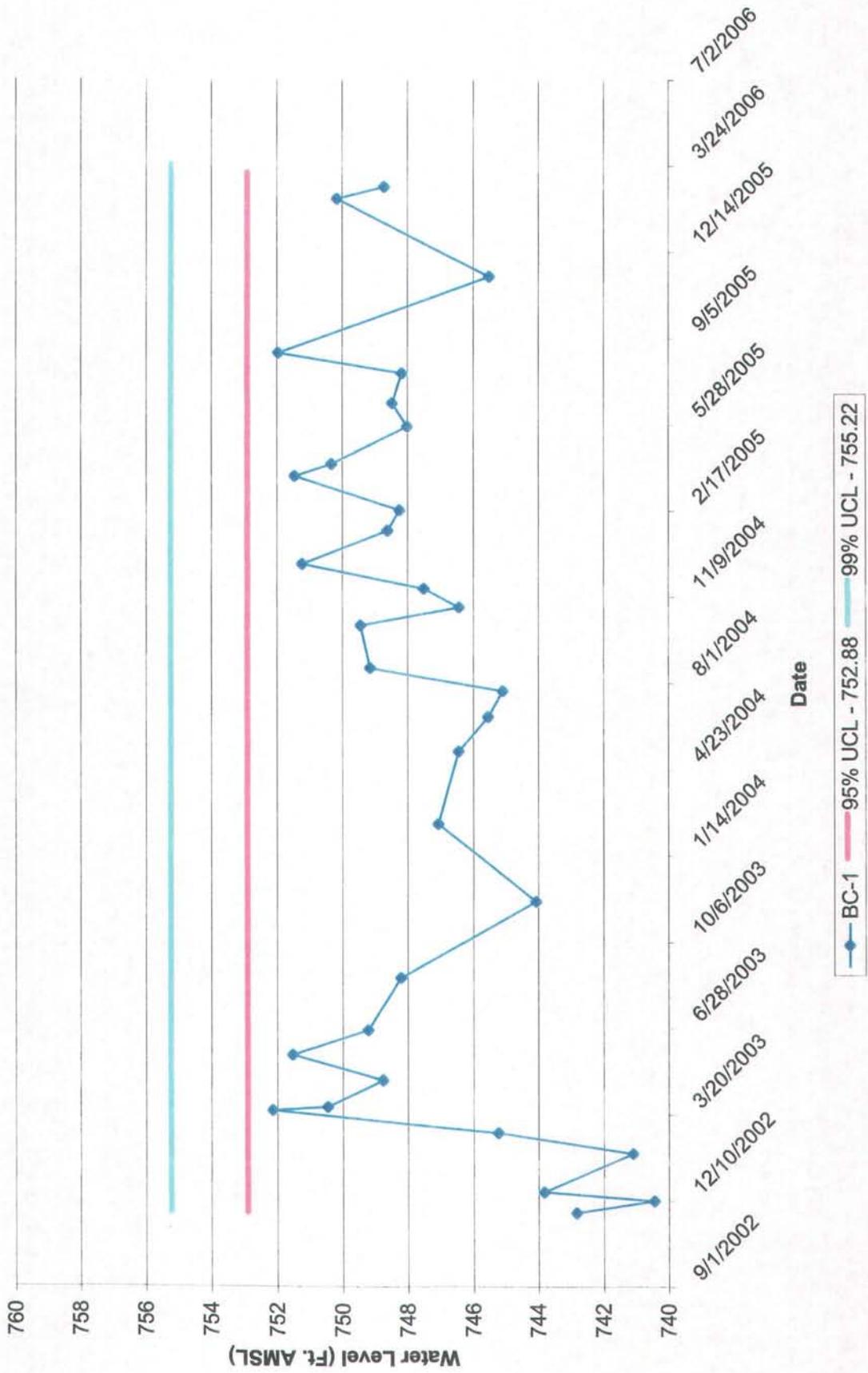
Aquifer Model: Unconfined
 $K = 0.001055$ ft/min

Solution Method: Bower-Rice
 $y_0 = 1.62$ ft

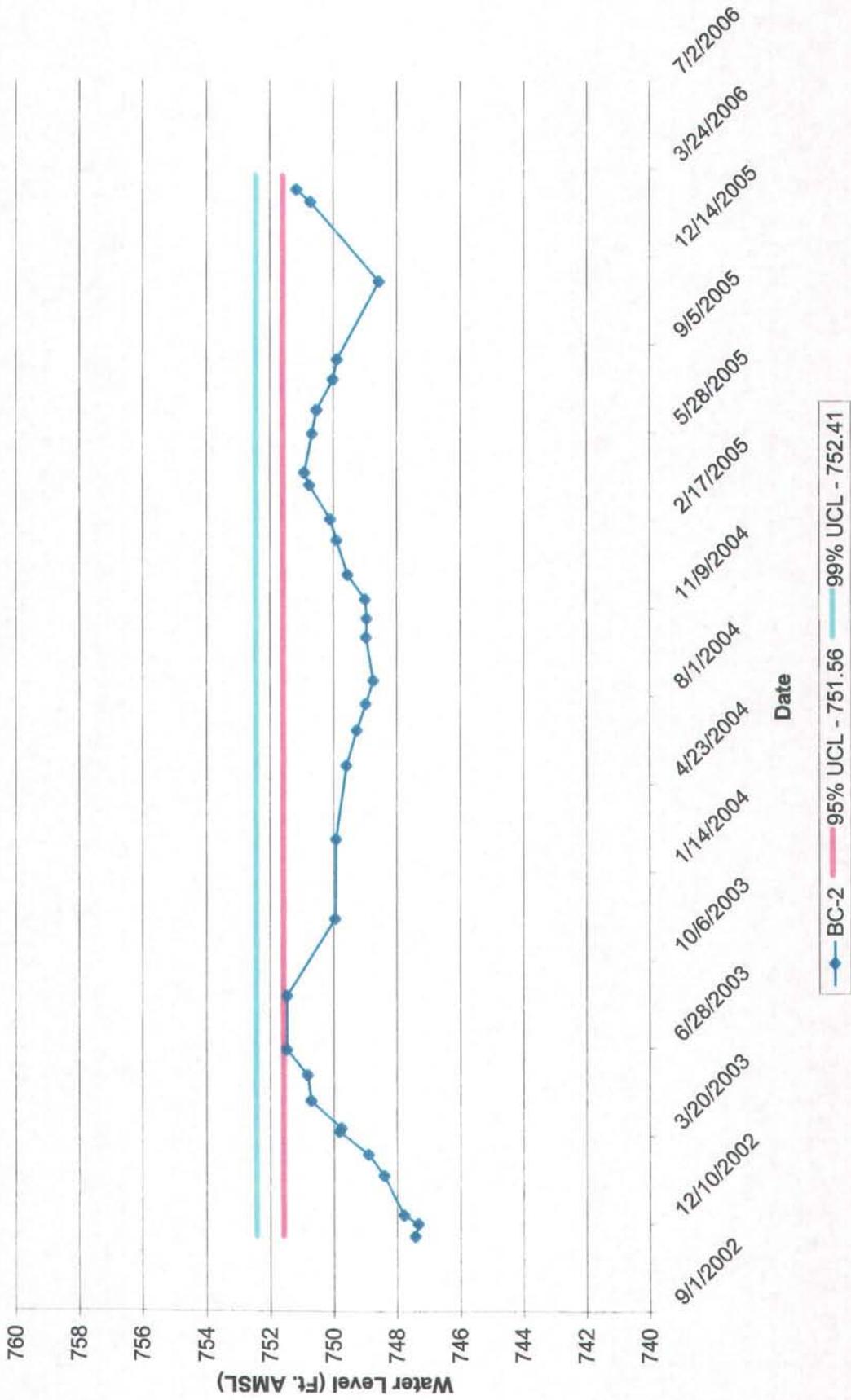
APPENDIX IV

HYDROGRAPHS VS PREDICTIVE CONFIDENCE LEVELS

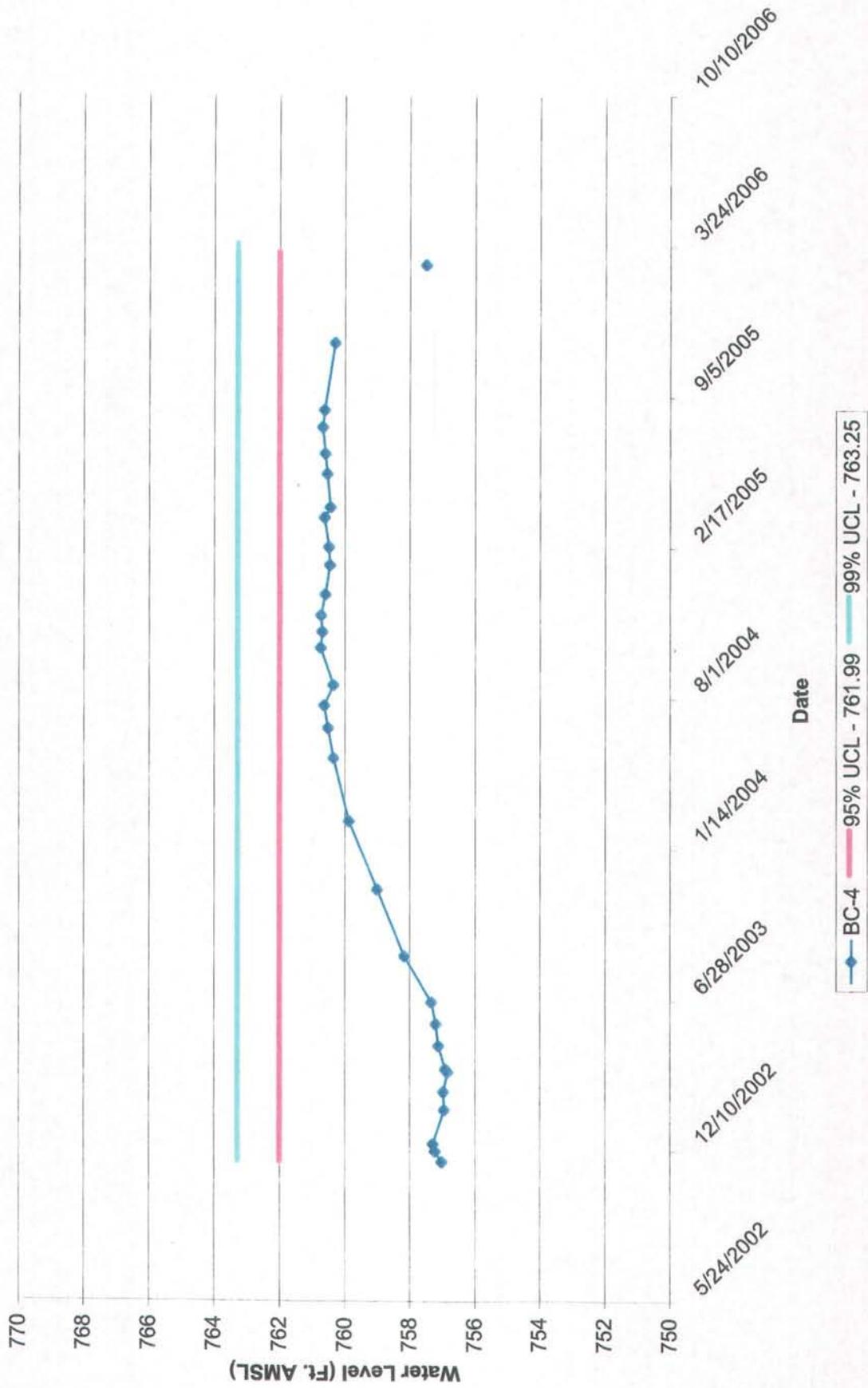
BC-1



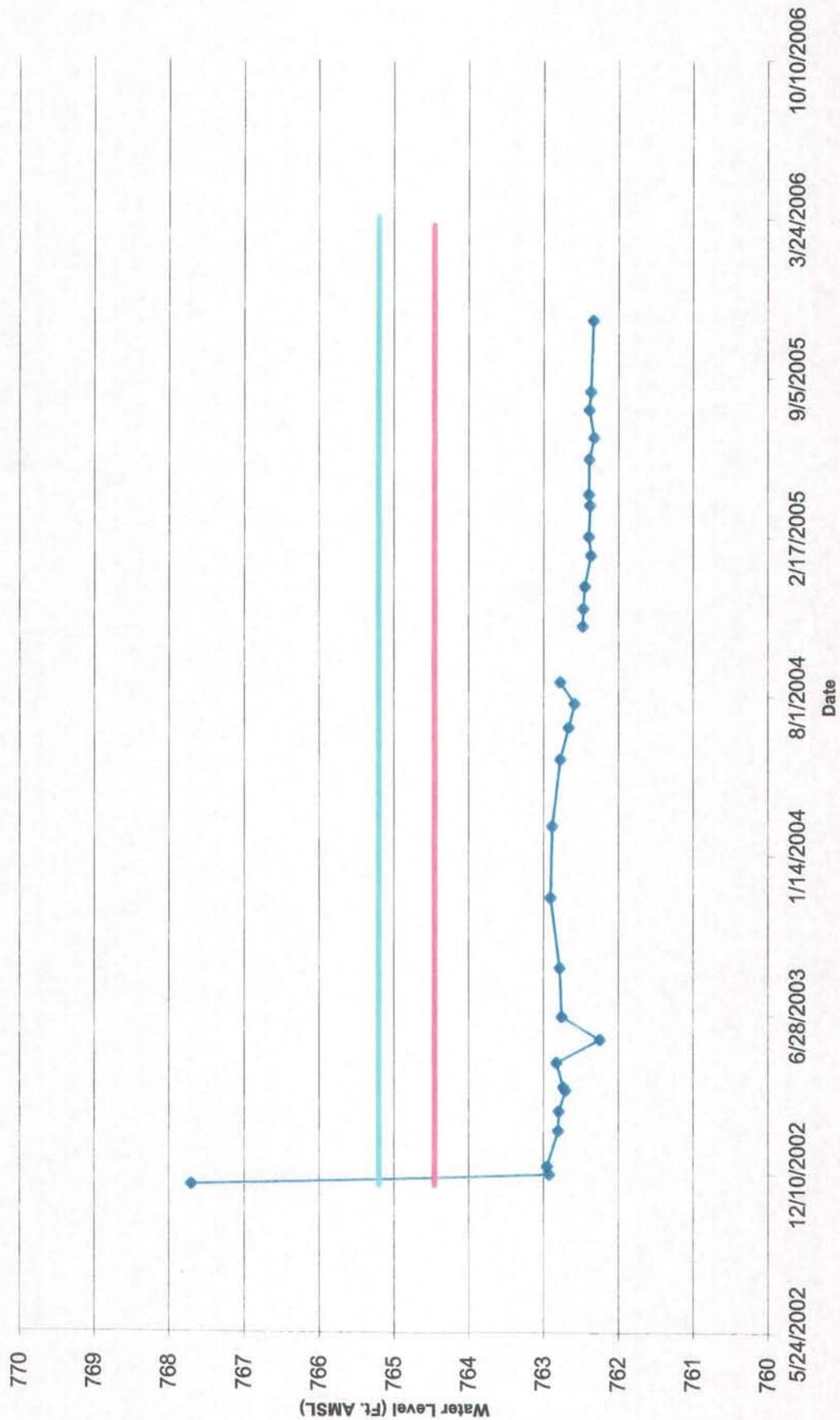
BC-2



BC-4

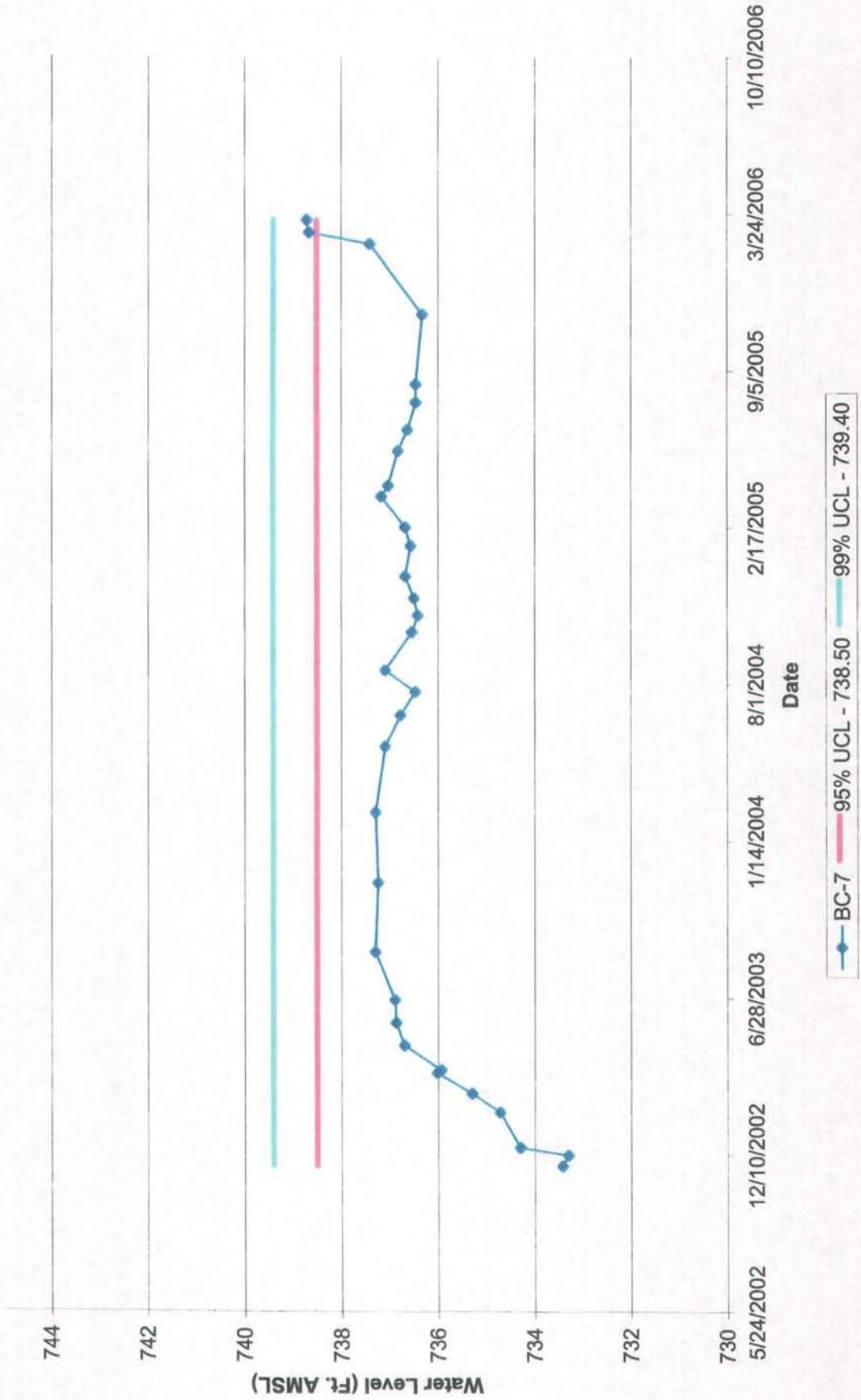


BC-6

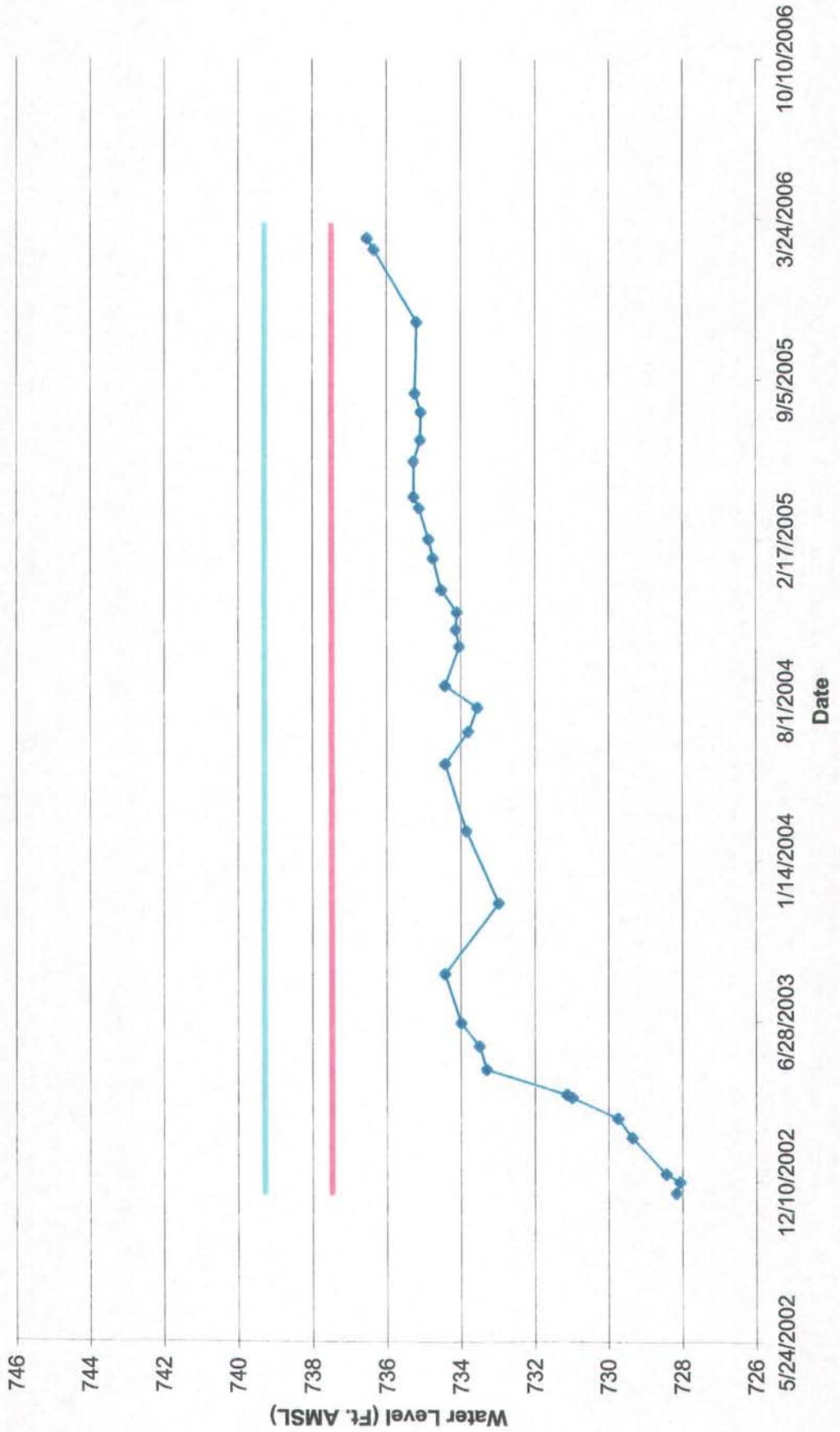


BC-6 95% UCL - 764.45 99% UCL - 765.20

BC-7

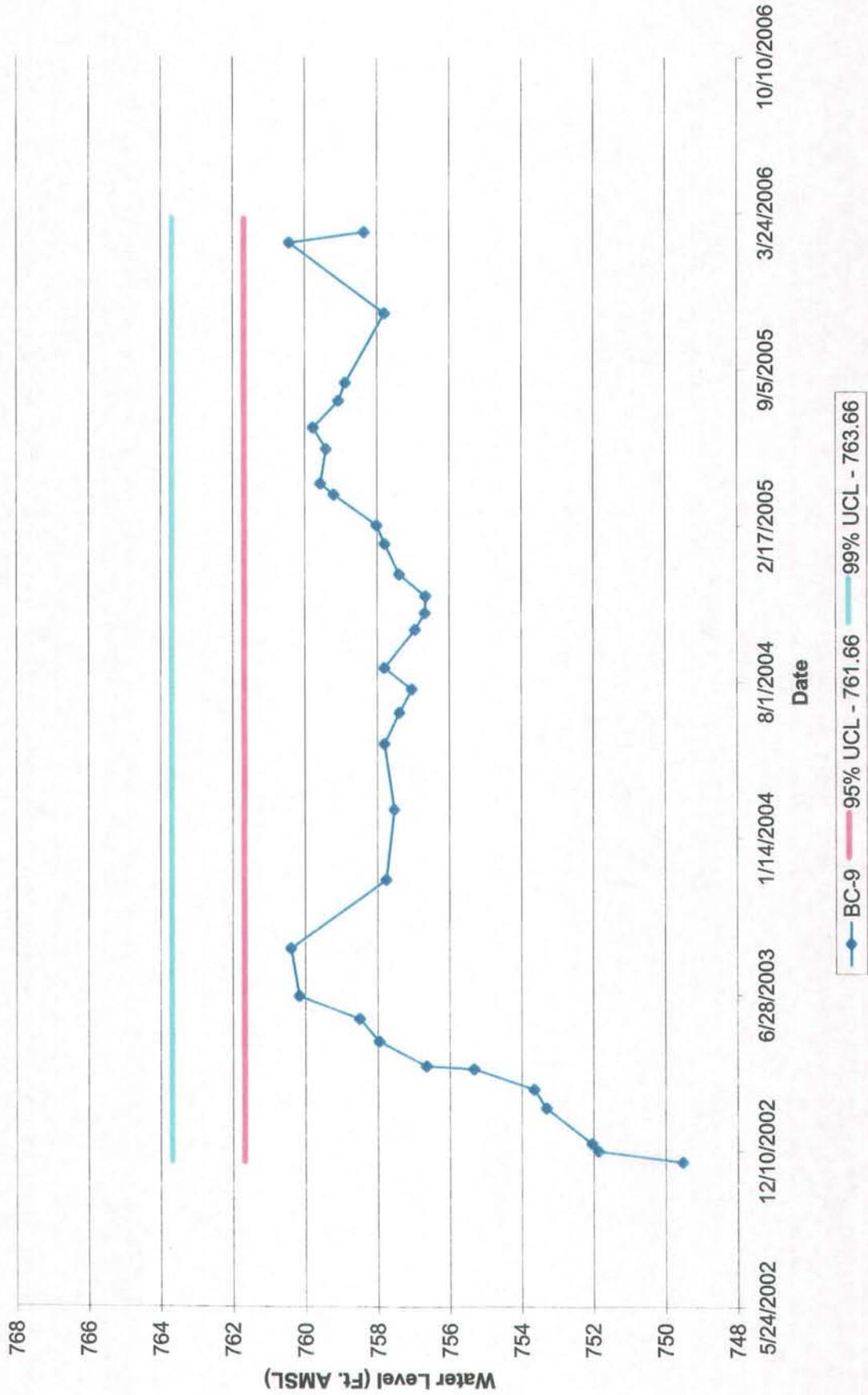


BC-8

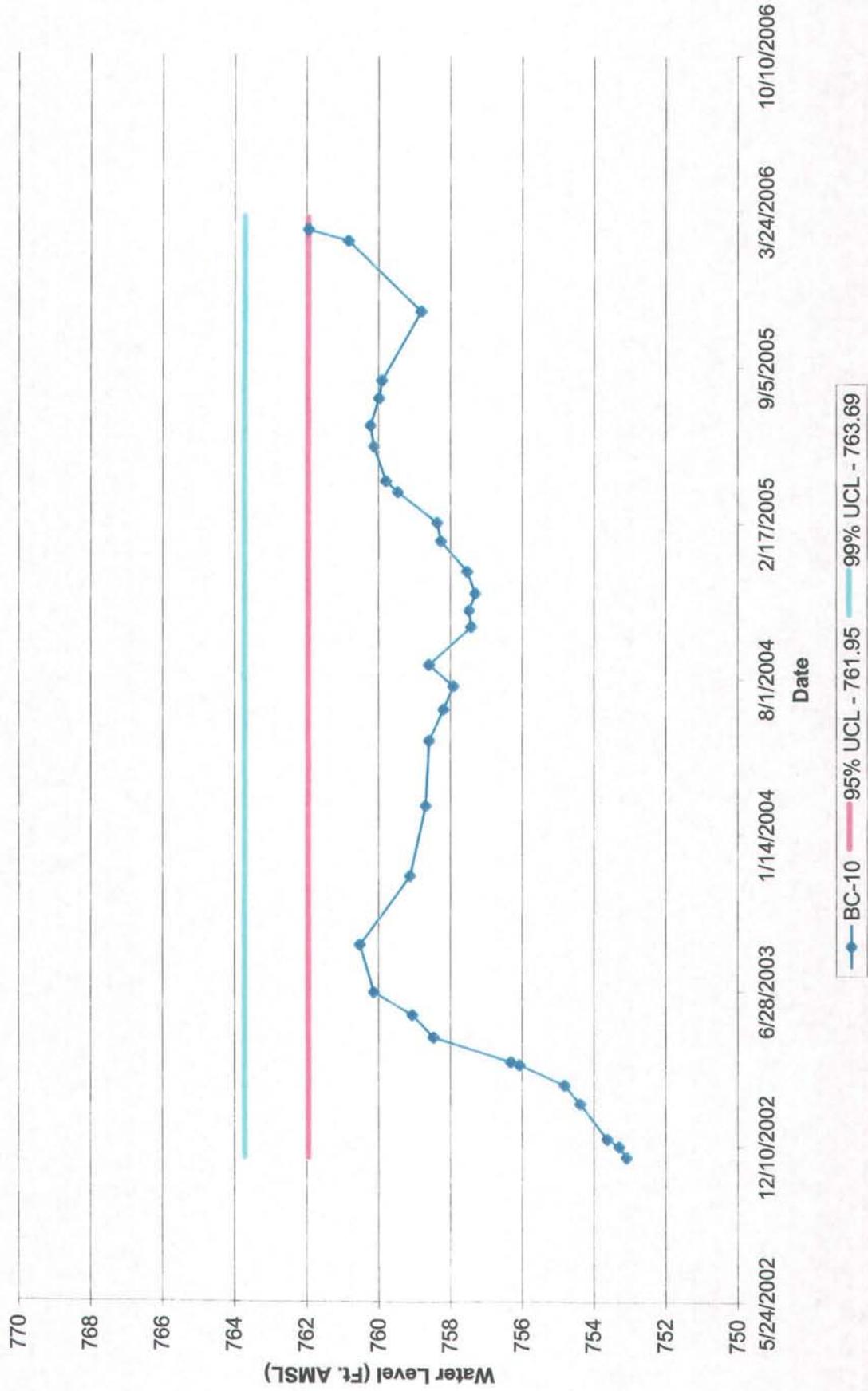


BC-8 95% UCL - 737.47 99% UCL - 739.28

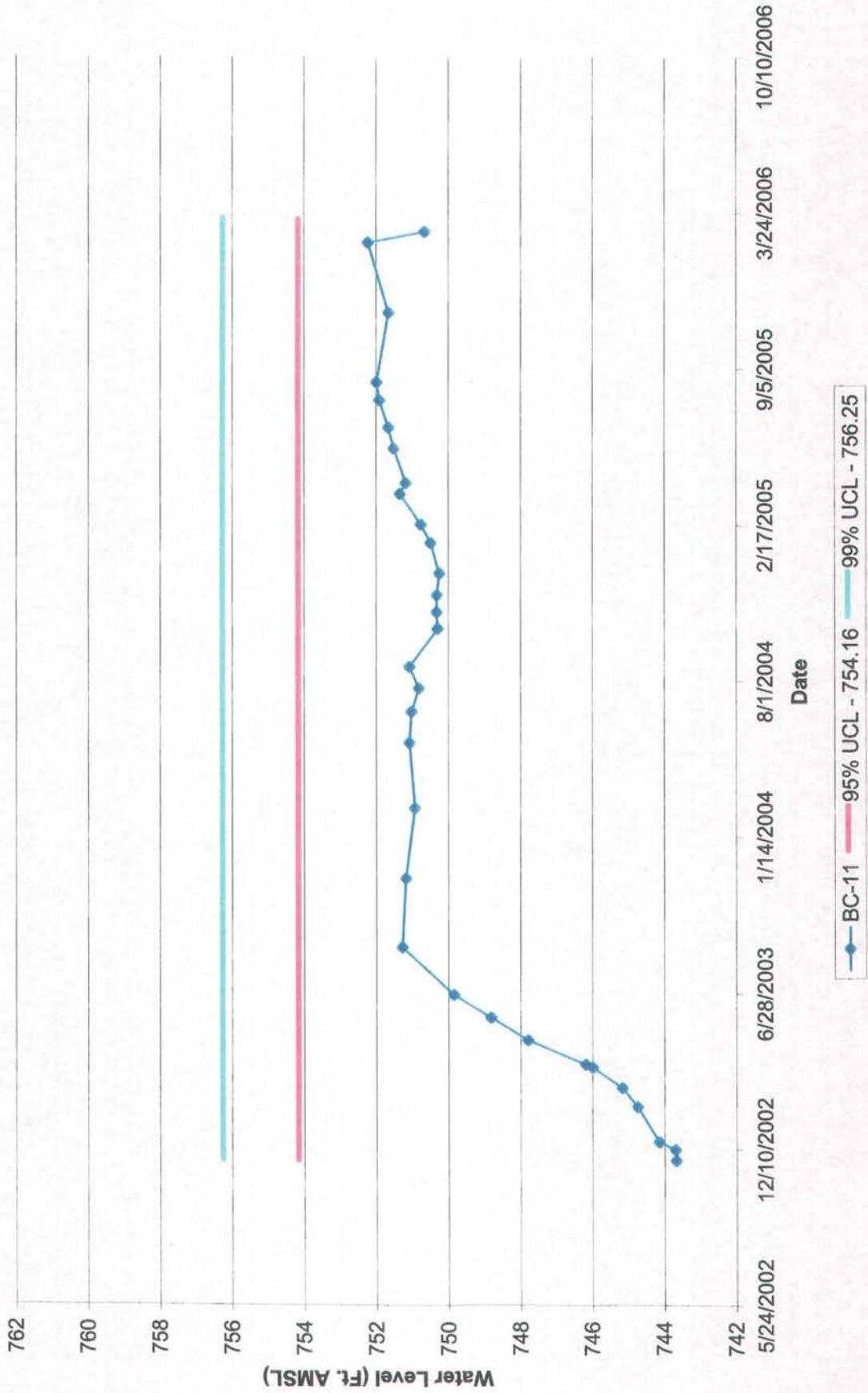
BC-9



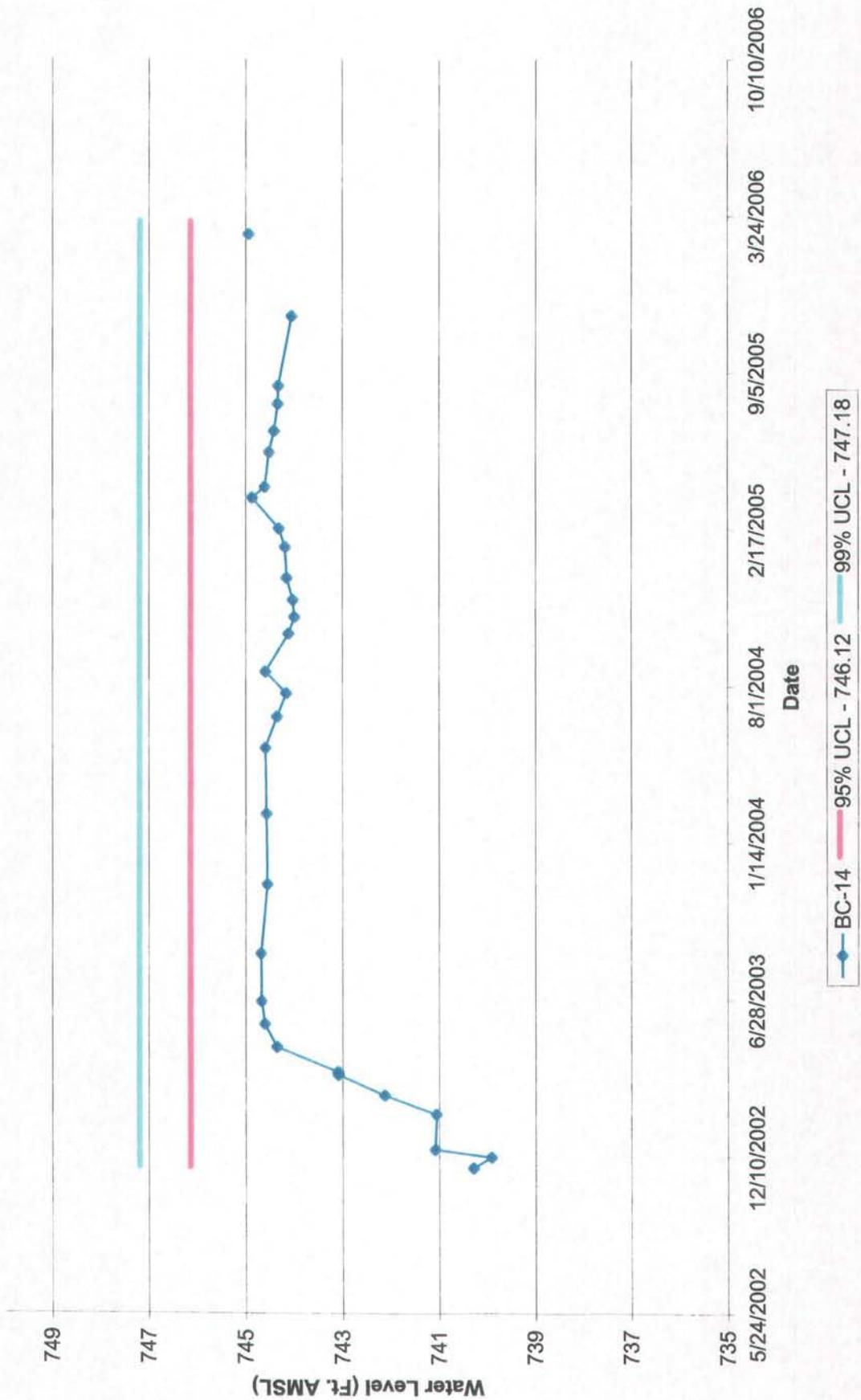
BC-10



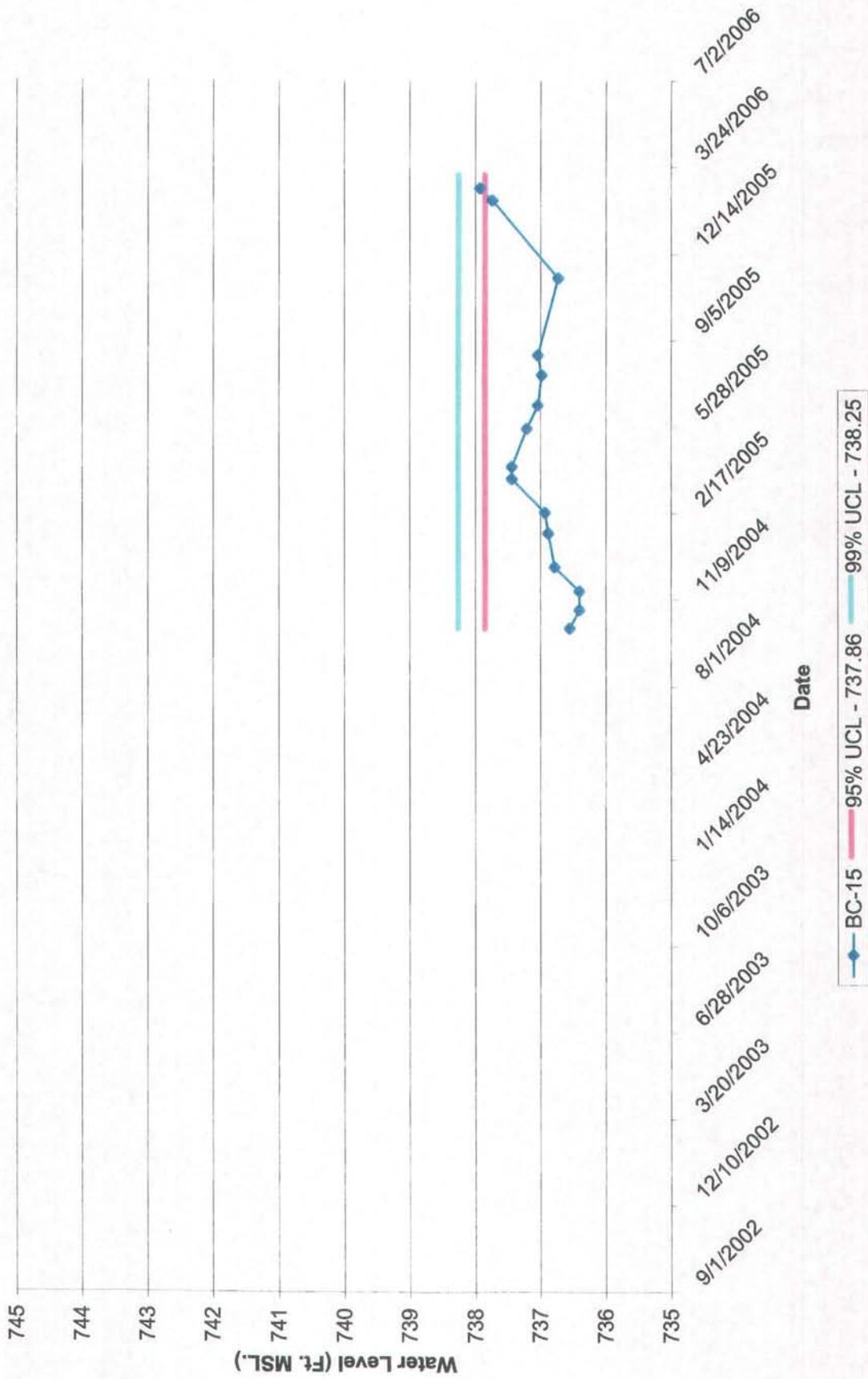
BC-11



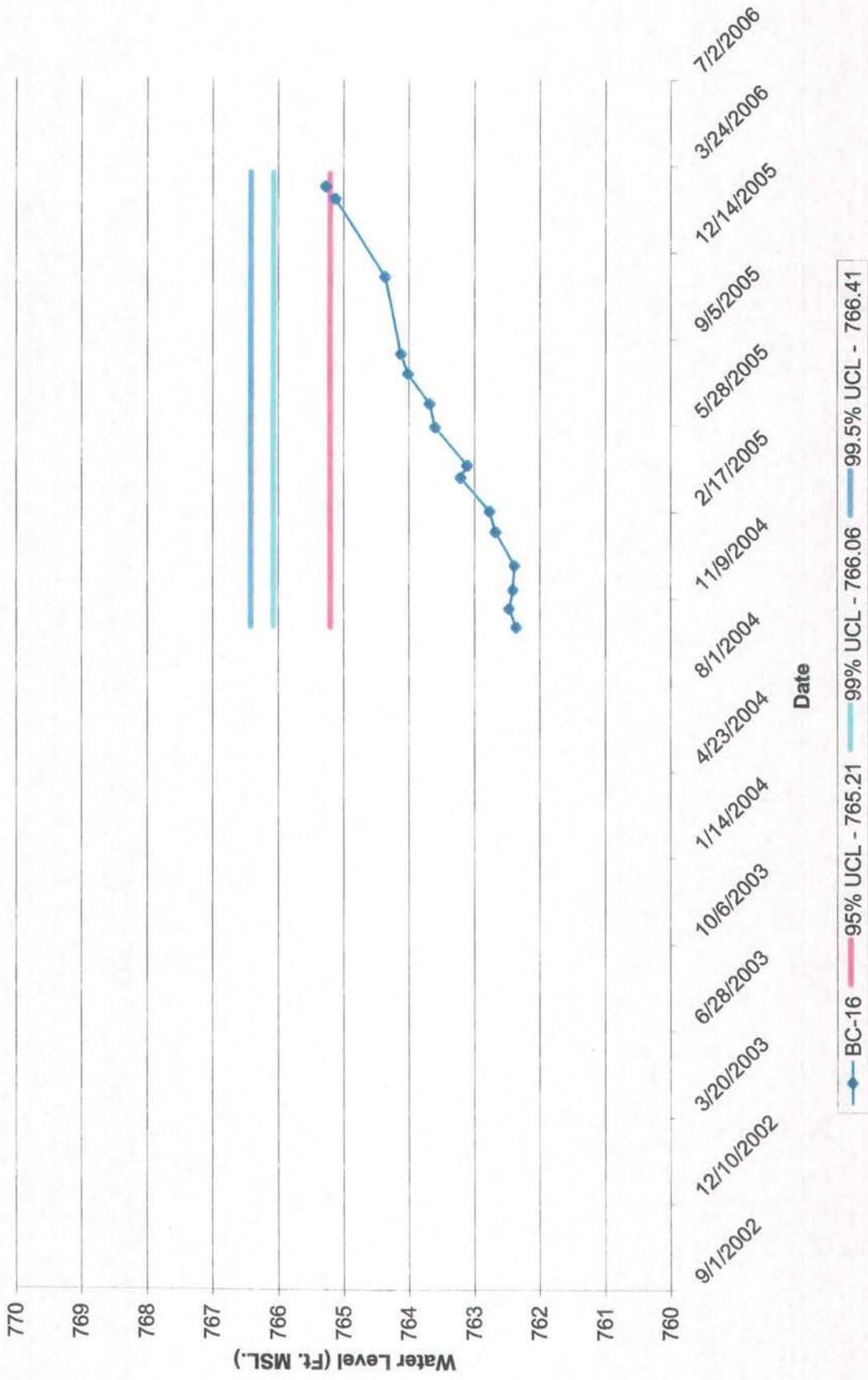
BC-14



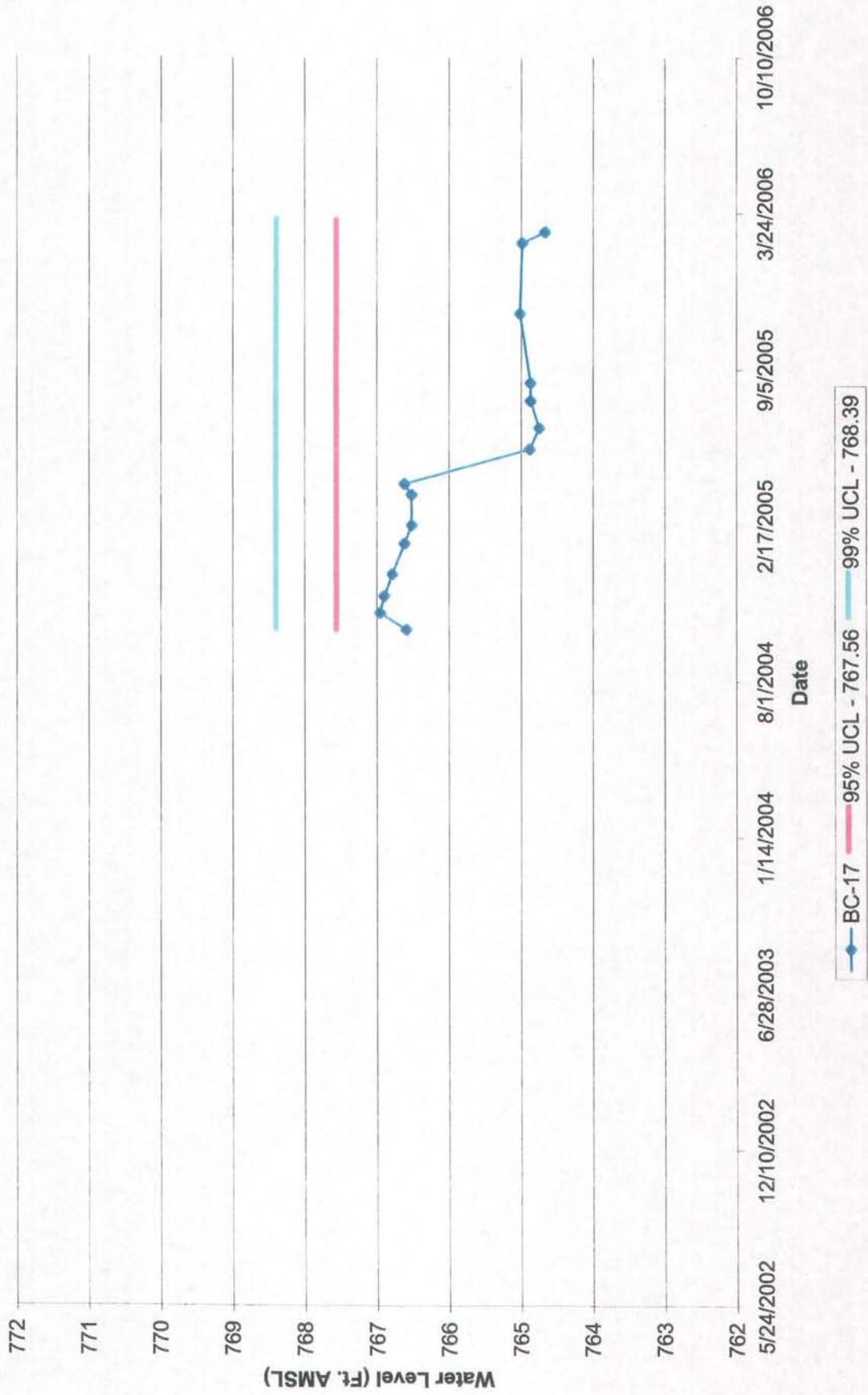
BC-15



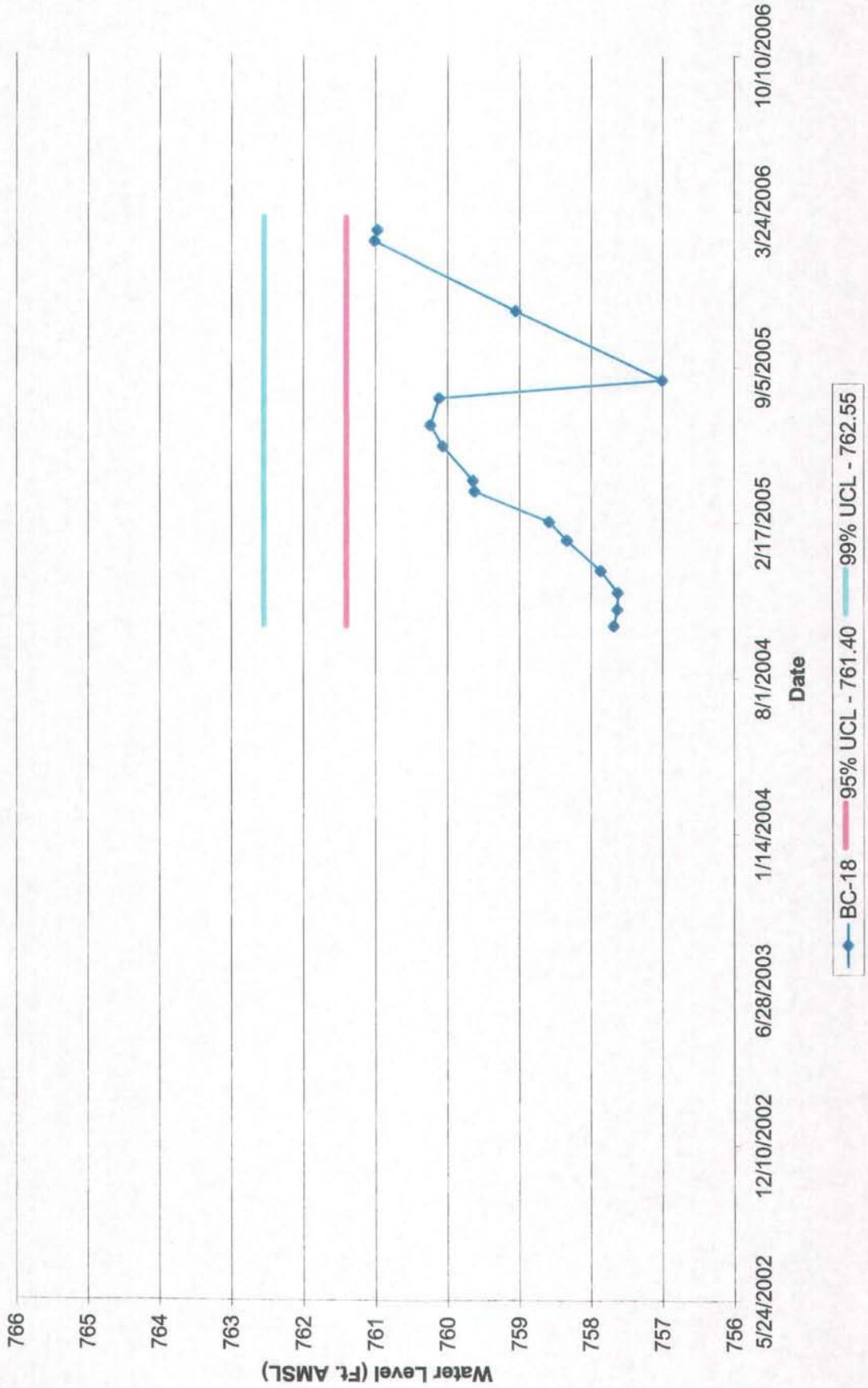
BC-16



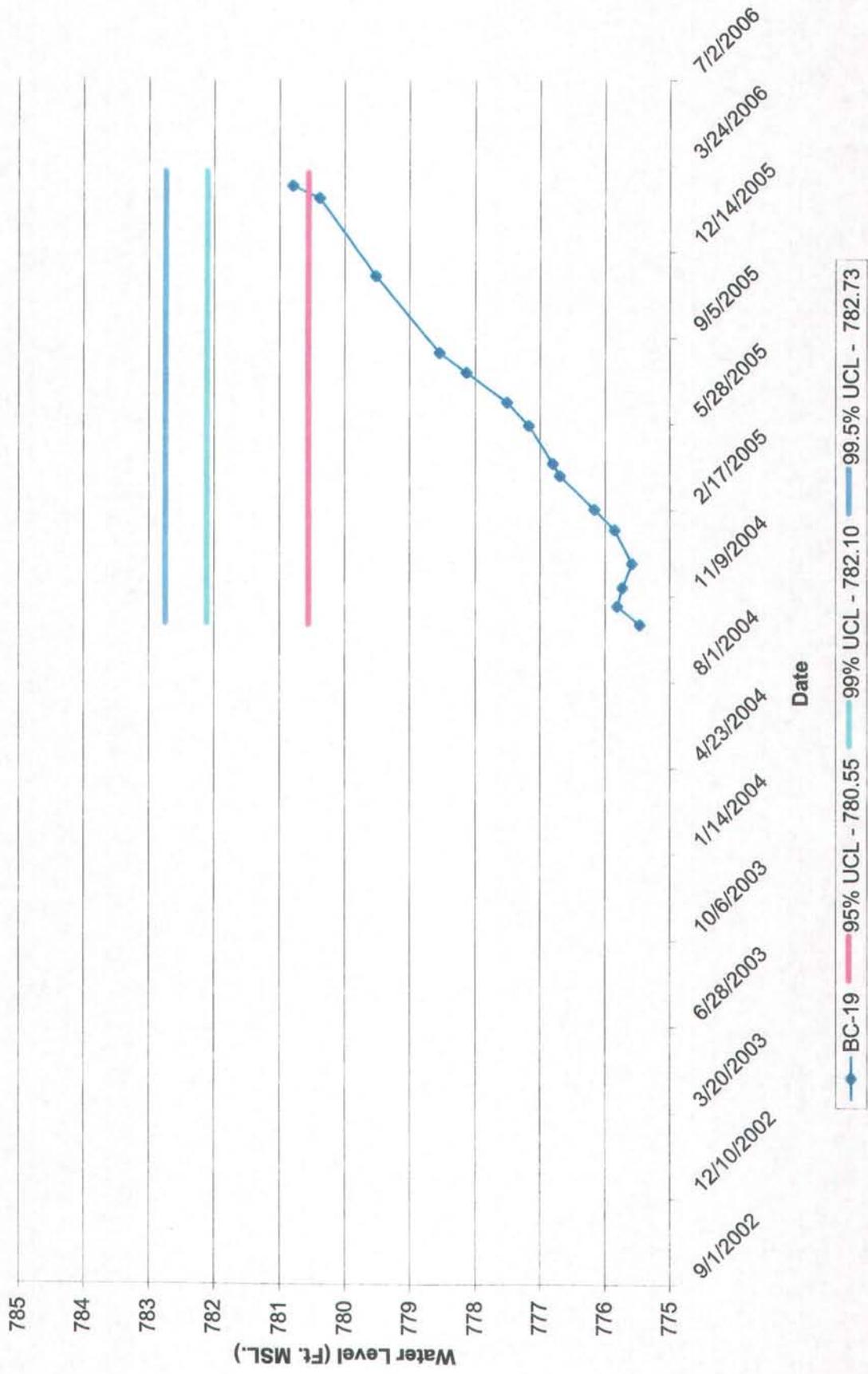
BC-17



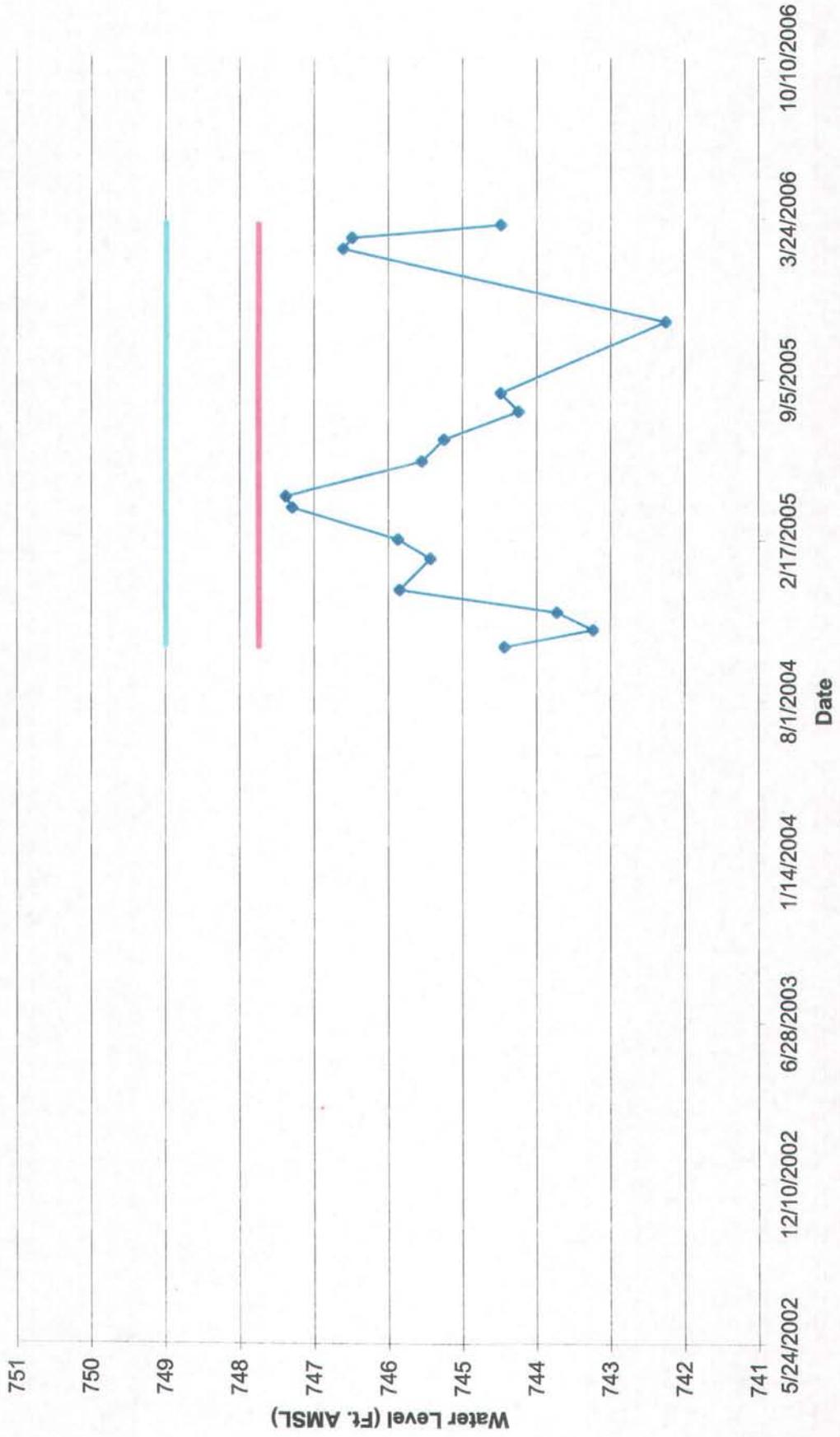
BC-18



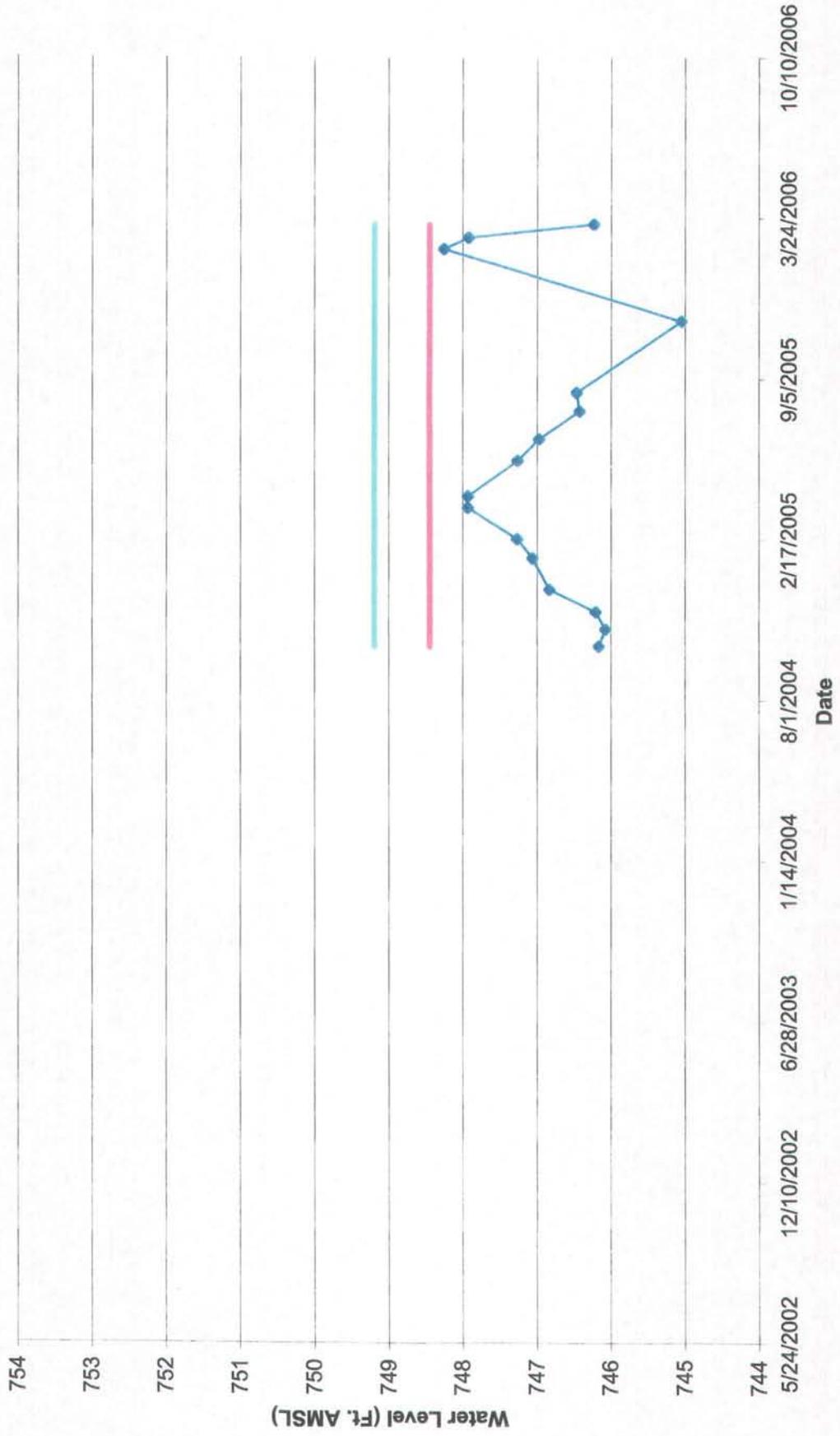
BC-19



BC-20



BC-21



BC-22



BC-23A

