Southern Nuclear Operating Company

AR-07-1421

Enclosure

Vogtle Early Site Permit Application

Supplement 2-S1*

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Document Components:

SSAR Chapter 1.0 Introduction and General Description
SSAR Section 2.5.4 Stability of Subsurface Materials and Foundations
SSAR Appendix 2.5C Vogtle Units 3 & 4 COL Project Geotechnical Data Report
SSAR Section 3.8.5 Foundations
SSAR Section 13.7 Fitness for Duty
SSAR Appendix 17.1A Nuclear Development Quality Assurance Manual
ER Section 1.3 Status of Reviews, Approvals and Consultations
ER Section 3.9 Pre-Construction and Construction Activities
Part 4 Site Redress Plan

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* ESP application Part Title Sheets, Revision Summary, Table of Contents, List of Tables, List of Figures, and Acronym and Abbreviation Lists that have been affected by this application supplement are not included. These application documents will be revised in the next application revision, as applicable.

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Insertion Instructions

Remove Existing Pages	Insert New Supplement 2-S1 Pages
Application Part 2 – Site Safety Analysis Report	
1-1 through 1-36	1-1 through 1-38
2.5.4-1 through 2.5.4-76	2.5.4-1 through 2.5.4-100
N/A	New Appendix 2.5C (including Att. A through D)
N/A	New 3.8-1 through 3.8-2
N/A	New 13.7-1 through 13.7-2
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Application Part 3 – Environmental Report	
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Part 2, Chapter 1

(Pages 1-1 through 1-38)

Part 2 SITE SAFETY ANALYSIS REPORT

Chapter 1 Introduction and General Description

1.1 Introduction

This Site Safety Analysis Report (SSAR) supports Southern Nuclear Operating Company's (SNC's or Southern Nuclear's) Early Site Permit (ESP) application. The SSAR addresses site suitability issues and complies with the applicable portions of Title 10, Part 52 of the Code of Federal Regulations (10 CFR 52), Subpart A*, Early Site Permits*.

The site selected for the ESP is the Vogtle Electric Generating Plant (VEGP) site in eastern Burke County, Georgia; approximately 26 miles southeast of Augusta, Georgia and 100 miles northwest of Savannah, Georgia; directly across the Savannah River from the US Department of Energy's Savannah River Site in Barnwell County, South Carolina. VEGP Units 1 and 2, two Westinghouse Electric Company, LLC (Westinghouse) pressurized water reactors (PWRs), each with a thermal power rating of 3565 megawatts thermal (MWt), are located on the VEGP site. VEGP Units 1 and 2 have been in commercial operation since 1987 and 1989, respectively. Plant Wilson, a six-unit oil-fueled combustion turbine facility owned by Georgia Power Company (GPC), is also located on the VEGP site.

SNC has selected the Westinghouse AP1000 certified reactor design for the VEGP ESP application. The AP1000 has a thermal power rating of 3,400 MWt, with a net electrical output of 1,117 megawatts electrical (MWe) **(Westinghouse 2005)**. Two units are proposed, with projected commercial operation dates of May 2015 and May 2016, respectively.

The ESP units, VEGP Units 3 and 4, are adjacent to and west of the existing VEGP units.

The existing VEGP units are co-owned by Georgia Power Company, Oglethorpe Power Corporation, the Municipal Electric Authority of Georgia, and the City of Dalton, Georgia, an incorporated municipality in the State of Georgia acting by and through its Board of Water, Light and Sinking Fund Commissioners ("Dalton Utilities"). SNC is the licensed operator of the existing facilities at the VEGP site, with control of the existing facilities, including complete authority to regulate any and all access and activity within the plant exclusion area boundary. SNC has been authorized by GPC, acting as agent for the other owners (also known as co-owners) of the existing VEGP, to apply for an ESP for the VEGP site. SNC has no ownership interest in the VEGP.

GPC and SNC are subsidiaries of Southern Company, and SNC is the licensed operator for all Southern Company nuclear generating facilities. SNC's business purpose is management and operation of nuclear generating facilities owned or co-owned by Southern Company

subsidiaries. SNC ESP Application Part 1, *Administrative Information*, Chapter 3, provides additional information about Southern Company, GPC, VEGP co-owners, and SNC.

The SSAR discusses the design parameters, site characteristics, and site interface values for the two units that would form the basis for NRC's issuance of an ESP. The SSAR also contains information about site safety, emergency preparedness, and quality assurance. The following paragraphs briefly describe the contents of the SSAR:

- Chapter 1, Introduction and General Description, includes a general site description; an overview of the AP1000; the design parameter, site characteristic, and site interface value approach; and a summary of regulatory compliance (CFR, Regulatory Guides, and NUREG-0800/RS-002).
- Chapter 2, Site Characteristics, includes geography and demography; nearby industrial installations; transportation and military facilities; and meteorologic, hydrologic, geologic, and seismic characteristics of the site. It also includes descriptions of effluents; thermal discharges; and conformance with 10 CFR 100, *Reactor Site Criteria*, requirements.
- Chapter 3, Design of Structures, Components, Equipment, and Systems, contains information in Section 3.5.1.6 on aircraft hazards, and in Section 3.8.5 on safety-related structure foundations and embedments.
- Chapter 13, Conduct of Operations, includes emergency planning, fitness for duty, and industrial security information.
- Chapter 15, Accident Analyses, includes accident and dose consequence analyses required by 10 CFR 52.17(a)(1), 10 CFR 50.34(a)(1), and 10 CFR 100.21(c)(2).
- Chapter 17, Quality Assurance, includes the Quality Assurance Program (QAP) under which the ESP application has been prepared. The QAP also addresses ESP activities prior to Combined Operating License (COL) receipt, such as site preparation, earthwork, pre-construction activities, and procurement.

10 CFR 52.17 (c) currently authorizes NRC to issue as part of an ESP the authority to conduct pre-construction activities described in 10 CFR 50.10 (e)(1). In conjunction with SNC's request in the ESP Environmental Report for permission to conduct LWA-1 activities, SNC is requesting an LWA-2 under 10 CFR 50.10 (e)(3) for safety related construction activities. These activities include placement of engineered backfill including retaining walls and preparation of the Nuclear Island foundation including installation of mudmats, water proofing, formwork, rebar, and foundation embedments necessary to prepare the foundation for placement of concrete subsequent to the issuance of the COL.

Additional information to support safety-related construction activities has been included in the SSAR to address the LWA-2 activities. The following list identifies the additional information and location:

- LWA-2 Request is contained in Chapter 1.0 Introduction and General Description.
- Engineered Backfill is described in Section 2.5.4 Stability of Subsurface Materials and foundations
- Preparation of Nuclear Island basemat for COL concrete placement addressed in the new Section 3.8.5 Foundation
- Fitness for Duty is described in new Section 13.7 Fitness for Duty
- Construction Quality Assurance information included in 17.1A Nuclear Development Quality Assurance Manual

1.2 General Site Description

1.2.1 Site Location

The 3,169-acre VEGP site is located on a coastal plain bluff on the southwest side of the Savannah River in eastern Burke County. The site exclusion area boundary (EAB) is bounded by River Road, Hancock Landing Road and 1.7 miles of the Savannah River (River Miles 150.0 to 151.7). The property boundary entirely encompasses the EAB and extends beyond River Road in some areas. The site is approximately 30 river miles above the U.S. 301 bridge and directly across the river from the Department of Energy's Savannah River Site (Barnwell County, South Carolina). The VEGP site is approximately 15 miles east-northeast of Waynesboro, Georgia and 26 miles southeast of Augusta, Georgia, the nearest population center (i.e., having more than 25,000 residents). It is also about 100 miles from Savannah, Georgia and 150 river miles from the mouth of the Savannah River. Numerous small towns exist within 50 miles of the site. A major Interstate highway, I-20, crosses the northern portion of the 50-mile radius. Access to the site is via US Route 25; Georgia Routes 56, 80, 24, 23; and New River Road. A navigation channel is authorized on the Savannah River from the Port of Savannah to Augusta, Georgia. A railroad spur connects the site to the Norfolk Southern Savannah-to-Augusta track.

Figures 1-1 and 1-2 show the site location and a 6-mile and 50-mile radius, respectively.

1.2.2 Site Development

The VEGP site currently has two Westinghouse pressurized water reactors (PWRs), rated at 3,565 MWt, and their supporting structures. These structures include two natural-draft cooling towers (one per unit), associated pumping and discharge structures, water treatment building, switchyard, and training center. Plant Wilson, a six-unit oil-fueled combustion turbine facility, is also located on the VEGP site. Figure 1-3 shows the current VEGP site plan.

The new plant footprint selected for the ESP is adjacent to the west side of the VEGP Units 1 and 2, and is generally the area that was originally designated for VEGP Units 3 and 4 when the

plant was first proposed for construction. The footprint is shown on Figure 1-4.

SNC has selected the Westinghouse AP1000 certified reactor design for the ESP application. SSAR Section 1.3 identifies the design parameters, site characteristics, and site interface values that form the permit basis for NRC's issuance of an ESP. The design parameters are based on the addition of two Westinghouse AP1000 units, to be designated Vogtle Units 3 and 4. Each unit represents a portion of the total generation capacity to be added and will consist of one reactor with a thermal power rating of 3,400 MWt and a net electrical output of 1,117 MWe **(Westinghouse 2005)**. The layout and arrangement of the proposed new units are shown in Figure 1-5.

1.3 Site Characteristics, Design Parameters, and Site Interface Values

The required contents of an ESP application are specified in 10 CFR 52.17. As detailed in 10 CFR 52.17(a)(1), the application is required to specify, among other things, the number, type, and thermal power level of the facilities; boundaries of the site and proposed general location of each facility; type of cooling systems, intakes, and outflows; anticipated maximum levels of radiological and thermal effluents; site seismic, meteorological, hydrologic, and geologic characteristics; and existing and projected future population profile of the area surrounding the site. The SNC approach to providing this information is presented in the following subsections.

1.3.1 Site Characteristic, Design Parameters, and Site Interface Value Approach

The list of plant parameters necessary to define the plant-site interface was developed in the early 1990s based on work sponsored by the US Department of Energy (DOE) and the nuclear industry, which included reactor vendors and utilities. The effort was intended to provide a comprehensive list of plant parameters to accurately characterize a plant at a site. Over time, this list evolved to encompass information needed to support development of an ESP application, including the SSAR and the Environmental Report.

During 2002, *Site Characteristic* and *Design Parameter* terminology was discussed in several public meetings involving the NRC and nuclear industry representatives as part of the resolution of Generic Topic ESP-6 (*Plant Parameters Envelope Approach for ESP*) and was the subject of associated correspondence between the NRC and the Nuclear Energy Institute (NEI). Definitions of these terms are now proposed in the NRC staff's draft amendment to 10 CFR 52. *Site Characteristics* are the actual physical, environmental, and demographic features of a site. These values are established through data collection and/or analysis and are reported in an ESP application. They are developed in accordance with NRC requirements and guidance and form the basis for comparison with the design characteristics of the selected plant to verify site suitability for that design. *Design Parameters* are the postulated features of a reactor or reactors that could be built at a proposed site. These features describe plant design information that is necessary to prepare and review an ESP application. The SNC approach evaluates the

AP1000 reactor design and the VEGP site to identify the *Site Characteristics* and *Design Parameters*. In a COL application, the AP1000 site-specific engineering and design features will be compared with the ESP parameters to demonstrate they are bounded.

SNC has further defined *Site Interface Values* as those values that have been determined based on the specific interrelationships between select site characteristics and plant design parameters. Examples include (1) cooling system evaporation rate, which is dependent on both design heat rejection rate and the environmental characteristics of the heat sink, and (2) gaseous radioactive dose consequences, which are dependent on the plant design source terms and the site air dispersion characteristics. Similar to above, *Site Interface Values* will be evaluated at COL application to demonstrate they are bounded by the ESP analysis.

An overview of the AP1000 PWR design and a more detailed discussion of the implementation of the *Site Characteristic–Design Parameter* approach are presented below.

1.3.2 Overview of Reactor Type

The AP1000 PWR design, with a thermal power rating of 3,400 MWt, developed by Westinghouse, has been selected for evaluation in this ESP application.

In January 2006, the NRC issued the Westinghouse AP1000 Design Certification Final Rule under 10 CFR 52, Appendix D. The AP1000 is a two-loop, four-reactor-coolant-pump PWR that uses fuel, a reactor vessel, and internals similar to those in service today at South Texas Project. The reactor coolant pumps are canned pumps to reduce the probability of leakage and to improve reliability.

The AP1000 is designed to use passive features for accident mitigation. An externally cooled steel containment building, in-containment refueling water storage tank, rapid depressurizing capability, and other design features preclude the need for safety-related electrical alternating-current-powered equipment used by the current nuclear fleet. Electrical power generation is through the use of a standard steam turbine cycle.

The AP1000 is designed in a single-unit, stand-alone configuration.

1.3.3 Use of the Site Characteristics, Design Parameters, and Site Interface Values Table

The *Site Characteristics, Design Parameters, and Site Interface Values* table (Table 1-1) provides a summary list of the limiting site characteristic values that have been established by analyses presented throughout the SSAR. This list also provides a summary of important site characteristics necessary to establish the findings required by 10 CFR Parts 52 and 100 on the suitability of the proposed ESP site. This list is intended to support development of the *Site Characteristics and Plant Design Parameters for the Early Site Permit* table, as defined by the NRC **(NRC-NEI 2004)**. Table 1-1 further provides a list of limiting design parameters and

assumptions involving the design of a nuclear power plant that may be constructed on the ESP site in the future, in order to assess site characteristics.

Table 1-1 is divided into three parts. Part I, Site Characteristics, includes the data that is specific to the ESP site. Part II, Design Parameters, includes information supplied by the reactor vendor, Westinghouse, for the AP1000 plant design. Part III, Site Interface Values, includes the values that have been determined based on the interrelationship of certain site characteristics and design parameters. The table includes a summary description of each item and a reference to the SSAR section(s) in which more detailed information can be found. Where two-unit values are different from one-unit values, the two-unit value is included in brackets [ ].

Since certain support system designs, such as cooling towers, have not yet been completed, the data in this table are based on design requirements and interface information from the reactor vendor, Westinghouse.

1.4 Identification of Agents and Contractors

SNC has selected Bechtel Power Corporation (Bechtel) as its principal contractor to assist with preparing the SSAR portion of the ESP application and Tetra Tech NUS, Inc. (TtNUS), to assist with preparing the Environmental Report portion. A Consortium composed of Westinghouse Electric Corporation and Shaw Stone & Webster Nuclear Services (Shaw) will act as the engineering and procurement construction contractor for proposed VEGP Units 3 and 4, with Shaw providing the bulk of the construction services for the LWA-2 activities. Bechtel, Westinghouse, Shaw, and TtNUS have supplied personnel, systems, project management, and resources to work on an integrated team with SNC.

1.4.1 Bechtel Corporation

Bechtel is the nation's largest power contractor and is headquartered in San Francisco. Bechtel has a history of supporting the nuclear power industry, beginning with the construction in 1950 of the EBR-1 reactor. Since then, Bechtel has engineered and constructed more than 60,000 MWe of nuclear power capacity worldwide. Bechtel currently has approximately 40,000 employees working on 400 projects in 47 different countries around the globe.

1.4.2 Tetra Tech NUS, Inc.

TtNUS is an environmental and engineering consulting company with a history of service to the nuclear power industry since the inception of its predecessor company, Nuclear Utility Services (NUS) Corporation in 1960. TtNUS currently has 20 offices and approximately 700 employees throughout the country. TtNUS is a wholly owned subsidiary of Tetra Tech, Inc., which has approximately 9,000 employees worldwide.

1.4.3 Shaw Stone & Webster Nuclear Services (Shaw)

Shaw is a Fortune 500 company which has been an active participant in the nuclear industry for nearly 60 years, from providing engineering and design services for Shippingport, the nation's first commercial nuclear power plant, to the restart of Tennessee Valley Authority's Browns Ferry Unit 1, which at the time was the largest nuclear construction project in the western hemisphere. Shaw continues to prove its leadership role in the nuclear industry by being part of the AP1000 Consortium. Shaw is part of a vertically integrated company, Shaw Group, Inc., which has nearly 180 offices worldwide and over 21,000 employees, of which approximately 3,100 are nuclear professionals offering nuclear services on four continents.

1.4.4 Westinghouse Electric Company, LLC (Westinghouse)

Westinghouse offers a wide range of nuclear plant products and services to utilities throughout the world, including fuel, service and maintenance, instrumentation and control, and advanced nuclear plant designs, including the AP1000 certified reactor design. With headquarters in Monroeville, Pennsylvania, Westinghouse now has operations in twelve states and fourteen countries. After designing the world's first commercial pressurized water reactor nuclear power plant at Shippingport in 1957, Westinghouse and its licensees provided more than 40 percent of the world's 434 operating commercial nuclear plants. By the end of 2003, reactors based on Westinghouse technology had amassed over 2500 reactor-years of power generation.

1.4.5 Other Contractors

In addition to Bechtel, Westinghouse, Shaw, and TtNUS, contractual relationships were established with several specialized consultants to assist in developing the ESP application.

1.4.5.1 MACTEC Engineering and Consulting, Inc.

MACTEC Engineering and Consulting, Inc., performed geotechnical field investigations and laboratory testing in support of SSAR Section 2.5, Geology, Seismology, and Geotechnical Engineering. That effort included performing standard penetration tests; obtaining core samples and rock cores; performing cone penetrometer tests, downhole geophysical logging, and laboratory tests of soil and rock samples; installing groundwater observation wells; and preparing a data report.

1.4.5.2 William Lettis & Associates, Inc.

William Lettis & Associates, Inc., performed geologic mapping and characterized seismic sources in support of SSAR Section 2.5, including literature review, geologic field reconnaissance, review and evaluation of existing seismic source characterization models,

identification and characterization of any new or different sources, and preparation of the related SSAR sections.

1.4.5.3 Risk Engineering, Inc.

Risk Engineering, Inc., performed probabilistic seismic hazard assessments and related sensitivity analyses in support of SSAR Section 2.5. These assignments included sensitivity analyses of seismic source parameters and updated ground motion attenuation relationships, development of updated Safe Shutdown Earthquake ground motion values, and preparation of the related SSAR sections.

1.5 Requirements for Further Technical Information

No technical information development programs remain to be performed to support this application.

1.6 Material Incorporated by Reference

The following materials are incorporated by reference in this application as they are related to the LWA-2 activities:

- Westinghouse document APP-GW-GL-700, *AP1000 Design Control Document* (DCD), Revision 15 as modified by the following Technical Reports:
    - APP-GW-GLN-105, "Building and Structure Configuration, Layout, and General Arrangement Design Updates," (Technical Report 105)
    - APP-GW-GLR-005, "Containment Vessel Design Adjacent to Large Penetrations," (Technical Report 9)
    - APP-GW-GLR-021, "AP1000 As-Built COL Information Items," (Technical Report 6)
    - APP-GW-GLR-044, "Nuclear Island Basemat and Foundation," (Technical Report 85)
    - APP-GW-GLR-045, "Nuclear Island: Evaluation of Critical Sections," (Technical Report 57)
    - APP-GW-GLR-130, "Editorial Format Changes Related to "Combined License applicant" and "Combined License Information Items," (Technical Report 130)
    - APP-GW-S2R-010, "Extension of Nuclear Island Seismic Analysis to Soil Sites," (Technical Report 03)

1.7 Drawings and Other Detailed Information

No such information has been submitted separately as part of this application.

1.8 Conformance to NRC Regulations and Regulatory Guidance

This section discusses the conformance of the ESP application SSAR with applicable NRC regulations and guidance. NRC regulations are contained in Title 10 of the Code of Federal Regulations. NRC guidance is contained in NRC Regulatory Guides (RGs) and in NRC Review Standard RS-002, Processing Applications for Early Site Permits.

Clarifications are identified when guidance is met, but additional information is needed to provide complete understanding of the method of conformance. In certain instances, regulations and regulatory guides do not apply due to design features not being applicable or due to process timing (i.e., applies at COL application versus ESP application).

Conformance with NRC regulations, Regulatory Guides, and Review Standard RS-002 is summarized in Table 1-2. A matrix of ESP sections confirms compliance with each regulatory requirement. The revision number and date are provided for applicable Regulatory Guides. Clarification explanations are provided in Table 1-3.

Table 1-1 Site Characteristics, Design Parameters, and Site Interface Values

Part I Site Characteristics		
Item	**Value**	**Description and Reference**
Precipitation		
Maximum Rainfall Rate	19.2 inches in 1 hr 6.2 inches in 5 min	PMP for 1-hr and 5-min duration of precipitation at the site. Refer to Table 2.4.2-3 and Figure 2.4.2-4
100-Year Snow Pack 48-Hour Winter Probable Maximum Precipitation (PMP)	10 lb/sq ft 28.3 in.	Weight, per unit area, of the 100-year return period snowpack at the site Maximum probable winter rainfall in 48-hour period. Refer to Section 2.3.1.3.4
Seismic		
Design Response Spectra	Values specified and illustrated in Section 2.5.2	Site-specific response spectra. Refer to Section 2.5.2 and Figure 2.5.2-44.
Capable Tectonic Structures or Sources	No fault displacement potential within the investigative area	Conclusion on the presence of capable faults or earthquake sources in the vicinity of the plant site. Refer to Sections 2.5.1.1.4, 2.5.1.2.4, and 2.5.3; Table 2.5.3-1
Water		
Maximum Flood (or Tsunami)	178.10 ft msl	Water level at the site due to dam breach. Refer to Sections 2.4.2.2, 2.4.3.4, 2.4.4.3, and 2.4.10;
Maximum Groundwater	165 ft msl	Site basis for subsurface hydrostatic loading due to difference in elevation between the site grade elevation in the power block area and the maximum site groundwater level. Refer to Sections 2.4.12.4 and 2.5.4.6.1

Table 1-1 (cont.) Site Characteristics, Design Parameters, and Site Interface Values

Part I Site Characteristics		
Item	**Value**	**Description and Reference**
Subsurface Material Properties		
Liquefaction	None at site-specific SSE. Compacted structural fill will provide an adequate safety factor against liquefaction (min 1.9-2.0).	Liquefaction potential for subsurface material at the site. Refer to Section 2.5.4.8
Minimum Bearing Capacity (Static)	Values in Figure 2.5.4-13	Allowable load-bearing capacity of the layer supporting plant structures. Refer to Sections 2.5.4.10.1 and 2.5.4.11; Figure 2.5.4-13
Minimum Shear Wave Velocity	Values in Tables 2.5.4-10 and 2.5.4-11	Propagation velocity of shear waves through the foundation materials. Refer to Section 2.5.4.7.1; Tables 2.5.4-10, and 2.5.4-11; Figures 2.5.4-6, 2.5.4-7, and 2.5.4-8
Tornado		
Maximum Pressure Drop	2.0 psi	Decrease in ambient pressure from normal atmospheric pressure at the site due to passage of a tornado having a probability of occurrence of 10^{-7} per year. Refer to Section 2.3.1.3.2
Maximum Rotational Speed	240 mph	Rotation component of maximum wind speed at the site due to passage of a tornado having a probability of occurrence of 10^{-7} per year. Refer to Section 2.3.1.3.2
Maximum Translational Speed	60 mph	Translation component of maximum wind speed at the site due to the movement across ground of a tornado having a probability of occurrence of 10^{-7} per year. Refer to Section 2.3.1.3.2

Table 1-1 (cont.) Site Characteristics, Design Parameters, and Site Interface Values

Part I Site Characteristics		
Item	**Value**	**Description and Reference**
Maximum Wind Speed	300 mph	Sum of the maximum rotational and maximum translational wind speed components at the site due to passage of a tornado having a probability of occurrence of 10^{-7} per year. Refer to Section 2.3.1.3.2
Radius of Maximum Rotational Speed	150 ft	Distance from the center of the tornado at which the maximum rotational wind speed occurs at the site due to passage of a tornado having a probability of occurrence of 10^{-7} per year. Refer to Section 2.3.1.3.2
Maximum Rate of Pressure Drop	1.2 psi/sec	Maximum rate of pressure drop at the site due to passage of a tornado having a probability of occurrence of 10^{-7} per year. Refer to Section 2.3.1.3.2
Wind		
Basic Wind Speed	104 mph	Three-second gust wind velocity, associated with a 100-year return period, at 33 ft (10 m) above ground level in the site area. Refer to Section 2.3.1.3.1
Selected Site Characteristic Ambient Air Temperatures		*(Site characteristic wet bulb and dry bulb temperatures associated with listed exceedance values and 100-year return period)*
Maximum Dry Bulb • 2% annual exceedance • 0.4% annual exceedance • 100-year return period	 92°F 97°F 115°F	Refer to Section 2.3.1.5

Table 1-1 (cont.) Site Characteristics, Design Parameters, and Site Interface Values

Part I Site Characteristics		
Item	**Value**	**Description and Reference**
Minimum Dry Bulb • 1% annual exceedance • 0.4% annual exceedance • 100-year return period	 25°F 21°F -8°F	Refer to Section 2.3.1.5
Maximum Wet Bulb • 0.4% annual exceedance • 100-year return period	 79°F 88°F	Refer to Section 2.3.1.5
Site Temperature Basis for AP1000 • Maximum Safety Dry Bulb and Coincident Wet Bulb • Maximum Safety Wet Bulb (Non-coincident) • Maximum Normal Dry Bulb and Coincident Wet Bulb • Maximum Normal Wet Bulb (Non-coincident)	 107.1°F dry bulb/80.1°F wet bulb 83.0°F 94°F dry bulb/78°F wet bulb 78°F	Refer to Section 2.3.1.5
Airborne Effluent Release Point		
Atmospheric Dispersion (χ/Q) (Accident)		
0-2 hr @ Exclusion Area Boundary (EAB) 0-8 hr @ Low Population Zone (LPZ) 8-24 hr @ LPZ 1-4 day @ LPZ 4-30 day @ LPZ	3.49E-04 sec/m^3 7.04E-05 sec/m^3 5.25E-05 sec/m^3 2.77E-05 sec/m^3 1.11E-05 sec/m^3	The atmospheric dispersion coefficients used in the design safety analysis to estimate dose consequences of accident airborne releases. Refer to Section 2.3.4.2; Table 15-11.

Table 1-1 (cont.) Site Characteristics, Design Parameters, and Site Interface Values

Part I Site Characteristics		
Item	**Value**	**Description and Reference**
Atmospheric Dispersion (χ/Q) (Routine Release)		
Annual Average Undepleted/No Decay χ/Q Value @ EAB	5.5E-06 sec/m^3	The maximum annual average EAB undepleted/no decay atmospheric dispersion factor (χ/Q) value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Section 2.3.5.2; Table 2.3-17
Annual Average Undepleted/ 2.26-Day Decay χ/Q Value @ EAB	5.5E-06 sec/m^3	The maximum annual average EAB undepleted/2.26-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Annual Average Depleted/ 8.00-Day Decay χ/Q Value @ EAB	5.0E-06 sec/m^3	The maximum annual average EAB depleted/8.00-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Annual Average D/Q Value @ EAB	1.7E-08 1/m^2	The maximum annual average EAB relative deposition factor (D/Q) value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Annual Average Undepleted/No Decay χ/Q Value @ Nearest Resident	3.4E-06 sec/m^3	The maximum annual average resident undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Section 2.3.5.2; Table 2.3-17
Annual Average Undepleted/ 2.26-Day Decay χ/Q Value @ Nearest Resident	3.4E-06 sec/m^3	The maximum annual average resident undepleted/2.26-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17

Table 1-1 (cont.) Site Characteristics, Design Parameters, and Site Interface Values

Part I Site Characteristics		
Item	**Value**	**Description and Reference**
Annual Average Depleted/ 8.00-Day Decay χ/Q Value @ Nearest Resident	3.0E-06 sec/m^3	The maximum annual average resident depleted/8.00-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Annual Average D/Q Value @ Nearest Resident	1.0E-08 1/m^2	The maximum annual average resident D/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Annual Average Undepleted/No Decay χ/Q Value @ Nearest Meat Animal	3.4E-06 sec/m^3	The maximum annual average meat animal undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Section 2.3.5.2; Table 2.3-17
Annual Average Undepleted/ 2.26-Day Decay χ/Q Value @ Nearest Meat Animal	3.4E-06 sec/m^3	The maximum annual average meat animal undepleted/2.26-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Annual Average Depleted/ 8.00-Day Decay χ/Q Value @ Nearest Meat Animal	3.0E-06 sec/m^3	The maximum annual average meat animal depleted/8.00-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Annual Average D/Q Value @ Nearest Meat Animal	1.0E-08 1/m^2	The maximum annual average meat animal D/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17

Table 1-1 (cont.) Site Characteristics, Design Parameters, and Site Interface Values

Part I Site Characteristics		
Item	**Value**	**Description and Reference**
Annual Average Undepleted/No Decay χ/Q Value @ Nearest Vegetable Garden	3.4E-06 sec/m^3	The maximum annual average vegetable garden undepleted/no decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Annual Average Undepleted/ 2.26-Day Decay χ/Q Value @ Nearest Vegetable Garden	3.4E-06 sec/m^3	The maximum annual average vegetable garden undepleted/2.26-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Annual Average Depleted/ 8.00-Day Decay χ/Q Value @ Nearest Vegetable Garden	3.0E-06 sec/m^3	The maximum annual average vegetable garden depleted/8.00-day decay χ/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Annual Average D/Q Value @ Nearest Vegetable Garden	1.0E-08 1/m^2	The maximum annual average vegetable garden D/Q value for use in determining gaseous pathway doses to the maximally exposed individual. Refer to Table 2.3-17
Population Density		
Population Center Distance	Approximately 26 mi (Augusta, GA)	The minimum allowable distance from the reactor(s) to the nearest boundary of a densely populated center containing more than about 25,000 residents (not less than one and one-third times the distance from the reactor(s) to the outer boundary of the LPZ) (i.e., 2-2/3 mi for VEGP). Refer to Sections 1.1, 1.2.1, 2.1.1, 2.1.3.2, and 2.1.3.5

Table 1-1 (cont.) Site Characteristics, Design Parameters, and Site Interface Values

Part I Site Characteristics		
Item	**Value**	**Description and Reference**
Exclusion Area Boundary (EAB)	See Figure 1-4	The area surrounding the reactor(s), in which the reactor licensee has the authority to determine all activities, including exclusion or removal of personnel and property from the area. Refer to Sections 2.1.1, 2.1.2, and 2.3.4.1; Figure 1-4
Low Population Zone (LPZ)	A 2-mile-radius circle from the midpoint between the containment buildings of Units 1 and 2.	The area immediately surrounding the exclusion area that contains residents. Refer to Sections 2.1.3.4, 2.3.4.1, 2.3.4.2, and 2.3.5.1; Table 2.3-15
Dose Calculation EAB	See Figure 1-4	A circle extending ½ mi beyond the power block area circle (775-ft radius circle encompassing Units 3 and 4). Total radius is 3,415 ft from the centroid of the power block circle. Dose Calculation EAB is completely within the actual plant EAB and is used to conservatively determine χ/Q values and subsequent accident radiation doses. Refer to Sections 2.3.4.1, 2.3.4.2, and 2.3.5.1; Tables 2.3-14, 2.3-16, and 2.3-17; Figure 1-4

Part II Design Parameters		
Item	**Single Unit [Two Unit] Value**	**Description and Reference**
Structures		
Building Height	234 ft 0 in.	The height from finished grade to the top of the tallest power blocks structure, excluding cooling towers (i.e., Containment Building). Refer to Section 2.3.3.3

Table 1-1 (cont.) Site Characteristics, Design Parameters, and Site Interface Values

Part II Design Parameters		
Item	**Single Unit [Two Unit] Value**	**Description and Reference**
Building Foundation Embedment	39 ft 6 in. to bottom of basemat from plant grade	The depth from finished grade to the bottom of the basemat for the most deeply embedded power block structure (i.e., Containment/Auxiliary Building). Refer to Sections 2.4.12 and 2.5.4.10
Cooling Tower Height	600 ft	The height is from the finished grade to the top of the cooling tower Refer to Section 2.3.3.3
Cooling Tower Base Diameter	550 ft	The bottom of the cooling tower where it connects to the basin Refer to Section 2.3.3.3
Cooling Tower Diameter at the Top	330 ft	The cooling tower diameter at its highest elevation Refer to Section 2.3.3.3
Airborne Effluent Release Point		
Gaseous Source Term (Post-Accident)	See Chapter 15 Tables	The activity, by isotope, contained in post-accident airborne effluents. Refer to Section 15.3; Tables 15-2 through 15-10
Release Point Elevation (Post-Accident)	Ground level	The elevation above finished grade of the release point for accident sequence releases. Refer to Section 2.3.4.1, 2.3.5.1, and 15.2; Tables 2.3-14 and 2.3-15
Plant Characteristics		
Megawatts Thermal	3,400 MWt [6,800 MWt]	The thermal power generated by one unit. Refer to Sections 1.1, 1.2.2, and 1.3.2

Table 1-1 (cont.) Site Characteristics, Design Parameters, and Site Interface Values

Part III Site Interface Values		
Item	**Single Unit [Two Unit] Value**	**Description and Reference**
Normal Plant Heat Sink		
Cooling Tower Make-up Flow Rate	28,892 gpm [57,784 gpm]	The maximum rate of removal of water from the Savannah River to replace water losses from the circulating water system. The bounding Makeup Flow Rate is a calculated value based on the sum of the expected evaporation rate at design ambient conditions plus the bounding blowdown flow rate and drift. Refer to Sections 2.4.8 and 2.4.11.5
Airborne Effluent Release Point		
Post-Accident Dose Consequences	10 CFR 100 10 CFR 50.34(a)(1)	The estimated design radiological dose consequences due to gaseous releases from postulated accidents. Refer to Chapter 15; Tables 15-12 through 15-22
Minimum Distance to Site Boundary	3,420 ft	The minimum lateral distance from the release point (power block area circle) to the site boundary. Refer to Figure 1-4

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Table 1-2 Regulatory Compliance Matrix

Legend:
X = Complies
C = Clarification Required, See Table 1-3

Regulatory Requirements Document Title	Rev.	Date	Chapter 1	2.1.1	2.1.2	2.1.3	2.2.1 - 2.2.2	2.2.3	2.3.1	2.3.2	2.3.3	2.3.4	2.3.5	2.4.1	2.4.2	2.4.3	2.4.4	2.4.5	2.4.6	2.4.7	2.4.8	2.4.9	2.4.10	2.4.11	2.4.12	2.4.13	2.5.1	2.5.2	2.5.3	2.5.4	2.5.5	2.5.6	3.5.1.6	11.2.3	11.3.3	13.3	13.6	Chapter 15	Chapter 17
NRC Regulations																																							
10 CFR 20				X																																	X			
10 CFR 20, Appendix B, Table 2																										X								X	X				
10 CFR 20.1301																																		X	X				
10 CFR 50.34(a)																																							
10 CFR 50.34(a)(1)					X	X																															X	
10 CFR 50.34(a)(10)																																				X			
10 CFR 50.34(a)(12)																												X										
10 CFR 50.34(b)(10)																												X										
10 CFR 50.47											X																												
10 CFR 50.47(b)(4)																																				X			
10 CFR 50, Appendix A, GDC 2									X	X				X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X								
10 CFR 50, Appendix A, GDC 4									X																													
10 CFR 50, Appendix B																																							X
10 CFR 50, Appendix E											X																									X			
10 CFR 50, Appendix I				X							X		X																					X	X				
10 CFR 50, Appendix S IV(a)																												X										
10 CFR 50, Appendix S IV(b)																													X									
10 CFR 50, Appendix S IV(c)															X		X	X																				
10 CFR 52.17(a)(1)			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	
10 CFR 52.17(b)(1)						X																													X			
10 CFR 52.17(b)(2)																																				X			
10 CFR 52.17(b)(3)																																				X			
10 CFR 73.55																																					X		
10 CFR 100.3					X	X																																
10 CFR 100.20				X		X	X					X	X																			X						
10 CFR 100.20 (b)								X																														
10 CFR 100.20(c)									X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							
10 CFR 100.21(a)					X																																		
10 CFR 100.21(c)(1)										X			X																										
10 CFR 100.21(c)(2)						X				X		X																									X	
10 CFR 100.21(d)									X	X	X														X														
10 CFR 100.21(e)							X	X																															
10 CFR 100.21(f)																																					X		
10 CFR 100.23																									X		X	X	X	X	X								
10 CFR 100.23(c)																	X		X					X	X														
10 CFR 100.23(d)(4)																									X														
40 CFR 190																																		X	X				

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Table 1-2 (cont.) Regulatory Compliance Matrix

Legend:
X = Complies
C = Clarification Required, See Table 1-3

NRC Regulatory Guides	Rev.	Date	Chapter 1	2.1.1	2.1.2	2.1.3	2.2.1 - 2.2.2	2.2.3	2.3.1	2.3.2	2.3.3	2.3.4	2.3.5	2.4.1	2.4.2	2.4.3	2.4.4	2.4.5	2.4.6	2.4.7	2.4.8	2.4.9	2.4.10	2.4.11	2.4.12	2.4.13	2.5.1	2.5.2	2.5.3	2.5.4	2.5.5	2.5.6	3.5.1.6	11.2.3	11.3.3	13.3	13.6	Chapter 15	Chapter 17
NRC RG 1.23	Pr-1	Sep-80							X	X	C	X	X																										
NRC RG 1.28	3	Aug-85																																					X
NRC RG 1.29	3	Sep-78													X	X	X	X	X	X	X		X																
NRC RG 1.59	2	Aug-77													X	X	X	X	X	X	X		X																
NRC RG 1.60	1	Dec-73																										C											
NRC RG 1.70	3	Nov-78	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	C	X	X
NRC RG 1.76 (DG-1143)	Pr-1	Jan-06							X																														
NRC RG 1.78	1	Dec-01					X	X																															
NRC RG 1.91	1	Feb-78					X	X																															
NRC RG 1.101	4	Jul-03																																		X			
NRC RG 1.102	1	Sep-76													X	X	X	X	X		X		X																
NRC RG 1.109	1	Oct-77											X																					X	X				
NRC RG 1.111	1	Jul-77										X	X																						X				
NRC RG 1.112	0	Apr-76											X																										
NRC RG 1.113	1	Apr-77																								X													
NRC RG 1.125	1	Oct-78																X	X		X		X																
NRC RG 1.132	2	Oct-03																									X	X	X	X	X								
NRC RG 1.138	2	Dec-03																												X	X								
NRC RG 1.145	1	Nov-82										X																										X	
NRC RG 1.165	0	Mar-97																									X	C	X										
NRC RG 1.183	0	Jul-00										X																										X	
NRC RG 1.198	0	Nov-03																										X		X	X								
NRC RG 4.2 and Supplement 1	2 S-1	Jul-76 Sep-00									X																												
NRC RG 4.4	0	May-74																						X		X													
NRC RG 4.7	2	Apr-98				X						X															X	X	X	X							X		
NUREG-0800 / RS-002																																							
RS-002, Main Body Document, Section 4.4			X																																				
RS-002, Attachment 2, Section 2.1.1				X																																			
RS-002, Attachment 2, Section 2.1.2					X																																		
RS-002, Attachment 2, Section 2.1.3						X																																	
RS-002, Attachment 2, Section 2.2.1 - 2.2.2							X																																
RS-002, Attachment 2, Section 2.2.3								X																															

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Table 1-2 (cont.) Regulatory Compliance Matrix

Legend:
X = Complies
C = Clarification Required, See Table 1-3

Regulatory Requirements Document Title	Rev.	Date	Chapter 1	2.1.1	2.1.2	2.1.3	2.2.1 - 2.2.2	2.2.3	2.3.1	2.3.2	2.3.3	2.3.4	2.3.5	2.4.1	2.4.2	2.4.3	2.4.4	2.4.5	2.4.6	2.4.7	2.4.8	2.4.9	2.4.10	2.4.11	2.4.12	2.4.13	2.5.1	2.5.2	2.5.3	2.5.4	2.5.5	2.5.6	3.5.1.6	11.2.3	11.3.3	13.3	13.6	Chapter 15	Chapter 17
RS-002, Attachment 2, Section 2.3.1									X																														
RS-002, Attachment 2, Section 2.3.2										X																													
RS-002, Attachment 2, Section 2.3.3											X																												
RS-002, Attachment 2, Section 2.3.4												X																											
RS-002, Attachment 2, Section 2.3.5													X																										
RS-002, Attachment 2, Section 2.4.1														X																									
RS-002, Attachment 2, Section 2.4.2															X																								
RS-002, Attachment 2, Section 2.4.3																X																							
RS-002, Attachment 2, Section 2.4.4																	X																						
RS-002, Attachment 2, Section 2.4.5																		X																					
RS-002, Attachment 2, Section 2.4.6																			X																				
RS-002, Attachment 2, Section 2.4.7																				X																			
NUREG-0800, Section 2.4.8	2	Jul-81																			X																		
RS-002, Attachment 2, Section 2.4.9																						X																	
NUREG-0800, Section 2.4.10	2	Jul-81																					X																
RS-002, Attachment 2, Section 2.4.11																								X															
RS-002, Attachment 2, Section 2.4.12																									X														
RS-002, Attachment 2, Section 2.4.13																										X													
NUREG-0800, Section 2.5.1	3	Mar-97																									X												
NUREG-0800, Section 2.5.2	3	Mar-97																										X											
NUREG-0800, Section 2.5.3	3	Mar-97																											X										
RS-002, Attachment 2, Section 2.5.4																														X									
NUREG-0800, Section 3.7.2	Dr-3	Apr-96																												X									
RS-002, Attachment 2, Section 2.5.5																															X								
RS-002, Attachment 2, Section 3.5.1.6																																	X						
NUREG-0800, Section 3.5.1.6	2	Jul-81																															X						
RS-002, Attachment 2, Section 13.3.1																																				X			
RS-002, Attachment 2, Note 2																																					X		
RS-002, Attachment 2, Section 15.0																																						X	
NUREG-0800, Chapter 15	1&2	Jul-81																																				X	
RS-002, Attachment 2, Section 17.1.1																																							X

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Table 1-3 Regulatory Compliance Clarifications

Regulatory Document	Affected ESP Application Section	Clarification
Reg Guide 1.23	2.3.3	System Accuracy for Wind Speed is +/- 0.5 mph (+/- 0.22 m/sec) and for Differential Temperature is +/- 0.27°F (+/- 0.15°C) per 50-m height.
Reg Guide 1.60	2.5.2	Site-specific response spectra is derived in accordance with 10 CFR Part 100 Subpart B 100.23. The standard spectral shape of Regulatory Guide is not used.
Reg Guide 1.165	2.5.2	Regulatory Guide 1.165 is used to (1) conduct geological, seismological, and geophysical investigations of the site and region around the site, (2) identify and characterize seismic sources, and (3) perform PSHA. The procedure to determine the SSE for the site departs from the Regulatory Guide 1.165 procedure. Site-specific SSE spectra following the procedures of ASCE 43-05 for defining the Design Response Spectra (DRS) using a Target Performance Goal (P_f) of a mean annual probability of exceedance of 1E- 05 is used to define the ESP SSE design ground motion.
Reg Guide 1.70	13.6	Regulatory Guide 1.70 requires the security plan to be submitted as a separate document. The security plan will be submitted with the COL. The ESP application follows the guidance described in RS-002, Attachment 2, Note 2.

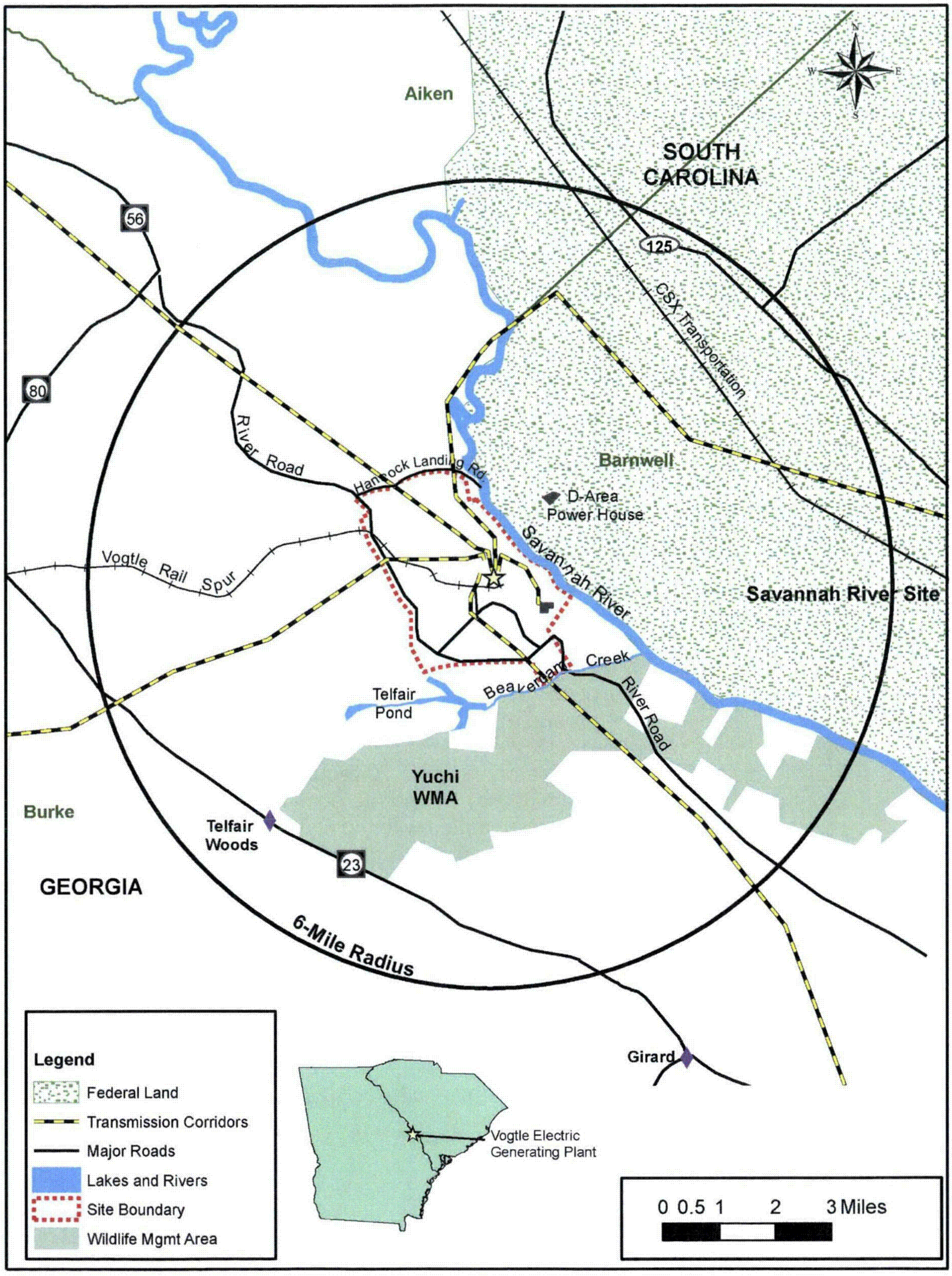

Figure 1-1 6-Mile Vicinity

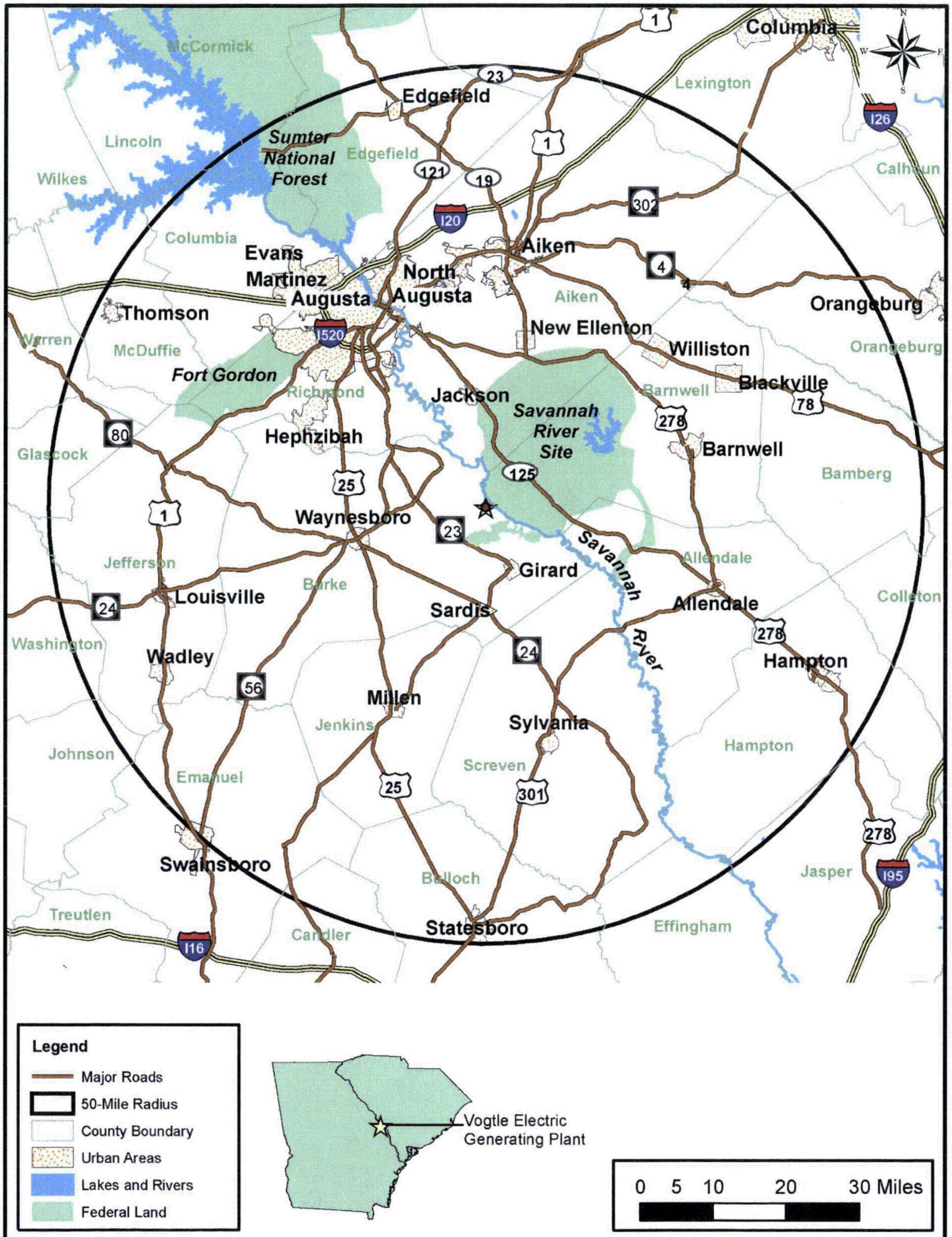

Figure 1-2 50-Mile Vicinity

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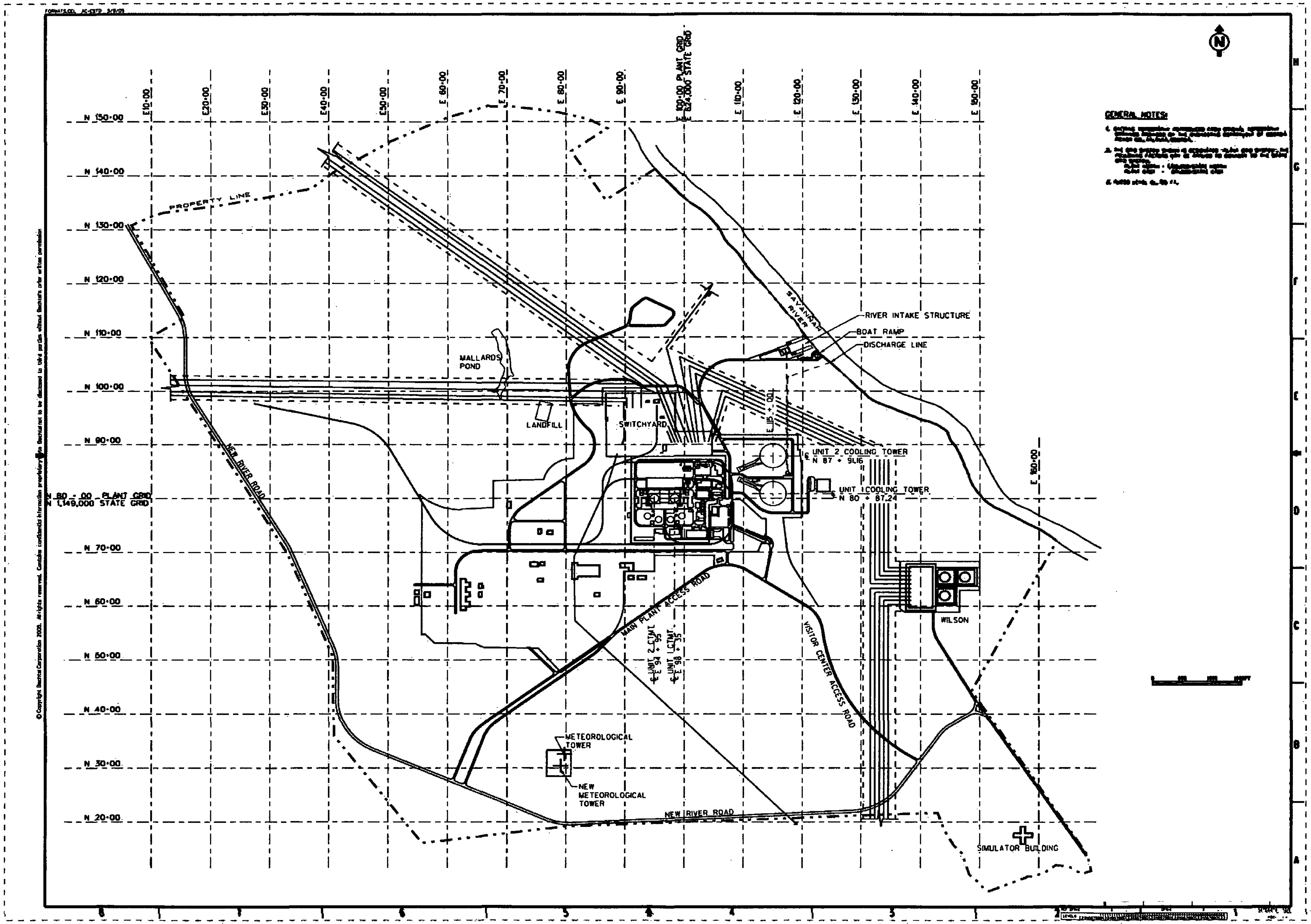

Figure 1-3 Site Layout – Current Development

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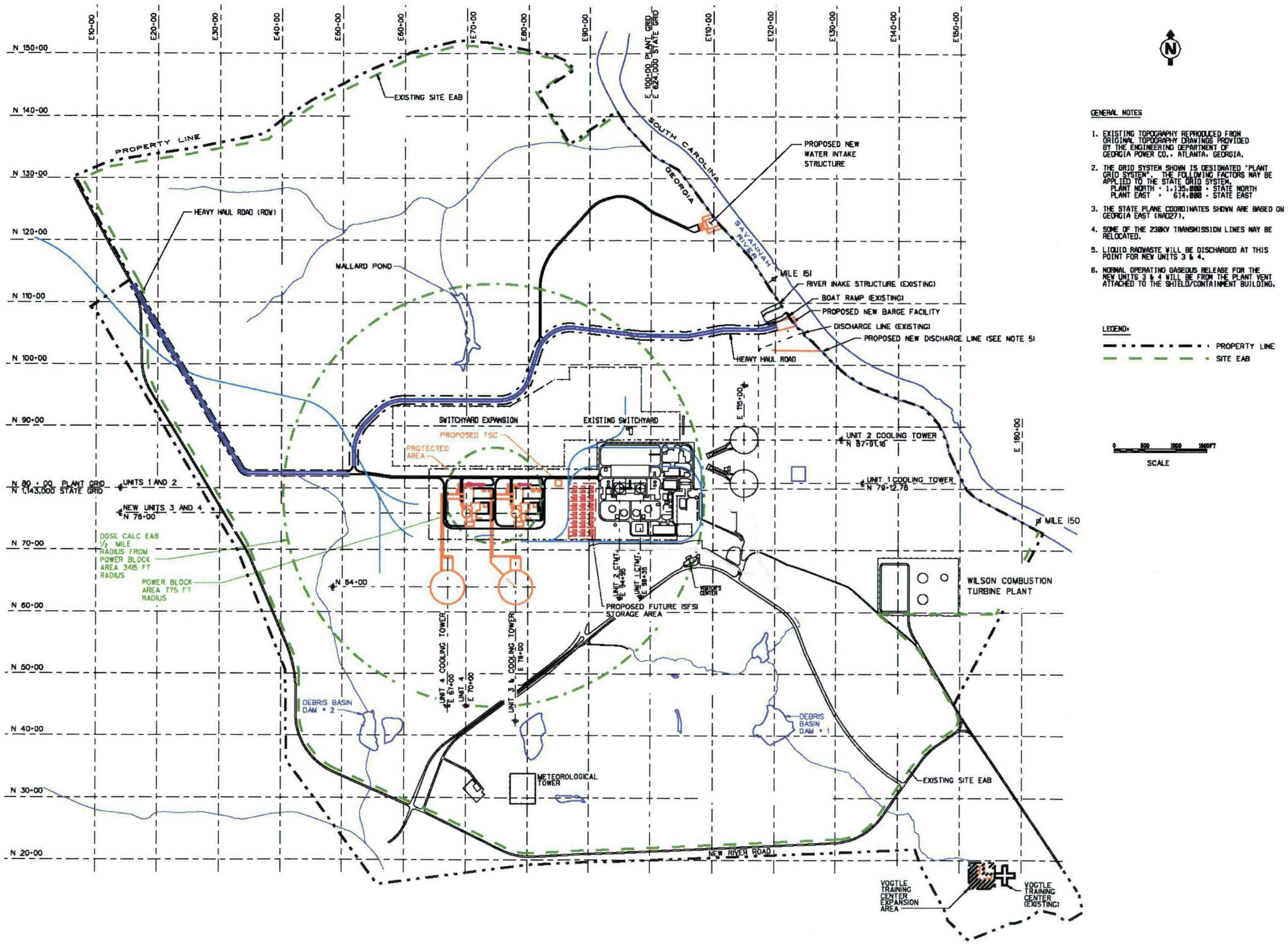

Figure 1-4 Site Layout – New Development

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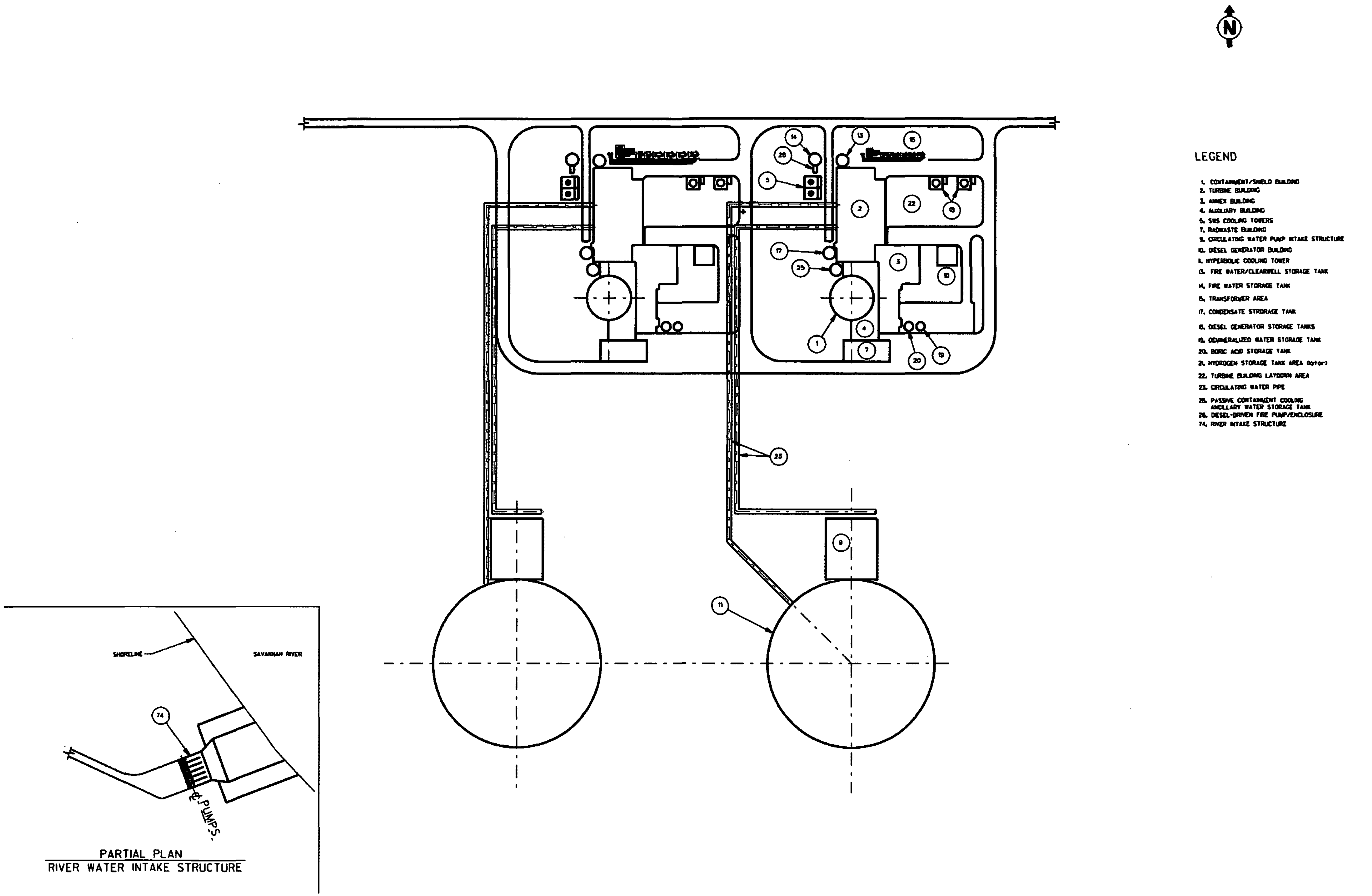

Figure 1-5 VEGP Units 3 and 4 Power Block Arrangement

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Chapter 1 References

(NRC-NEI 2004) *Early Site Permit Template*, NRC letter to NEI, J.E. Lyons to A. Heymer, June 22, 2004.

(Westinghouse 2005) *AP1000 Design Control Document,* AP1000 Document No. APP-GW-GL-700, Revision 15, Westinghouse Electric Company, 2005.

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Vogtle ESP Application Supplement 2-S1

Part 2, Section 2.5.4

(Pages 2.5.4-1 through 2.5.4-100)

2.5.4 Stability of Subsurface Materials and Foundations

This section presents information on the stability of subsurface materials and foundations at the VEGP site that may affect the proposed new unit's seismic Category 1 facilities. This geological, geophysical, geotechnical, and seismological information is developed and used as a basis to evaluate the stability of subsurface materials and foundations at the site.

Information presented in this section was developed from onsite geotechnical and geophysical investigations, a review of analysis and reports prepared for the existing VEGP units, and a review of geotechnical literature. Site specific reports prepared by Bechtel Power Corporation were included in this review; these reports addressed foundation investigation **(Bechtel 1974b)**, backfill material investigations **(Bechtel 1978a, 1978b and 1979)**, dynamic properties of the backfill **(Bechtel 1978c)**, and the test fill program **(Bechtel 1978d)**.

The ESP geotechnical field and laboratory investigation performed for the application was intended to enhance the understanding of the VEGP site and complement the existing geotechnical data developed for VEGP Units 1 and 2. The ESP geotechnical investigation data report was finalized in February 2006 and is included as Appendix 2.5A. The ESP seismic reflection/refraction data report was finalized in February 2006 and is included as Appendix 2.5B.

A structure-specific geotechnical field and laboratory investigation was performed by MACTEC Engineering and Consulting, Inc to support the COL application. One hundred and seventy-four soil borings, along with other types of exploration methods, were conducted across the site. This investigation was conducted to augment the existing ESP geotechnical data and to further develop geotechnical data at specific proposed VEGP structure locations. Field work was substantially completed on April 20, 2007. The geotechnical data report for this work was received on July 31, 2007, and is currently under review. A limited number of laboratory tests are currently outstanding and are expected to be completed by fall 2007. The MACTEC geotechnical data report, Attachments A–D, is provided in Appendix 2.5C. Attachments E–G will be provided as part of the ESP Revision 3 submittal, currently projected for the fall of 2007. A description of Attachments A through G is provided below:

Attachment	Description
A	Survey Data and Test Locations
B	Geotechnical Boring Logs, Geotechnical Test Pit Logs, and SPT Energy Ratio Measurements
C	Cone Penetrometer Test Results
D	Geophysical Test Data (Downhole), Field Electrical Resistivity
E	ReMi Seismic Shear Wave Velocity Measurements

F Laboratory Testing Data (Geotechnical)
G Resonant Column Torsional Shear Test Results

The COL investigation included explorations across the site for both safety and non-safety related structures as presented in Figures 2.5.4-1a and 2.5.4-1b. Figure 2.5.4-1a provides an overall site boring location plan, while Figure 2.5.4-1b provides a boring location plan for the power block and cooling tower areas. The 3000 series borings were taken in the area of Unit 3 (power block and cooling tower). The 4000 series borings were taken in the area of Unit 4 (power block and cooling tower). The geotechnical data report in Appendix 2.5C includes all of the borings performed for the COL investigation; however, only the data from the power block borings and proposed borrow areas are evaluated and discussed herein in the context of engineering properties. The COL investigation is described in more detail in Section 2.5.4.3.

2.5.4.1 Geologic Features

Section 2.5.1.1 describes the regional geology, including regional physiography and geomorphology, regional geologic history, regional stratigraphy, and the regional tectonic setting. Section 2.5.1.2 addresses site-specific geology and structural geology, including site physiography and geomorphology, site geologic history, site stratigraphy, site structural geology, and a site geologic hazard evaluation.

2.5.4.2 Properties of Subsurface Materials

2.5.4.2.1 Introduction

This section describes the static and dynamic engineering properties of the VEGP site subsurface materials. An overview of the subsurface profile and materials is given in Section 2.5.4.2.2. The field investigations, described in Section 2.5.4.3, are summarized in Section 2.5.4.2.3. The soils encountered during the ESP subsurface investigation constitute alluvial and Coastal Plain deposits and can be placed in three groups for stability of subsurface materials and foundation purposes (i.e., for geotechnical purposes). These soils include, from top to bottom, sands with silt and clay (Group 1), clay marl (Group 2), and coarse-to-fine sand with interbedded thin seams of silt and/or clay (Group 3). The Upper Sand Stratum (Group 1 soils) will be completely removed and replaced with compacted structural fill prior to the construction of VEGP Units 3 and 4. The static and dynamic engineering properties of the three principal soil groups and the compacted backfill were determined by field investigation and laboratory testing. The laboratory tests and their results are summarized in Section 2.5.4.2.4. The engineering properties of the subsurface materials are presented in Section 2.5.4.2.5.

The results of the COL geotechnical field and laboratory investigation are being evaluated to confirm and update, as necessary, the engineering properties of the subsurface materials.

2.5.4.2.2 Description of Subsurface Materials

The site soils and bedrock are divided into five strata (Upper Sand Stratum, Marl Bearing Stratum, Lower Sand Stratum, Dunbarton Triassic Basin bedrock, and Paleozoic Crystalline bedrock), which correspond to the three soil groups mentioned in Section 2.5.4.2.1 plus the two bedrock units:

I Upper Sand Stratum (Barnwell Group) – predominantly sands, silty sands, and clayey sands with occasional clay seams. A shelly limestone (Utley Limestone) layer was encountered at the base of the Upper Sand Stratum or the top of the Blue Bluff Marl. The limestone contains solution channels, cracks, and discontinuities and was the cause of severe fluid loss observed during drilling for the ESP subsurface investigation.

II Marl Bearing Stratum (Blue Bluff Marl or Lisbon Formation) – slightly sandy, cemented, calcareous clay.

III Lower Sand Stratum (comprises several formations from the Still Branch just beneath the Blue Bluff Marl to Cape Fear just above the Dunbarton Triassic Basin rock) – fine-to-coarse sand with interbedded silty clay and clayey silt.

IV Dunbarton Triassic Basin Rock – red sandstone, breccia, and mudstone, weathered through the upper 120 ft.

V Paleozoic Crystalline Rock - a competent rock with high shear wave velocities that underlies the non-capable Pen Branch Fault, which underlies the site.

These strata have been previously used as a means for classifying the soils and rock with regard to engineering properties, and is also used in this ESP SSAR.

The following is a brief description of the subsurface materials, giving the soil and rock constituents, and their range of thickness encountered at the site. The information has been taken from the 14 borings and 10 cone penetrometer tests (CPTs) performed during the ESP subsurface investigation. The locations of the ESP borings and CPTs are shown on Figure 2.5.4-1. Reference is made, as appropriate, to borings performed for VEGP Units 1 and 2. For reference, the VEGP site elevations in the areas explored range from about El. 219 to 256 ft msl, with a median of about El. 222 ft msl. It is noted that most of the VEGP ESP site is flat at about El. 220 ft msl with surrounding areas at higher elevations of about 250 ft msl. A finished plant grade of El. 220 ft msl is used for the new unit ESP analysis. The engineering

properties are provided in Section 2.5.4.2.5. Figures 2.5.4-3, 2.5.4-4, and 2.5.4-5 provide illustrations of the subsurface conditions across the VEGP site. A profile legend is provided as Figure 2.5.4-2.

The locations of the explorations performed for the COL investigation are shown on Figures 2.5.4-1a and 2.5.4-1b. Results from the explorations will be used to confirm and update, as necessary, the descriptions of the subsurface materials. ESP subsurface profiles will be updated as necessary using the COL subsurface investigation data.

2.5.4.2.2.1 Upper Sand Stratum (Barnwell Group)

The ESP subsurface investigation (Appendix 2.5A) determined that the Upper Sand Stratum ranged in thickness from 78 to 157 ft beneath the ground surface at the completed boring locations. The wide range of thickness was due to two factors. First, three borings (B-1004, B-1005, and B-1006) were drilled from elevations about 30 ft higher than the remaining borings. Second, the top of the Blue Bluff Marl dips down toward the west and northwest portions of the VEGP site. The average thickness of the Upper Sand Stratum was 102 ft, and the median thickness was 94 ft at the ESP boring locations.

Field Standard Penetration Test (SPT) N-values obtained according to ASTM D 1586 **(ASTM D 1586 1999)** within the Upper Sand Stratum during the ESP subsurface investigation ranged from weight of rod (WOR) to 50 blows for 0-in. penetration (50/0"). The very high blow count values are indicative of zones containing the shelly limestone. The average field SPT N-value was 25 blows per foot (bpf), and the median N-value was 21 bpf. These field values are uncorrected for hammer efficiency of the respective drill rig hammers used. Measurements of hammer energy were performed in borings B-1006 and B-1013. The measured energy transfer efficiency ranged from 65 to 87 percent, with an average value of 76 percent and a median value of 75 percent.

Selected samples recovered within the Upper Sand Stratum were submitted for laboratory testing, including percent fines, moisture content, and Atterberg limits. The percent fines ranged from 3 to 60 percent, with an average value of 21 percent and a median value of 19 percent. The Plastic Limit ranged from 19 to 30, with an average value of 25 and a median value of 26. The Liquid Limit ranged from 43 to 97, with an average value of 62 and a median value of 53. The Plasticity Index ranged from 21 to 67, with an average value of 37 and a median value of 29. The natural moisture content of samples tested for Atterberg limits ranged from 20 to 93 percent, with an average value of 63 percent and a median value of 70 percent.

Site geotechnical investigations for the existing units determined that the Upper Sand Stratum (Barnwell Group) is approximately 90 ft thick. A shelly limestone (Utley Limestone) is encountered at the base of this stratum and/or the top of the Blue Bluff Marl. The Upper Sand

Stratum was determined to be susceptible to liquefaction during a seismic event equivalent to the safe shutdown earthquake (SSE) developed for VEGP Units 1 and 2. In addition, the underlying limestone layer was determined to contain significant channeling, cracking, and other discontinuities. Therefore, it was considered necessary to remove both the Upper Sand Stratum and limestone layers before constructing VEGP Units 1 and 2. The standard penetration test data from previous studies indicate that the relative density of the Upper Sand Stratum is highly variable with a range from very loose to dense. Clay lenses encountered within the stratum ranged in consistency from soft to medium stiff.

Existing Units 1 and 2 unconsolidated undrained (UU) triaxial test results of samples within the Upper Sand Stratum indicate that the Mohr strength envelope of total stresses ranges from c=2,100 pounds per square foot (psf), Φ=6° to c=440 psf, Φ=32°, depending on the clay and sand content within the sample. Likewise, previous consolidated undrained (CU) triaxial test results for samples within the Upper Sand Stratum indicate that the Mohr strength envelope ranges from c=1,650 psf, Φ=17° to c=4,000 psf, Φ=25° for total stress and Φ=33° to Φ=34.5° for effective stresses. Because of the large number of UU and CU triaxial tests previously performed on Upper Sand Stratum samples, and the fact that this stratum would be completely removed before constructing the ESP units, no new strength tests were performed during the ESP subsurface investigation.

The design properties of the Upper Sand Stratum are provided in Table 2.5.4-1 and were developed from laboratory and field test results, and published engineering correlations.

Results of the COL subsurface investigation are being evaluated to confirm and update, as necessary, the characterization of the Upper Sand Stratum.

2.5.4.2.2.2 Blue Bluff Marl (Lisbon Formation)

The ESP subsurface investigation (Appendix 2.5A) determined that the Blue Bluff Marl was found to range in thickness from 63 to 95 ft at three locations where the stratum was fully penetrated, with an average thickness of 76 ft and a median thickness of 69 ft. The typical thickness of the Blue Bluff Marl is illustrated on the subsurface profiles on Figures 2.5.4-3, 2.5.4-4, and 2.5.4-5. The profiles on Figures 2.5.4-3 and 2.5.4-4 also illustrate the downward dip of the top of the Blue Bluff Marl toward the west side of the VEGP site.

Field SPT N-values obtained within the Blue Bluff Marl during the ESP subsurface investigation ranged from 26 bpf to 50 blows for 1-in. penetration (50/1"). The average field SPT N-value was 83 bpf, and the median N-value was 100 bpf. SPT blow counts corresponding to less than 12 in. of sampler penetration were linearly extrapolated to the 12 in. standard penetration. SPT blow counts that were linearly extrapolated to more than 100 bpf were truncated at 100 bpf when calculating SPT averages. The field values are uncorrected for hammer efficiency of the

respective drill rig hammers used. It is noted that the 26 bpf value was measured near the bottom of the stratum in boring B-1002, and most measured values were above 50 bpf. Also, the SPT N-values did not suggest the presence of a likely weathered portion at the top of the stratum.

Selected samples recovered within the Blue Bluff Marl during the ESP subsurface investigation were submitted for laboratory testing, including percent fines, moisture content, and Atterberg limits. The percent fines ranged from 24 to 64 percent, with an average value of 37 percent and a median value of 35 percent. The plastic limit ranged from non-plastic (NP) to 51 percent, with an average value of 29 percent and a median value of 27 percent. The liquid limit ranged from NP to 99 percent, with an average value of 51 percent and a median value of 43 percent. The plasticity index ranged from NP to 58 percent, with an average value of 22 percent and a median value of 16 percent. The natural moisture content of samples tested for Atterberg limits ranged from 14 to 67 percent, with an average value of 35 percent and a median value of 29 percent. In addition, 15 one-point UU tests were performed on Blue Bluff Marl samples. The laboratory measured undrained shear strength ranged from 150 to 4,300 psf. The low end of measured values (150 psf) is lower than previously reported (260 psf) for VEGP Units 1 and 2, and the high end of measured values (4,300 psf) is significantly lower than previously reported (500,000 psf) for VEGP Units 1 and 2. The SPT N-values measured during the ESP and values previously measured in the laboratory for VEGP Units 1 and 2 support the use of a 10,000-psf design value. The reason for the sharp disagreement between the ESP laboratory values and previously reported undrained shear strength for the Blue Bluff Marl is severe sample disturbance due to sampling technique (pitcher sampler) and preparation of testing specimen. The SPT N-values measured during the ESP and values previously measured in the laboratory for VEGP Units 1 and 2 support the use of a 10,000-psf design value. Additional confirmatory tests will be performed during the COL phase.

Site investigations for the existing units determined that the marl stratum (Blue Bluff Marl or Lisbon Formation) consists of hard, slightly sandy, cemented, calcareous clay and ranges in thickness from approximately 60 ft to 100 ft. The comparative consistency of the Blue Bluff Marl ranges from hard to very hard. The materials are moderately brittle and resemble a calcareous claystone or siltstone. Previous seismic exploration within this stratum indicates a velocity interface approximately 15 ft beneath the top of the stratum. The upper 15 ft, a likely weathered portion, of the stratum recorded a compressive wave velocity of approximately 5,000 ft per second (fps), while the underlying material recorded a compressive wave velocity of approximately 7,000 fps. The static engineering properties of the Blue Bluff Marl stratum are summarized in Table 2.5.4-1.

Previous laboratory results indicate the Blue Bluff Marl to be highly preconsolidated. Plasticity index values ranged from 2 to 70 with an average value of 25. Based on work by Skempton

(1957), using the average PI value yields an s_u/p ratio of approximately 0.2, where s_u is undrained shear strength and p is the effective preconsolidation pressure at sample depth. An undrained shear strength of 16,000 psf was determined using the average value of shear strength test results which failed at less than 50,000 psf. Therefore, using the 16,000 psf value for undrained shear strength and a s_u/p ratio of 0.2, the preconsolidation pressure of the Blue Bluff Marl stratum was estimated to be 80,000 psf. Settlements due to loadings from new structures would be small due to this high preconsolidation pressure.

The undrained shear strength of the Blue Bluff Marl was verified during the excavation for VEGP Units 1 and 2. Core samples of the Blue Bluff Marl were obtained and tested. The design value of c = 10,000 psf, $\Phi = 0°$ was found to be appropriately conservative. The average undrained shear strength of the core samples was 20,000 psf, and the lowest value obtained was 11,700 psf.

The heave of the Blue Bluff Marl stratum was monitored during the excavation for VEGP Units 1 and 2. Measurements were taken at nine locations at regular intervals. After excavation completion, an average heave of 1.25 in. was observed. Based on the heave measurements, the undrained Young's modulus, E, of the Blue Bluff Marl stratum was calculated to be 10,000 $kips/ft^2$, similar to values of E estimated from Menard pressuremeter and seismic velocity measurements during previous field investigations.

The static design properties of the Blue Bluff Marl stratum are provided in Table 2.5.4-1 and were developed from laboratory and field test results, available data from VEGP Units 1 and 2, as well as published engineering correlations.

A summary of the design dynamic shear modulus at strain levels of 10^{-4} percent, or lower, for the Blue Bluff Marl stratum is given in Table 2.5.4-2. Dynamic shear modulus values were computed from the in situ shear wave velocity measurements shown in Table 2.5.4-6.

Results of the COL subsurface investigation are being evaluated to confirm and update, as necessary, the characterization of the Blue Bluff Marl.

2.5.4.2.2.3 Lower Sand Stratum

The ESP subsurface investigation (Appendix 2.5A) determined that the Lower Sand Stratum encompassed a number of geologic formations, including, listed in top to bottom order, the Still Branch, Congaree, Snapp, Black Mingo, Steel Creek, Gaillard/Black Creek, Pio Nono/ Unnamed, and Cape Fear formations. The Lower Sand Stratum was fully penetrated at boring B-1003 and found to have a thickness of 900 ft at this location. Boring B-1003 also disclosed that the Lower Sand Stratum rests upon Dunbarton Triassic Basin rock. Typical depths are illustrated on the subsurface profile in Figure 2.5.4-4.

Field SPT N-values obtained to depths of about 300 ft within the Lower Sand Stratum during the ESP subsurface investigation ranged from 9 bpf to 50 blows for 4-in. penetration (50/4"). The average field SPT N-value was 59 bpf, and the median N-value was 47 bpf. These field values are uncorrected for hammer efficiency of the respective drill rig hammers used and comprise values measured mostly in the Still Branch Formation directly beneath the Blue Bluff Marl.

ESP subsurface investigation selected samples recovered within the Lower Sand Stratum were submitted for laboratory testing, including percent fines, moisture content, and Atterberg limits. The percent fines ranged from 3 to 79 percent, with an average value of 18 percent and a median value of 14 percent. The plastic limit ranged from NP to 38 percent, with average and median values of 30 percent. The liquid limit ranged from NP to 53 percent, with average and median values of 47 percent. The plasticity index ranged from NP to 19 percent, with average and median values of 17 percent. The natural moisture content for samples tested for Atterberg limits ranged from 21 to 41 percent, with an average value of 30 percent and a median value of 28 percent. Samples with the higher percent fines and plasticity were from the silty clay and clayey silt layers.

Site geotechnical investigations for the existing units determined that the Lower Sand Stratum consists of sands with interbedded silty clay or clayey silt. The thickness of this stratum was estimated to be 900 to 1,000 ft. SPT N-values obtained to depths of about 300 to 400 ft below grade during previous field investigations within the Lower Sand Stratum ranged from 70 to 100 bpf, indicative of a very dense material.

The static design properties of the Lower Sand Stratum are provided in Table 2.5.4-1 and were developed from laboratory and field test results, available data from VEGP Units 1 and 2, as well as published engineering correlations.

A summary of the design dynamic shear modulus at strain levels of 10^{-4} percent, or lower, for the Lower Sand Stratum is given in Table 2.5.4-2. Dynamic shear modulus values were computed from the in situ shear wave velocity measurements shown in Table 2.5.4-6.

Results of the COL subsurface investigation are being evaluated to confirm and update, as necessary, the characterization of the Lower Sand Stratum.

2.5.4.2.2.4 Dunbarton Triassic Basin Rock

The Dunbarton Triassic Basin Rock was cored at ESP borehole B-1003 only, and consisted of red sandstone, breccia, and mudstone, weathered through the upper 120 ft. The deepest COL borehole was advanced to a depth of 40 ft in the lower sand stratum and did not reach bedrock. Further details are provided in Section 2.5.1. Because the rock was too deep to be of any interest to foundation design, no laboratory tests were performed on the rock cores. Shear

wave velocity was measured in the upper 274 ft of the rock profile, and these results were used to develop the shear wave velocity profile for site amplification that are presented in Section 2.5.4.7.1.

2.5.4.2.2.5 Paleozoic Crystalline Rock

As indicated in Figure 2.5.4-4, the VEGP site sits on over 1,000 feet of Coastal Plain sediments underlain by Triassic Basin sedimentary rock. Borehole B-1003 encountered the bottom of the Coastal Plain sediments and the start of a weathered section of the Triassic Basin at a depth of 1,049 feet. Under the part of Savannah River Site [SRS] adjacent to the VEGP site, the southeast dipping Pen Branch fault separates the Triassic Basin rock from Paleozoic crystalline rock to the northwest (**Lee et al. 1997**). A seismic reflection survey in and around the VEGP site (shown in Appendix 2.5B and discussed in section 2.5.1.2.4.2), has been interpreted to show the southwest continuation of the Pen Branch fault beneath the site and to indicate that the depth to the bottom of the Coastal Plain sediments is about 1,000 feet (Figure 2.5.1-40). This and interpretation of flexures within the older Coastal Plain sediments suggest that the Pen Branch fault lies below the area of the new containment units. Therefore, the information available implies that at some depth below the VEGP site the Paleozoic crystalline rock underlies the Triassic Basin rock.

2.5.4.2.2.6 Subsurface Profiles

Figures 2.5.4-3, 2.5.4-4, and 2.5.4-5 illustrate typical subsurface profiles across the power block area proposed for the proposed VEGP Units 3 and 4. A profile legend is provided as Figure 2.5.4-2. The locations of the borings used to develop profiles are shown in Figure 2.5.4-1. These profiles are discussed in Section 2.5.4.5 with respect to excavation for the new units and in Section 2.5.4.10.1 for bearing capacity considerations.

The ESP subsurface profiles will be updated, as necessary, using the COL subsurface investigation data.

2.5.4.2.3 Field Investigations

The exploration programs performed previously for VEGP Units 1 and 2 are referenced, as warranted, and the ESP subsurface investigation is described in Section 2.5.4.3. The borings from previous explorations are not included here. The borings and cone penetrometer tests from the ESP subsurface investigation program are summarized in Tables 2.5.4-7. Previous geophysical surveys and new geophysical surveys for the ESP study are described in Section 2.5.4.4. Boring logs and CPT logs from the ESP field exploration are included in Appendix 2.5A.

The exploration program for the COL subsurface investigation included borings, CPTs, seismic CPTs, geophysical surveys, and test pits. The boring, CPT, and test pit locations are summarized in Table 2.5.4-7a. Boring logs, CPT logs, geophysical survey results, and test pit logs from the COL field exploration are included in Appendix 2.5C.

2.5.4.2.4 Laboratory Testing

2.5.4.2.4.1 Testing Overview

Numerous laboratory tests of soil samples were performed previously for VEGP Units 1 and 2, and new tests have been performed as part of the ESP subsurface investigation. Previous test results are contained within Bechtel Power Corporation's Report on Foundation Investigations **(Bechtel 1974b)**. The types and numbers of tests completed during the ESP subsurface investigation are shown in Table 2.5.4-3, and the test results are contained within the MACTEC report for the ESP subsurface investigation (Appendix 2.5A). A summary of all laboratory test results performed as part of the ESP subsurface investigation is provided in Table 2.5.4-4.

Laboratory tests were performed on numerous soil samples obtained from the COL subsurface investigation. The types and numbers of tests completed to date are shown in Table 2.5.4-3a. This table will be updated when all laboratory tests are completed. The completed test results are currently under review.

2.5.4.2.4.2 Laboratory Tests for the ESP Subsurface Investigation

Laboratory testing for the ESP investigation was performed in accordance with the guidance presented in Regulatory Guide 1.138, *Laboratory Investigations of Soils for Engineering Analysis and Design of Nuclear Power Plants*, US Nuclear Regulatory Commission, 2003 (RG 1.138). The laboratory work was performed under an approved quality program with work procedures developed specifically for the ESP application. Soil samples were shipped under Chain-of-Custody protection from the on-site storage area (described in Section 2.5.4.3.2) to the testing laboratory. Laboratory testing was performed at the MACTEC laboratories in Atlanta, Georgia.

The types and numbers of laboratory tests performed on the soil samples from the ESP exploration program are included on Table 2.5.4-3. The ESP tests focused primarily on verifying the basic properties of the Upper Sand Stratum, Blue Bluff Marl, and the upper formations in the Lower Sand Stratum.

The details and results of the laboratory testing are included in Appendix 2.5A. This appendix includes references to the industry standard used for each specific laboratory test. The results of the tests on soil samples are shown on Table 2.5.4-4.

2.5.4.2.4.3 Laboratory Tests for the COL Subsurface Investigation

Laboratory testing for the COL investigation was performed in accordance with the guidance presented in RG 1.138. The laboratory work was performed under an approved quality assurance program with work procedures developed specifically for the COL application. Soil samples were shipped under Chain-of-Custody protection from the on-site storage area (described in Section 2.5.4.3.2) to the testing laboratory. Laboratory tests (index, strength, and consolidation testing) are being performed at the MACTEC laboratories in Atlanta, Georgia, and are expected to be completed in September 2007. Resonant column torsional shear (RCTS) tests are being performed at the FUGRO laboratories in Houston, Texas. Currently, these tests are expected to be completed in October 2007.

2.5.4.2.5 Engineering Properties

The engineering properties for the Upper Sand Stratum, Blue Bluff Marl, and Lower Sand Stratum, derived from the previous studies and from the ESP subsurface investigation and laboratory testing program, are provided in Table 2.5.4-1. The engineering properties obtained from the ESP subsurface investigation and laboratory testing program (Appendix 2.5A) were similar to those obtained from the previous field and laboratory testing programs.

Results of the COL subsurface investigation and laboratory testing program (Appendix 2.5C) will be used to confirm and update, as necessary, the engineering properties of the proposed borrow material, Upper Sand Stratum, Blue Bluff Marl, and Lower Sand Stratum.

Rock densities were derived from Tables 5-2 and 5-3 of WSRC **(1998)** for crystalline and Triassic rock, respectively. Rock densities increased with depth from 2.75 gm/cc to 3.42 gm/cc in the crystalline rock, and from 2.53 gm/cc to 3.42 gm/cc in the Triassic rock.

The following sections briefly describe the sources and/or methods used to develop the selected properties shown in Table 2.5.4-1.

2.5.4.2.5.1 Rock Properties

The Recovery and Rock Quality Designations (RQD) are based on the results provided from the deep boring, B-1003. Rock coring was not performed during the previous investigations for VEGP Units 1 and 2. Geophysical testing at the deep boring, B-1003, extended for about 290 ft into the bedrock encountered at depth of 1,049 ft below the ground surface. The shear and compressional wave velocities are based on the suspension P-S velocity seismic test performed in borehole B-1003 as part of the ESP subsurface investigation (Appendix 2.5A). Laboratory strength testing of rock cores was not performed because the rock is deemed to be too deep to provide any additional useful engineering information.

2.5.4.2.5.2 Soil Properties

Sieve analyses of 30 Upper Sand Stratum samples (including 1 fill sample), 19 Blue Bluff Marl samples, and 12 Lower Sand Stratum samples were performed as part of the ESP laboratory testing program (Appendix 2.5A).

The natural moisture content and Atterberg Limits of 4 Upper Sand Stratum, 19 Blue Bluff Marl, and 4 Lower Sand Stratum samples were determined as part of the ESP laboratory testing program. Design values shown on Table 2.5.4-1 were taken as the average of these test results for the respective soil strata.

The undrained shear strength of the Blue Bluff Marl bearing stratum is estimated from SPT N-values and from previous test results of high quality Blue Bluff Marl samples obtained during the excavation for VEGP Units 1 and 2.

The effective angle of internal friction of the Upper Sand Stratum was determined to be 34 degrees **(Bowles 1982)** from correlation with the average SPT N-value (based on N = 25 bpf). The N-value of 25 bpf represents the measured value of 20 bpf corrected to account for the higher automatic hammer efficiency measured in the field. This correction was made following the guidelines in ASTM D 6066 (1996).

The effective angle of internal friction of the Lower Sand Stratum was determined to be 41 degrees **(Bowles 1982)** from correlation with the average SPT N-value (based on N = 62 bpf). The N-value of 62 bpf represents the measured value of 50 bpf corrected to account for the higher automatic hammer efficiency measured in the field. This correction was made following the guidelines in ASTM D 6066 (1996).

Unit weights were measured in selected samples of the Blue Bluff Marl and Lower Sand Stratum. Unit weight of 15 Blue Bluff Marl samples ranged from 103.6 pounds per cubic foot (pcf) to 140.2 pcf, with an average of 120 pcf. Unit weights of three Lower Sand Stratum samples were 119.4 pcf, 121.7 pcf, and 128.3 pcf, with an average of 123 pcf. The in situ moist unit weights of the Upper Sand Stratum, Blue Bluff Marl, and Lower Sand Stratum for VEGP Units 1 and 2 were 118 pcf, 119 pcf, and 117 pcf, respectively. However, there were only a few measurements made for the ESP investigation in the Lower Sand Stratum. Measurements made at the adjacent SRS site in the deeper sands indicate an average total unit weight of about 127 pcf **(WSRC 1998).**

The design SPT N-value for the Upper Sand Stratum is taken as 25 bpf. This value is based on the results reported in Table 2.5.4-5 and includes correction for hammer efficiency. The results in Table 2.5.4-5 show an average uncorrected field SPT N-value of 25 bpf and median value of 21 bpf. The design corrected N-value of 25 bpf corresponds to a field N-value of 20 bpf, which

is lower than the average and median values. SPT N-values for VEGP Units 1 and 2 ranged from 2 to 60 bpf with an average of 30 bpf. The design value is within the range and near the average of the previous investigation values.

The design SPT N-value for the Blue Bluff Marl is taken as 100 bpf. This value is based on the results reported in Table 2.5.4-5 and includes correction for hammer efficiency. The results in Table 2.5.4-5 show an average uncorrected field SPT N-value of 83 bpf and median value of 100 bpf. The design corrected N-value of 100 bpf corresponds to a field N-value of 80 bpf, which is lower than the average and median values. SPT N-values for VEGP Units 1 and 2 ranged from 10 to over 100 bpf with an average of over 100 bpf. The design value is within the range and near the average of the previous investigation values.

The design SPT N-value for the Lower Sand Stratum is taken as 62 bpf. This value is based on the results reported in Table 2.5.4-5 and includes correction for hammer efficiency. The results in Table 2.5.4-5 show an average uncorrected field SPT N-value of 59 bpf and median value of 47 bpf. The design corrected N-value of 62 bpf corresponds to a field N-value of 50 bpf, which is lower than the average value and slightly higher than the median value. SPT N-values for VEGP Units 1 and 2 ranged from 70 to 100+ bpf with an average of 100+ bpf. The design value is somewhat less than the previous investigation range of values. This may partially be due to limited sampling within the upper formations of the Lower Sand Stratum compared to ample sampling during the previous investigations. During the ESP subsurface investigation, only 16 SPTs were performed within the Lower Sand stratum.

Shear wave velocities were measured by suspension P-S velocity tests and seismic CPTs during the ESP subsurface investigation (Appendix 2.5A). The suspension P-S velocity tests were performed in boreholes B-1002, B-1002A, B-1003, B-1005, and C-1005A. Three seismic CPTs were performed in accordance with ASTM D 5778 (2000) at C-1003, C-1005, and C-1009A. Seismic CPT tests did not extend into the very hard underlying Blue Bluff Marl stratum. Further discussion of suspension P-S velocity and seismic CPT testing is provided in Section 2.5.4.4.2.

A complete shear wave velocity profile was developed from the ground surface to about 300 ft into the Dunbarton Triassic Basin rock for a total depth of about 1,340 ft using both suspension P-S velocity and seismic CPT testing. Shear wave velocities within the Upper Sand Stratum ranged from about 570 fps to 3,310 fps. Shear wave velocities ranged from 1,060 fps to 4,260 fps within the Blue Bluff Marl stratum, 930 fps to 4,670 fps within the underlying Lower Sand Stratum, and 2,320 fps to 9,350 fps within the Dunbarton Triassic Basin. Shear wave velocity measurements were made to depths of up to 290 ft during previous investigations for VEGP Units 1 and 2. In addition, shear wave velocity data were reviewed from seven deep borings performed at the neighboring Savannah River Site. Typical shear wave velocity values

were determined for the Upper Sand Stratum, Blue Bluff Marl, Lower Sand Stratum, and the Dunbarton Triassic Basin rock data based upon review of all the available data and are provided in Table 2.5.4-6. Shear wave velocity values within the Lower Sand Stratum were determined for each of the geologic formations contained within. A more detailed discussion of shear wave velocity values and establishment of the shear wave velocity profile for site amplification are presented in Section 2.5.4.7.1. The profile of shear wave velocity versus depth for the subsurface soils is given in Section 2.5.4.7.

The high strain (i.e., in the range of 0.25 to 0.5 percent) elastic modulus values, tabulated in Table 2.5.4-1, for the Upper Sand Stratum and Lower Sand Stratum have been derived using the relationship with the SPT N-value given in **Davie and Lewis (1988)**. The high strain elastic modulus for the Blue Bluff Marl stratum has been derived using the relationship with undrained shear strength given in **Davie and Lewis (1988)**. The shear modulus values have been obtained from the elastic modulus values using the relationship between elastic modulus, shear modulus, and Poisson's ratio **(Bowles 1982)**.

The low strain (i.e., 10^{-4} percent) shear modulus, tabulated in Table 2.5.4-2, for the Upper Sand Stratum has been derived from the average shear wave velocity of 930 fps. The low strain shear modulus of the Blue Bluff Marl stratum has been derived from the average shear wave velocity of 2,354 fps. The low strain shear modulus of the Lower Sand Stratum has been derived from the average shear wave velocity of 2,282 fps. The elastic modulus values have been obtained from the shear modulus values using the relationship between elastic modulus, shear modulus, and Poisson's ratio **(Bowles 1982)**. The low strain shear modulus for the compacted backfill has been derived assuming an average shear wave velocity of 1,000 fps.

The values of unit coefficient of subgrade reaction are based on values for medium dense sand (Upper Sand Stratum), very-stiff-to-hard clay (Blue Bluff Marl), and dense-to-very-dense sand (Lower Sand Stratum) provided by Terzaghi (1955).

The earth pressure coefficients are Rankine values, assuming level backfill and a zero friction angle between the soil and the wall.

2.5.4.2.5.3 Chemical Properties

Chemical tests were not included in the ESP laboratory testing program. There have been no aggressive subsurface conditions identified in analysis of Unit 1 and 2 buried concrete. Chemical property testing of proposed backfill material was conducted as part of the COL investigation and will be used to confirm that there will be no aggressive subsurface conditions associated with Units 3 and 4. Laboratory tests included pH, chloride, and sulfate and were conducted on bulk soil samples taken from test pits excavated in the proposed borrow area.

Tests were performed by Severn Trent Laboratories, Inc., working as a subcontractor to MACTEC. The completed test results are currently under review.

2.5.4.3 Exploration

Section 2.5.4.3.1 summarizes previous subsurface investigation programs performed at the VEGP site, while Section 2.5.4.3.2 describes the ESP subsurface investigation program. Section 2.5.4.3.3 describes the COL subsurface investigation program.

2.5.4.3.1 Previous Subsurface Investigation Programs

Field investigations for VEGP Units 1 and 2 were initiated in January 1971. Field investigations consisted of borings, geophysical methods, and groundwater studies. Additional investigation was completed during excavation for VEGP Units 1 and 2 to verify and obtain further details concerning subsurface conditions in the power block area. A total of 474 borings and 60,000 ft of drilling were completed during these investigations. An additional 111 borings were completed after the initial investigations mentioned above for the following purposes: 41 borings were drilled to define soil conditions and lateral extent of the Blue Bluff Marl in the river facilities, 38 borings were drilled in the power block to collect samples of the Blue Bluff Marl and perform confirmatory testing, and 32 borings were drilled to collect subsurface data for the natural draft cooling tower foundation design. During the previous investigations, electric logging, natural gamma, density, neutron, caliper, and 3-D velocity logs (Birdwell) were performed at selected borings. Water pressure tests and Menard pressuremeter tests were completed to determine properties of the Blue Bluff Marl bearing stratum. Fossil, mineral, or soluble carbonate tests were performed on recovered samples as warranted.

Geophysical methods were applied to supplement the test borings. The geophysical methods are described in Section 2.5.4.4. For the previous investigations, a total of 28,400 ft of shallow refraction lines, 5,000 ft of deep refraction lines, and cross-hole velocities of subsurface were performed extending from the ground surface to a depth of 290 ft.

Several of the previously drilled borings for VEGP Units 1 and 2 fall within the proposed VEGP Units 3 and 4 site. Results of previous investigations are referenced and are used here as needed to supplement subsurface data obtained during the ESP subsurface investigation.

2.5.4.3.2 ESP Subsurface Investigation Program

The ESP subsurface investigation was performed during September through December 2005 over a substantial portion of the site enveloping the area that would contain the new reactors as well as the switchyard and the cooling towers for the proposed VEGP Units 3 and 4. This

investigation consisted of exploration points that were located primarily to confirm the results obtained from the previous extensive investigations.

The ESP exploration point locations are shown in Figure 2.5.4-1. The exploration points from the ESP investigation are combined with selected boring locations from the previous investigations in Figure 2.5.4-1.

The scope of work and the special methods used by the subsurface investigation contractor (MACTEC) and its subcontractors to collect data are listed below:

- Thirteen exploratory borings were drilled by MACTEC. Two of these borings (B-1002A and C-1005A) were drilled without sampling to allow suspension P-S velocity testing to be performed above zones of drilling fluid loss encountered in the Upper Sand Stratum above the Blue Bluff Marl.
- The efficiency of the automatic hammers employed by the two rotary drill rigs was determined by SPT energy measurements. These services were provided by GRL Engineers, Inc., of Cleveland, Ohio, working as a subcontractor to MACTEC.
- One continuous soil and rock coring borehole was completed at B-1003 by MACTEC.
- Ten CPTs were performed, including three down-hole seismic CPTs. These services were provided by Applied Research Associates (ARA) of South Royalton, Vermont, working as a subcontractor to MACTEC.
- In-situ hydraulic conductivity testing was performed by MACTEC (Section 8 of ASTM D 4044 2002) in 15 groundwater observation wells. Southern Company Services installed these wells and the report is in Appendix 2.4A.
- Geophysical down-hole suspension P-S velocity logging was performed in five completed boreholes (B-1002, B-1002A, B-1003, B-1004, and C-1005A). These services were provided by GEOVision Geophysical Services (GEOVision) of Corona, California, working as a subcontractor to MACTEC. GEOVision also performed caliper, natural gamma, resistivity, and spontaneous potential measurements in boreholes B-1002, B-1003, and B-1004, and a borehole deviation survey at B-1003.
- A topographic survey of all exploration points was performed by MACTEC.
- Laboratory testing of selected borehole samples was performed by MACTEC in its Atlanta, Georgia, laboratories.

The exploration program was performed following the guidelines in Regulatory Guide 1.132, *Site Investigations for Foundations of Nuclear Power Plants*, US Nuclear Regulatory Commission, 2003 (RG 1.132). The fieldwork was performed under an audited and approved

quality program and work procedures developed specifically for the ESP application. The subsurface investigation and sample/core collection were directed by the MACTEC site manager, who was on site at all times during the field operations. A Bechtel geotechnical engineer or geologist, along with an SNC representative, was also on site during these operations. MACTEC's QA/QC expert made periodic visits to the site and was on site to audit MACTEC's subcontractors. The draft boring and well logs were prepared in the field by MACTEC geologists.

An on-site storage facility for soil samples and rock cores was established before the fieldwork began. Each sample and core was logged into an inventory system. Samples removed from the facility were noted in the sample inventory logbook. A Chain-of-Custody form was also completed for all samples removed from the facility.

Complete details and results of the exploration program appear in Appendix 2.5A. The borings, CPTs, field permeability testing, and geophysical surveys are summarized below. The laboratory tests are summarized and the results discussed in Section 2.5.4.2. The geophysical tests are summarized and the results discussed in Section 2.5.4.4.

Additionally, a seismic reflection and refraction survey was performed at the site in early 2006 to collect data to help delineate the rock profile associated with the non-capable Pen Branch fault. The results of the seismic reflection and refraction survey are presented in Appendix 2.5B and interpreted results are discussed in Section 2.5.1.2.4.2.

2.5.4.3.2.1 Borings and Samples/Cores

Thirteen borings (excluding B-1003) were drilled to depths ranging from 90 ft (C-1005A) to 304 ft (B-1004). The borings were advanced in the soil using mud-rotary drilling techniques and polymer and/or bentonite drilling fluids. Table 2.5.4-7 provides a summary of the ESP boring and CPT locations and depths, and identifies geophysical testing performed in the boreholes.

The soil was sampled using an SPT sampler at continuous intervals to a 15-ft depth and at 5- or 10-ft intervals below 15 ft. The SPT was performed with automatic hammers and was conducted in accordance with ASTM D 1586 (1999). The recovered soil samples were visually described and classified by the onsite geologist in accordance with ASTM D 2488 (2000). A selected portion of the soil sample was placed in a glass sample jar with a moisture-proof lid. The sample jars were labeled, placed in boxes, and transported to the on-site storage area. Additionally, undisturbed samples of the Blue Bluff Marl (Lisbon Formation) were obtained using rotary pitcher samplers. Disturbed materials were removed from the upper and the lower ends of the tube, and both ends were trimmed square to establish an effective seal. Pocket penetrometer tests were taken on the trimmed lower end of the samples. Both ends of the sample were then sealed with hot microcrystalline wax and protected with plastic caps. Tubes

were labeled and transported to the on-site storage area. Table 2.5.4-8 provides a summary all undisturbed samples of the Blue Bluff Marl collected during the ESP subsurface investigation.

The energy transfer efficiency of the automatic SPT hammers used by the drill rigs was obtained using a PAK model pile driving analyzer for both drill rigs. Testing was performed at borings B-1006 and B-1013 from depth ranges of 5 to 20 ft, 30 to 50 ft, and 75 to 100 ft. Resultant energy transfer efficiency measurements ranged from 65 to 87 percent. The average energy transfer efficiency was 75 percent. Table 2.5.4-9 provides the SPT hammer energy transfer efficiency results.

The continuous core boring, B-1003, was performed with a Christensen 94 mm wire line system. A Speedstar Quickdrill 275 drill rig was used. Casing was installed through the soil column to prevent cave-ins and to allow coring of rock at depths below 1,049 ft. Rock coring was performed using a HW-size, double-tube core barrel in accordance with ASTM D 2113 (1999). The recovered soil and rock core samples were placed in wooden core boxes, lined with plastic sheeting. The onsite geologist visually described the core, noting the presence of joints and fractures, and distinguishing natural breaks from mechanical breaks. The geologist also computed the percentage recovery and the RQD. The average core recovery was 77 percent for the entire borehole depth (Appendix 2.5A). Filled core boxes were transported to the on-site sample storage facility, where a photograph of each core was taken.

The boring logs and the photographs of the rock cores appear in Appendix 2.5A. The soil materials encountered in the ESP borings are similar to those found in the previous borings conducted at the VEGP site.

2.5.4.3.2.2 Cone Penetrometer Tests

The CPTs were advanced in accordance with ASTM D 5778 (2000) using a 30-ton self-contained truck rig. Each CPT was advanced to refusal at depths ranging from 6 to 116.7 ft. Shallow refusal was encountered at locations C-1001 and C-1009, and offset CPT tests were performed at locations C-1001A and C-1009A. All remaining CPT locations met refusal at or near the top of the Blue Bluff Marl bearing stratum. Down-hole seismic testing was performed at 5 ft intervals in CPTs C-1003, C-1005, and C-1009A (see Section 2.5.4.4) to measure the shear wave velocity in the Upper Sand Stratum. Pore pressure dissipation tests were performed at 68 ft and 79 ft depths in C-1003; 66 ft depth in C-1004; 56 ft, 73 ft, and 82 ft depths in C-1005; and 60 ft, 77 ft, 90 ft, and 99 ft depths in C-1009A.

The CPT logs, shear wave velocity results, and pore pressure versus time plots are contained in Appendix 2.5A. CPT locations and depths are summarized in Table 2.5.4-7.

2.5.4.3.2.3 In Situ Hydraulic Conductivity Testing

Fifteen observation wells were installed at the ESP project limits during May and June 2005, and a replacement observation well was installed in October 2005. Observation well details are provided in Appendix 2.4A and discussed in Section 2.4.12.

Each well was developed by pumping. The well was considered developed when the pH and conductivity stabilized and the pumped water was reasonably free of suspended sediment. Permeability tests were then performed in each well in accordance with Section 8 of ASTM D 4044 (2002) using a procedure that is commonly termed the slug test method. Slug testing involves establishing a static water level, lowering a solid cylinder (slug) into the well to cause an increase in water level in the well, and monitoring the time rate for the well water to return to the pre-test static level. The slug is then rapidly removed to lower the water level in the well, and the time rate for the water to recover to the pre-test static level is again measured. Electronic transducers and data loggers were used to measure the water levels and times during the test.

Appendix 2.5A contains the well permeability test results and Appendix 2.4A contains the boring logs for the observation wells and the well installation records.

2.5.4.3.3 COL Subsurface Investigation Program

The COL subsurface investigation was performed by MACTEC from November 2006 through April 2007 over a large portion of the site, including the power block areas for VEGP Units 3 and 4, cooling towers, switchyard/borrow areas, haul road, intake structure, pumphouse, pipeline, and construction-related areas. The exploration points were located in accordance with the guidelines in Regulatory Guide 1.132, *Site Investigations for Foundations of Nuclear Power Plants*, US Nuclear Regulatory Commission, 2003 (RG 1.132).

The COL exploration point locations are shown on Figures 2.5.4-1a and 2.5.4-1b. The scope of work and the methods used by the subsurface investigation contractor (MACTEC) and its subcontractors to collect data are listed below:

- Fifty-three exploratory borings were drilled in the power block areas: the 3000 series conducted in the area of Unit 3 (east power block) and the 4000 series conducted in the area of Unit 4 (west power block). Continuous sampling was conducted in two of these borings, B-3013(C) and B-4013(C), to depths of 155 feet and 165 feet, respectively.
- Twenty-four borings were drilled in the proposed switchyard/borrow area immediately north of the power block areas.

- Ninety-seven borings were drilled in the area of other proposed site features, including a new intake structure, access and haul roads, and construction laydown areas.
- The efficiency of the automatic hammers employed by the 12 rotary drill rigs was determined by SPT energy measurements.
- Twenty-one CPTs were performed, including eight seismic CPTs taken in the power block areas. These services were provided by Gregg In-Situ, Inc., of Columbia, South Carolina, working as a subcontractor to MACTEC.
- Eight test pits were excavated in proposed borrow locations to obtain bulk samples for laboratory testing. The test pit excavations were logged by a MACTEC geologist.
- Geophysical down-hole suspension P-S velocity logging was performed in six completed boreholes, B-3001(DH), B-3002(DH), B-3003(DH), B-4001(DH), B-4002(DH), and B-4003(DH). These services were provided by GEOVision Geophysical Services (GEOVision) of Corona, California, working as a subcontractor to MACTEC. GEOVision also performed caliper, natural gamma, and resistivity measurements in these boreholes.
- Electrical resistivity testing was performed by MACTEC along 10 arrays.
- Geophysical refraction microtremor (ReMi) testing was performed by MACTEC at four arrays.
- A horizontal and vertical survey of all exploration points was performed by Toole Surveying Company, Inc., working as a contractor to Southern Company Services.
- Laboratory testing of selected borehole samples is currently being performed by MACTEC in its Atlanta, Georgia, laboratories.
- RCTS testing is currently being performed by FUGRO laboratories in Houston, Texas.

The exploration program was performed following the guidelines in RG 1.132. The fieldwork was performed under an audited and approved quality assurance program and work procedures developed specifically for the COL application. The subsurface investigation and sample/core collection were directed by the MACTEC site manager, who was on site at all times during the field operations. A Bechtel geotechnical engineer or geologist, along with an SNC representative, were also on site during these operations. MACTEC's QA/QC supervisor made periodic visits to the site, and additional QA/QC personnel visited the site to audit MACTEC's subcontractors. Draft boring logs were prepared in the field by MACTEC geologists and geotechnical engineers. A data report, along with Attachments A through D, was also prepared by MACTEC as provided in Appendix 2.5C.

An on-site storage facility for soil samples was established before the fieldwork began. Each sample was logged into an inventory system. Samples removed from the facility were noted in the sample inventory logbook. A Chain-of-Custody form was also completed for all samples removed from the facility.

2.5.4.4 Geophysical Surveys

Section 2.5.4.4.1 summarizes previous geophysical investigations performed at the VEGP site, and Section 2.5.4.4.2 summarizes the VEGP site geophysical program for this ESP application. Section 2.5.4.4.3 identifies the geophysical surveys performed for the COL investigation program.

2.5.4.4.1 Previous Geophysical Survey Programs

Field investigations that included geophysical methods for VEGP Units 1 and 2 were initiated in January 1971. Geophysical seismic refraction and cross-hole surveys were conducted at the site to evaluate the occurrence and characteristics of subsurface materials. The seismic refraction survey was used to determine depths to seismic discontinuities, based on measured compressive wave velocities. Shallow and deep refraction profiles were obtained throughout the site area, totaling 28,400 and 5,000 linear ft, respectively. The cross-hole seismic survey was conducted in the VEGP Units 1 and 2 power block area to determine in situ velocity data for both compressional and shear waves to a depth of 290 ft (82 ft below sea level) in bore holes 136, 146G, 148, 149, 151, and 154. In this procedure, three-component geophones were lowered into four of the bore holes to equal elevation levels. Energy was generated in a fifth bore hole, at the same elevation level, to determine cross-hole velocities.

The seismic (compressional wave) velocities measured in the subsurface soils from depths of 0 to 290 ft ranged from 1,400 fps to 6,800 fps. The shear wave velocities measured in the subsurface soils from depths of 0 to 290 ft ranged from 600 to 1,800 fps. The Upper Sand Stratum, extending from a depth of 0 to 90 ft, has a compressional wave velocity range of 1,400 to 6,650 fps and a shear wave velocity range from 600 to 1,650 fps. The Blue Bluff Marl stratum (and underlying Lower Sand Stratum), extending from a depth of 90 to 290 ft, has a compressional wave velocity of 6,800 fps and shear wave velocities ranging from 1,600 to 1,800 fps (Note that this range is lower than that measured at the VEGP ESP site). Young's Modulus and Shear Modulus were determined from these results. For the Upper Sand Stratum, Young's Modulus ranged from 0.2×10^5 to 2.0×10^5 pounds per square inch (psi), and Shear Modulus ranged from 0.8×10^4 to 6.8×10^4 psi. For the Blue Bluff Marl (and underlying Lower Sand Stratum), Young's Modulus was 2.3×10^5 psi, and Shear Modulus was 8.0×10^4 psi.

2.5.4.4.2 ESP Geophysical Surveys

Three down-hole seismic CPT tests and five suspension P-S velocity tests were performed during the VEGP site investigation, as described in Section 2.5.4.3.2. In addition a seismic reflection and refraction survey was performed to image the subsurface and characterize the basement lithology and velocities beneath the VEGP site. This survey provided an image of the basement rock across the VEGP ESP site. The results of this survey are presented in Appendix 2.5B and the interpreted results are discussed in Section 2.5.1.2.4.2. The incorporation of these results into the development of the rock shear wave velocity profile is described in Section 2.5.4.7.1.2.

2.5.4.4.2.1 Suspension P-S Velocity Tests in Boreholes

Suspension P-S velocity testing was conducted in borings B-1002, B-1002A, B-1003, B-1004, and C-1005A. Details of the equipment used to create the seismic compressional and shear waves and to measure the seismic wave velocities are described in detail by Ohya (1986) and are also provided in Appendix 2.5A. Appendix 2.5A also contains a detailed description of the results and the method used to compute the results. Because no ASTM standard is currently available for the suspension P-S velocity testing, a brief description is provided here. The suspension P-S velocity logging system uses a 23-ft (7-m) probe containing a source near the bottom, and two geophone receivers spaced 3.3 ft (1 m) apart, suspended by a cable. The probe is lowered into the borehole to a specified depth, where the source generates a pressure wave in the borehole fluid (drilling mud). The pressure wave is converted to seismic waves (P-wave and S-wave) at the borehole wall. Along the wall, at each receiver location, the P- and S-waves are converted back to pressure waves in the fluid and received by the geophones, which send the data to the recorder on the surface. This procedure is typically repeated at every 1.65 ft (0.5 m) or 3.3 ft (1 m) as the probe is moved up the borehole. The elapsed time between arrivals of the waves at the geophone receivers is used to determine the average velocity of a 3.3-ft (1-m) high column of soil around the borehole. Source to receiver analysis is also performed for quality assurance. The results are summarized below.

The shear wave velocity was defined to the maximum explored depth of 1,338 ft (Appendix 2.5A). For the Upper Sand Stratum, shear wave velocities ranged from 590 to 3,300 fps, with an average value of 1,089 fps. For the Blue Bluff Marl, shear wave velocities ranged from 1,060 to 4,260 fps, with an average value of 2,354 fps. For the Lower Sand Stratum, shear wave velocities ranged from 930 fps to 4,670 fps, with an average value of 2,282 fps. Typical values for the shear wave velocities of each geologic formation contained within the Lower Sand Stratum are as follows: 1,700 fps for the Still Branch, 1,950 fps for the Congaree, 2,050 fps for the Snapp, 2,350 fps for the Black Mingo, 2,650 fps for the Steel Creek, 2,850 fps for the Gaillard/Black Creek, 2,870 fps for the Pio Nono, and 2,710 fps for the Cape Fear. The shear

wave velocity in the portion of the Dunbarton Triassic Basin rock measured ranged from 2,320 to 9,350 fps. There was an upper weathered rock zone about 120 ft thick, where shear wave velocities increased linearly with depth at a very high rate. This high rate of linear increase with depth abated once shear wave velocities achieved values of about 5,300 fps, and shear wave velocities increased linearly with depth at a smaller rate. It is noted that sound rock with an average shear wave velocity of 9,200 fps was not encountered. However, enough data are available to linearly extrapolate to the sound rock horizon from the measurements.

The compressional wave was also defined to the maximum explored depth of 1,338 ft (Appendix 2.5A). For the Upper Sand Stratum, the compressional wave velocity ranged from 1,300 to 7,960 fps, with an average value of 2,572 fps. For the Blue Bluff Marl, compressional wave velocities ranged from 4,640 to 9,830 fps, with an average value of 6,793 fps. For the Lower Sand Stratum, compressional wave velocities ranged from 4,990 to 9,030 fps, with an average value of 6,610 fps. The compressional wave velocity in the Dunbarton Triassic Basin rock ranged from 7,300 to 18,360 fps.

Poisson's ratio was determined from the shear wave and compressional wave velocities (Appendix 2.5A). Poisson's ratio ranged from 0.09 to 0.49 within the Upper Sand Stratum, 0.33 to 0.48 within the Blue Bluff Marl, 0.32 to 0.49 within the Lower Sand Stratum, and 0.10 to 0.46 within the Dunbarton Triassic Basin.

2.5.4.4.2.2 Down-Hole Seismic Tests with Cone Penetrometer

The tests were performed at 5-ft intervals in C-1003, C-1005, and C-1009A. A seismic source, located on the surface, primarily generates shear waves and two geophones mounted horizontally inside near the bottom of the cone string record incoming seismic data. Measurements were only obtained at depths within the Upper Sand Stratum because all CPTs reached refusal at the top of the Blue Bluff Marl.

The shear wave speed and time of peak versus depth plots are included in Appendix 2.5A. The shear wave velocities ranged from 572 to 1,317 fps, with an average value of 930 fps. These values were lower than those measured using the suspension P-S velocity technique and may reflect site variability.

2.5.4.4.2.3 Discussion and Interpretation of Results

Shear and compressional wave velocity measurements made during the ESP subsurface investigation were used as the basis for developing the recommended design values for each stratum that are provided in Section 2.5.4.2. Results from seismic CPTs and suspension velocity logging were used to develop recommended values for the Barnwell Group. Because the seismic CPTs could not penetrate into the Blue Bluff Marl, the recommended values for the

Blue Bluff Marl and the Lower Sand Stratum are based on suspension velocity logging results only. No shear or compressional wave velocity measurements were made for the compacted fill during the ESP subsurface investigation. Recommended values for the compacted fill will be based on data for existing VEGP Units 1 and 2 **(Bechtel 1984)**, as discussed in Section 2.5.4.7.1.

The profile of shear wave velocity versus depth for the subsurface strata is provided in Section 2.5.4.7.

2.5.4.4.3 COL Geophysical Surveys

Eight down-hole seismic CPT tests, six suspension P-S velocity tests, and four ReMi tests were performed during the COL site investigation. The results of these tests are currently under review. Data from these surveys will be used to confirm and revise, as necessary, the shear wave velocity profiles developed during the ESP investigation.

2.5.4.5 Excavation and Backfill

This section covers the following topics:

- The extent (horizontally and vertically) of anticipated safety-related excavations, fills, and slopes.
- Excavation methods and stability.
- Backfill sources and quality control.
- Construction dewatering impacts.

2.5.4.5.1 Extent of Excavations, Fills, and Slopes

Within the VEGP Units 3 and 4 footprint (Figure 2.5.4-1) that will contain all safety-related structures, existing ground elevations are about El. 220 ft msl. The subsurface profiles in Figures 2.5.4-3, 2.5.4-4, and 2.5.4-5 provide an impression of the grade elevation range across the VEGP ESP site. Plant grade for the proposed VEGP Units 3 and 4 will be at El. 220 ft msl. The base of the containment and auxiliary building foundations for the new units will be about El. 180 ft msl. This level corresponds to a depth of approximately 40 ft below final grade (below El. 220 ft msl), or approximately 50 to 60 ft above the top of the Blue Bluff Marl bearing stratum based on the borings completed during the ESP subsurface investigation. Results from the COL subsurface investigation will be used to confirm and update, as necessary, the subsurface profiles for Units 3 and 4. Other foundations in the power block area will be placed at nominal depths near final grade.

Construction of the new units will require a substantial amount of excavation. The excavation will be necessary to completely remove the Upper Sand Stratum. Excavation total depth to the Blue Bluff Marl bearing stratum will range from approximately 80 to 90 ft below existing grade, based on the borings completed during the ESP subsurface investigation and as confirmed by the borings completed during the COL subsurface investigation. Deeper localized excavations will be required to remove shelly, porous material that may be encountered near the top surface of the Blue Bluff Marl.

Backfill will be placed from the top of the Blue Bluff Marl to the bottom of the Nuclear Island (NI) foundation at a depth of about 40 ft below final grade. A retaining wall will be constructed along the perimeter of the NI as described in Section 2.5.4.5.5 to facilitate backfilling and construction. Backfill will continue up around the retaining wall to final grade or foundation elevation of non NI structures. The backfill material will consist of granular materials, selected from portions of the excavated Upper Sand Stratum and from other available onsite borrow sources, or flowable fill. Fill material properties and source locations are described in more detail in Section 2.5.4.5.3.

Temporary slopes will be graded as the excavation through the Upper Sand Stratum progresses. Other temporary or permanent slopes planned for the project will be considered for stability as warranted.

2.5.4.5.2 Excavation Methods and Stability

Excavation in the Upper Sand Stratum will be achieved with conventional excavating equipment. Excavation must adhere to OSHA regulations **(OSHA 2000)**. The excavation will be open-cut, with slopes no steeper than 2-horizontal to 1-vertical. Since the sandy soils can be highly erosive, even temporary slopes cut into the Upper Sand Stratum will be sealed and protected. Where insufficient space for open-cut slopes exists, vertical cuts will be supported with sheet pile or soldier pile and lagging walls. Dewatering will be required once the excavation progresses to depths beneath the groundwater table (approximately El. 165 ft, based on the groundwater monitoring results contained in Section 2.4.12).

Possible soft zones that may be encountered in the upper portion of the Blue Bluff Marl will be removed using conventional excavating equipment. These excavations will be sloped to facilitate placement of compacted structural fill, and the excavation areas will be thoroughly cleaned of loose materials before fill is placed.

2.5.4.5.3 Backfill Sources and Quality Control

Sufficient sources of backfill have been identified on the Vogtle site through the boring and laboratory testing programs and analysis of their results. Backfill material for Seismic

Category 1 and Category 2 fill will be a select sand or silty sand material, with no more than 25 percent of the particle sizes smaller than the No. 200 sieve, or flowable fill. Seismic Category 1 backfill will be placed beneath Seismic Category 1 structures (NI foundation). Seismic Category 2 backfill will be placed above the NI foundation level and adjacent to the Seismic Category 1 structures. Seismic Category 2 backfill will also be placed under the Seismic Category 2 power block structures. All backfill placed in the excavation above the NI foundation level will be to the same criteria as Seismic Category 2 backfill.

Approximately 3,900,000 cubic yards of material (including an allowance for ramps) will be excavated for the Units 3 and 4 power blocks. Approximately 3,600,000 cubic yards of material will be required to backfill these excavations. Based on a review of the boring logs and laboratory test results on selected samples from the COL subsurface investigation, approximately 50 percent of the material excavated from the power block areas will qualify for reuse as Seismic Category 1 backfill. However, because a significant portion of the excavated material may be difficult to segregate, only approximately 30 percent of the excavated material is intended to be reused. The remaining backfill for the power blocks, approximately 2,500,000 cubic yards, is available from a borrow area located immediately north of the power blocks (Units 3 and 4 switchyard area). See Figures 2.5.4-15 and 2.5.4-16 for plan and section views, respectively.

2.5.4.5.3.1 Backfill Design

The Seismic Category 1 backfill will be compacted to an average of 97 percent and a minimum of 93 percent, with no more than 10 percent of field compaction tests less than 95 percent of the maximum dry density, as determined by ASTM D 1557 (2002). The fill will be compacted to within 3 percentage points of its optimum moisture content. Field density tests will be performed, with a minimum of one test per lift per 10,000 square ft of fill placed. The backfill placement procedures will be developed through a Test Fill Program and will be included in a detailed earthwork specification.

The Seismic Category 2 backfill will be compacted to an average of 95 percent and a minimum of 93 percent, with no more than 10 percent of field compaction tests less than 95 percent of the maximum dry density, as determined by ASTM D 1557 (2002).

2.5.4.5.3.2 Quality Control and ITAAC

A quality assurance and quality control program for the backfill will be established for the backfill placement. An on-site soils testing laboratory will be established to control the quality of the fill materials and the degree of compaction, and to ensure that the fill conforms to the requirements of the earthwork specification. The soil testing firm will be independent of the earthwork contractor and will have an approved quality program. Field density testing will be performed by

the soil testing firm to verify compaction requirements as the backfill is placed. Sufficient laboratory compaction (modified Proctor) and grain size distribution tests will be performed to ensure that variations in the fill material are taken into account.

The results of backfill testing and analysis will be documented in a report to support the Inspection Test and Acceptance Criteria (ITAAC) identified in the table below:

Design Requirement	Inspections and Tests	Acceptance Criteria
Backfill soil density under Seismic Category 1 structures is installed to meet an average of 97 percent modified Proctor compaction and a minimum of 93 percent, with no more than 10 percent of results falling below 95 percent.	Testing will be performed during placement of the backfill materials.	A report exists that documents that the soil density of installed backfill under Seismic Category 1 structures meets the average 97 percent modified Proctor compaction and minimum of 93 percent, with no more than 10 percent of results falling below 95 percent.

2.5.4.5.4 Control of Groundwater During Excavation

Construction dewatering is discussed in Section 2.5.4.6.2. Since the Upper Sand Stratum soils can be highly erosive, sumps and ditches constructed for dewatering will be lined. The tops of excavations will be sloped back to prevent runoff down the excavated slopes during heavy rainfall.

2.5.4.5.5 Retaining Wall

A retaining wall will be constructed within each power block excavation to facilitate construction of the nuclear islands (NI). This retaining wall is planned as a mechanically stabilized earth (MSE) wall. The wall will be constructed around the perimeter of the each NI and will permit backfilling of the excavations before construction of the NI foundations and substructure walls. The MSE wall will act as the exterior form for the foundation and substructure walls. Waterproofing will be placed on the surface of the precast concrete MSE wall facing panels before placing NI foundation and substructure wall concrete. (Figure 2.5.4-17)

2.5.4.6 Groundwater Conditions

2.5.4.6.1 Groundwater Measurements and Elevations

Groundwater conditions at the site are discussed in detail in Section 2.4.12, and only a summary is presented here. Groundwater is present in unconfined conditions in the Upper Sand Stratum and in confined conditions in the Lower Sand Stratum at the VEGP site. The Blue Bluff Marl is considered to be an aquiclude that separates the unconfined aquifer in the Upper Sand Stratum from the confined aquifer in the Lower Sand Stratum. The groundwater generally occurs at a depth of about 60 ft below the existing ground surface.

Fifteen observation wells were installed at the site during June and July 2005, before the start of the ESP subsurface investigation program. Ten of these wells were installed in the unconfined aquifer, and five were installed in the confined aquifer. Additionally, 22 existing wells were used as part of the groundwater monitoring program for the ESP study. Thirteen of these wells were installed in the unconfined aquifer, and nine were installed in the confined aquifer. The wells installed in the unconfined aquifer exhibit groundwater levels ranging from about El. 133 to El. 165 ft, while the wells installed in the confined aquifer exhibit groundwater levels ranging from about El. 82 to El. 128 ft. The logs and details of well installation and testing are contained in Appendix 2.4A and Appendix 2.5A. Hydraulic conductivity (slug) tests were performed in the wells installed during the ESP field investigation, as described in Section 2.5.4.3.2.3. Hydraulic conductivity (k) values for the unconfined aquifer in the Upper Sand Stratum, based on the slug test results, range from 4.4×10^{-5} to 9.3×10^{-4} cm/second, with a geometric mean of 1.75×10^{-4} cm/second. The hydraulic conductivity of the confined aquifer in the Lower Sand Stratum, based on the slug test results, ranges from 1.3×10^{-4} to 7.5×10^{-4} cm/second, with a geometric mean of 2.9×10^{-4} cm/second. A detailed description of groundwater conditions is provided in Section 2.4.12.

Groundwater levels at the site will require temporary dewatering of excavations extending below the water table during construction of new Units 3 and 4. Dewatering will be performed in a manner that will minimize drawdown effects on the surrounding environment and VEGP Units 1 and 2. Drawdown effects are expected to be limited to the VEGP site and to be negligible for VEGP Units 1 and 2. The relatively low permeability of the Upper Sand Stratum and underlying Blue Bluff Marl means that sumps and pumps should be sufficient for successful construction dewatering, as discussed in Section 2.5.4.6.2.

The design groundwater level for VEGP Units 3 and 4 will be taken at El. 165 ft msl based on the results of groundwater monitoring performed during a period of 10 years prior to the ESP subsurface investigation, and during the ESP subsurface investigation, as discussed in Section 2.4.12. This level corresponds to the design groundwater level for the existing VEGP

Units 1 and 2. The static stability of the proposed structures based on this design groundwater level is discussed in Section 2.5.4.10.

2.5.4.6.2 Construction Dewatering

Dewatering for all major excavations could be achieved by gravity-type systems. Due to the relatively impermeable nature of the Upper Sand Stratum, sump-pumping of ditches will be adequate to dewater the soil. These ditches will be advanced below the progressing excavation grade.

During construction of VEGP Units 1 and 2, the excavation materials were dewatered by a series of ditches oriented in an east-west direction. They were connected by a north-south ditch, which drained to a sump in the southwest corner of the excavation. The sump was equipped with four pumps each with a capacity of 500 gal./min to remove inflows from groundwater. Additional capacity was provided for the removal of inflows of storm water in the excavation.

Similar dewatering procedures will be implemented during the excavation for VEGP Units 3 and 4.

2.5.4.7 Response of Soil and Rock to Dynamic Loading

All new safety-related structures will be founded on the planned structural backfill, which will completely replace the existing Upper Sand Stratum soils. The seismic acceleration at the sound bedrock level will be amplified or attenuated up through the soil and rock column. To estimate this amplification or attenuation, the following data are required.

- Shear wave velocity profile of the soils and rock
- Variation with strain of the shear modulus and damping values of the soils
- Site-specific seismic acceleration-time history

In addition, an appropriate computer program is required to perform the analysis.

2.5.4.7.1 Shear Wave Velocity Profile

2.5.4.7.1.1 Soil Shear Wave Velocity Profile

Various measurements have been made at the VEGP ESP site to obtain estimates of the shear wave velocity in the soil. Measurements were also made at the site during the COL

investigation to confirm ESP estimates of shear wave velocity in the soil. The results of these measurements are currently under review.

All safety-related structures will be founded on the structural backfill that will be placed on top of the Blue Bluff Marl after complete removal of the Upper Sand Stratum. Shear wave velocity was not determined for the compacted backfill during the ESP subsurface investigation. Data for existing Units 1 and 2 is used **(Bechtel 1984)**, and the backfill shear wave velocity values are summarized in Table 2.5.4-10. Currently, laboratory and field data from the COL investigation are being reviewed to confirm and revise, as necessary, the values provided in Table 2.5.4-10.

Figure 2.5.4-6 shows the shear wave velocity values measured in the subsurface soil and rock strata for the ESP subsurface exploration program using suspension P-S velocity and CPT down-hole seismic testing. The shear wave velocity profile shown in Figure 2.5.4-7 is the profile interpreted from the results shown in Figure 2.5.4-6 for strata below the Upper Sand Stratum, plus the shear wave velocity values for the backfill shown on Table 2.5.4-10. The shear wave velocity values corresponding to the profile shown on Figure 2.5.4-7 for the different soil strata encountered by the borings are provided in Table 2.5.4-11.

The shear wave velocity profile shown in Figure 2.5.4-7 is used in the seismic amplification/ attenuation analysis. The soil profile used consists of: Compacted backfill from 0 to 86 ft, Blue Bluff Marl from 86 to 149 ft, Upper Sand Stratum from 149 to 1,049 ft, Dunbarton Triassic Basin and Paleozoic Crystalline Rock below 1,049 ft.

Currently, data collected during the COL investigation to determine shear wave velocity values in the soil strata are being evaluated. Results will be used to confirm and revise, as necessary, the shear wave velocity profiles shown on Figures 2.5.4-6 and 2.5.4-7 and the values presented in Tables 2.5.4-10 and 2.4.5-11.

2.5.4.7.1.2 Rock Shear Wave Velocity Profile

As discussed in Section 2.5.4.2.2, the VEGP ESP site sits on over 1,000 feet of Coastal Plain sediments underlain by Triassic Basin sedimentary rock, which in turn is underlain by Paleozoic crystalline rock (see Figure 2.5.1-40). For the purpose of subsequent site response analysis, for which input rock time histories must be inserted at a depth where the material shear-wave velocity is approximately 9,200 ft/s, it is necessary to know the shear-wave velocity profile and materials properties for the site down to the depth at which this velocity is encountered. Because the site overlies both Triassic Basin and Paleozoic crystalline rocks, it is necessary to consider effect of shear-wave velocities and material properties of both rock types and their geometries.

As indicated in Figure 2.5.4-6, the shear-wave velocities measured at the top of the Triassic Basin, even through the weathered portion, do not reach the velocity of 9,200 ft/s. Inspection of available deep borehole shear-wave velocity at SRS **(SRS 2005)** along with the B-1003 data [Figure 2.5.4-8], however, suggests the following character of rock shear-wave in the Triassic Basin:

- A weathered zone of ~200 feet thickness occurs at the top of the Triassic Basin, characterized by a steep shear-wave velocity gradient, where the shear-wave velocity rapidly increases with depth to a point where a relatively high shear-wave velocity, but less than 9,200 ft/s is reached;
- Below the weathered zone the shear-wave velocity increases with a gentler gradient within the unweathered rock;
- Considering the SRS data as a guide for shear-wave velocity within deep portions of the Triassic Basin, there are a range of gentle gradients and a range of shear-wave velocities for the top of the unweathered Triassic Basin that could be considered as a continuation of the site-specific profile presented by B-1003.

Figure 2.5.1-41 indicates that the non-capable Pen Branch fault separates the Triassic Basin from the Paleozoic crystalline rocks. The structural geometry of these rock units and the fault, relative to the locations of boreholes B-1002 and B-1003 (approximate locations of the proposed nuclear units) and considering the velocity profiles shown in Figure 2.5.4-8, a shear-wave velocity profile through the Triassic Basin would not likely reach 9,200 ft/s before encountering the Paleozoic crystalline rock. Several observations and studies at SRS [e.g., (**Geovision 1999**, **Lee et al 1997**, **Domaracki 1994**)] indicate that the shear-wave velocity of the Paleozoic crystalline rock is at least 9,200 ft/s.

Therefore, to represent the variability of the depth at which the Paleozoic crystalline rock is encountered, with a shear-wave velocity of at least 9,200 ft/s, and the uncertainty of the shear-wave velocity gradient and velocity at the top of the unweathered Triassic Basin, six rock shear-wave velocity profiles were considered to comprise the base case used in the seismic amplification/attenuation analysis. Figure 2.5.4-7 shows a plot of these six rock shear-wave velocity profiles and Table 2.5.4-11, Part B presents their tabulation.

Figures 2.5.1-40 and Figure 2.5.4-8 suggest additional geometries for the shear-wave velocity profiles of the Triassic Basin and the Paleozoic crystalline rock that could impact site response. As interpreted in Figure 2.5.1-41, further to the northwest of the footprint of the project site the coastal Plain sediments would be underlain immediately by the Paleozoic crystalline rock. Conversely, further to the southeast of the footprint of the project, the Paleozoic crystalline rock is at such a depth that the shear-wave velocity gradient in the Triassic Basin would result in

9,200 ft/s being reached in the shear-wave velocity profile while still within the Triassic Basin. Close inspection of the DRB-9 shear-wave velocity profile in Figure 2.5.4-8 suggests a low-velocity zone at the bottom of the Triassic Basin at the encountering of the Pen Branch fault. Sensitivity analyses were performed that indicated that alternate shear-wave velocity models suggested by these observations result in insignificant variations in the site response, relative to the six profiles that were explicitly considered, as discussed above.

2.5.4.7.2 Variation of Shear Modulus and Damping with Shear Strain

2.5.4.7.2.1 Shear Modulus

The variation of soil shear modulus values of sands, gravels, and clays with shear strain is well-documented by researchers such as Seed and Idriss (1970); Seed et al. (1984); and Sun et al. (1988). This research, along with additional work, has been summarized by EPRI **(EPRI TR-102293 1993)**.

Shear modulus is derived from the respective unit weight and shear wave velocity of the soil strata with the following equation:

$G_{max} = \rho \cdot (V_s)^2 = \gamma \cdot (V_s)^2/g$ Equation (20-27) on page 758 of Bowles (1982)

Shear wave velocity data are shown on Table 2.5.4-11. Unit weight data are shown on Table 2.5.4-1. Values for shear modulus are tabulated during analysis with the SHAKE 2000 program **(Bechtel 2000)**, and the low strain values are also shown on Tables 2.5.4-2 for the existing soils and rock, and on Table 2.5.4-10 for the compacted backfill.

From EPRI **(EPRI TR-102293 1993)**, the dynamic shear modulus reduction is derived in terms of depth for granular soils (Upper and Lower Sand Strata) and in terms of Plasticity Index (PI) for cohesive soils (Blue Bluff Marl).

The EPRI curves for sands **(EPRI TR-102293 1993, Figure 7.A-18)** were used to derive the shear modulus reduction factors for the granular soil strata (compacted backfill and Lower Sand Stratum). The EPRI curves for clays **(EPRI TR-102293 1993, Figure 7.A-16)** were used to derive the shear modulus reduction factors for the Lisbon Formation using PI = 25 percent. The shear modulus reduction factors are provided in Table 2.5.4-12 and Figure 2.5.4-9. These shear modulus degradation relationships were used in the SHAKE analysis. The shear modulus reduction factors developed for the neighboring Savannah River Site and contained in Lee (1996) were also used. The SRS-based shear modulus degradation relationships are provided in Table 2.5.4-13 and Figure 2.5.4-10.

Site-specific dynamic shear modulus reduction curves for the compacted backfill, Lisbon Formation, and Lower Sand Stratum are currently being evaluated though RCTS testing as part of the COL investigation. These test results will be used to confirm and revise, as necessary, the dynamic shear modulus reduction factors presented in Tables 2.5.4-12 and 2.5.4-13.

2.5.4.7.2.2 Damping

The publications cited above address the variation of soil damping with cyclic shear strain as well as the variation of shear modulus with shear strain.

From EPRI **(EPRI TR-102293 1993)**, the damping ratio is derived in terms of depth for granular soils (Upper and Lower Sand Strata) and in terms of PI for cohesive soils (Blue Bluff Marl).

The EPRI curves for sands **(EPRI TR-102293 1993, Figure 7.A-19)** were used to derive the damping ratios for the granular soil strata (compacted backfill and Lower Sand Stratum). The EPRI curves for clays **(EPRI TR-102293 1993, Figure 7.A-17)** were used to derive the damping ratios for the Lisbon Formation using PI = 25 percent. The damping ratios are provided in Table 2.5.4-12 and Figure 2.5.4-11. These damping degradation relationships were used in the SHAKE analysis. The damping ratio values developed for the neighboring Savannah River Site and contained in Lee (1996) were also used. The SRS-based damping degradation relationships are provided in Table 2.5.4-13 and Figure 2.5.4-12.

After randomization, the damping curves were cut off at 15 percent damping ratio per NUREG-0800, Section 3.7.2 (1996).

Site-specific damping ratios for the compacted backfill, Lisbon Formation, and Lower Sand Stratum are currently being evaluated through RCTS testing as part of the COL investigation. Test results will be used to confirm and revise, as necessary, the damping ratio values presented in Tables 2.5.4-12 and 2.5.4-13.

2.5.4.7.3 Soil/Rock Column Amplification/Attenuation Analysis

The SHAKE2000 **(Bechtel 2000)** computer program was used to compute the site dynamic responses for the soil/rock profiles described in Section 2.5.4.7.1. The computation was performed in the frequency domain using the complex response method. Section 2.5.2.5 describes in detail the soil/rock column amplification/attenuation analysis.

SHAKE2000 uses an equivalent linear procedure to account for the non-linearity of the soil by employing an iterative procedure to obtain values for shear modulus and damping that are compatible with the equivalent uniform strain induced in each sublayer. At the outset of the analysis, a set of properties (based on the values of shear modulus and damping presented in

Section 2.5.4.7.1, and total unit weight) was assigned to each sublayer of the soil profile. The analysis was conducted using these properties, and the shear strain induced in each sublayer was calculated. The shear modulus and damping ratio for each sublayer was then modified based on the shear modulus and damping ratio versus strain relationships presented in Section 2.5.4.7.2. The analysis was repeated until strain-compatible modulus and damping values were achieved.

2.5.4.8 Liquefaction Potential

Soil liquefaction is a process by which loose, saturated, granular deposits lose a significant portion of their shear strength due to pore pressure buildup resulting from cyclic loading, such as that caused by an earthquake. Soil liquefaction can occur, leading to foundation bearing failures and excessive settlements, when all of the following criteria are met:

1. Design ground acceleration is high.
2. Soil is saturated (i.e., close to or below the water table).
3. Site soils are sands or silty sands in a loose or medium dense condition.

The naturally occurring Upper Sand Stratum soils at the VEGP site meet these three criteria. These soils consist of sands with varying fines content. An approximate 30-ft depth of the Upper Sand Stratum occurs beneath the groundwater table at a depth of 60 ft beneath the ground surface. The average corrected SPT N-value within the Upper Sand Stratum was 25 bpf, indicating a medium dense condition. The underlying Blue Bluff Marl soils are significantly cohesive, and the Lower Sand Stratum is sufficiently dense and deep; therefore, liquefaction is not a concern within these strata. The only material discussed here regarding liquefaction is the Upper Sand Stratum.

During construction of VEGP Units 1 and 2, the entire portion of the Upper Sand Stratum was removed and replaced with engineered fills due to susceptibility to liquefaction. A similar excavation will be executed for VEGP Units 3 and 4.

In Section 2.5.4.8.1, Regulatory Guide 1.198, *Procedures and Criteria for Assessing Seismic Soil Liquefaction at Nuclear Power Plant Sites*, US Nuclear Regulatory Commission, November 2003 (RG 1.198) is used as a guide.

2.5.4.8.1 Acceptable Factor of Safety Against Liquefaction

RG 1.198 states that factors of safety (FS) ≤ 1.1 against liquefaction are considered low, FS ≈ 1.1 to 1.4 are considered moderate, and FS ≥ 1.4 are considered high. The Committee of Earthquake Engineering of the National Research Council **(NRC/NAP 1985)** states:

> *There is no general agreement on the appropriate margin (factor) of safety, primarily because the degree of conservatism thought desirable at this point depends upon the extent of the conservatism already introduced in assigning the design earthquake. If the design earthquake ground motion is regarded as reasonable, a safety factor of 1.33 to 1.35...is suggested as adequate. However, when the design ground motion is excessively conservative, engineers are content with a safety factor only slightly in excess of unity.*

2.5.4.8.2 Previous Liquefaction Analyses

The liquefaction potential of the Upper Sand Stratum was previously evaluated using the standard penetration test blow counts obtained during the investigations for VEGP Units 1 and 2 and the simplified procedure of Seed and Idriss. This evaluation indicated that the Upper Sand Stratum below the groundwater table was susceptible to liquefaction when subjected to the maximum SSE acceleration of 0.2g developed for VEGP Units 1 and 2. Based on this evaluation, the Upper Sand Stratum was removed to an approximate elevation of 130 to 135 ft in the VEGP Units 1 and 2 power block area. Select sand and silty sand compacted to 97 percent of the maximum density determined by ASTM D 1557 was placed from the top of the Blue Bluff Marl stratum to the design elevation of the various power block structures with the exception of an area north of the turbine building. The liquefaction potential of compacted backfill in the power block area was evaluated, and the analysis indicated a factor of safety against liquefaction on the order of 1.9 to 2.0. The analysis was done utilizing cyclic strength data (PSAR data) obtained from tests on specimens of compacted backfill.

During the investigations for borrow sources for VEGP Units 1 and 2, additional dynamic data (borrow source data) were obtained to supplement the cyclic strength data for the compacted fill. Cyclic triaxial tests were performed on compacted specimens of sands obtained from stockpiles and borrow areas. The cyclic stress ratios versus the number of cycles to 2.5 percent total strain (initial liquefaction) showed that the stress ratios for the cleaner sands were substantially lower than for silty sands. In the liquefaction analysis performed using the PSAR data, stress ratios for the cleaner sands were used to obtain the safety factor against liquefaction. Therefore, the cyclic stress ratios for the cleaner sands obtained during investigations for borrow material were compared with values obtained during the PSAR investigations. A comparison of the two test data (PSAR data versus borrow source data) indicates that the PSAR data represent a lower bound of test values. If the liquefaction analysis

were performed using the upper bound values (borrow source data), a factor of safety higher than 1.9 to 2.0 would have been obtained for the design SSE conditions.

From the discussion presented above for the VEGP Units 1 and 2, it is concluded that there exists an adequate factor of safety against liquefaction for backfill compacted to 97 percent of the maximum density obtained by ASTM D 1557.

2.5.4.8.3 Liquefaction Analyses Performed

2.5.4.8.3.1 Liquefaction Analyses Performed for the ESP Investigation

Based on previous investigations and excavation completed for the existing VEGP Units 1 and 2 and their proximity to proposed VEGP Units 3 and 4, the Upper Sand Stratum will be completely removed and replaced with select compacted non-liquefiable fills back to the plant grade within the footprint of the planned power block.

Because select compacted non-liquefiable fills will be used to replace the Upper Sand Stratum in the power block area of proposed VEGP Units 3 and 4, no liquefaction study was performed for this ESP investigation..

2.5.4.8.3.2 Liquefaction Analyses Performed for the COL Investigation

Borrow sources and quantities have been identified as summarized in Section 2.5.4.5.3. Laboratory testing is currently being conducted on these materials. A confirmatory liquefaction analysis will be conducted for these materials. The results of this analysis will be provided as part of ESP Revision 3.

2.5.4.8.4 Liquefaction Conclusions

Based on the foregoing sections on the analysis of liquefaction potential, the following conclusions are made:

- Only the Upper Sand Stratum below the groundwater table falls into the gradation and relative density categories where liquefaction would be considered possible.
- The Upper Sand Stratum was completely removed and replaced with compacted structural fill before construction of the existing VEGP Units 1 and 2. The same approach will be used before construction of the proposed VEGP Units 3 and 4.
- The compacted structural fill, consisting of sands and silty sands, at VEGP Units 1 and 2 provides an adequate factor of safety against liquefaction (minimum 1.9 to 2.0). Similar soils and compaction effort will be used for construction of VEGP Units 3 and 4.

- A COL liquefaction analysis is being conducted on the proposed borrow materials for VEGP Units 3 and 4 to confirm these conclusions.

2.5.4.9 Earthquake Design Basis

The Safe Shutdown Earthquake (SSE) is derived and discussed in detail in Sections 2.5.2.6 and 2.5.2.7.

The Operating Basis Earthquake (OBE) is discussed in Section 2.5.2.8.

2.5.4.10 Static Stability

All safety-related structures will be founded on the structural backfill that will be placed on top of the Blue Bluff Marl after complete removal of the Upper Sand Stratum. The base of the Containment and Auxiliary Building foundations for VEGP Units 3 and 4 will be about El. 180 ft msl. This level corresponds to a depth of 40 ft below final grade (below El. 220 ft msl), or 50 to 60 ft above the top of the Blue Bluff Marl bearing stratum based on the borings completed during the ESP subsurface investigation. Other foundations in the power block area will be placed at depths of about 4 ft below final grade. The following sections on bearing capacity and settlement focus on these two scenarios.

Field and laboratory test data obtained during the COL investigation is currently under review. These data will be used to revise and update, as necessary, the static stability, including bearing capacity and settlement, of the foundation materials and underlying soils. The results will be provided in ESP Revision 3.

2.5.4.10.1 Bearing Capacity

The allowable bearing capacity values for foundations placed at a depth of 4 ft below finish grade in Figure 2.5.4-13.

The allowable bearing capacity values are based on Terzaghi's bearing capacity equations modified by Vesic (1975), using the effective angle of friction provided for compacted fills beneath VEGP Units 1 and 2, that is shown on Table 2.5.4-1. The effects of the Blue Bluff Marl on the allowable bearing pressures shown in Figure 2.5.4-13 were evaluated using procedures outlined by Vesic (1975).

The allowable bearing capacity of the containment building foundation was calculated using the same assumptions summarized in the previous paragraph. For calculation purposes, the containment building mat was modeled as a circle with a diameter of about 142 ft placed at a

depth of 39.5 ft below finish grade. The calculated allowable bearing pressure is 30.7 ksf under static loading conditions, and 46 ksf under dynamic loading conditions.

Section 2.5.4.10.2 contains the results of settlement analyses performed for typical foundations.

2.5.4.10.2 Settlement Analysis

For the large mat foundations that support the major power plant structures, general considerations based on previous site experience **(Bechtel 1986)** indicate that the total settlement can exceed the suggested limit of 2 in. encountered in the geotechnical literature (Peck et al. 1974). Settlement monitoring of VEGP Units 1 and 2 **(Bechtel 1986)** disclosed foundation settlements ranging from 2.7 to 3.2 in. for the containment buildings, versus calculated/design values of 4.0 to 4.3 in. Similar results were obtained for the control building (measured settlements ranging from 1.1 to 1.9 inches versus calculated/design values of 3.2 to 3.4 in.), auxiliary building (measured settlements ranging from 2.9 to 3.3 in. versus calculated/design values of 4.4 to 4.6 in.), and the NSCW towers (measured settlements ranging from 2.5 to 3.6 in. versus calculated/design values of 4.5 to 4.8 in.).

The measured differential settlements between mats of Units 1 and 2 **(Bechtel 1986)**, which can affect pipe connections, was generally within the suggested limit of ¾ in. encountered in the geotechnical literature **(Peck et al. 1974)**. The measured differential settlements within structures of Units 1 and 2 were smaller than the design limit of 1/670.

It is noted that settlements reported in Bechtel (1986) were essentially elastic, i.e., they took place during construction. This reflects the elastic nature of the compacted backfill, the heavily overconsolidated Blue Bluff Marl, and the underlying Lower Sand Stratum.

For footings that support smaller plant components, the total settlement can be limited to 1 inch, while the differential settlement between footings can be limited to ½ in. **(Peck et al. 1974)**.

The general approach used for Units 1 and 2 consisted of estimating total and differential settlements for powerblock structures and using them as design values. A detailed settlement monitoring program was established, and monitored settlements were compared with the design values. Reanalysis and/or corrective measures were employed if monitored settlements exceeded design values. An additional strategy consisted of installing pipes as late in the construction schedule as practicable and installing pipe supports only when construction of the structure the pipe was connected to was essentially complete.

Consolidation test results from the COL investigation are currently being reviewed. These data will be used to perform a settlement analysis for Units 3 and 4. The results will be provided in ESP Revision3.

2.5.4.10.2.1 Settlement of Compacted Fills

Any settlement of the compacted fill is essentially elastic and will occur during the construction period. Typical foundations have been analyzed for settlement assuming a profile consisting of 79 ft of compacted fills underlain by the Blue Bluff Marl and then the Lower Sand Stratum. The stiffness values used are the high-strain elastic modulus values given in Table 2.5.4-1 for the compacted fill, Blue Bluff Marl and Lower Sand Stratum. The foundations that were analyzed were square and rectangular with foundation length equal to twice the foundation width. An average bearing pressure of 5 ksf was used in the settlement analyses. The computed total settlements of these foundations are shown on Figure 2.5.4-14.

The settlement of the containment building foundation was calculated using the same assumptions summarized in the previous paragraph. For calculation purposes, the containment building mat was modeled as a circle with a diameter of about 142 ft placed at a depth of 39.5 ft below finish grade. The calculated settlement under an average bearing pressure of 5 ksf was 1.6 in.

Laboratory test results from the COL investigation are being reviewed. These data will be used to evaluate the potential settlement of the containment building. The results will be provided in ESP Revision 3.

2.5.4.10.2.2 Settlement of Blue Bluff Marl

Settlement at the VEGP site is only a consideration for structures that would be founded directly on the compacted fills. The underlying materials consist of hard clay Blue Bluff Marl consolidated under approximately 90 ft of overburden, and dense Lower Sand Stratum. Minimal settlement of these strata would be anticipated under planned structure loads.

2.5.4.11 Design Criteria

The design criteria are covered in various sections of the SSAR. The criteria summarized below are considered geotechnical criteria. Other geotechnically related criteria that pertain to structural design (such as wall rotation, sliding, or overturning) are not included.

Section 2.5.4.8 specifies that the acceptable factor of safety against liquefaction of site soils should be ≥ 1.35.

Bearing capacity and settlement criteria are presented in Section 2.5.4.10. Figure 2.5.4-13 provides allowable bearing capacity values for typical foundations placed at a depth of 4 ft below finish grade. The allowable bearing capacity values shown on Figure 2.5.4-13 do not take into consideration foundation settlements. Total and differential settlement criteria will be developed from the settlement analyses that are being conducted as part of the COL

investigation. These criteria will follow the approach used for VEGP Units 1 and 2 that is described in Section 2.5.4.10.2.

Section 2.5.5.2 specifies that the minimum acceptable long-term static factor of safety against slope stability failure is 1.5. Section 2.5.5.3 specifies that the minimum acceptable long-term seismic factor of safety against slope stability failure is 1.1.

2.5.4.12 Techniques to Improve Subsurface Conditions

For the ESP investigation, ground improvement techniques were not considered beyond the removal and replacement of the Upper Sand Stratum. Likewise, no additional ground improvement methods are being considered based on the COL investigation. For areas outside the power block excavation, surficial ground can be improved through densification with heavy vibratory rollers. Other ground improvement methods and the use of piles will be considered as warranted.

Table 2.5.4-1 Static Engineering Properties of Subsurface Materials

Parameter[(1)]	Stratum			
	Upper Sand	Compacted Structural Fill	Blue Bluff Marl	Lower Sand
Depth range below El. 220 ft, feet	79 to 124	79 to 124	63 to 95	900
Average thickness, feet	92	92	76	900
USCS symbol	SP/SM/SC/ML	SP/SM/SC	CL/ML	SP/SM/ML
Natural moisture content (ω), %	N/A	N/A	35	N/A
Unit weight (pcf)	115	123 (moist) 133 (saturated)	115	115
Atterberg limits				
Liquid limit (LL), %	N/A[(2)]	N/A	51	N/A
Plastic limit (PL), %	N/A	N/A	26	N/A
Plasticity index (PI), %	N/A	N/A	25	N/A
Measured SPT N-value, bpf	20	N/A	80	50
Adjusted SPT N_{60}-value, bpf	25	N/A	100	62
Strength properties				
Undrained shear strength (c_u), ksf	-	0	10	0
Internal friction angle (Ø'), degrees	34	34	0	34
Elastic modulus (high strain) (E_s), ksf	900	1,500	10,000	10,800[(3)] 13,500[(4)]
Shear modulus (high strain) (G_s), ksf	350	600	3,500	4,200[(3)] 5,200[(4)]
Shear modulus (low strain) (G_{max}), ksf	3088	3820	20,475	20,538
Coefficient of Subgrade Reaction (k_1), tcf	N/A	300	N/A	N/A
Earth Pressure Coefficients				
Active (K_a)	N/A	0.3	N/A	N/A
Passive (K_p)	N/A	3.5	N/A	N/A
At Rest (K_0)	N/A	0.5	N/A	N/A
Coefficient of Sliding	N/A	0.45	N/A	N/A
Poison's Ratio	0.09-0.49		0.33-0.48	0.32-0.49

Notes.
[(1)]The values tabulated above are for use as a design guideline only. Reference should be made to specific boring and CPT logs and laboratory test results for appropriate modifications at specific design locations.
[(2)]N/A indicates that the properties were not measured or are not applicable.
[(3)]This value applies between depth of 0 to 100 ft below the bottom of the Blue Bluff Marl.
[(4)]This value applies between depth of 100 to 300 ft below the bottom of the Blue Bluff Marl.
Engineering properties for the Dunbarton Triassic Basin are not included because the rock is too deep to be of interest for foundation design.
Dynamic properties, including those for the Dunbarton Triassic Basin, can be derived from the shear wave velocity profile shown on Table 2.5.4-10.

Table 2.5.4-2 Design Dynamic Shear Modulus

Geologic Formation	Depth (ft)	Elevation (ft)	G_{max} (ksf)
Upper Sand Stratum (Barnwell Group)	0 to 16	223 to 207	7,000
	16 to 41	207 to 182	2,286
	41 to 58	182 to 165	2,580
	58 to 86	165 to 137	2,893
Blue Bluff Marl (Lisbon Formation)	86 to 92	137 to 131	6,978
	92 to 97	131 to 126	10,321
	97 to 102	126 to 121	15,750
	102 to 105	121 to 118	10,321
	105 to 111	118 to 112	17,286
	111 to 123	112 to 100	19,723
	123 to 149	100 to 74	25,080
Lower Sand Stratum	149 to 156	74 to 67	14,286
(Still Branch)	156 to 216	67 to 7	9,723
(Congaree)	216 to 331	7 to -108	13,580
(Snapp)	331 to 438	-108 to -215	15,009
(Black Mingo)	438 to 477	-215 to -254	19,723
(Steel Creek)	477 to 587	-254 to -364	25,080
(Gaillard/Black Creek)	587 to 798	-364 to -575	29,009
(Pio Nono)	798 to 858	-575 to -635	29,418
(Cape Fear)	858 to 1,049	-635 to -826	26,229
Dunbarton Triassic Basin	1,049		

Note: G_{max} was calculated using γ from Table 2.5.4-1, and the shear wave velocity values from Table 2.5.4-6.

Table 2.5.4-3 Types and Numbers of Laboratory Tests Completed for the ESP Application

Type of Test	Number of Tests Performed
Grain size	61
Unit Weight	31
Natural Moisture Content	75
Atterberg Limits	27
UU Triaxial (1-point)	15

Table 2.5.4-3a Types and Numbers of Completed Laboratory Tests for the COL Investigation

Type of Test	Number of Tests Performed
Natural Moisture Content	181
Gradation (sieve)	144
Wash #200	191
Gradation (hydrometer)	11
Unit Weight	29
Atterberg Limits	117
Chemical Analysis	15
UU Triaxial (1-point)	14
Unconfined Compression	33
Unconsolidated Undrained Triaxial	14
Consolidated Undrained Triaxial	14
1-D Consolidation	26
Direct Shear	1
Modified Proctor	7
Resonant Column Torsional Shear	3

Note: Additional tests are being conducted and will be included in ESP Revision 3.

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Table 2.5.4-4 Summary of Laboratory Tests Performed on Selected Soils Samples from ESP Borings

SAMPLE DETAILS						SOIL TESTING							
Boring No.	Top Depth (ft)	Length (ft)	Type	Formation	SPT N-value (bpf)	% Fines	γ (pcf)	ω_N (%)	PL (%)	LL (%)	PI (%)	USCS Classification	UU s_u (ksf)
B-1002	7.5	1.5	SS	Fill	20	9.4		6.2					
	18.5	1.5	SS	Barnwell	19	37.1		24.4					
	28.5	1.5	SS	Barnwell	8	24.9		31.8					
	33.5	1.5	SS	Barnwell	6	31.6		58.8					
	38.5	1.5	SS	Barnwell	7			92.8	27	48	21		
	53.5	1.5	SS	Barnwell	8	10.5		42.9					
	63.5	1.5	SS	Barnwell	13	7.2		29.3					
	73.5	1.5	SS	Barnwell	12	10		24.5					
	83.5	1.5	SS	Barnwell	9	6.1		27.6					
	92.0	2.5	UD-Upper	Lisbon	N/A	28.9	103.6	52.1	37	72	35	GM	1.15
			UD-Middle				102.4						3.35
	103.5	2.5	UD	Lisbon	N/A	35.9	114.3	56.6	22	34	12	CL	
							114.5	26.5					2.4
	113.5	2.5	UD	Lisbon	N/A	33.8	132.8	25.5	19	29	10	SC	
							132.9	16.3					2.15
	123.5	2.5	UD	Lisbon	N/A	24.5	140.2	13.5	17	22	5	GC-GM	
	133.5	2.0	UD	Lisbon	N/A	24.3	118.0	28.6	25	32	7	SM	
							118.1	29.8					2.4
	153.5	1.5	SS	Lisbon	27	39.4		23.3	21	34	13	ML	
	188.5	1.5	SS	Still Branch	9	6.6		40.7	NP	NP	NP	SM	
	238.5	1.5	SS	Congaree	77	12.3		18.5					
B-1003	15	5	C	Barnwell	N/A	20.9		13.4					
	35	5	C	Barnwell	N/A	29.8		42.1					
	55	5	C	Barnwell	N/A	13.4		17.5					
	75	5	C	Barnwell	N/A	8.2		32.3					

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Table 2.5.4-4 (cont.) Summary of Laboratory Tests Performed on Selected Soils Samples from ESP Borings

SAMPLE DETAILS						SOIL TESTING							
Boring No.	Top Depth (ft)	Length (ft)	Type	Formation	SPT N-value (bpf)	% Fines	γ (pcf)	ω_N (%)	PL (%)	LL (%)	PI (%)	USCS Classification	UU s_u (ksf)
B-1003	88	5	C	Lisbon	N/A	33.4		67.4	42	93	51	SM	
	93	2.5	UD-1	Lisbon	N/A	40.6	115.7	30.6	32	54	22	SM	
							115.8	29.5					4.3
	104.7	2	C	Lisbon	N/A	31.7	111.5	40.6	51	83	32	SM	
	121.7	5	C	Lisbon	N/A	42.5	122.5	28.0	NP	NP	NP	SM	
	141.7	5	C	Lisbon	N/A	34.2	126.1	25.9	28	46	18	SM	
B-1003	165.7	5	C	Still Branch	N/A	5.4	121.7	23.6	NP	NP	NP	SP-SM	
	185.7	5	C	Still Branch	N/A	16.4		32.3					
	205.7	5	C	Still Branch	N/A	21.4		39.3					
	240.7	5	C	Congaree	N/A	10.9		23.2					
	280.7	5.0	C	Congaree	N/A	14.2		23.2					
	315.7	5.0	C	Congaree	N/A	3.3		32.7	38	53	15	GW	
							119.4	31.0					
	350.7	5.0	C	Snapp	N/A	78.5	128.3	21.3	22	41	19	ML	
	400.7	5.0	C	Snapp	N/A	15.8		18.9					
	450.7	5.0	C	Black Mingo	N/A	15.9		28.6					
	496.7	5.0	C	Steel Creek	N/A	13.2		26.4					
B-1004	9.0	1.5	SS	Barnwell	13	24.4		13.8					
	12.0	1.5	SS	Barnwell	12	23.1		14.5					
	23.5	1.5	SS	Barnwell	8	14.9		18.5					
	43.5	1.5	SS	Barnwell	4	60.0		46.2	24	58	34	ML	
	53.5	1.5	SS	Barnwell	7	41.0		62.9					
	68.5	1.5	SS	Barnwell	6	19.9		24.1					
	83.5	1.5	SS	Barnwell	6	11.5		28.8					
	123.5	1.5	SS	Barnwell	5	19.2		19.7	19	43	24	GM	

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Table 2.5.4-4 (cont.) Summary of Laboratory Tests Performed on Selected Soils Samples from ESP Borings

SAMPLE DETAILS						SOIL TESTING							
Boring No.	Top Depth (ft)	Length (ft)	Type	Formation	SPT N-value (bpf)	% Fines	γ (pcf)	ω_N (%)	PL (%)	LL (%)	PI (%)	USCS Classification	UU s_u (ksf)
B-1004	144.0	1.5	UD-Upper	Lisbon	N/A	46.3	105.1	44.6	38	59	21	SM	
							105.2	52.0					0.15
			UD-Middle				114.2	29.8					0.8
	153.5	1.5	UD	Lisbon	N/A	41.7		30.1	27	43	16	SM	
							117.4	25.2					
							119.3	28.7					3.75
	163.5	2.5	UD-Upper	Lisbon	N/A	32.2		25.1	22	31	9	GM	
							117.4	30.2					1.05
			UD-Middle				125.6	24.5					1.2
	177.0	2.5	UD-Upper	Lisbon	N/A	41.7	124.7	20.8	22	31	9	SM	
							124.6	22.4					0.8
			UD-Middle				131.8	39.2					1.9
B-1004	188.5	2.0	UD	Lisbon	N/A	23.8	120.4	29.0	27	34	7	SM	
							120.6	28.4					4.0
	198.5	2.0	UD	Lisbon	N/A	34.5	128.1	26.2	21	31	10	SM	
							128.2	21.7					3.0
B-1006	7.5	1.5	SS	Barnwell	3	7.3		3.8					
	33.5	1.5	SS	Barnwell	13	26.1		19.7					
	58.5	1.5	SS	Barnwell	W HAMM	58.3		92.8	30	97	67	CH	
	68.5	1.5	SS	Barnwell	W HAMM	3.1		25.4					
	88.5	1.5	SS	Barnwell	W HAMM	15.7		51.9					
	108.5	1.5	SS	Barnwell	42	21.5		22.0					
	123.5	1.5	SS	Lisbon	50/2"	64.1		53.7	43	99	56	MH	

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Table 2.5.4-4 (cont.) Summary of Laboratory Tests Performed on Selected Soils Samples from ESP Borings

SAMPLE DETAILS						SOIL TESTING							
Boring No.	Top Depth (ft)	Length (ft)	Type	Formation	SPT N-value (bpf)	% Fines	γ (pcf)	ω_N (%)	PL (%)	LL (%)	PI (%)	USCS Classification	UU s_u (ksf)
B-1010	7.5	1.5	SS	Barnwell	27	7.8		5.7					
	33.5	1.5	SS	Barnwell	23	17.0		18.9					
	58.5	1.5	SS	Barnwell	19	13.3		27.3					
	73.5	1.5	SS	Barnwell	6	23.9		30.8					
	98.5	1.5	SS	Lisbon	77	44.9		49.9	36	94	58	CH	

Legend: NP = non-plastic

ω_N = natural moisture content

γ = unit weight

% Finer = % finer than the #200 sieve

PL = plastic limit

LL = liquid limit

PI = plasticity index

UU s_u = undrained strength from UU triaxial test

SS = split spoon or split barrel sample

UD = undisturbed sample

UD-Upper = test specimen taken from top of UD sample

UD-Middle = test specimen taken from middle of UD sample

C = soil core

W HAMM = weight of hammer (sampler penetrated at least 18" under the weight of the hammer, no blows applied by the hammer)

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Table 2.5.4-5 Summary of SPT N-Values Measured at the ESP Borings

Boring Number	Measured SPT N-value (blows/ft) for Different Formations		
	Upper Sand Stratum (Barnwell Group)	Blue Bluff Marl (Lisbon Formation)	Lower Sand Stratum
B-1001	47, 32, 22, 22, 22, 23, 21, 23, 23, 37, 13, 10, 7, 5, 6, 12, 13, 30, 11, 37, 36, 47, WOR, 50/5"	50/5", 50/4", 51, 50/4", 50/6", 50/4", 50/5"	Not measured
B-1002	30, 67, 28, 33, 19, 10, 8, 6, 7, 12, 22, 8, 11, 13, 18, 12, 10, 9	77/11", 68/7", 54, 72, 50/2", 78/8", 65, 40, 27	46, 26, 50/4", 40, 9, 43, 32, 41, 50, 77
B-1004	21, 24, 25, 16, 16, 13, 19, 12, 14, 10, 8, 17, 13, 14, 4, 5, 7, 7, 18, 6, 5, 9, 5, 5, 17, 11, 16, 20, 18, 34, 5, 9, 50/5"	77, 50/4", 50/0", 50/3", 50/3", 77, 79, 50/5", 50/4", 70/10", 81, 78, 58	79/10", 35, 50/5", 95, 47, 104
B-1005	27, 29, 26, 15, 11, 11, 10, 17, 13, 19, 17, 19, 11, 7, WOH, 37, 17, 34, 28, 25, 50/1", 56, 37, 69, 46, 54, 57, 33, 31, 37, 95, 30, 32, 50/4", 80/9", 39	50/5", 50/4"	Not measured
B-1006	19, 20, 15, 9, 2, 3, 4, 8, 10, 11, 30, 24, 17, 13, 10, 2, 8, 7, WOH, 9, WOH, WOH, 13, 7, WOH, 14, 19, 28, 42, 50	50/5", 50/2"	Not measured
B-1007	30, 32, 10, 10, 8, 14, 23, 20, 27, 26, 31, 25, 23, 15, 15, 24, 21, 26, 36, 37, 27, 36, 18, 13	50/2", 50/3", 45, 50/2", 50/5", 50/4", 74	Not measured
B-1008	19, 30, 53, 67, 34, 31, 19, 24, 30, 36, 30, 20, 17, 17, 25, 18, 22, 33, 39, 22, 25, 50/5", 50/4", 50/5"	46, 65, 53, 71/9", 50/3", 50/3", 50/4"	Not measured
B-1009	19, 37, 42, 44, 20, 21, 27, 21, 20, 30, 29, 35, 19, 31, 37, 42, 23, 13, 27, 32, 20, 8, 10, 40, 24	51, 50/5"	Not measured
B-1010	13, 18, 29, 24, 20, 27, 9, 13, 18, 29, 72, 23, 27, 23, 30, 26, 15, 34, 19, 6, 28, 6, 20, 10, 15, 21	67, 50/4"	Not measured
B-1011	8, 7, 11, 10, 14, 15, 15, 20, 13, 44, 42, 12, 25, 48, 28, 41, 37, 49, 60, 40, 50/0", 50/4"	69, 74, 50/3", 50/1", 36	Not measured
B-1013	9, 14, 26, 26, 12, 26, 26, 33, 9, 22, 16, 41, 16, 34, 22, 25, 21, 28, 12, 26, 15, 8, 18, 36, 13, 26	50/2", 76	Not measured
Range:	WOR-50/0"	27-50/1"	9-50/4"
Average:	25	83	59
Median	21	100	47

NOTES: [a]SPT blow counts will be adjusted to reflect the measured hammer efficiencies.

[b]WOR means that the sampler penetrated 18" or more under weight of the rods, and WOH means that the sampler penetrated 18" or more under weight of the rods and hammer. These values were taken as zero when calculating the average.

[c]SPT blow counts linearly extrapolated to more than 100 bpf were truncated at 100 bpf when calculating the average.

[d]SPT N-values shown for the Barnwell Group exclude measurements in the fill layers encountered at borings B-1001, B-1002, B-1004, and B-1005.

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Table 2.5.4-6 Typical Shear Wave Velocity Values for Existing Strata

Geologic Formation	Depth (ft)	Elevation (ft)	V_s (fps)
Upper Sand Stratum (Barnwell Group)	0 to 16	223 to 207	1,400
	16 to 41	207 to 182	800
	41 to 58	182 to 165	850
	58 to 86	165 to 137	900
Blue Bluff Marl (Lisbon Formation)	86 to 92	137 to 131	1,400
	92 to 97	131 to 126	1,700
	97 to 102	126 to 121	2,100
	102 to 105	121 to 118	1,700
	105 to 111	118 to 112	2,200
	111 to 123	112 to 100	2,350
	123 to 149	100 to 74	2,650
Lower Sand Stratum	149 to 156	74 to 67	2,000
(Still Branch)	156 to 216	67 to 7	1,650
(Congaree)	216 to 331	7 to -108	1,950
(Snapp)	331 to 438	-108 to -215	2,050
(Black Mingo)	438 to 477	-215 to -254	2,350
(Steel Creek)	477 to 587	-254 to -364	2,650
(Gaillard/Black Creek)	587 to 798	-364 to -575	2,850
(Pio Nono)	798 to 858	-575 to -635	2,870
(Cape Fear)	858 to 1,049	-635 to -826	2,710
Dunbarton Triassic Basin	1,049	-826	2,710
	1,093	-870	5,300
	1,323	-1,100	7,800

Table 2.5.4-7 Summary of ESP Borings and CPTs

Boring Number	Plant Coordinates Northing (ft)	Plant Coordinates Easting (ft)	State Coordinates Northing (ft)	State Coordinates Easting (ft)	Elevation (ft msl)	Depth (ft)
B-1001	7,662	6,220	1,142,662	620,220	221.64	123.9
B-1002[a, b]	7,999	6,985	1,142,999	620,985	221.98	260
B-1002A[a, d]	7,986	6,986	1,142,986	620,986	222.27	105
B-1003[a, b, c]	7,974	7,890	1,142,974	621,890	223.21	1338
B-1004[a, b]	7,985	6,131	1,142,985	620,131	249.78	304
B-1005	8,992	6,155	1,143,992	620,155	253.14	164.3
B-1006	8,810	7,343	1,143,810	621,343	255.95	124.2
B-1007	7,662	7,120	1,142,662	621,120	221.02	125
B-1008	7,671	7,996	1,142,671	621,996	219.51	124.3
B-1009	6,001	6,361	1,141,001	620,361	220.39	98.9
B-1010	6,000	7,280	1,141,000	621,280	218.60	104.3
B-1011	8,741	8,378	1,143,741	622,378	219.38	100
B-1013	5,976	8,272	1,140,976	622,272	218.62	105
C-1005A[a, d]	7,990	8,179	1,142,990	622,179	223.66	90
CPT Number	**Plant Coordinates Northing (ft)**	**Plant Coordinates Easting (ft)**	**State Coordinates Northing (ft)**	**State Coordinates Easting (ft)**	**Elevation (ft msl)**	**Depth (ft)**
C-1001A	8,028	6,356	1,143,028	620,356	248.57	116.7
C-1002	7,668	6,575	1,142,668	620,575	222.13	78.5
C-1003[e, f]	7,669	7,478	1,142,669	621,478	219.80	80
C-1004[f]	7,646	8,362	1,142,646	622,362	220.82	77
C-1005[e, f]	7,995	8,175	1,142,995	622,175	223.81	82
C-1006	8,001	7,262	1,143,001	621,262	222.80	74
C-1007	8,271	8,055	1,143,271	622,055	222.81	81.7
C-1008	8,268	6,931	1,143,268	620,931	221.30	76
C-1009A[e, f]	5,980	6,798	1,140,980	620,798	218.93	99
C-1010	6,008	7,754	1,141,008	621,754	219.06	96

[a] Location of suspension P-S velocity logging.
[b] Location of caliper, natural gamma, resistivity, and spontaneous potential measurements.
[c] Location of borehole deviation survey.
[d] Boreholes drilled without sampling to allow the performance of suspension P-S velocity logging above the zone of drilling fluid loss.
[e] Location of seismic CPT.
[f] Location of pore pressure dissipation tests.

Note: State Plane Coordinates are from NAD27 Georgia East state grid system. Plant coordinates are converted from the following formula:
Plant North + 1,135,000 = State North
Plant East + 614,000 = State East

Table 2.5.4-7a Summary of COL Borings, CPTs, and Test Pits

Boring Number	Plant Coordinates		State Coordinates		Elevation (ft, msl)	Depth (ft)
	Northing (ft)	Easting (ft)	Northing (ft)	Easting (ft)		
B-1105	9,168	6,003	1,144,168	620,003	257.89	148.8
B-1107	9,154	6,916	1,144,154	620,916	266.66	150.0
B-1108	9,214	7,273	1,144,214	621,273	273.56	149.8
B-1109	9,180	7,581	1,144,180	621,581	276.48	150.0
B-1110	9,171	8,011	1,144,171	622,011	265.14	150.0
B-1111	9,213	8,334	1,144,213	622,334	224.90	150.0
B-1112	9,223	8,691	1,144,223	622,691	213.74	23.0
B-1112A	9,219	8,561	1,144,219	622,561	227.14	150.0
B-1113	8,901	6,217	1,143,901	620,217	249.99	170.0
B-1116	8,894	7,265	1,143,894	621,265	261.82	138.5
B-1117	8,891	7,628	1,143,891	621,628	263.89	149.3
B-1118	8,886	8,008	1,143,886	622,008	257.91	149.4
B-1119	8,888	8,334	1,143,888	622,334	223.57	150.0
B-1120	8,893	8,558	1,143,893	622,558	227.18	149.8
B-1121	8,576	6,216	1,143,576	620,216	241.33	150.0
B-1123	8,575	6,922	1,143,575	620,922	241.27	150.0
B-1124	8,628	7,422	1,143,628	621,422	241.21	150.0
B-1125	8,587	7,628	1,143,587	621,628	240.97	150.0
B-1126	8,568	7,980	1,143,568	621,980	219.88	150.0
B-1127	8,573	8,332	1,143,573	622,332	219.67	150.0
B-1128	8,573	8,682	1,143,573	622,682	218.26	73.0
B-1128A	8,574	8,685	1,143,574	622,685	217.92	148.8
B-1129	8,278	7,894	1,143,278	621,894	221.84	100.0
B-1130	7,483	8,250	1,142,483	622,250	217.46	99.2
B-1131	8,173	7,823	1,143,173	621,823	222.18	98.6
B-1132	7,614	7,450	1,142,614	621,450	218.73	100.0
B-1133	7,969	7,451	1,142,969	621,451	221.20	100.0
B-1134	8,283	7,104	1,143,283	621,104	222.04	100.0
B-1136	8,178	7,023	1,143,178	621,023	221.65	100.0
B-1138	8,470	5,193	1,143,470	619,193	215.82	100.0
B-1139	7,290	7,027	1,142,290	621,027	216.68	150.0
B-1140	7,290	7,824	1,142,290	621,824	216.58	150.0
B-1142	9,417	6,650	1,144,417	620,650	224.69	100.0
B-1146	10,428	8,272	1,145,428	622,272	240.04	98.6
B-1148	10,538	9,237	1,145,538	623,237	218.94	100.0
B-1150	10,467	10,235	1,145,467	624,235	170.69	100.0
B-1152	10,582	11,227	1,145,582	625,227	117.05	100.0
B-1153	10,569	11,673	1,145,569	625,673	103.58	100.0
B-1154	10,664	12,216	1,145,664	626,216	95.08	98.8
B-1155	12,390	10,936	1,147,390	624,936	84.95	150.0

Table 2.5.4-7a (cont.) Summary of COL Borings, CPTs, and Test Pits

Boring Number	Plant Coordinates		State Coordinates		Elevation (ft, msl)	Depth (ft)
	Northing (ft)	Easting (ft)	Northing (ft)	Easting (ft)		
B-1156	12,302	10,572	1,147,302	624,572	85.70	99.2
B-1157	12,210	11,062	1,147,210	625,062	86.77	150.0
B-1158	10,195	12,669	1,145,195	626,669	88.74	149.5
B-1159	12,286	10,955	1,147,286	624,955	88.70	150.0
B-1161	12,363	10,862	1,147,363	624,862	86.10	150.0
B-1162	12,235	10,815	1,147,235	624,815	85.55	200.0
B-1163	12,171	10,939	1,147,171	624,939	85.95	150.0
B-1164	11,995	10,519	1,146,995	624,519	220.50	150.0
B-1166	12,453	9,962	1,147,453	623,962	203.40	100.0
B-1168	12,688	9,468	1,147,688	623,468	202.20	100.0
B-1170	12,424	8,954	1,147,424	622,954	223.29	98.9
B-1172	11,983	8,539	1,146,983	622,539	249.49	100.0
B-1174	11,476	8,228	1,146,476	622,228	225.81	100.0
B-1176	10,876	8,195	1,145,876	622,195	221.48	35.0
B-1176A	10,879	8,197	1,145,879	622,197	221.51	100.0
B-1185	9,717	8,232	1,144,717	622,232	226.78	148.9
B-1186	9,712	4,819	1,144,712	618,819	277.51	178.8
B-1187	9,710	5,260	1,144,710	619,260	277.68	150.0
B-1189	9,460	4,997	1,144,460	618,997	279.98	150.0
B-1191	9,302	5,491	1,144,302	619,491	260.30	150.0
B-1192	9,217	4,841	1,144,217	618,841	243.17	179.5
B-1193	9,091	5,278	1,144,091	619,278	254.11	178.8
B-1194	12,505	7,630	1,147,505	621,630	199.35	50.0
B-1195	12,575	8,478	1,147,575	622,478	220.60	50.0
B-1196	12,287	8,018	1,147,287	622,018	217.52	50.0
B-1197	11,875	8,004	1,146,875	622,004	245.60	50.0
B-3001(DH)	7,600	7,800	1,142,600	621,800	218.40	420.0
B-3002(DH)	7,600	7,872	1,142,600	621,872	218.89	249.9
B-3002A	7,598	7,879	1,142,598	621,879	218.83	21.5
B-3003(DH)	7,600	7,727	1,142,600	621,727	218.29	250.0
B-3004	7,447	7,867	1,142,447	621,867	218.51	160.0
B-3005	7,718	7,749	1,142,718	621,749	219.20	155.0
B-3006	7,426	7,925	1,142,426	621,925	217.59	155.0
B-3007	7,719	7,877	1,142,719	621,877	220.78	159.8
B-3008	7,425	7,773	1,142,425	621,773	217.86	155.0
B-3009	7,484	7,957	1,142,484	621,957	217.85	153.9
B-3010	7,635	8,025	1,142,635	622,025	219.69	160.0
B-3011	7,777	8,025	1,142,777	622,025	220.57	165.0
B-3012	7,773	7,912	1,142,773	621,912	220.40	159.3
B-3013(C)	7,843	7,825	1,142,843	621,825	220.51	155.0

Table 2.5.4-7a (cont.) Summary of COL Borings, CPTs, and Test Pits

Boring Number	Plant Coordinates		State Coordinates		Elevation (ft, msl)	Depth (ft)
	Northing (ft)	Easting (ft)	Northing (ft)	Easting (ft)		
B-3014	7,799	7,749	1,142,799	621,749	220.26	158.7
B-3015	7,957	7,824	1,142,957	621,824	221.78	150.0
B-3016	7,978	7,913	1,142,978	621,913	222.48	150.0
B-3017	8,034	7,750	1,143,034	621,750	222.10	150.0
B-3018	7,738	8,116	1,142,738	622,116	219.80	155.0
B-3019	7,977	8,167	1,142,977	622,167	222.42	153.8
B-3020	7,978	8,075	1,142,978	622,075	222.44	149.4
B-3021	8,070	8,033	1,143,070	622,033	223.19	154.5
B-3022	8,070	7,873	1,143,070	621,873	223.86	150.0
B-3023	8,061	7,680	1,143,061	621,680	222.81	150.5
B-3024	7,906	7,400	1,142,906	621,400	220.16	150.0
B-3025	7,460	7,425	1,142,460	621,425	218.21	150.0
B-3026	7,290	7,404	1,142,290	621,404	215.76	149.2
B-3027	7,059	7,423	1,142,059	621,423	218.80	150.0
B-3028	6,867	7,409	1,141,867	621,409	220.12	150.0
B-3029	6,882	7,804	1,141,882	621,804	220.13	149.9
B-3030	6,700	7,800	1,141,700	621,800	221.99	150.0
B-3031	6,399	8,042	1,141,399	622,042	222.70	150.0
B-3032	6,158	7,710	1,141,158	621,710	220.05	149.5
B-3033	6,405	7,715	1,141,405	621,715	222.26	149.3
B-3034	6,400	7,915	1,141,400	621,915	224.67	149.2
B-3035	7,729	7,675	1,142,729	621,675	219.34	150.5
B-3036	7,442	7,676	1,142,442	621,676	217.87	155.0
B-3037	8,057	7,769	1,143,057	621,769	222.94	150.0
B-3038	6,883	7,543	1,141,883	621,543	220.76	98.9
B-3039	7,918	7,754	1,142,918	621,754	219.17	150.0
B-4001(DH)	7,600	7,000	1,142,600	621,000	218.88	399.9
B-4002(DH)	7,600	7,072	1,142,600	621,072	219.06	250.0
B-4003(DH)	7,600	6,927	1,142,600	620,927	218.99	249.8
B-4004	7,460	7,047	1,142,460	621,047	218.45	150.0
B-4005	7,715	6,949	1,142,715	620,949	221.13	164.9
B-4006	7,720	7,076	1,142,720	621,076	220.98	165.0
B-4007	7,426	7,125	1,142,426	621,125	217.90	170.0
B-4008	7,424	6,974	1,142,424	620,974	218.08	169.4
B-4009	7,486	7,157	1,142,486	621,157	217.91	164.9
B-4010	7,668	7,249	1,142,668	621,249	219.09	160.0
B-4011	7,773	7,236	1,142,773	621,236	219.08	150.0
B-4013(C)	7,843	7,020	1,142,843	621,020	222.24	165.0
B-4014	7,832	6,950	1,142,832	620,950	220.74	158.6
B-4015	7,773	7,115	1,142,773	621,115	220.11	155.0

Table 2.5.4-7a (cont.) Summary of COL Borings, CPTs, and Test Pits

Boring Number	Plant Coordinates		State Coordinates		Elevation (ft, msl)	Depth (ft)
	Northing (ft)	Easting (ft)	Northing (ft)	Easting (ft)		
B-4016	7,996	7,113	1,142,996	621,113	221.23	149.6
B-4017	8,035	6,950	1,143,035	620,950	220.94	150.0
B-4018	7,735	7,316	1,142,735	621,316	220.30	160.0
B-4019	7,976	7,371	1,142,976	621,371	221.76	160.0
B-4020	7,969	7,280	1,142,969	621,280	222.79	89.4
B-4020A	7,974	7,280	1,142,974	621,280	222.56	165.0
B-4021	8,093	7,247	1,143,093	621,247	224.55	150.0
B-4022	8,081	7,074	1,143,081	621,074	220.71	148.7
B-4023	8,062	6,880	1,143,062	620,880	220.71	150.0
B-4024	7,905	6,602	1,142,905	620,602	223.80	150.0
B-4025	7,510	6,625	1,142,510	620,625	220.80	150.0
B-4026	7,330	6,598	1,142,330	620,598	221.54	150.0
B-4027	7,180	6,633	1,142,180	620,633	217.73	150.0
B-4028	6,984	6,588	1,141,984	620,588	219.57	150.0
B-4029	6,875	6,700	1,141,875	620,700	220.28	150.0
B-4030	6,677	6,698	1,141,677	620,698	222.35	150.3
B-4031	6,400	6,975	1,141,400	620,975	222.13	150.0
B-4032	6,118	6,795	1,141,118	620,795	220.24	38.5
B-4032A	6,124	6,795	1,141,124	620,795	220.22	150.0
B-4033	6,398	6,349	1,141,398	620,349	219.93	149.4
B-4034	6,376	6,795	1,141,376	620,795	222.79	150.0
B-4035	7,729	6,876	1,142,729	620,876	220.52	164.8
B-4036	7,457	6,876	1,142,457	620,876	218.05	170.0
B-5001	11,177	7,808	1,146,177	621,808	218.99	150.0
B-5002	11,340	7,808	1,146,340	621,808	241.53	150.0
B-5003	11,387	7,575	1,146,387	621,575	227.94	148.7
B-5004	11,548	7,568	1,146,548	621,568	236.61	149.8
B-6002	9,134	5,627	1,144,134	619,627	247.90	150.0
B-6003	8,925	5,423	1,143,925	619,423	229.76	179.4
B-6004	8,718	5,473	1,143,718	619,473	231.59	150.0
B-6005	8,718	5,874	1,143,718	619,874	242.59	178.8
B-6006	8,070	6,302	1,143,070	620,302	248.22	50.0
B-6007	7,731	6,302	1,142,731	620,302	222.28	50.0
B-6008	10,444	8,676	1,145,444	622,676	240.11	150.0
B-6009	9,774	7,748	1,144,774	621,748	246.04	100.0
B-6010	8,893	7,059	1,143,893	621,059	263.39	169.3
B-6011	9,558	7,262	1,144,558	621,262	244.00	120.0
B-6012	9,257	6,481	1,144,257	620,481	194.20	120.0
B-6013	8,170	3,235	1,143,170	617,235	251.14	50.0
B-6014	8,168	4,281	1,143,168	618,281	209.79	50.0

Table 2.5.4-7a (cont.) Summary of COL Borings, CPTs, and Test Pits

Boring Number	Plant Coordinates Northing (ft)	Plant Coordinates Easting (ft)	State Coordinates Northing (ft)	State Coordinates Easting (ft)	Elevation (ft, msl)	Depth (ft)
B-6015	8,166	5,318	1,143,166	619,318	221.52	50.0
B-6018	7,909	4,367	1,142,909	618,367	204.66	50.0
B-6019	7,133	4,344	1,142,133	618,344	163.94	50.0
B-6020	7,634	5,556	1,142,634	619,556	221.48	130.0
B-6021	7,186	5,103	1,142,186	619,103	209.80	120.0
B-6022	7,225	6,040	1,142,225	620,040	216.23	90.0
B-6023	6,553	5,178	1,141,553	619,178	202.77	50.0
B-6024	6,546	5,998	1,141,546	619,998	216.07	50.0
B-6025	5,519	5,190	1,140,519	619,190	172.69	50.0
B-6026	5,538	5,900	1,140,538	619,900	215.46	50.0
B-6027	10,779	12,145	1,145,779	626,145	96.65	75.0
B-6028	10,611	12,062	1,145,611	626,062	95.70	50.0
B-6029	12,772	9,967	1,147,772	623,967	85.41	50.0
B-6030	12,588	10,223	1,147,588	624,223	88.37	50.0
CPT Number	**Plant Coordinates Northing (ft)**	**Plant Coordinates Easting (ft)**	**State Coordinates Northing (ft)**	**State Coordinates Easting (ft)**	**Elevation (ft, msl)**	**Depth (ft)**
C-1101	9,357	6,185	1,144,357	620,185	265.76	71.4
C-1102	9,424	7,333	1,144,424	621,333	267.61	51.4
C-1103	10,012	8,037	1,145,012	622,037	236.52	27.4
C-1104	10,602	8,747	1,145,602	622,747	230.19	77.1
C-1105	10,483	9,734	1,145,483	623,734	200.57	50.2
C-1106	10,534	10,748	1,145,534	624,748	138.02	20.0
C-1107	12,234	10,202	1,147,234	624,202	211.92	71.0
C-1108	12,628	9,753	1,147,628	623,753	200.89	59.6
C-1109	12,622	9,172	1,147,622	623,172	209.79	72.5
C-1110	12,199	8,740	1,147,199	622,740	242.39	72.3
C-1111	11,753	8,346	1,146,753	622,346	250.69	32.2
C-3001(S)	7,611	7,727	1,142,611	621,727	218.37	70.1
C-3002(S)	7,607	7,873	1,142,607	621,873	218.89	67.9
C-3003(S)	6,772	7,802	1,141,772	621,802	221.38	82.0
C-3004	6,542	7,807	1,141,542	621,807	223.25	72.7
C-3005(S)	6,267	7,792	1,141,267	621,792	221.27	101.1
C-4001(S)	7,600	6,919	1,142,600	620,919	218.87	74.2
C-4002(S)	7,600	7,064	1,142,600	621,064	219.08	82.2
C-4003(S)	6,785	6,708	1,141,785	620,708	221.16	82.5
C-4004	6,543	6,598	1,141,543	620,598	219.99	77.1
C-4005(S)	6,250	6,594	1,141,250	620,594	220.01	90.2

Table 2.5.4-7a (cont.) Summary of COL Borings, CPTs, and Test Pits

Test Pit Number	Plant Coordinates		State Coordinates		Elevation (ft, msl)	Depth (ft)
	Northing (ft)	Easting (ft)	Northing (ft)	Easting (ft)		
TP-B-1108	9,312	7,146	1,144,312	621,146	264.14	12.2
TP-B-1117	8,967	7,628	1,143,967	621,628	269.50	9.0
TP-B-1121	8,592	6,402	1,143,592	620,402	241.17	14.0
TP-B-1125	8,604	7,686	1,143,604	621,686	240.61	11.0
TP-B-1185	9,634	8,242	1,144,634	622,242	225.17	11.0
TP-B-1194	12,501	7,708	1,147,501	621,708	202.73	11.5
TP-B-1195	12,648	8,363	1,147,648	622,363	212.15	8.0
TP-B-1197	11,874	8,075	1,146,874	622,075	245.94	11.0

(DH) - Location of suspension P-S velocity logging and/or geophysical measurements.
(S) - Location of seismic CPT.
(C) – Borings with continuous sampling
Note: State Plane Coordinates are from NAD27 Georgia East state grid system. Plant coordinates are converted from the following formula:
Plant North + 1,135,000 = State North
Plant East + 614,000 = State East
Plant vertical datum is NGVD29, for this study msl = NGVD29

Table 2.5.4-8 Summary of Undisturbed Samples of the Blue Bluff Marl

Boring Number	Sample Number	Depth at Top of Sample (ft)	Length of Sample (in.)
B-1002	UD-1	92.0	30
B-1002	UD-2	103.5	30
B-1002	UD-3	113.5	30
B-1002	UD-4	123.5	30
B-1002	UD-5	133.4	30
B-1003	UD-1	92.0	30
B-1004	UD-1	144.0	18
B-1004	UD-2	148.5	18
B-1004	UD-3	163.5	30
B-1004	UD-4	177.0	30
B-1004	UD-5	188.5	30
B-1004	UD-6	198.5	30

Table 2.5.4-9 Summary of SPT Hammer Energy Transfer Efficiency

Borehole and Sample Number	**Energy Transfer Efficiency (%)**
B1013-SS5	65
B1013-SS8	70
B1013-SS10	68
B1013-SS13	71
B1013-SS14	72
B1013-SS15	73
B1008-SS26	79
B1008-SS27	75
B1008-SS28	75
B1006-SS7	71
B1006-SS8	74
B1006-SS10	77
B1006-SS15	85
B1006-SS16	86
B1006-SS17	87
B1006-SS26	83
B1006-SS27	80
B1006-SS28	82
Range:	65-87
Average:	76
Median:	75

Table 2.5.4-10 Estimated Shear Wave Velocity and Dynamic Shear Modulus Values for the Compacted Backfill

Depth (ft)	V_s [1] (fps)	G_{max} [2] (ksf)
0 to 6	573	1,255
6 to 10	732	2,049
10 to 14	811	2,510
14 to 18	871	2,898
18 to 23	927	3,280
23 to 29	983	3,694
29 to 36	1040	4,130
36 to 43	1092	4,553
43 to 50	1137	4,940
50 to 56	1175	5,274
56 to 63	1209	5,588
63 to 71	1232	5,796
71 to 79	1253	6,001
79 to 86	1273	6,186

(1) From Figure 6-1 of **Bechtel (1984)**.

(2) G_{max} were calculated using γ from Table 2.5.4-1.

Table 2.5.4-11 Shear Wave Velocity Values for Site Amplification Analysis Part A: Soil Shear-Wave Velocities

Geologic Formation	Depth (feet)	V_s (fps)
Compacted Backfill	0 to 6	573
	6 to 10	732
	10 to 14	811
	14 to 18	871
	18 to 23	927
	23 to 29	983
	29 to 36	1,040
	36 to 43	1,092
	43 to 50	1,137
	50 to 56	1,175
	56 to 63	1,209
	63 to 71	1,232
	71 to 79	1,253
	79 to 86	1,273
Blue Bluff Marl	86 to 92	1,400
(Lisbon Formation)	92 to 97	1,700
	97 to 102	2,100
	102 to 105	1,700
	105 to 111	2,200
	111 to 123	2,350
	123 to 149	2,650
Lower Sand Stratum	149 to 156	2,000
(Still Branch)	156 to 216	1,650
(Congaree)	216 to 331	1,950
(Snapp)	331 to 438	2,050
(Black Mingo)	438 to 477	2,350
(Steel Creek)	477 to 587	2,650
(Gaillard/Black Creek)	587 to 798	2,850
(Pio Nono)	798 to 858	2,870
(Cape Fear)	858 to 1,049	2,710
Dunbarton Triassic Basin & Paleozoic Crystalline Rock	> 1,049	see Table 2.5.4-11, Part B

Table 2.5.4-11 Shear Wave Velocity Values for Site Amplification Analysis Part B: Rock Shear-Wave Velocities - Six Alternate Profiles

	Vs (ft/s)	
Depth (ft)	**Gradient #1**	**Gradient #2**
1,049 to 1,100	4,400	4,400
1,100 to 1,150	5,650	5,650
1,150 to 1,225	6,650	6,650
1,225 to 1,337.5	7,600	7,600
1,337.5 to 1,402.5	8,000	8,700
1,402.5 to 1,405	8,005	8,703
1,405 to 1,525	8,059	8,739
> 1,525	9,200	9,200

Rock Vs profile corresponding to the location midway between B-1002 and B-1003.

	Vs (ft/s)	
Depth (ft)	**Gradient #1**	**Gradient #2**
1,049 to 1,100	4,400	4,400
1,100 to 1,150	5,650	5,650
1,150 to 1,225	6,650	6,650
1,225 to 1,337.5	7,600	7,600
1,337.5 to 1,450	8,000	8,700
1,450 to 1,550	8,090	8,760
1,550 to 1,650	8,180	8,820
1,650 to 1,750	8,270	8,880
1,750 to 1,830	8,360	8,940
1,830 1,900	8,414	8,976
> 1,900	9,200	9,200

Rock Vs profile corresponding to the location of B-1003.

	Vs (ft/s)	
Depth (ft)	**Gradient #1**	**Gradient #2**
1,049 to 1,100	4,400	4,400
1,100 to 1,150	5,650	5,650
1,150 to 1,225	6,650	6,650
1,225 to 1,337.5	7,600	7,600
1,337.5 to 1,450	8,000	8,700
1,450 to 1,550	8,090	8,760
1,550 to 1,650	8,180	8,820
1,650 to 1,750	8,270	8,880
1,750 to 1,850	8,360	8,940
1,850 to 1,950	8,450	9,000
1,950 to 2,050	8,540	9,060
2,050 to 2,127.5	8,630	9,120
2,127.5 to 2,155	8,679.5	9,153
2,155 to 2,275	8,733.5	9,189
> 2,275	9,200	9,200

Table 2.5.4-12 Summary of Modulus Reduction and Damping Ratio Values – EPRI-Based

Shear Strain (%)	0-20 ft (Compacted Backfill)		20-50 ft (Compacted Backfill)		50-86 ft (Compacted Backfill)		86-149 ft (Blue Bluff Marl)		149-215.7 ft (Lower Sand Stratum-Still Branch Formation)		Between 215.7 and 500 ft (Lower Sand Stratum below Still Branch)		Soil between 500 ft and top of rock (about 1,000 ft) (Deep Sands)	
	G/G_{max}	Damping Ratio	G/G_{max}	Damping Ratio	G/G_{max}	Damping Ratio	G/G_{max}	Damping Ratio	G/G_{max}	Damping Ratio	G/G_{max}	Damping Ratio	G/G_{max}	Damping Ratio
0.0001	1	1.4	1	1.2	1	1	1	1.4	1	0.8	1	0.7	1	0.6
0.00032	1	1.5	1	1.2	1	1	1	1.4	1	0.9	1	0.8	1	0.6
0.001	0.98	1.8	0.99	1.4	1	1.2	0.99	1.5	1	1	1	0.8	1	0.6
0.00316	0.914	2.8	0.946	2.1	0.97	1.64	0.96	2	0.98	1.33	0.988	1.12	0.99	0.81
0.01	0.75	5	0.82	3.6	0.87	2.8	0.84	2.9	0.9	2.2	0.93	1.8	0.95	1.2
0.03162	0.509	9.3	0.608	7	0.68	5.49	0.63	6	0.74	4.36	0.791	3.53	0.852	2.5
0.1	0.27	15.3	0.36	12.4	0.43	10.2	0.36	11.4	0.5	8.6	0.57	7.1	0.65	5.3
0.3162	0.116	21.9	0.165	19.1	0.22	16.5	0.16	17	0.27	14.61	0.321	12.78	0.41	10.27
1	0.04	27	0.06	24.9	0.09	22.9	0.06	19.4	0.12	21.2	0.15	19.3	0.2	16.7

Table 2.5.4-13 Summary of Modulus Reduction and Damping Ratio Values – SRS-Based

Cyclic Shear Strain (%)	Blue Bluff Marl		Shallow Sand (<300 ft)		Deep Sand (>300 ft)	
	G/G_{max}	Damping Ratio	G/G_{max}	Damping Ratio	G/G_{max}	Damping Ratio
0.0001	1	0.8	1	0.6	1	0.5
0.0002	1	0.8	1	0.6	1	0.5
0.0003	1	0.8	1	0.7	1	0.5
0.0005	1	0.8	1	0.7	1	0.5
0.001	0.99	0.9	0.99	0.8	0.995	0.6
0.002	0.98	1.1	0.98	1	0.99	0.7
0.003	0.965	1.2	0.96	1.1	0.985	0.8
0.005	0.94	1.5	0.93	1.4	0.96	0.9
0.01	0.89	2.1	0.87	2.2	0.92	1.4
0.02	0.8	3.3	0.77	3.5	0.85	2.2
0.03	0.72	4.3	0.69	4.7	0.78	3
0.05	0.61	6.1	0.57	6.7	0.69	4.5
0.1	0.43	9.6	0.4	10.4	0.53	7.3
0.2	0.28	13.1	0.25	14.8	0.36	11.2
0.3	0.205		0.18		0.27	13.8
0.5	0.13	19	0.12	21	0.18	
0.7	0.1		0.09		0.14	
1	0.08		0.07	27	0.1	23

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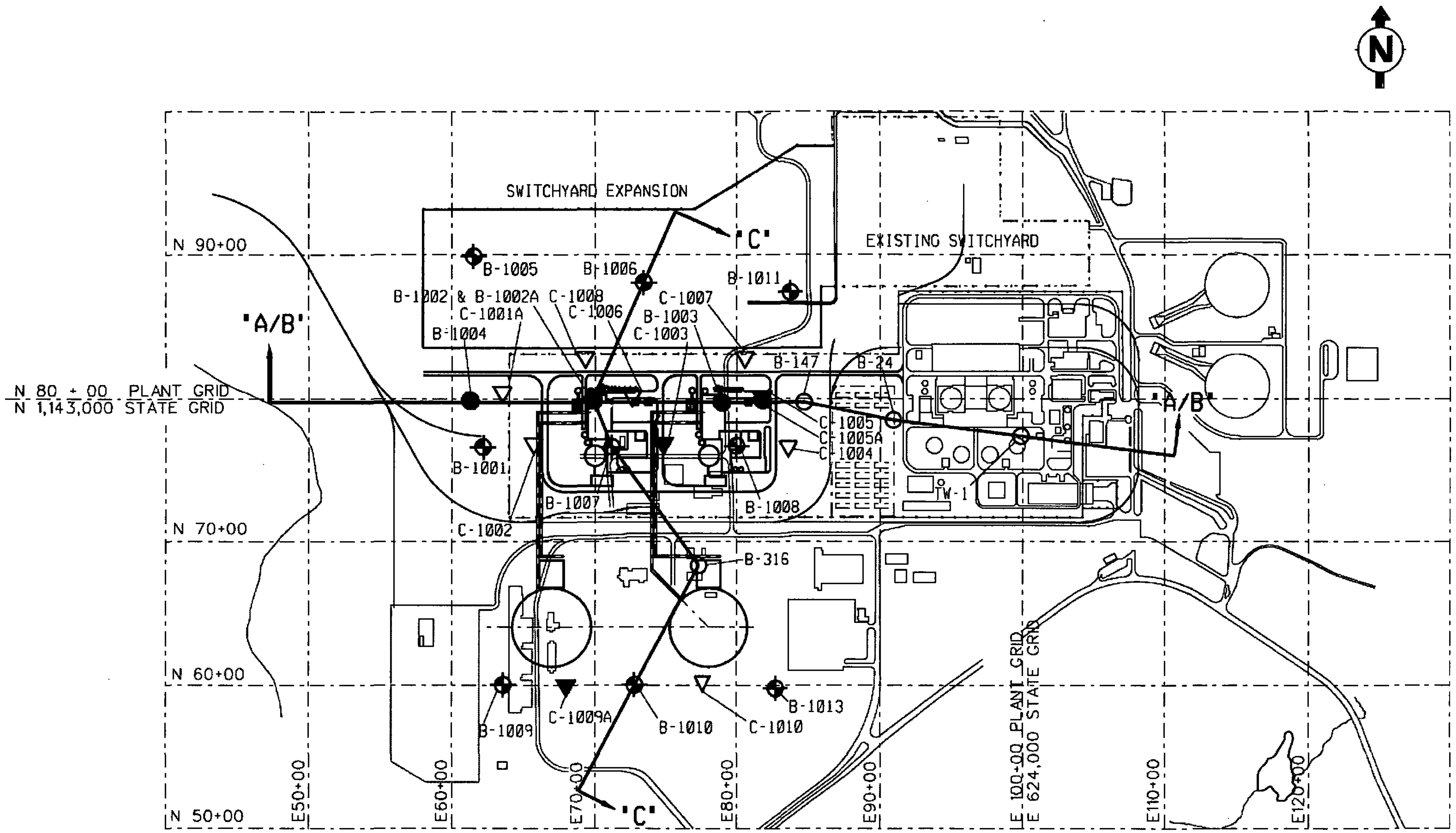

NOTES:

1. REFER TO FIGURES 2.5.4-3, 2.5.4-4, AND 2.5.4-5 FOR SUBSURFACE PROFILES.
2. SUBSURFACE PROFILES 'A-A' AND "B-B' USE THE SAME BORINGS, BUT SHOW DIFFERENT AMOUNTS OF DETAIL.
3. THE GRID SYSTEM SHOWN IS DESIGNATED 'PLANT GRID SYSTEM". THE FOLLOWING FACTORS MAY BE APPLIED TO CONVERT TO THE GEORGIA EAST (NAD27) STATE GRID SYSTEM.
   PLANT NORTH + 1,135,000 = STATE NORTH
   PLANT EAST + 614,000 = STATE EAST

LEGEND:

- ⊕ ESP BORING
- ● ESP BORING WITH GEOGRAPHICAL TESTS
- ▽ ESP CONE PENETRATION TEST (CPT)
- ▼ ESP CPT WITH SEISMIC DOWN-HOLE TESTING
- O EXISTING BORING

Figure 2.5.4-1 ESP Study Boring Location Plan

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Figure 2.5.4-1a COL Site Boring Location Plan

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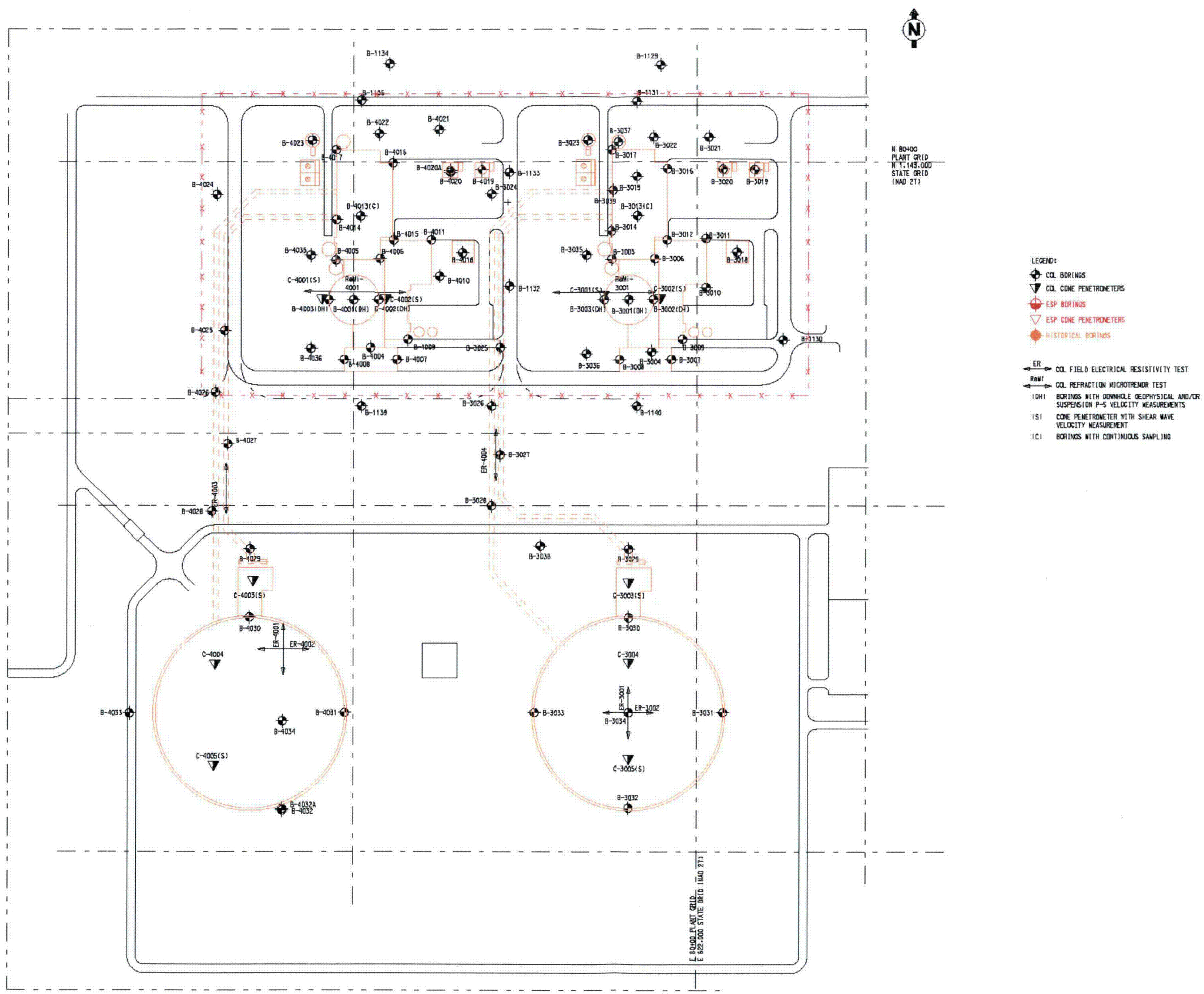

Figure 2.5.4-1b COL Power Block—Cooling Tower Boring Location Plan

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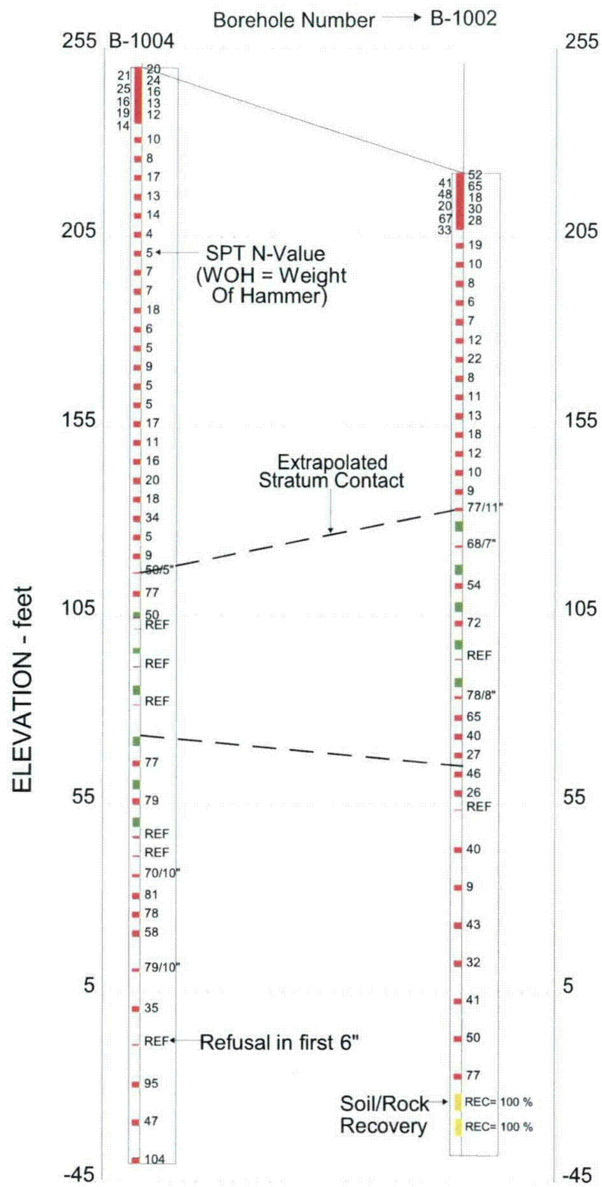

Stratum Descriptions Continued

GAILLARD/BLACK CREEK FM. Interbedded SAND, SILT and CLAY

PIO NONO/UNNAMED FM. SAND with silt

CAPE FEAR FM. Silty, clayey SAND with silt and clay layers

TRIASSIC BASIN (BEDROCK). Interbedded CONGLOMERATE, BRECCIA, SANDSTONE and MUDSTONE.

Notes

Subsurface data have been obtained only at the actual boring locations. The stratification shown by the dashed lines between borings is based on extrapolation of the data from the borings. Actual stratification between the borings may differ from that shown.

Stratum Descriptions

BARNWELL GROUP. Silty, clayey SAND with layers of silt and clay. Lower limestone / shell hash (UTLEY LMST FM.)

LISBON FM (BLUE BLUFF MEMBER). Marl with limestone layers

STILL BRANCH FM. Silty, clayey SAND

CONGAREE FM. SAND with silt and clay

SNAPP FM. Interbedded SAND, SILT and CLAY

BLACK MINGO FM. Interbedded SAND, SILT and CLAY

STEEL CREEK FM. SAND with silt and clay

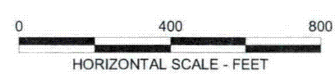

Figure 2.5.4-2 Subsurface Profile Legend

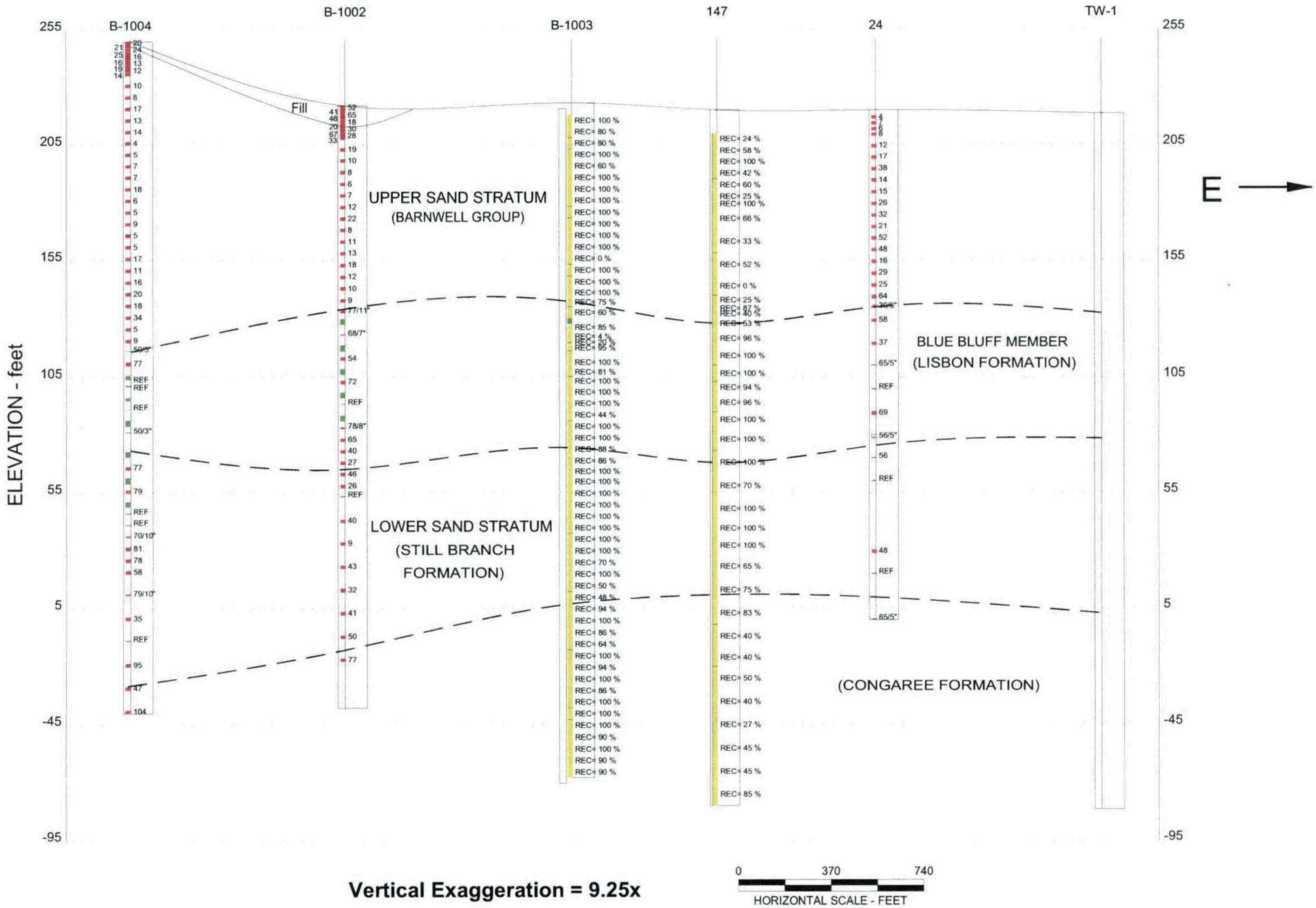

Figure 2.5.4-3 Subsurface Profile A–A'

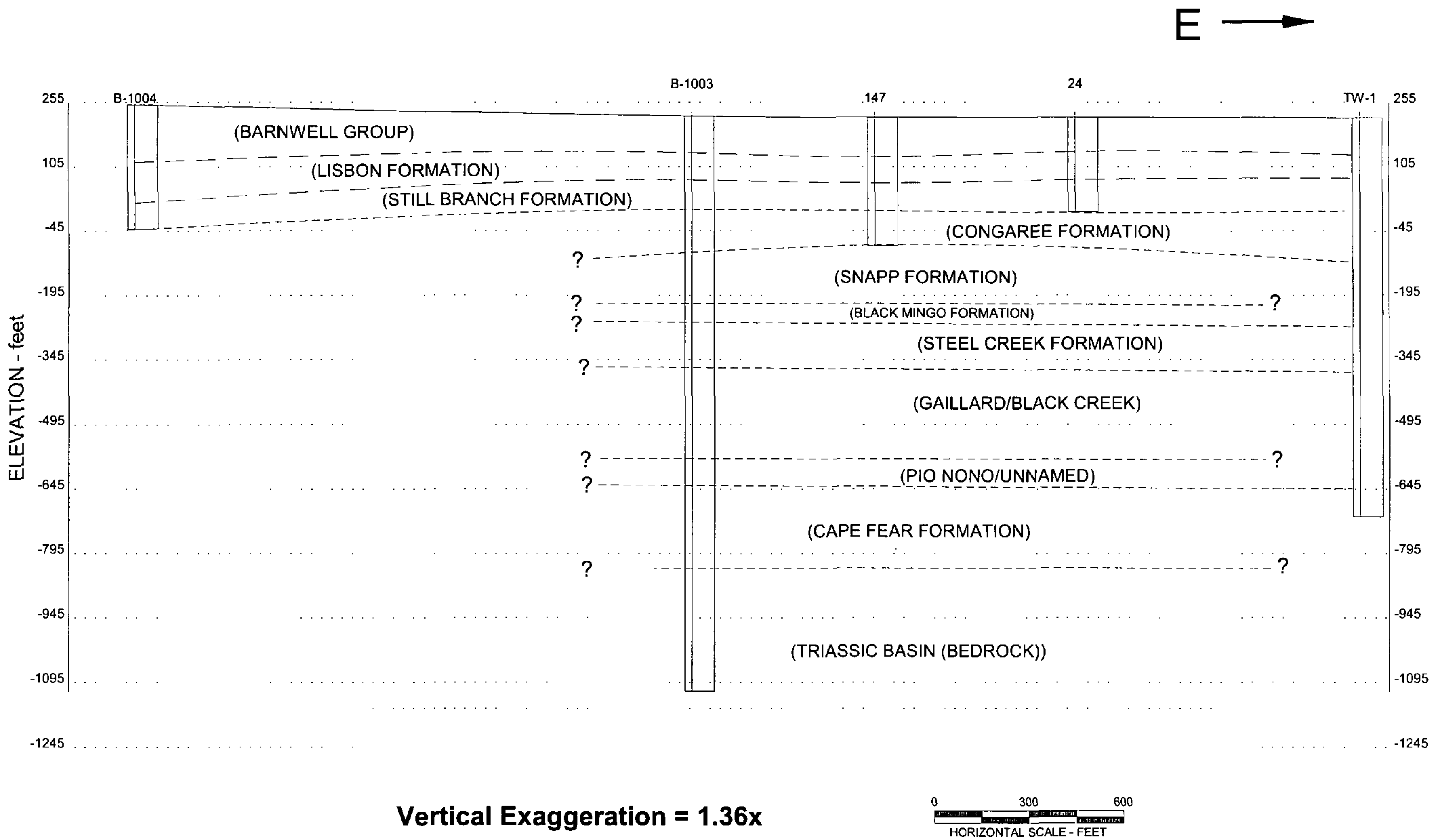

Figure 2.5.4-4 Subsurface Profile B–B'

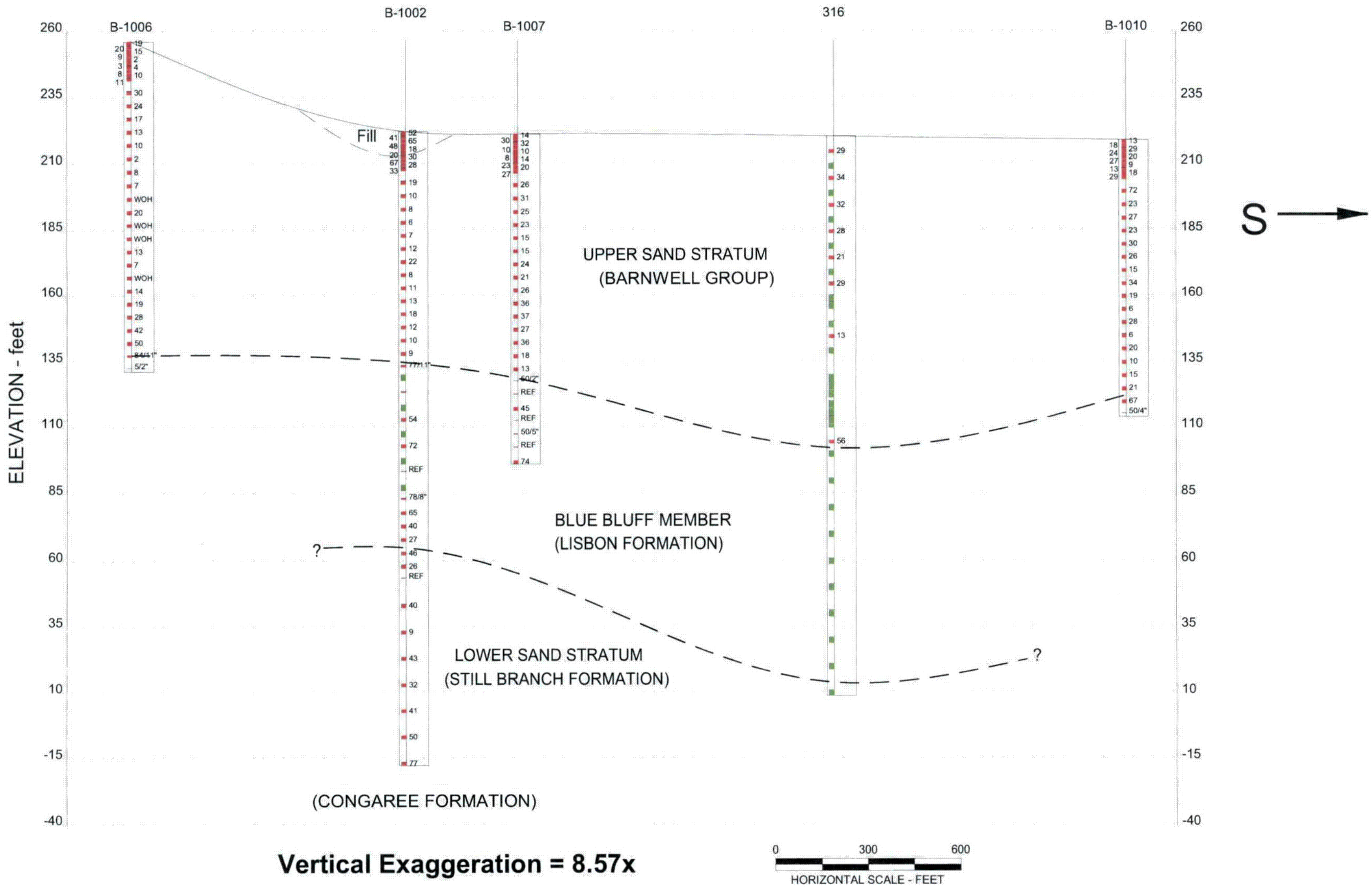

Figure 2.5.4-5 Subsurface Profile C–C'

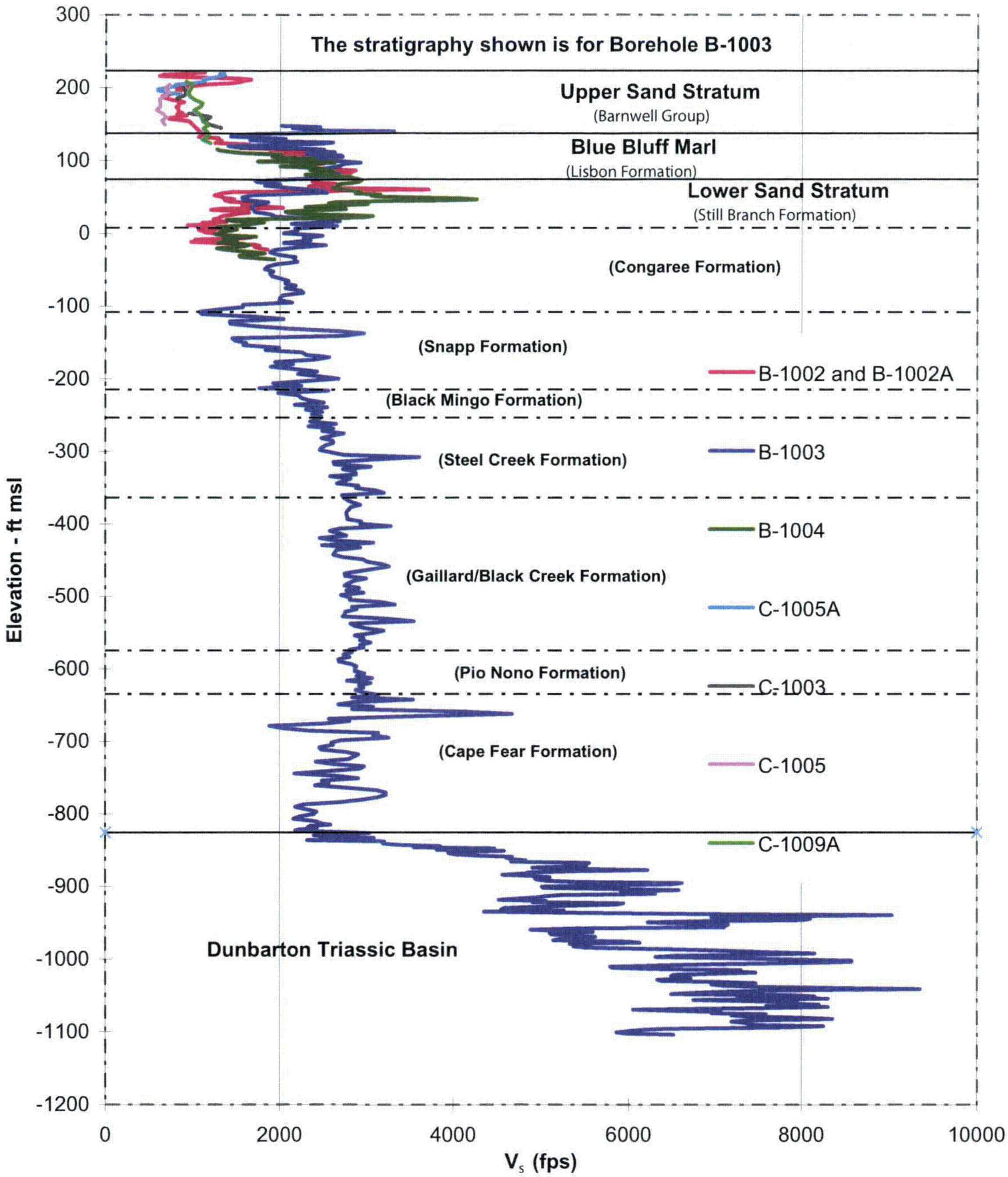

Figure 2.5.4-6 Shear Wave Velocity Measurements

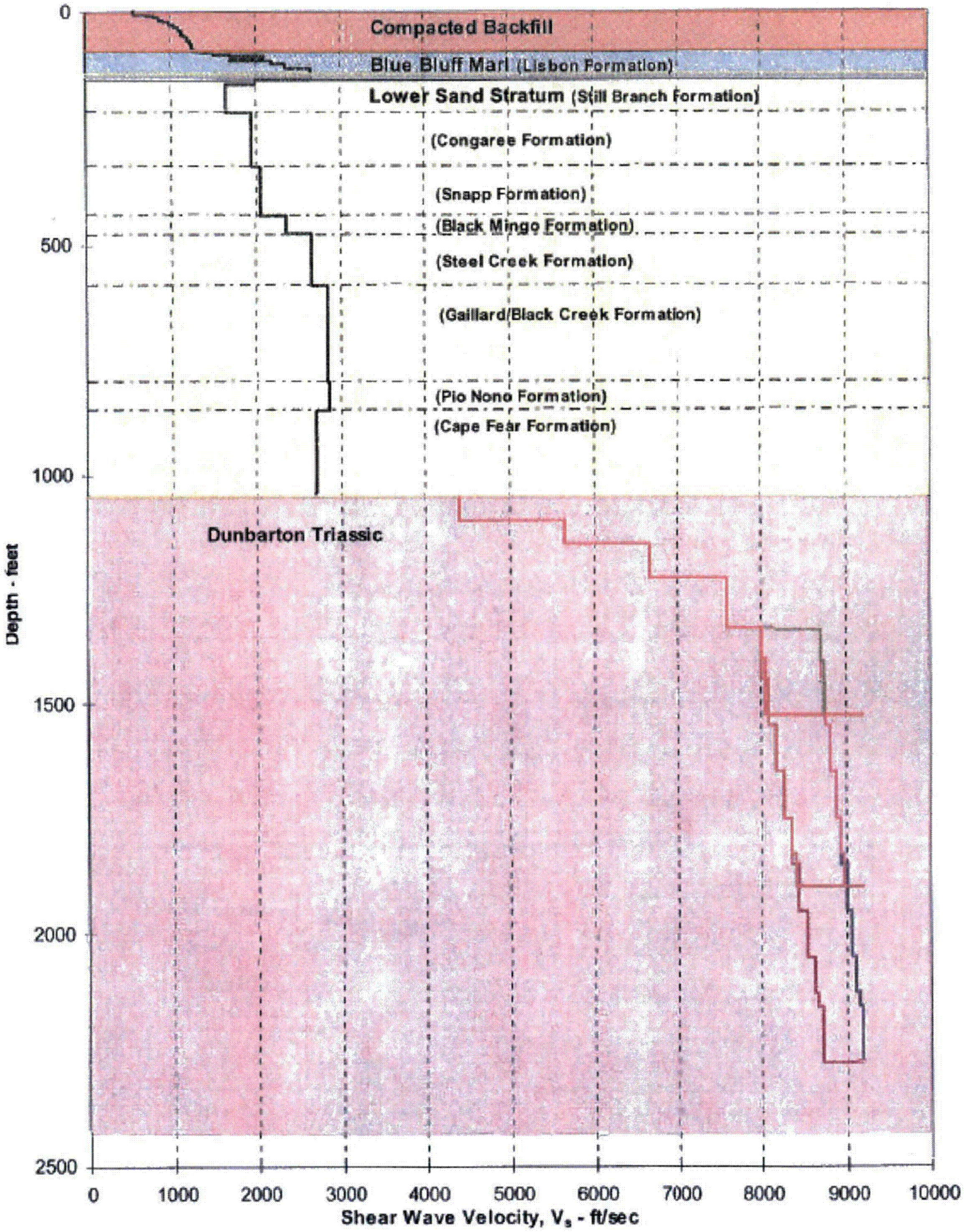

Figure 2.5.4-7 Shear Wave Velocity Profile for SHAKE Analysis

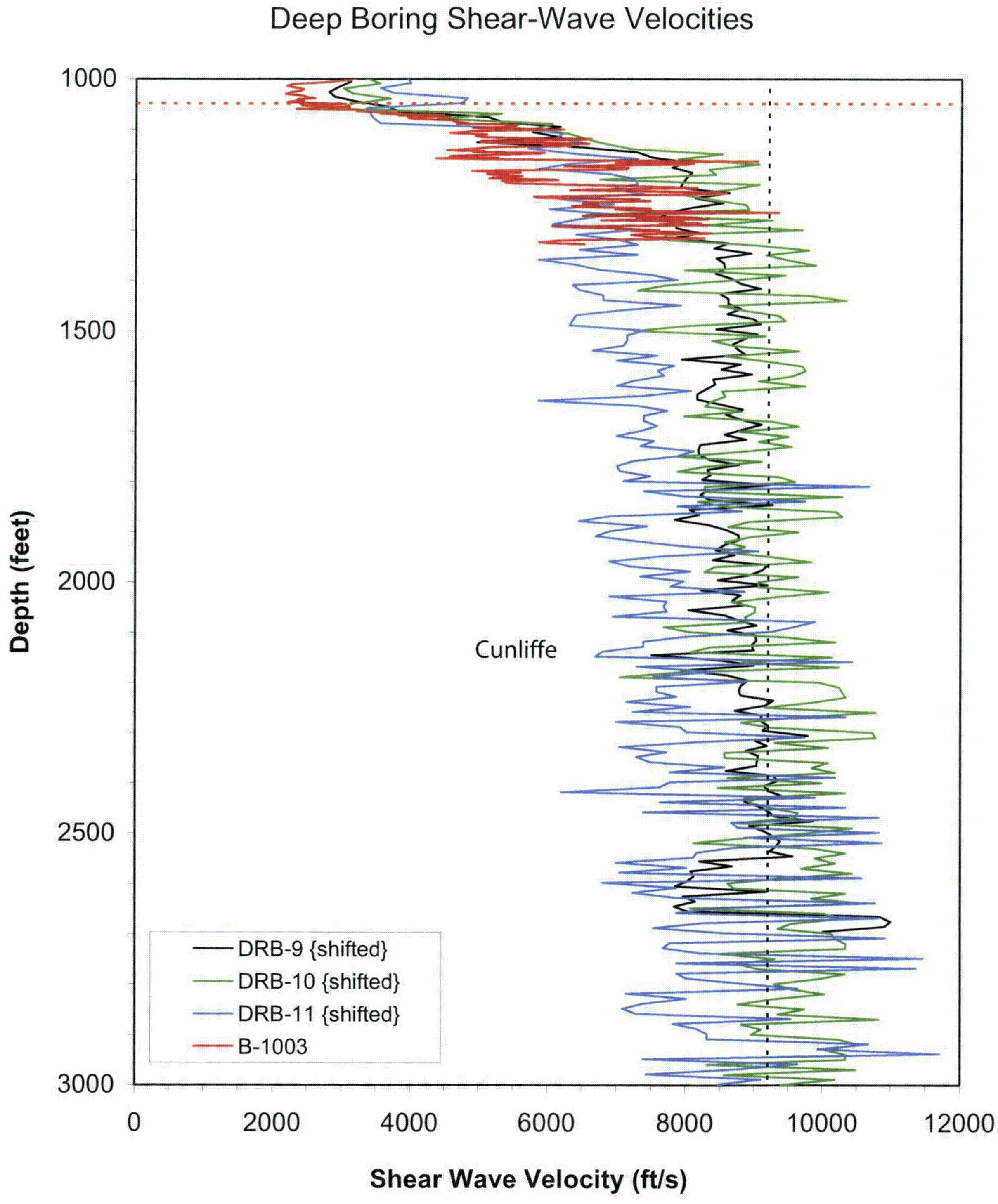

Figure 2.5.4-8 Rock shear-wave velocities for three SRS sites [DRB] (SRS 2005) and B-1003 (Figure 2.5.4-6]. The DRB data has been shifted in depth so that the depth to top of rock is consistent with B-1003.

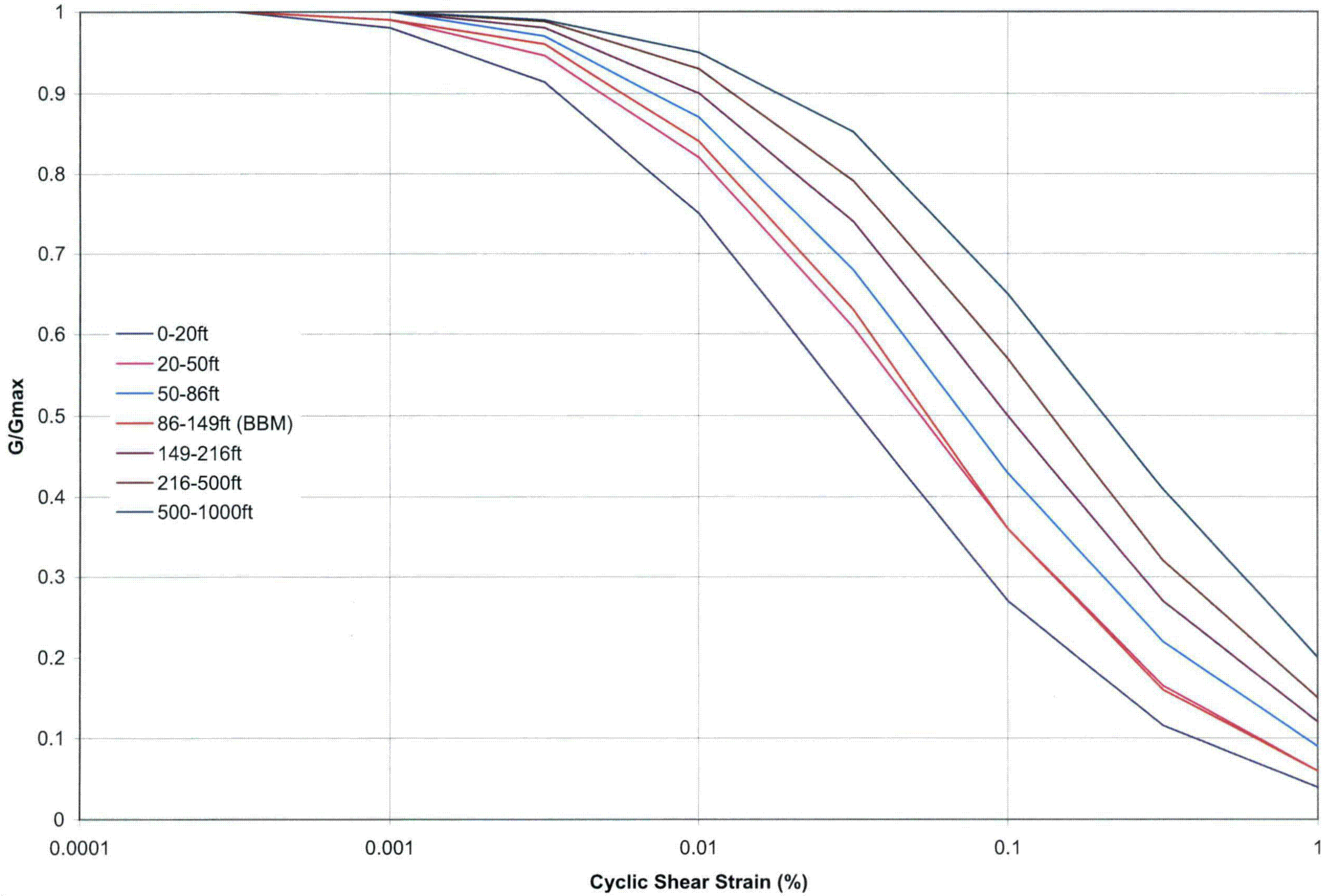

Figure 2.5.4-9 Shear Modulus Reduction Curves for SHAKE Analysis – EPRI Curves

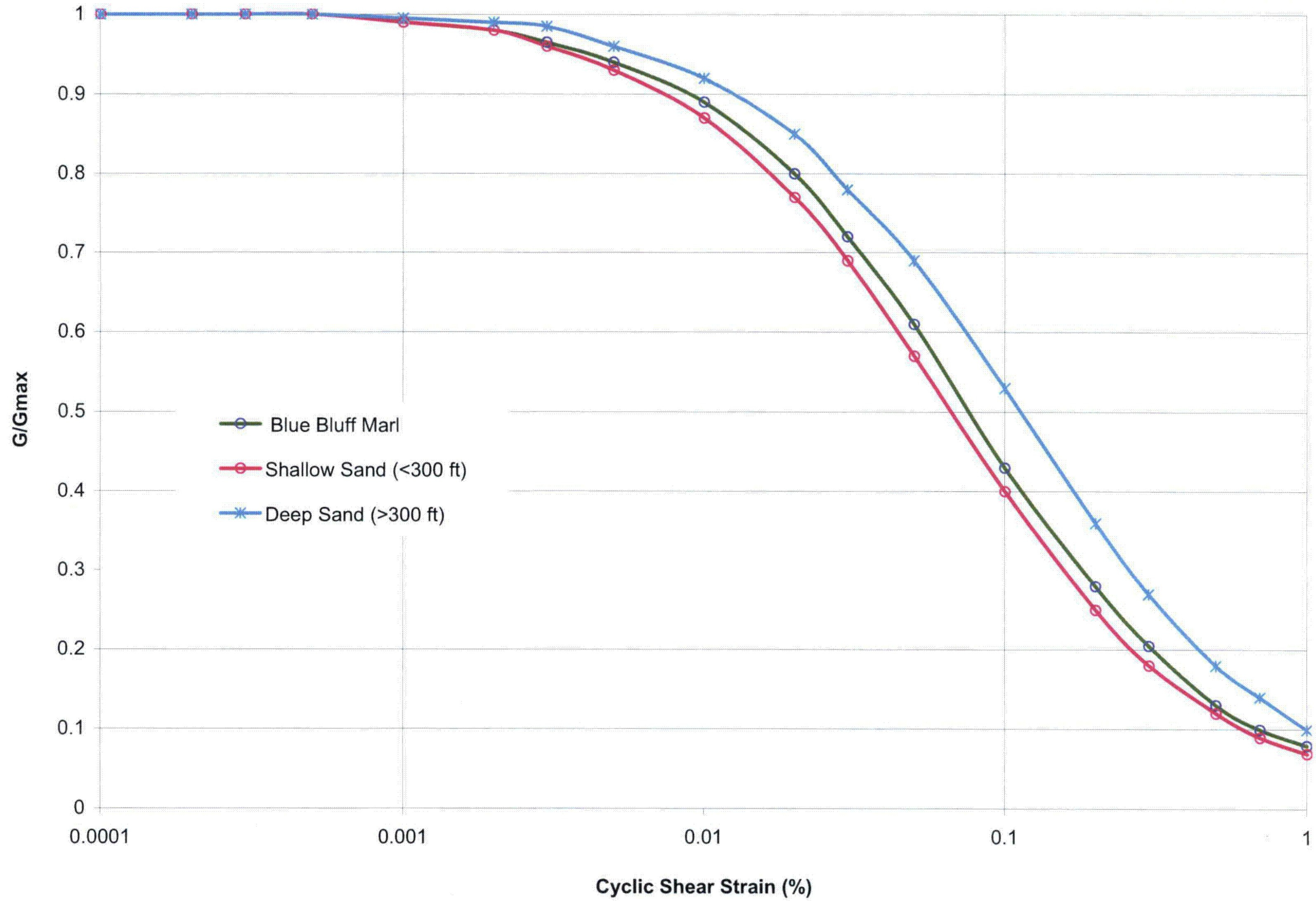

Figure 2.5.4-10 Shear Modulus Reduction Curves for SHAKE Analysis – SRS Curves

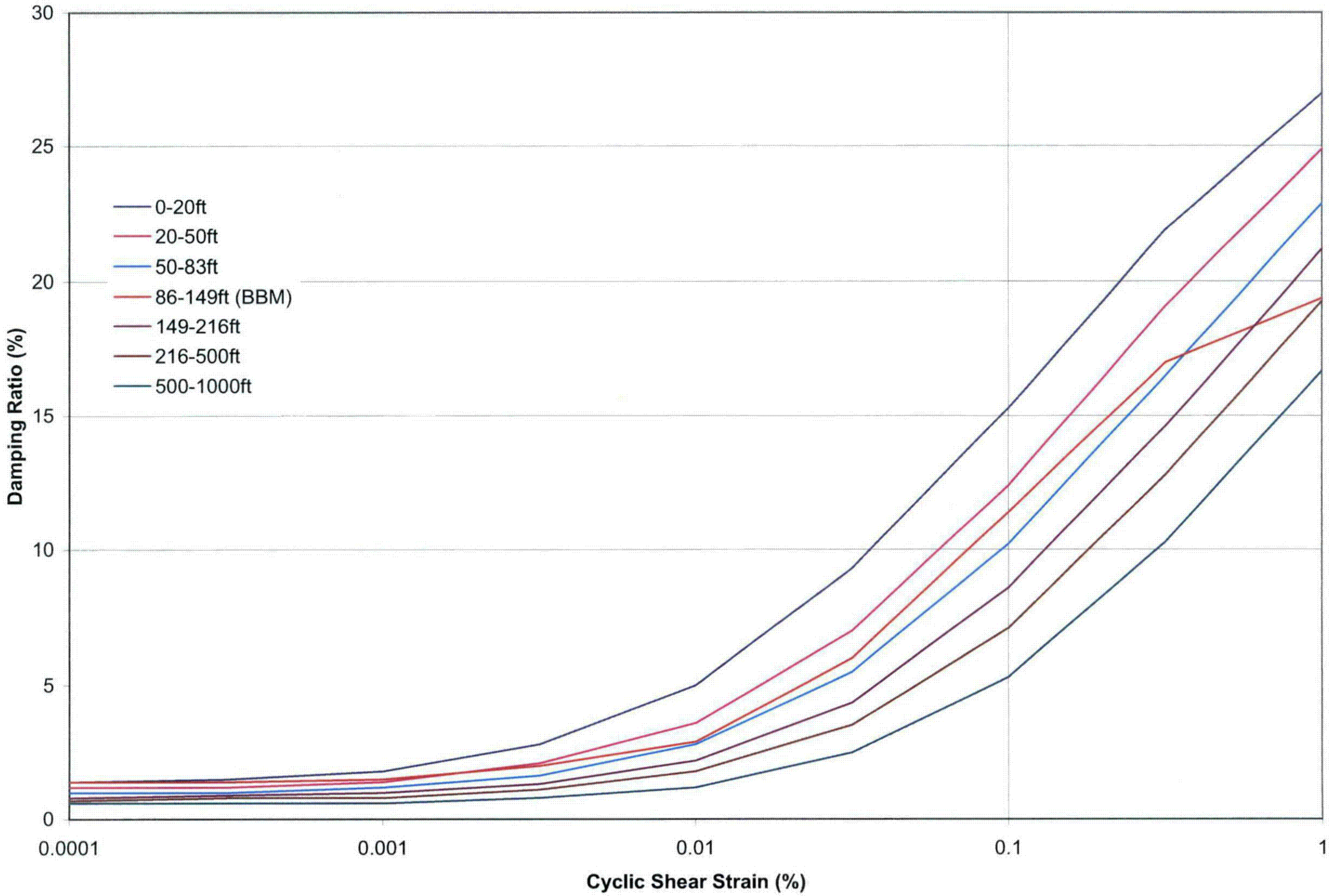

Figure 2.5.4-11 Damping Ratio Curves for SHAKE Analysis – EPRI Curves

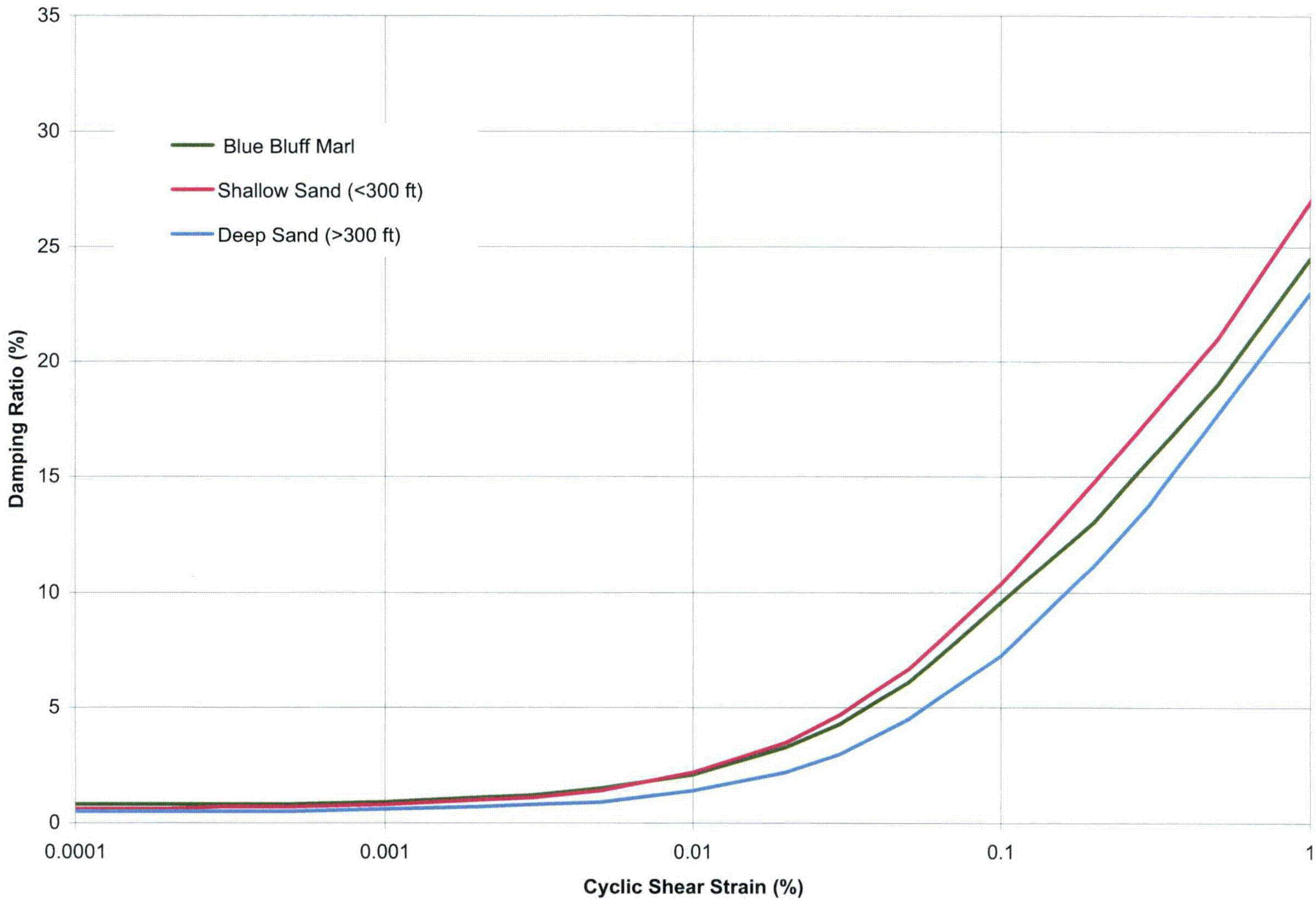

Figure 2.5.4-12 Damping Ratio Curves for SHAKE Analysis – SRS Curves

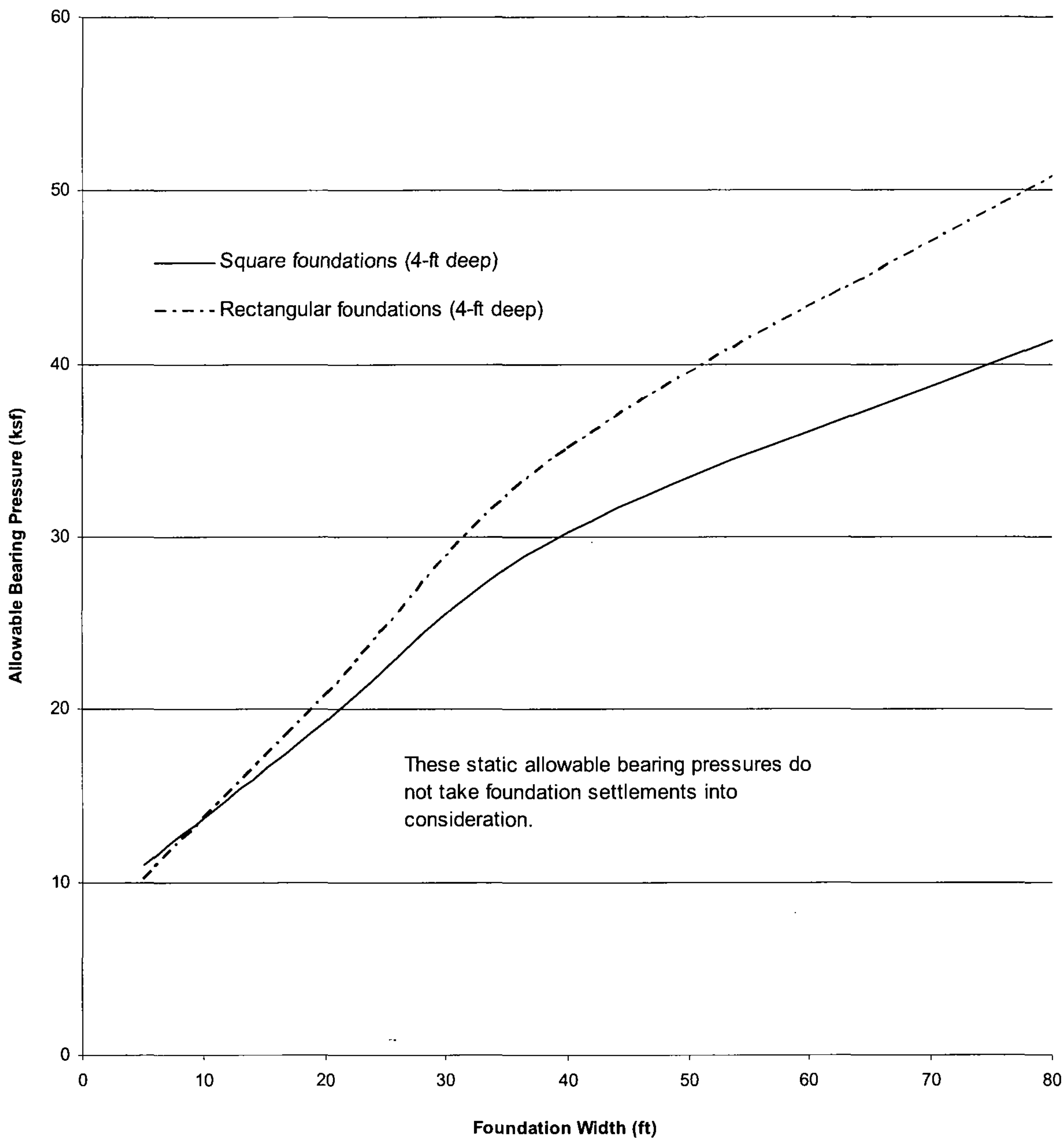

Figure 2.5.4-13 Allowable Bearing Capacity of Typical Foundation

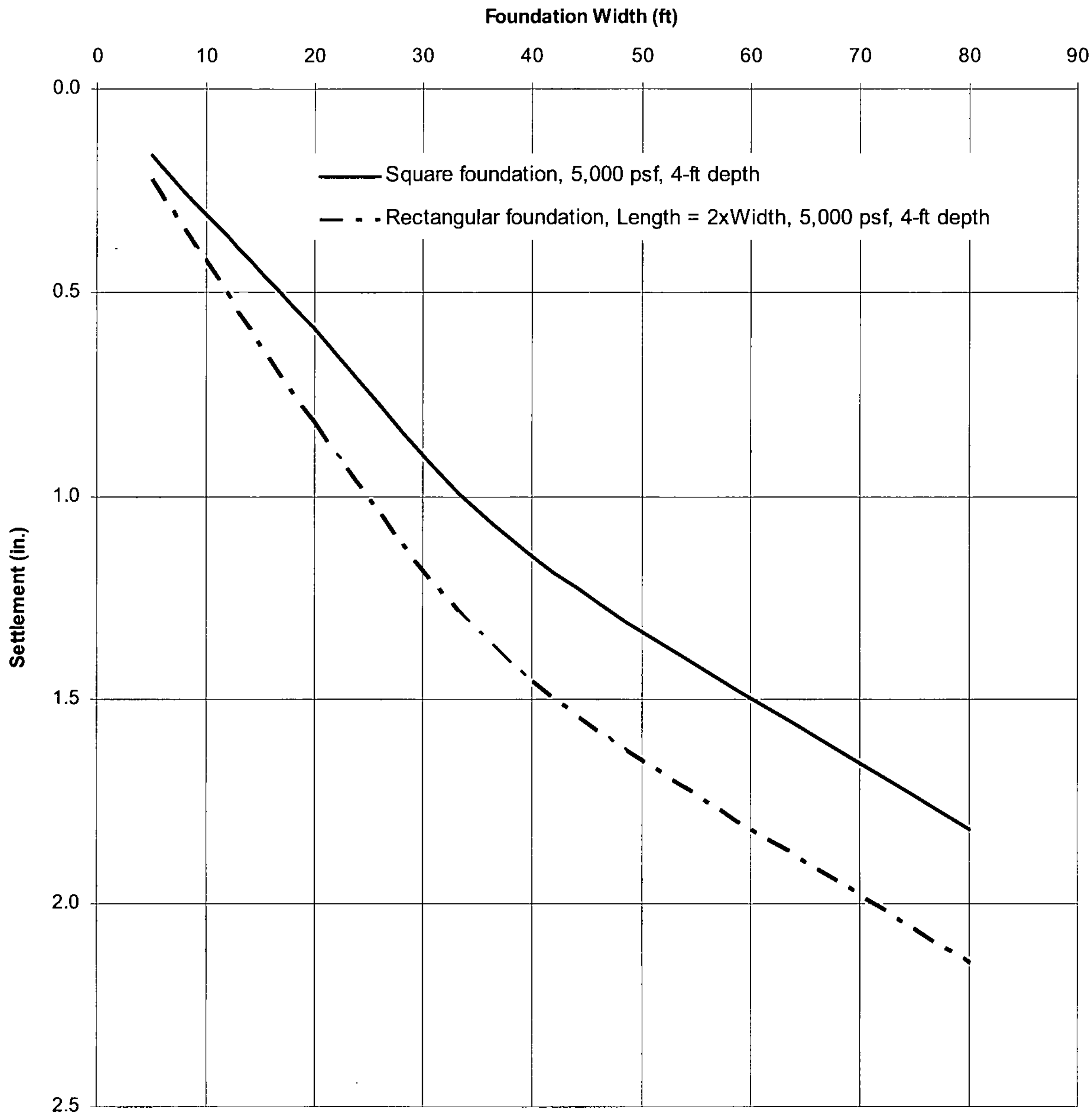

Figure 2.5.4-14 Settlement of Typical Foundations

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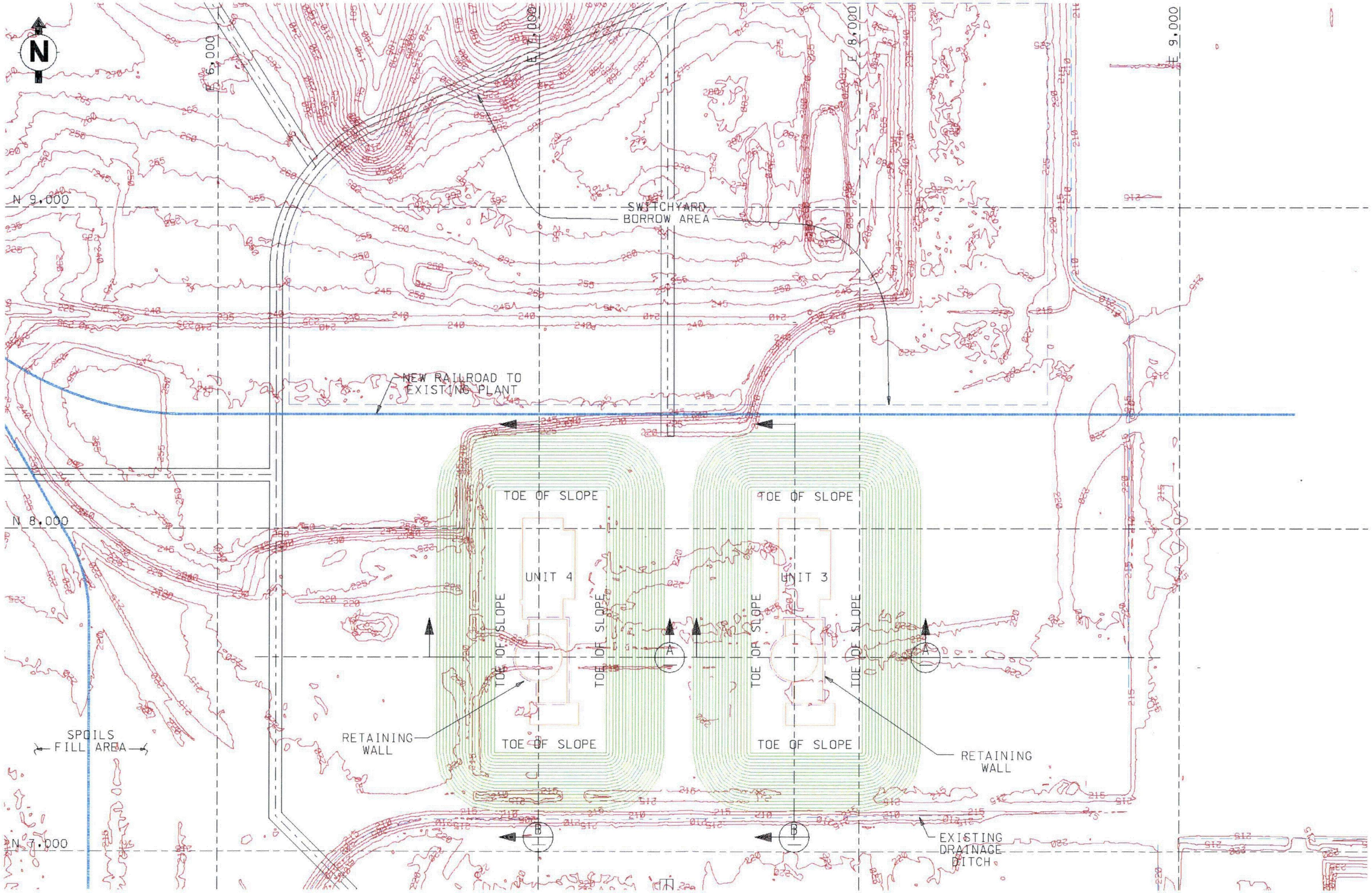

Figure 2.5.4-15 Power Block Excavation and Switchyard Borrow Area

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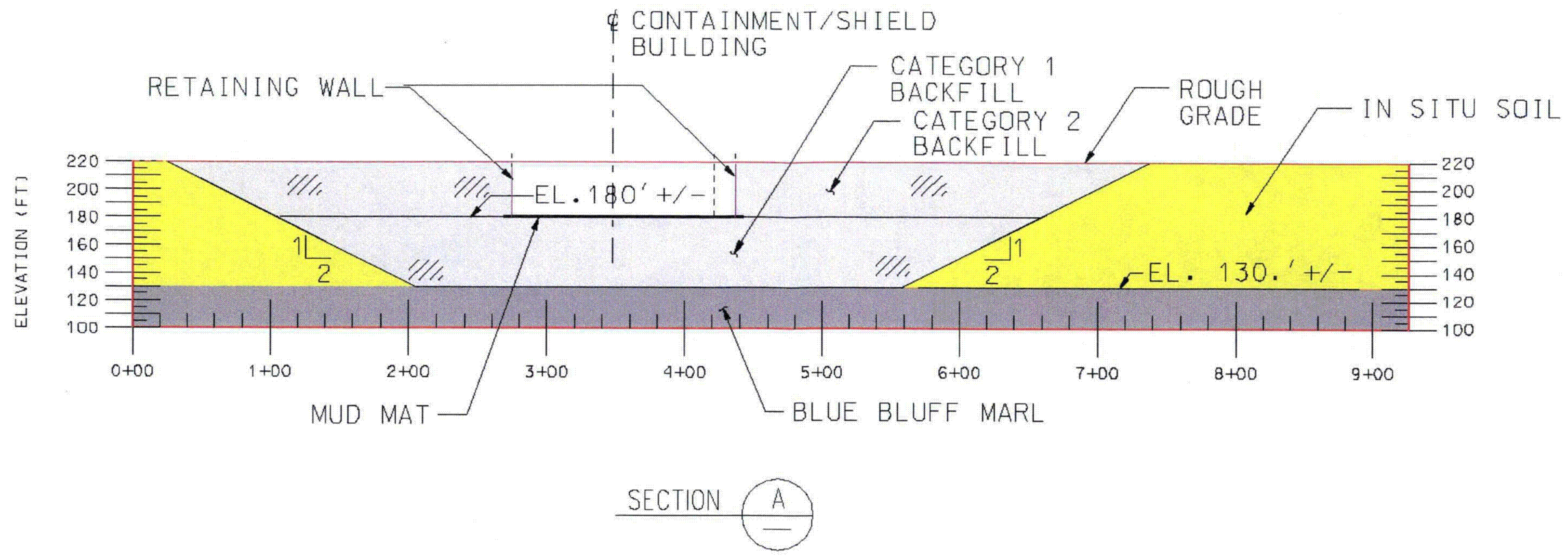

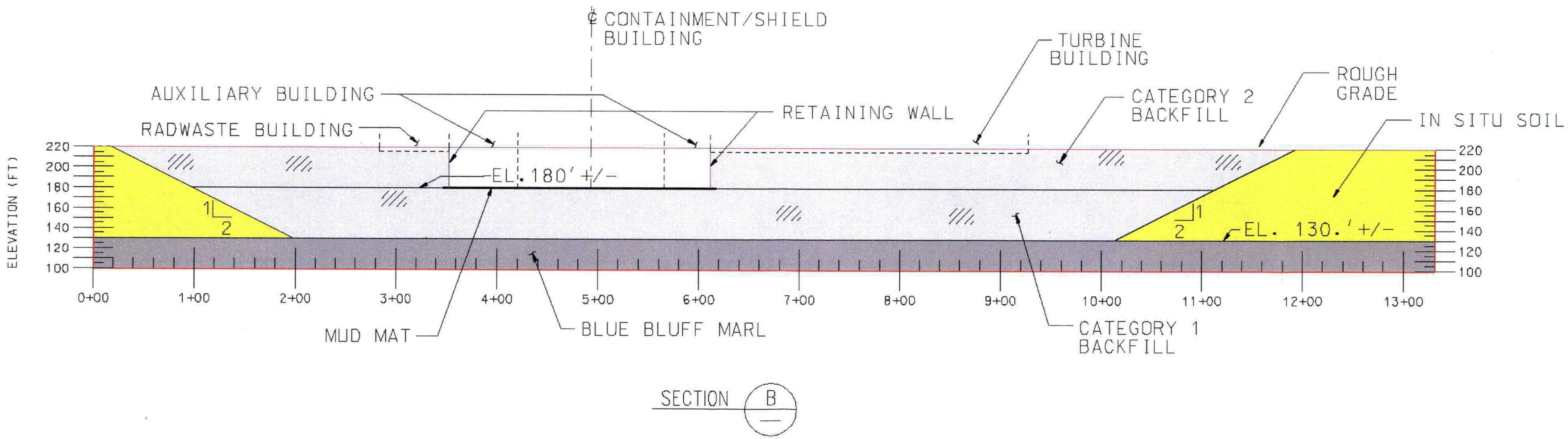

Figure 2.5.4-16 Power Block Excavation Sections

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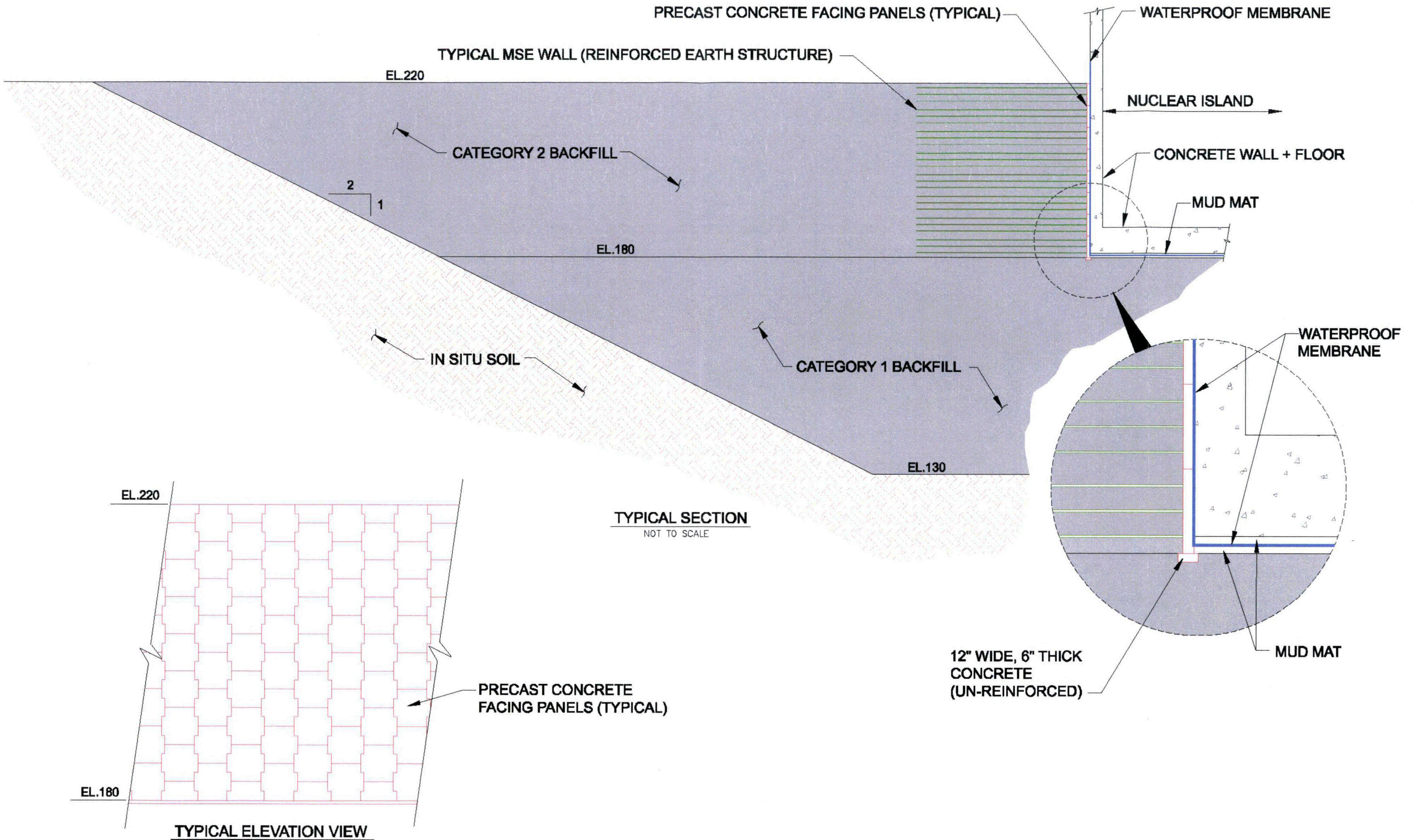

Figure 2.5.4-17 Nuclear Island Temporary Retaining Wall

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Vogtle ESP Application Supplement 2-S1

Part 2, Appendix 2.5C

(Including Attachments A through D)

MACTEC

DATA REPORT

RESULTS OF GEOTECHNICAL EXPLORATION AND LABORATORY TESTING
VOGTLE UNITS 3 & 4 COL PROJECT
VOGTLE ELECTRIC GENERATING PLANT

Waynesboro, Burke County, Georgia
July 31, 2007

Prepared By:

MACTEC ENGINEERING AND CONSULTING, INC

ATLANTA, GEORGIA

MACTEC PROJECT NUMBER 6141-06-0286

Submitted To:

GEORGIA POWER COMPANY
c/o SOUTHERN NUCLEAR OPERATING COMPANY

Birmingham, Alabama

SNC SUBCONTRACT NUMBER 7074425

DCN VGCOL 324
Revision 1, 7/31/07

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LIST OF ACRONYMS, SYMBOLS AND TERMINOLOGY

AP1000	Nuclear Technology by Westinghouse Electric Company
ASTM	American Society for Testing and Materials
Bechtel	Bechtel Power Corporation
bpf	blows per foot
c	total cohesion
c'	effective cohesion
C'	bearing capacity index
C_c	compression index
C_e	SPT Energy Ratio to ER=60%
CD	consolidated drained triaxial test
cf	cubic feet
CH	highly plastic clay
CL	clay of low plasticity
C_n	vertical effective stress correction factor for SPT-N
COC	Chain of Custody
COE	Corps of Engineers
COL	Combined Construction and Operating License
CPT	cone penetration test sounding (used in lieu of SCPTU or CPTU where distinction is not important)
CPTU	piezocone penetration test sounding
C_r	recompression index
CU	consolidated undrained triaxial test
Cv	coefficient of consolidation
D_{50}	mean grain size

DCC	Document Control Center
DCN	Document Control Number
DOE	Department of Energy
D_r	relative density
EPA	Environmental Protection Agency
ER	Energy Ratio for Standard Penetration Test
e_o	initial void ratio
fps	feet per second
fr or FR	CPT friction ratio
fs	CPT sleeve stress (also called sleeve friction)
FS	factor of safety
ft	foot or feet
g	acceleration of gravity
G	shear modulus
GPS	Global Positioning System
gINT	Geotechnical Data presentation Software provided by gINT, Inc.
G_{max}	low strain shear modulus
GW	groundwater table or groundwater depth
H	layer thickness
HSA	hollow stem auger
K	soil permeability coefficient (hydraulic conductivity)
K_a	active earth pressure coefficient
K_d	Distribution Coefficient
K_o	at-rest earth pressure coefficient
K_p	passive earth pressure coefficient
kip	1,000 pounds
km	kilometer
ksf	kips per square foot
LL	liquid limit
LL	Live Load, force or pressure
m/sec	meters per second
MACTEC	MACTEC Engineering and Consulting, Inc. f/k/a LAW

MH	high plasticity silt
micaceous	containing mica
ML	low plasticity silt
mm	millimeter
MOD	modified
MSL	mean sea level, ft
M&TE	Measuring and Test Equipment
N-value	Sum of second and third set of recorded blows from the SPT
N60, N_{60}	SPT N-value corrected to 60 percent energy ratio (ER)
N_1	SPT N-value normalized to 1 tsf
$(N_1)_{60}$	SPT N-value normalized to 1 tsf and 60% max. hammer energy ratio (also modified to account for room for liner but no sample liner used for Project)
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
MDD	maximum dry density, pcf (laboratory compaction test)
OCR	overconsolidation ratio
OD	outside diameter
OMC	optimum moisture content, % (laboratory compaction test)
OW	Observation Well
P	P-wave, compressional seismic wave
P	Pitcher Samples (UD, Soil Sampling)
p - q	total stress path strength parameters
p' - q'	effective stress path strength parameters
pH	Index of acidity
p_c or P_c	preconsolidation pressure (also called σ_c')
p_o or P_o	existing vertical effective stress (also called σ_o')
pcf	pounds per cubic foot
pci	pounds per cubic inch
PDA	pile driving analyzer
PI	plasticity index
PL	plastic limit
Pitcher	Pitcher Sampler (Undisturbed (UD) soil sampling, also see ST)

psf	pounds per square foot
psi	pounds per square inch
QA	quality assurance
QAPD	Quality Assurance Project Document
QAR	Quality Assurance Representative
Q_a	allowable bearing pressure
q_c or Q_c	measured CPT tip resistance
$Q_{t,}$, q_{NT}	normalized CPT tip resistance $Q_t = (q_t-\sigma_{vo})/ \sigma'_o$
$q_{t,}$, qT	CPTU tip stress corrected for unequal area effects
$(q_c)_1$	CPT tip resistance normalized to 1 ton per square foot
QC	quality control
RC	Relative Compaction
RCTS	Resonant Column Torsional Shear (Laboratory Test)
REC	Recovery (SPT Samples, UD Samples)
ReMi	Refraction Microtremor Testing
r_u	pore water pressure ratio = $\Delta u/\sigma_0'$
SC	clayey sand
SCPTU	seismic piezocone penetration test sounding
slickenside surface	parting surface in sample with particles oriented parallel to surface, giving shiney appearance
SM	silty sand
SNC	Southern Nuclear Operating Company, Inc.
SP	poorly graded sand
SPT	Standard Penetration Test
Specification	1) SNC Technical Specification AR01-0000-XGS-2001, Version 1.0, Issued 9/20/06 Subsurface Investigation and Laboratory Testing.
SRP	Standard Review Plan
ST	Shelby tube (undisturbed (UD) soil sampling)
STD	standard
STDEV	standard deviation (also known as σ)
S_u	undrained shear strength
t	time
TP	Test Pit

tsf	tons per square foot
TX	triaxial
UD	undisturbed (soil sampling, either ST (Shelby Tube), pushed or P (Pitcher Sample), drilled
US	United States
USCS	Unified Soil Classification System (e.g. SM. SC, etc.)
USNRC	U. S. Nuclear Regulatory Commission
UU	Unconsolidated Undrained Triaxial Test
VEGP	Vogtle Electric Generating Plant
v_s	S-wave velocity (Shear wave velocity)
$(v_s)_1$	S-wave velocity normalized to 1 ton per square foot
WI	Work Instruction
WC or W	water content (moisture content)
α	total stress path angle
α'	effective stress path angle
ε or γ	normal strain or shear strain
ε_r or γ_r	reference strain
ϕ	total stress friction angle
ϕ'	effective stress friction angle
γ	unit weight of soil
γ_s	saturated unit weight of soil
γ'	effective or buoyant unit weight of soil, $\gamma_s - \gamma_w$
γ_w	unit weight of water
ρ	mass density of the soil
σ	standard deviation
σ_1, σ_3	principal normal stresses
σ_c'	preconsolidation pressure
σ_o'	initial effective vertical stress
σ_v'	effective vertical stress
σ_{vo}	initial total vertical stress
τ	shear stress
υ	Poisson's ratio

SECTION 1
OVERVIEW

1.1 INTRODUCTION

MACTEC Engineering and Consulting (MACTEC) was retained by Georgia Power Company by and through its agent Southern Nuclear Operating Company (SNC) to conduct a geotechnical exploration and associated laboratory testing at the Vogtle Units 3 & 4 COL Project Site. The site is located adjacent to the existing Vogtle Electric Generating Plant (VEGP) near Waynesboro, Burke County, Georgia. MACTEC executed these services per SNC Subcontract Number 7074425.

The geotechnical services were completed as part of the combined construction and operating license (COL) project for SNC. The field work commenced on November 7, 2006 and was substantially completed on April 20, 2007.

The Scope of Work was defined in Section 1.0 of the Technical Specification, SNC Technical Specification AR01-0000-XGS-2001, Version 1.0, Subsurface Investigation and Laboratory Testing. The scope of work is briefly described below:

- Prepare and submit a quality plan (Quality Assurance Project Document).
- Submit a qualified Safety Program.
- Submit a Work Plan.
- Provide quality assurance inspectors (surveillance) of the field and laboratory work activities.
- Perform a utility location survey using one or more approved method at each exploration point prior to starting work.
- Obtained necessary permits to accomplish work.
- Drill geotechnical borings at locations specified by Bechtel, adjust as necessary and as approved by Bechtel's representatives to accommodate access and utility conflicts. Geotechnical borings were completed at locations identified in Tables 2A and 2B.
- Conduct Standard Penetration Testing (SPT) to obtain samples of soil and undisturbed sampling of soil as directed by Bechtel field representatives.
- Prepare field logs for all drilling and sampling and transfer all samples to a secure, on-site sample storage facility, provided by SNC.
- Seal all boreholes by grouting.
- Perform electronic cone penetrometer tests (CPT) in 21 locations; perform down-hole seismic tests; perform pore pressure dissipation tests at locations selected by Bechtel. The CPT numbers are identified in Tables 2A and 2B.
- Perform down-hole geophysical logging in 6 locations.
- Perform suspension P-S velocity logging in 6 locations
- Perform four pole field electrical resistivity tests along ten arrays. These are identified on Tables 2A and 2B
- Perform Refraction Microtremor Testing along four arrays. These are identified in Tables 2A and 2B.
- Excavate test pits at 8 locations determined by Bechtel. Obtain bulk samples of the excavated material as directed by the Bechtel field representative. The center of each test pit is identified in Tables 2A and 2B.
- Conduct laboratory testing on soil samples as assigned by Bechtel.

The work was completed under a Quality Assurance Program meeting the Code of Federal Regulations 10CFR50, Appendix B and conforming to the provisions of ANSI/ASME N45.2-1977.

This Data Report describes the field and laboratory testing methods and presents the results.

1.2 PERSONNEL

All work to prepare this report was performed by MACTEC with assistance from SNC in providing office space, office facilities, and sample storage facilities located in the Plant Vogtle Administration Support Building (November through about February) and at the former Vogtle Security Building (February through April). Both of these facilities are located on Plant Vogtle property and are near the proposed Units 3 & 4 Site. After MACTEC completed its work at the site, the soil jar samples were placed in a locked, 40-foot metal storage container located adjacent to the former Vogtle Security Building. Undisturbed samples were stored in a climate controlled room in the former Vogtle Security Building. Upon the completion of field work, all undisturbed samples were transported to the MACTEC Atlanta laboratory. The logistical assistance and White Badge training sessions given to numerous MACTEC and subcontractor personnel provided by Mr. Greg Lee are gratefully acknowledged. Bechtel site representatives during the field work were Mr. Mohab Sabry, Mr. Sami Jabbour, and Mr. Gerald Lefevre. Jose Clemente and John Damm of Bechtel were on site several times during the field work. MACTEC personnel and their responsibilities were:

Wm. Allen Lancaster, P.E., Project Manager
Pieter J. Depree, P.E., Principal Geotechnical Engineer
Matthew F. Cooke, Senior Geologist, Site Superintendent (Site Coordinator)

Rig Geologist/Engineers:

Daniel Atkinson	Dustin Brooks	Christopher Bruce
Rodney Clark	Luke Davis	Chris Gandy
Mandel Harvey	Martha Herrera	Bill Mabie
Gautham Pillappa	Adria Reimer	Bill Sharp
Alexandra Taylor	Stephen Woodham	

Christopher J. Gaskins, Senior Geotechnical Professional, ReMi Testing
Daniel J. Powell, Project Professional, ReMi Testing
Jeremiah Harmon, Staff Geotechnical Professional, ReMi Testing
Alexandra Taylor, Engineer, supervised preparation of gINT Boring Logs
Bill Sharp, Geologist, assisted in preparation of Data Report
Scott Towe, Drilling Manager
James Lane, Geotechnical Laboratory Group Leader
Harry Johnson, Geotechnical Laboratory Manager
John Jedrosko, Quality Assurance Representative
John E. Lynch, Quality Assurance Manager

The organizations that performed on-site work or laboratory testing of samples as part of this effort are listed in Table 1.

1.3 ORGANIZATION OF REPORT

This report and its attachments are organized in the following sequence; this report consists of the transmittal letter; table of contents; list of tables; list of figures; acronyms, symbols and terminology; text; tables; and figures. The attachments are in separate volumes submitted on various dates and are as follows:

Attachment	Contains
A	Survey Data and Test Locations
B	Geotechnical Boring Logs, Geotechnical Test Pit Logs, and SPT Energy Ratio Measurements
C	Cone Penetrometer Test Results
D	Geophysical Test Data (Downhole), Field Electrical Resistivity
E	ReMi Seismic Shear Wave Velocity Measurements
F	Laboratory Testing Data (Geotechnical)
G	Resonant Column Torsional Shear (RCTS) Test Results

1.4 QUALITY ASSURANCE

Quality related activities performed by MACTEC and its subcontractors organizations during the work herein presented were in accordance with the MACTEC Quality Assurance Manual and the MACTEC Quality Assurance Project Document. The MACTEC QA program complies with NQA-1 Subpart 2.20 and to the requirements of 10CFR50 Appendix B.

SECTION 2
TEST METHODS

2.1 SURVEYING

The Surveyor was Toole Surveying Company, Inc. of Augusta, Georgia under direct subcontract to SNC.

The surveying for the project was conducted in two phases. The initial phase was to complete ("stake") the preliminary boring layout based on initial coordinates for test locations provided by the Specification drawings prepared by Bechtel (Drawings 23162-0-CY-0000-00001 and 23162-0-CY-0000-00002, latest revisions). After completing an initial assessment of test locations and potential utility and access conflicts, relocation of some borings were proposed by MACTEC field personnel and approved by Bechtel. The relocated borings were referenced to the staked locations left by Toole Surveying and were tabulated by MACTEC.

Several of the test locations were initially field located by MACTEC, as authorized by Bechtel using a hand-held GPS unit, and/or using a survey tape and a compass to measure from existing known points or other landmarks.

Some of the boring locations required bulldozer clearing to remove vegetation and/or to level the surface for drilling access. The stake marking the location was referenced to offset witness points outside the area to be disturbed, and then re-established after the access was completed. Some locations required multiple holes to be drilled due to drilling difficulties or for SPT energy testing. In all cases, a marked stake was placed in the grouted, abandoned hole to mark the as-drilled location.

The second phase of surveying was performed after the completion of drilling. The surveyor returned to the site and determined the locations and elevations of the actual, as drilled boring and test pit locations. This information is contained in Tables 2A and 2B. Full details are contained in Attachment A.

2.2 UTILITY LOCATION

Utility location was performed by GEOVision, a subcontractor to MACTEC. Prior to the start of, and during the surveying, MACTEC and GEOVision reviewed the available utility drawings of the site area provided by SNC. Utility surveying was performed within a 10 foot radius of most of the exploration points using the following geophysical equipment:

- GSSI SIR 3000 Ground Penetrating Radar with 400 MHz Antenna
- Ditchwitch Subsite 950R Electromagnetic Utility Locator
- Metrotech 810 Electromagnetic Utility Locator
- Fisher TW-6 Deep Search Pipe Locator/Metal Detector

In general, the utility location procedures consisted of the following for each location:

- Visually inspect the area surrounding each location for evidence of subsurface utilities (maholes, valve boxes, etc.).
- Delineate the surface trace of identified utilities and mark their surface trace using a color code established by the American Public Works Association.
- Scan the target area with an 8 KHz signal connected directly to water and/or electric to identify any utilities that the signal bleeds into.

- Scan the site with the utility locator in passive 60 Hz and Radio modes to locate any active electrical lines not already located.
- Screen the clearance area using the Fisher TW-6 to identify abandoned conduits that have no surface expression.
- Conduct perpendicular GPR traverses throughout the target area tracing any additional pipes/cables encountered.
- Hold the Metrotech 810 transmitter over the target and circle at an approximate 40-foot radius tracing and marking any additional pipes/cables encountered.
- Daily Field Summaries and sketches showing the utilities encountered at each location and any recommended exploration point offset were prepared and submitted to the MACTEC Site Superintendent.

Utility survey as described above was not performed in some locations. These locations included undisturbed wooded areas where there was no evidence to indicate that underground utilities might exist. In all cases where utility survey was not performed, MACTEC and/or SNC's site representative reviewed the available utility drawings and obtained approval from SNC prior to drilling.

2.3 DRILLING EQUIPMENT/METHODS

Drilling equipment mobilized to the site included the following:

Hammer Serial Marker	Owner	Drill Rig	Driller	Drill Rod Type (1)
100	MACTEC	Dietrich D-50	Gary Skoglund	AWJ
165952	Gregg Drilling	CME-850	Marshall Burnett	NWJ/AWJ
200587	MACTEC	CME-75	Tony Christian	NWJ
211797	MACTEC	CME-75	Jimmy Warren	NWJ
219505	MACTEC	CME-55	Wayne Melvin	N3
219907	MACTEC	CME-75	Jimmy Oglesby/John Rosser	N3
270256	Miller Drilling	CME-85	Glen Bilbrey	NWJ
311025	Gregg Drilling	CME-55	Brian Giesecke	NWJ
328848	AE Drilling	CME-750	Kevin ("KW") Warren	NWJ
331145	MACTEC	CME-55LC	David White	AWJ
337153	MACTEC	CME-550	Robert Banks	AWJ
X02958	Gregg Drilling	Fraste Multidrill XL	Bill Poole/Marshall Burnett	NWJ
N/A	Gregg Drilling/Gregg In-Situ	20Ton CPT Track-Mounted	Aguilar	N/A (CPT Rig)

(1) AWJ rod is approximately 1.75" O.D., N3 Rod is approximately 2.375" O.D., NWJ rod is approximately 2.625" O.D.; N/A = Not applicable; CPT = Cone Penetration Test

In addition, rubber-tired highway-type water tanker trucks were utilized to haul water for the drill rigs from the on-site water source. Initial site access clearing was performed by Vernon Wallace under subcontract to SNC using a DC8 bulldozer. Mr. Wallace also visited the site several times during the course of the project to perform additional clearing as needed.

A John Deere Model 310G rubber-tired backhoe/front-end loader from Hertz Equipment Company was leased by MACTEC and used for minor clearing and other miscellaneous loading and unloading tasks during the course of the project.

Borings were advanced in soil using mud rotary wash drilling techniques, with the exception of one boring, B-3002A, which was drilled using hollow stem augers for SPT Energy Test purposes. Water used for drilling at the majority of the boring locations was obtained from an on-site potable water supply discharge point. Water used for drilling in floodplain areas near the Savannah River was pumped directly from the river to the drill rigs.

Temporary flush-threaded steel casing (3 or 4 inch size) was installed to various depths in many of the boreholes due to drilling fluid circulation loss and/or borehole cave-in. The temporary steel casing was removed upon completion of the borehole. Permanent steel (6-inch threaded and coupled) and PVC (6-inch flush threaded) casing was installed and grouted in-place in several boreholes in which geophysical testing and/or undisturbed sampling using the Pitcher rotary sampler was performed.

All boreholes and the grouted-in PVC and steel casings plus the CPT locations were filled prior to demobilizing from the site using a cement-bentonite grout. The grout was placed by pumping through a tremie pipe. The grout mixture in Specification Section 3.3.13 (approximately 8 gallons of water and 2.5 pounds of bentonite per 94 pound sack of cement) was used. As requested by SNC, boreholes in which permanent steel or PVC casing was installed were left approximately two feet above ground, capped, and painted bright orange.

2.4 <u>SPT ENERGY MEASUREMENTS</u>

SPT energy measurements were made on the drill rigs performing standard penetration testing (SPT). Energy measurements were recorded during sampling at the depth intervals shown in the SPT Energy Ratio Measurement Reports in Attachment B. The length of the drill rod string, including the instrumented drill rod insert for each sample was generally 4 feet longer than the depth of the sample being collected.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAK and calibrated accelerometers and strain gages. A section of appropriately sized drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT automatic hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod.

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t

The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed were tabulated and averaged to obtain the average measured energy at each depth tested. The ratio of the average measured energy to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR.

The ETR range of the automatic hammers used at the site is 70.1% to 90.2% of the theoretical potential energy. These ETR values are within the range of typical values for automatic hammers. The ETR values (as percent of the theoretical value) are shown in the SPT Energy Ratio Measurement Reports in Attachment B.

2.5 SAMPLING IN GEOTECHNICAL BORINGS

2.5.1 Standard Penetration Test Sampling (SPT)

Soil sampling in the borings using the SPT was conducted at intervals of 2.5 feet within the upper 15 feet and thereafter at 5 to 10 foot intervals using equipment and methods described in ASTM D 1586. For one boring in each Power Block area, the 2.5 ft sample interval was used to the full depth of the boring to accomplish continuous sampling. Automatic Hammers were used to perform the SPT tests. The sampler was typically driven 18 inches in soil with the number of hammer blows recorded for each six inch interval of penetration. In very hard soils, the test was terminated at 50 blows and the actual penetration recorded, (e.g., 50 blows / 3 inches).

The split tube sampler was opened at the drill site and the recovered materials were visually described and classified by MACTEC's rig geologist or engineer. A selected portion of the sample (typically the material for the lower portion of the sample) was placed in a glass sample jar with a moisture proof lid. Sample jars were labeled, placed in cardboard boxes, and transported to the on-site storage area.

2.5.2 Undisturbed Sampling

Undisturbed soil samples were taken when directed by Bechtel, using a 3-inch diameter thin-walled tube sampler in accordance with ASTM D 1587.

When subsurface material was too dense or hard to allow satisfactory samples to be recovered by pushing the tube sampler into the material using the drill rig hydraulics, a Pitcher sampler was used where requested by Bechtel. The Pitcher is a rotary sampler that drills the 3-inch diameter tube into the subsurface material. All undisturbed samples were sealed at the top and bottom against moisture loss, labeled, kept in an upright condition and transported to the climate-controlled on-site storage area following ASTM D4220.

2.6 BORING LOGS

The soil description on the boring logs in Attachment B are based on the field descriptions (ASTM D 2488) by the rig geologist or engineer, modified according to ASTM D 2487 where lab test results are

available. The water depths on these boring logs are from observations during drilling. Because water was introduced during rotary and core drilling, the water depths on the boring logs may not represent the stabilized water depths. The boring logs in Attachment B were prepared using the computer program "gINT" (Version 7). Electronic files with gINT data were provided with Attachment B.

2.7 SAMPLING IN GEOTECHNICAL TEST PITS

Test pits were excavated at eight locations identified by Bechtel (field-located). A track-mounted backhoe (Caterpillar 315L) was used to excavate the pits. The Bechtel field representative selected the materials to be sampled. A MACTEC rig geologist or engineer collected the bulk samples. As approved by Bechtel, the bulk samples were placed in new 5-gallon plastic buckets with handles for carrying. Two buckets of each sampled material were obtained. Glass jar samples were also obtained and sealed for moisture retention. The backhoe was used to backfill the test excavation using the excavated materials. The backfilled materials were tamped in-place using the backhoe. The rig geologist or engineer placed a stake for later survey location.

The buckets and jar samples were labeled and transported to the on-site storage area. The rig geologist or engineer prepared a Geotechnical Test Pit Log based on visual description of the excavated materials according to ASTMD 2488. These descriptions were modified according to ASTM D 2487 where lab test results are available. The Geotechnical Test Pit Logs are included in Attachment B. The surveyed locations of the test pits are contained in Attachment A and Tables 2A and 2B herein.

2.8 CONE PENETOMETER TESTING

Locations for 21 Cone Penetrometer Tests, (CPT) were included in the original scope of work for this project. Specified probe depths were to a depth of 120 feet or to refusal, whichever came first. Refusal is defined as reaching the full thrust loading capable of being applied by the CPT vehicle or to a thrust condition that if exceeded would (in the opinion of the CPT Supervisor) potentially damage the cone or rods.

CPT testing was completed by Gregg In-Situ, Inc. (Gregg), a subcontractor to MACTEC. Gregg utilized a 20 ton self-contained rig mounted on a tracked ATV carrier to complete the work. Seismic testing was completed in eight of the CPTs at intervals of one meter. Pore pressure dissipation tests were performed in seventeen of the CPTs. All testing was done in accordance with project Specifications and ASTM 5778. The CPT Data is found in Attachment C.

2.9 BOREHOLE GEOPHYSICAL LOGGING

Downhole geophysical logging was performed in 6 borings as required by the Specifications. GEOVision, a MACTEC subcontractor, performed this work in accordance with ASTM D 5753. The results are found in Attachment D. The following downhole geophysical logs were performed in the selected borings.

2.9.1 Natural Gamma

Gamma logs record the amount of natural gamma radiation emitted by the soil and rocks surrounding the boring.

2.9.2 Long and Short Normal Resistivity

Normal-resistivity logs record the electrical resistivity of the borehole environment and surrounding rocks and water as measured by variably spaced potential electrodes on the logging probe. Typical spacing for potential electrodes are 16 inches for short-normal resistivity and 64 inches for long normal resistivity. Normal resistivity logs are affected by bed thickness, borehole diameter, and borehole fluid and can only be collected in water or mud filled open holes.

2.9.3 Three Arm Caliper

Caliper logs record borehole diameter. Changes in borehole diameter are related to boring construction, such as casing or drilling bit size, and to fracturing or caving along the borehole wall. Because borehole diameter commonly affects log response, the caliper log may be useful in the analysis of other geophysical logs.

2.9.4 Data

Data was recorded in digital format and are contained in Attachment D. Also contained in Attachment D are printouts of the geophysical logs and the associated lithology.

2.10 SUSPENSION P-S VELOCITY LOGGING

Suspension P-S velocity logging was performed in 6 borings as required by the Specifications. Compression (P) and shear (S) were velocity measurements were made at 1 meter intervals or less. Attachment D contains the results.

2.11 FIELD ELECTRICAL RESISTIVITY TESTING

Field electrical resistivity testing was performed along 10 arrays in the proposed switchyard, the 230 kV switchyard, the cooling towers, and the circulating water line areas of the site. The locations and array lengths were adjusted from those in the Specifications with approval of Bechtel due to topographic features, man-made obstructions, or extensive clearing requirements associated with the initial locations. The Wenner four electrode method was used to perform the tests in accordance with ASTM G57. Electrode spacing ranging from 3 feet up to 300 feet were used in order to determine the soil resistivity at increasing depths. The resistivity data interpreted from the tests are contained in Attachment D.

2.12 REFRACTION MICROTREMOR (REMI) TESTING

ReMi surveys were performed at four locations (arrays) at the site. The as-built coordinates for each array location are contained in Attachment A. The data was processed using SeisOpt® ReMi™ software to reveal a one-dimensional average shear-wave (S-wave) velocity structure up to a depth of 100 feet for each array per Work Instructions VGCOL 125, 126, 127, and 128. A report detailing the equipment used, the data acquisition and processing steps, and the results are included as Attachment E.

SECTION 3
SAMPLE STORAGE

3.1 ON-SITE SAMPLE STORAGE FACILITY

Consistent with MACTEC's QAPD Requirements, on-site sample storage facilities were established. The sample storage facilities were located in the Plant Vogtle Administration Support Building (November through February) and at the former Vogtle Security Building (February through April). Both of these facilities are located on Plant Vogtle property and are near the proposed Units 3 & 4 Site. During MACTEC's residence at the Administration Support Building, boxes containing disturbed jar samples were stored in numerical order on tables around the perimeter of a large meeting room which served as MACTEC's field office. Undisturbed samples were stored in an office located off of the large meeting room. The MACTEC work area within the Administration Support Building was locked daily and patrolled by Plant Vogtle Security.

MACTEC re-located to the former Vogtle Security Building in February 2007. At this facility, disturbed jar samples were moved to a lockable 40-foot metal storage container located adjacent to the old Vogtle Security Building. The undisturbed samples were stored upright in racks in a climate controlled room inside the former Vogtle Security Building. Plant Vogtle Gate #13, which leads to the former Vogtle Security Building, was locked nightly. The area was also patrolled frequently by Plant Vogtle Security personnel.

Samples were transported daily from the field to the sample storage area(s) by the rig geologists/engineers. SPT samples were transported as Group "B" samples in their compartmentalized cardboard boxes, each labeled to show the contents therein. The UD samples were transported according to ASTM D4220, Group C samples.

Since copies of the field boring logs were kept at the facility, their logs served as the sample inventory for the storage facility. A chain of custody form was completed for all samples removed from the facility.

3.2 LABORATORY SAMPLE STORAGE FACILITY

All of the undisturbed samples and disturbed jar samples selected for laboratory testing by Bechtel, were transported to the MACTEC laboratory in Atlanta, Georgia. The samples were transported in accordance with ASTM D4220 requirements for Group C (Undisturbed samples), and Group B samples (disturbed jar samples). The samples are stored in a lockable, climate controlled room within the MACTEC Atlanta laboratory.

SECTION 4
LABORATORY TESTING - GEOTECHNICAL

Laboratory testing was performed on disturbed, undisturbed, and remolded soil samples obtained during the subsurface investigation. All testing was performed in accordance with ASTM standards or other standards where applicable. Selection of the samples to be tested and the tests to be performed on the samples were made by Bechtel. Bechtel provided thirteen separate Geotechnical Laboratory Test Assignment Sheets. The assignment sheet number (designated by MACTEC) and the final Bechtel revision date are tabulated below.

Laboratory Test Assignment Number	Date of Final Lab Assignment Revision by Bechtel
1	December 4, 2006
2	February 14, 2007
3	February 1, 2007
4	April 16, 2007
5	April 16, 2007
6	February 15, 2007
7	March 12, 2007
8	March 31, 2007
9	April 16, 2007
10	May 4, 2007
11	April 26, 2007
12	May 18, 2007
13	May 25, 2007

The laboratory personnel determined that some of the initially assigned tests on soil samples could not be performed due to insufficient sample volume, laboratory equipment constraints, or other reasons. In these cases, the information was reported to Bechtel who issued a revised laboratory assignment sheet deleting, modifying, or assigning replacement tests on other samples.

Testing of soil samples, except for chemical tests and resonant column torsional shear (RCTS) testing, was performed in MACTEC's laboratories in Atlanta, Georgia, and Charlotte, North Carolina.

Chemical testing for pH, sulfates and chlorides in selected soil samples as assigned by Bechtel was performed by Severn Trent Laboratories, Inc. (STL), a subcontractor to MACTEC.

Resonant Column Torsional Shear (RCTS) testing of soil samples as assigned by Bechtel are being conducted by the Fugro Consultants laboratory in Houston, Texas, a subcontractor to MACTEC, under the technical overview of Dr. K.H. Stokoe of the University of Texas. The tests on the samples selected for RCTS testing, including the classification tests on these samples, when completed will be presented in Attachment G.

Excluding the RCTS tests, the following tests were assigned and performed. The results are presented in Attachment F.

4.1 IDENTIFICATION TESTS

- Moisture content, ASTM D 2216-05
- Atterberg limits, ASTM D 4318-05
- Sieve and hydrometer analysis, ASTM D 422-63 (2002) and ASTM D 6913-04
- Specific gravity of soil, ASTM D 854-06
- Chemical analysis, (pH, Chloride, Sulfate) EPA SW846 9045C and EPA MCAWW 300.0A
- Unit weight of soil, ASTM D 5084-03 (Sections 5.7 – 5.9. 8.1, 11.3.2)

4.2 COMPRESSIBILITY TEST

- Consolidation tests, ASTM D 2435-04

4.3 COMPACTION AND STRENGTH TESTS

- Unconsolidated-undrained triaxial compression, ASTM D 2850-03
- Consolidated – undrained triaxial compression, ASTM D 4767-04
- Direct shear – Soil, ASTM D 3080-04
- Moisture-density, ASTM D 1557-02

4.4 REPORTING

Except for the RCTS tests, the laboratory test reports, consisting of individual test data and results sheets as required by the testing standard, are contained in Attachment F. A summary of the test results on soil samples in Attachment F is found in Table 5 of the Data Report, which is Table F-1 of Attachment F. The RCTS tests, including the data and report reviewed by Dr. K. H. Stokoe, when completed will be found in Attachment G. The classification tests on the RCTS tests, when completed will also be found in Attachment G.

4.5 DESCRIPTIONS

Brief descriptions of the tests performed are contained in Attachment F.

SECTION 5
RCTS TESTING OF SOIL

Resonant Column - Torsional Shear (RCTS) testing of soil samples assigned by Bechtel is being performed by Fugro Consults of Houston, Texas. The results will be reviewed by Dr. K.H. Stokoe of the University of Texas, Austin. These test results as well as the classification tests for the undisturbed samples upon which RCTS testing is performed, when completed will be contained in Attachment G.

List of Tables

Organization	Function
MACTEC Engineering and Consulting, Inc.	USCS Soil Classification (ASTM D 2488); QA Surveillance; SPT sampling; Undisturbed Sampling; Bulk Sampling; borehole abandonment; Geotechnical Laboratory Testing; SPT Energy Measurement on Drill Rigs of MACTEC and Subcontractors, ReMi Testing
Gregg Drilling and Testing, Inc./Gregg In-Situ, Inc.	SPT Tests; Undisturbed Sampling; CPT Tests; borehole abandonment
AE Drilling Services, LLC	SPT Tests; Undisturbed Sampling; borehole abandonment
Miller Drilling Company, Inc.	SPT Tests; Undisturbed Sampling; borehole abandonment
Graves Environmental and Geotechnical Services, Inc.	Steel Casing Installation, borehole abandonment, excavation of test pits
GEOVision	Downhole geophysical logging; natural gamma; short and long normal resistivity; 3 arm caliper; p-s suspension logging; surface electrical resistivity test arrays.
Toole Surveying Company, Inc.	Surveying of borings, CPTs, test pits, ReMi arrays, and surface electrical resistivity test arrays
Wallace Trucking, Grading & Logging, Inc.	Clearing for access and grading as necessary for drill access to boring and CPT locations.
Fugro Consultants – Houston, Texas	RCTS Tests
Prof. K.H. Stokoe, University of Texas / Austiin Consultants	Review of RCTS Tests

Prepared By/Date: Matt Cooke/7-31-07 MC WITH PERMISSION

Checked By/Date: Alexandra Taylor/7-31-07 AT

TABLE 1
ORGANIZATIONS PERFORMING WORK AT THE SITE OR IN THE LABORATORY

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TABLE 2A
TEST LOCATION SUMMARY (DEPTH BELOW GROUND SURFACE)
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Depth (ft, bgs) (1)	Top of Crushed Stone (ft, bgs) (1)	Top of Fill (ft, bgs) (1)	Top of Alluvium (ft, bgs) (1)	Top of Barnwell Group (ft, bgs) (1)	Top of Utley Limestone (ft, bgs) (1)	Top of Blue Bluff Marl (ft, bgs) (1)	Top of Still Branch (ft, bgs) (1)	Top of Congaree Formation (ft, bgs) (1)	Top of Snapp Formation (ft, bgs) (1)
B-1105	165952	SWITCHYARD	1144168.36	620002.76	257.89	148.8	-	-	-	-	0.0	-	-	-	-	-
B-1107	X02958	SWITCHYARD	1144153.75	620916.11	266.66	150.0	-	-	-	-	0.0	128.5	136.5	-	-	-
B-1108	X02958	SWITCHYARD	1144214.07	621273.00	273.56	149.8	-	-	-	-	0.0	122.0	138.5	-	-	-
B-1109	165952	SWITCHYARD	1144180.46	621580.64	276.48	150.0	-	-	-	-	0.0	117.0	131.6	-	-	-
B-1110	165952	SWITCHYARD	1144170.91	622011.31	265.14	150.0	-	-	-	-	0.0	97.0	118.0	-	-	-
B-1111	331145	SWITCHYARD	1144212.59	622333.79	224.90	150.0	-	-	-	-	0.0	71.5	81.8	146.8	-	-
B-1112	331145	SWITCHYARD	1144223.37	622691.31	213.74	23.0	-	-	0.0	-	1.0	-	-	-	-	-
B-1112A	328848	SWITCHYARD	1144219.36	622561.49	227.14	150.0	-	-	-	-	0.0	-	82.0	147.0	-	-
B-1113	331145	SWITCHYARD	1143901.44	620217.17	249.99	170.0	-	-	-	-	0.0	137.0	151.8	-	-	-
B-1116	165952	SWITCHYARD	1143894.12	621264.65	261.82	138.5	-	-	-	-	0.0	117.0	127.0	-	-	-
B-1117	337153	SWITCHYARD	1143890.75	621628.43	263.89	149.3	-	-	-	-	0.0	-	123.5	-	-	-
B-1118	165952	SWITCHYARD	1143885.92	622007.97	257.91	149.4	-	-	-	-	0.0	-	113.0	-	-	-
B-1119	331145	SWITCHYARD	1143888.30	622333.77	223.57	150.0	-	-	-	-	0.0	66.8	81.8	-	-	-
B-1120	219505	SWITCHYARD	1143893.05	622558.49	227.18	149.8	-	-	0.0	-	1.5	82.0	86.8	-	-	-
B-1121	331145	SWITCHYARD	1143575.57	620216.27	241.33	150.0	-	-	-	-	0.0	127.0	142.5	-	-	-
B-1123	337153	SWITCHYARD	1143575.43	620921.98	241.27	150.0	-	-	-	-	0.0	97.0	108.5	-	-	-
B-1124	337153	SWITCHYARD	1143627.62	621421.59	241.21	150.0	-	-	0.0	-	1.5	-	97.0	-	-	-
B-1125	337153	SWITCHYARD	1143586.80	621628.20	240.97	150.0	-	-	-	-	0.0	86.8	96.5	-	-	-
B-1126	211797	SWITCHYARD	1143567.68	621980.43	219.88	150.0	-	-	0.0	-	0.5	-	78.5	142.0	-	-
B-1127	165952	SWITCHYARD	1143573.26	622332.29	219.67	150.0	-	-	0.0	-	2.0	-	78.0	143.0	-	-
B-1128	331145	SWITCHYARD	1143572.65	622682.42	218.26	73.0	-	-	-	-	0.0	16.0	-	-	-	-
B-1128A	331145	SWITCHYARD	1143573.71	622685.46	217.92	148.8	-	-	-	-	-	-	76.5	141.8	-	-
B-1129	211797	POWER BLOCK ROADS	1143278.22	621893.74	221.84	100.0	-	-	0.0	-	1.5	76.8	81.7	-	-	-
B-1130	337153	POWER BLOCK ROADS	1142482.76	622250.00	217.46	99.2	-	-	-	-	0.0	72.0	81.0	-	-	-
B-1131	211797	POWER BLOCK ROADS	1143172.99	621823.06	222.18	98.6	-	-	-	-	0.0	85.0	88.5	-	-	-
B-1132	211797	POWER BLOCK ROADS	1142614.19	621450.08	218.73	100.0	-	-	0.0	-	1.5	81.8	91.8	-	-	-
B-1133	100	POWER BLOCK ROADS	1142968.94	621451.15	221.20	100.0	-	-	-	-	0.0	-	81.0	-	-	-
B-1134	211797	POWER BLOCK ROADS	1143282.88	621104.27	222.04	100.0	-	-	0.0	-	0.5	67.0	86.8	-	-	-
B-1136	211797	POWER BLOCK ROADS	1143178.11	621023.00	221.65	100.0	-	-	0.0	-	0.6	-	91.8	-	-	-
B-1138	331145	HEAVY HAUL ROAD	1143469.69	619192.80	215.82	100.0	-	-	-	-	0.0	-	-	-	-	-
B-1139	211797	POWER BLOCK ROADS	1142289.86	621026.81	216.68	150.0	-	-	0.0	-	1.5	87.0	94.8	-	-	-
B-1140	211797	POWER BLOCK ROADS	1142290.16	621823.56	216.58	150.0	-	-	0.0	-	0.6	83.5	88.5	-	-	-
B-1142	331145	HEAVY HAUL ROAD	1144416.58	620649.58	224.69	100.0	-	-	-	-	0.0	-	-	-	-	-
B-1146	331145	HEAVY HAUL ROAD	1145428.36	622272.08	240.04	98.6	-	-	-	-	0.0	87.0	92.0	-	-	-
B-1148	331145	HEAVY HAUL ROAD	1145537.78	623236.50	218.94	100.0	-	-	0.0	-	3.0	-	69.5	-	-	-
B-1150	331145	HEAVY HAUL ROAD	1145467.29	624235.30	170.69	100.0	-	-	0.0	-	0.5	-	26.5	96.5	-	-
B-1152	331145	HEAVY HAUL ROAD	1145581.68	625227.34	117.05	100.0	0.0	0.5	3.0	-	-	-	6.8	72.0	-	-
B-1153	331145	HEAVY HAUL ROAD	1145568.97	625673.46	103.58	100.0	0.0	0.6	2.5	-	-	-	4.5	51.0	-	-
B-1154	331145	HEAVY HAUL ROAD	1145664.20	626216.06	95.08	98.8	-	-	0.0	21.5	-	-	-	66.5	96.5	-

TABLE 2A
TEST LOCATION SUMMARY (DEPTH BELOW GROUND SURFACE)
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Depth (ft, bgs) (1)	Top of Crushed Stone (ft, bgs) (1)	Top of Fill (ft, bgs) (1)	Top of Alluvium (ft, bgs) (1)	Top of Barnwell Group (ft, bgs) (1)	Top of Utley Limestone (ft, bgs) (1)	Top of Blue Bluff Marl (ft, bgs) (1)	Top of Still Branch (ft, bgs) (1)	Top of Congaree Formation (ft, bgs) (1)	Top of Snapp Formation (ft, bgs) (1)
B-1155	331145	PUMPHOUSE	1147390.34	624936.42	84.95	150.0	-	-	-	0.0	-	-	-	46.5	76.5	-
B-1156	331145	PUMPHOUSE	1147302.50	624571.69	85.70	99.2	-	-	-	0.0	-	-	-	26.5	66.5	-
B-1157	331145	PUMPHOUSE	1147209.56	625062.18	86.77	150.0	-	-	-	0.0	-	-	31.5	49.3	69.4	-
B-1158	331145	PUMPHOUSE	1145194.92	626669.12	88.74	149.5	-	-	-	0.0	-	-	-	51.5	86.5	-
B-1159	331145	PUMPHOUSE	1147285.78	624954.51	88.70	150.0	-	-	-	0.0	-	-	36.5	41.5	66.5	-
B-1161	337153	PUMPHOUSE	1147363.37	624862.14	86.10	150.0	-	-	-	0.0	-	-	-	46.8	71.5	-
B-1162	337153	PUMPHOUSE	1147234.91	624815.03	85.55	200.0	-	-	-	0.0	-	-	-	42.0	76.0	178.8
B-1163	337153	PUMPHOUSE	1147170.58	624938.82	85.95	150.0	-	-	-	0.0	-	-	32.0	52.5	73.0	-
B-1164	337153	PIPE LINE	1146994.84	624518.63	220.50	150.0	-	-	-	-	0.0	62.5	68.5	136.8	-	-
B-1166	337153	PIPE LINE	1147452.97	623961.56	203.40	100.0	-	-	-	-	0.0	-	62.0	-	-	-
B-1168	100	PIPE LINE	1147688.45	623467.78	202.20	100.0	-	-	-	-	0.0	-	57.0	-	-	-
B-1170	100	PIPE LINE	1147423.85	622953.71	223.29	98.9	-	-	-	-	0.0	-	-	-	-	-
B-1172	100	PIPE LINE	1146983.44	622538.70	249.49	100.0	-	-	-	-	0.0	-	-	-	-	-
B-1174	100	PIPE LINE	1146476.06	622228.06	225.81	100.0	-	-	-	-	0.0	-	-	-	-	-
B-1176	100	PIPE LINE	1145876.27	622195.21	221.48	35.0	-	-	-	-	0.0	-	-	-	-	-
B-1176A	100	PIPE LINE	1145878.82	622196.80	221.51	100.0	-	-	-	-	-	35.0	72.5	-	-	-
B-1185	165952	SWITCHYARD	1144716.64	622232.17	226.78	148.9	-	-	-	-	0.0	53.5	83.0	143.0	-	-
B-1186	331145	BATCH PLANT	1144711.88	618818.88	277.51	178.8	-	-	-	-	0.0	-	-	-	-	-
B-1187	331145	BATCH PLANT	1144710.19	619259.61	277.68	150.0	-	-	-	-	0.0	-	-	-	-	-
B-1189	331145	BATCH PLANT	1144459.72	618997.50	279.98	150.0	-	-	-	-	0.0	-	-	-	-	-
B-1191	337153	BATCH PLANT	1144301.60	619490.75	260.30	150.0	-	-	-	-	0.0	-	-	-	-	-
B-1192	331145	BATCH PLANT	1144217.44	618840.90	243.17	179.5	-	-	-	-	0.0	-	157.5	-	-	-
B-1193	337153	BATCH PLANT	1144091.49	619277.79	254.11	178.8	-	-	-	-	0.0	-	162.0	-	-	-
B-1194	100	BORROW AREA 4	1147504.69	621630.15	199.35	50.0	-	-	-	-	0.0	-	-	-	-	-
B-1195	100	BORROW AREA 4	1147574.84	622478.35	220.60	50.0	-	-	-	-	0.0	-	-	-	-	-
B-1196	100	BORROW AREA 4	1147286.63	622017.51	217.52	50.0	-	-	-	-	0.0	-	-	-	-	-
B-1197	100	BORROW AREA 4	1146874.74	622003.82	245.60	50.0	-	-	-	-	0.0	-	-	-	-	-
B-3001(DH)	211797 (2)	EAST POWER BLOCK	1142599.50	621799.64	218.40	420.0	-	-	0.0	-	1.5	74.5	88.5	157.0	214.5 (3)	344.0 (3)
B-3002(DH)	200587 (2)	EAST POWER BLOCK	1142599.97	621872.49	218.89	249.9	-	-	0.0	-	2.0	76.0	85.5	153.0	220.0 (3)	-
B-3002A	X02958	EAST POWER BLOCK	1142597.90	621878.80	218.83	21.5	-	-	-	-	-	-	-	-	-	-
B-3003(DH)	211797 (2)	EAST POWER BLOCK	1142599.85	621727.30	218.29	250.0	-	-	0.0	-	1.5	66.5	88.5	152.0	215.0 (3)	-
B-3004	270256	EAST POWER BLOCK	1142447.42	621867.12	218.51	160.0	-	-	0.0	-	2.1	78.0	86.4	157.0	-	-
B-3005	337153	EAST POWER BLOCK	1142717.58	621749.10	219.20	155.0	-	-	-	-	0.0	82.0	87.0	150.5	-	-
B-3006	200587	EAST POWER BLOCK	1142425.58	621924.99	217.59	155.0	-	-	0.0	-	1.5	78.5	88.0	152.0	-	-
B-3007	200587	EAST POWER BLOCK	1142718.50	621876.74	220.78	159.8	-	-	0.0	-	1.0	58.0	86.5	157.5	-	-
B-3008	200587	EAST POWER BLOCK	1142425.35	621773.01	217.86	155.0	-	-	0.0	-	1.2	-	87.0	152.0	-	-
B-3009	211797	EAST POWER BLOCK	1142484.48	621956.58	217.85	153.9	-	-	-	-	0.0	77.0	88.5	148.5	-	-
B-3010	270256	EAST POWER BLOCK	1142634.86	622024.97	219.69	160.0	-	-	0.0	-	0.2	76.0	86.0	157.0	-	-
B-3011	211797	EAST POWER BLOCK	1142776.68	622024.86	220.57	165.0	-	-	-	-	0.0	87.0	92.0	162.0	-	-

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MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Depth (ft, bgs) (1)	Top of Crushed Stone (ft, bgs) (1)	Top of Fill (ft, bgs) (1)	Top of Alluvium (ft, bgs) (1)	Top of Barnwell Group (ft, bgs) (1)	Top of Utley Limestone (ft, bgs) (1)	Top of Blue Bluff Marl (ft, bgs) (1)	Top of Still Branch (ft, bgs) (1)	Top of Congaree Formation (ft, bgs) (1)	Top of Snapp Formation (ft, bgs) (1)
B-3012	165952	EAST POWER BLOCK	1142772.53	621911.91	220.40	159.3	-	-	-	-	0.0	-	87.0	157.0	-	-
B-3013(C)	337153	EAST POWER BLOCK	1142842.89	621825.35	220.51	155.0	-	-	-	-	0.0	83.0	85.5	150.5	-	-
B-3014	X02958	EAST POWER BLOCK	1142799.43	621748.55	220.26	158.7	-	-	0.0	-	7.0	81.0	88.0	152.0	-	-
B-3015	328848	EAST POWER BLOCK	1142956.89	621823.95	221.78	150.0	-	-	-	-	0.0	84.8	87.0	149.0	-	-
B-3016	200587	EAST POWER BLOCK	1142978.42	621913.43	222.48	150.0	-	-	-	-	0.0	80.0	88.5	-	-	-
B-3017	270256	EAST POWER BLOCK	1143034.35	621749.86	222.10	150.0	-	-	-	-	0.0	83.5	86.0	-	-	-
B-3018	328848	EAST POWER BLOCK	1142738.11	622115.75	219.80	155.0	-	-	-	-	0.0	52.0	87.0	152.0	-	-
B-3019	219505	EAST POWER BLOCK	1142977.36	622167.48	222.42	153.8	-	-	-	-	0.0	77.0	86.8	148.0	-	-
B-3020	328848	EAST POWER BLOCK	1142977.94	622074.78	222.44	149.4	-	-	-	-	0.0	82.0	87.0	147.0	-	-
B-3021	311025 (2)	EAST POWER BLOCK	1143070.22	622033.23	223.19	154.5	-	-	-	-	0.0	77.0	86.0	148.0	-	-
B-3022	200587	EAST POWER BLOCK	1143069.84	621873.43	223.86	150.0	-	-	-	-	0.0	81.5	-	146.5	-	-
B-3023	270256	EAST POWER BLOCK	1143061.11	621679.90	222.81	150.5	-	-	-	-	0.0	83.5	86.0	149.0	-	-
B-3024	337153	CIRC. WATER LINE	1142905.82	621399.65	220.16	150.0	-	-	-	-	0.0	-	82.0	-	-	-
B-3025	219907	CIRC. WATER LINE	1142460.42	621425.34	218.21	150.0	-	-	0.0	-	1.0	83.5	92.0	-	-	-
B-3026	219907	CIRC. WATER LINE	1142290.23	621403.73	215.76	149.2	-	-	0.0	-	0.5	78.5	85.5	-	-	-
B-3027	311025	CIRC. WATER LINE	1142058.69	621423.26	218.80	150.0	-	-	-	-	0.0	82.0	86.0	-	-	-
B-3028	311025	CIRC. WATER LINE	1141867.30	621408.76	220.12	150.0	-	-	-	-	0.0	87.0	92.0	-	-	-
B-3029	219505	CIRC. WATER LINE	1141881.50	621803.88	220.13	149.9	-	-	-	-	0.0	83.0	92.0	-	-	-
B-3030	311025	COOLING TOWER	1141699.94	621799.67	221.99	150.0	-	-	0.0	-	5.5	87.0	99.0	-	-	-
B-3031	219505	COOLING TOWER	1141398.73	622042.01	222.70	150.0	-	-	-	-	0.0	95.0	104.0	-	-	-
B-3032	219505	COOLING TOWER	1141158.18	621709.53	220.05	149.5	-	-	-	-	0.0	76.5	105.0	-	-	-
B-3033	219505	COOLING TOWER	1141405.26	621715.21	222.26	149.3	-	-	-	-	0.0	-	103.0	-	-	-
B-3034	219907	COOLING TOWER	1141399.76	621914.68	224.67	149.2	-	-	0.0	-	1.5	72.0	106.0	-	-	-
B-3035	328848	EAST POWER BLOCK	1142729.18	621675.37	219.34	150.5	-	-	-	-	0.0	78.0	90.0	150.0	-	-
B-3036	211797	EAST POWER BLOCK	1142441.55	621675.96	217.87	155.0	-	-	0.0	-	0.4	73.5	88.0	153.5	-	-
B-3037	270256	EAST POWER BLOCK	1143057.42	621768.87	222.94	150.0	-	-	-	-	0.0	83.0	87.0	149.0	-	-
B-3038	211797	CIRC. WATER LINE	1141882.97	621543.15	220.76	98.9	-	-	0.0	-	1.5	87.0	98.5	-	-	-
B-3039	331145	EAST POWER BLOCK	1142917.72	621753.54	219.17	150.0	-	-	-	-	0.0	56.5	81.5	147.0	-	-
B-4001(DH)	219907 (2)	WEST POWER BLOCK	1142599.53	621000.20	218.88	399.9	-	-	0.0	-	0.6	-	89.7	166.6	219.0 (3)	335.0 (3)
B-4002(DH)	219907	WEST POWER BLOCK	1142600.19	621072.22	219.06	250.0	-	-	0.0	-	0.8	-	92.0	161.7	224.8 (3)	-
B-4003(DH)	219907	WEST POWER BLOCK	1142599.93	620927.13	218.99	249.8	-	-	0.0	-	0.6	-	92.0	166.0	228.0 (3)	-
B-4004	219907	WEST POWER BLOCK	1142459.68	621046.56	218.45	150.0	-	-	0.0	-	1.0	87.5	91.0	-	-	-
B-4005	219907	WEST POWER BLOCK	1142714.97	620948.74	221.13	164.9	-	-	0.0	-	1.0	-	89.5	163.0	-	-
B-4006	219907	WEST POWER BLOCK	1142719.63	621076.36	220.98	165.0	-	-	-	-	0.0	-	89.5	160.0	-	-
B-4007	219907	WEST POWER BLOCK	1142426.19	621125.28	217.90	170.0	-	-	0.0	-	1.0	82.0	93.8	166.0	-	-
B-4008	219907	WEST POWER BLOCK	1142424.22	620973.78	218.08	169.4	-	-	0.0	-	0.8	87.0	92.0	165.0	-	-
B-4009	328848	WEST POWER BLOCK	1142486.09	621156.86	217.91	164.9	-	-	0.0	-	0.3	81.5	92.5	162.0	-	-
B-4010	328848	WEST POWER BLOCK	1142667.58	621249.04	219.09	160.0	-	-	-	-	0.0	82.0	89.8	157.0	-	-
B-4011	328848	WEST POWER BLOCK	1142773.07	621236.36	219.08	150.0	-	-	-	-	0.0	-	83.0	147.0	-	-

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Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Depth (ft, bgs) (1)	Top of Crushed Stone (ft, bgs) (1)	Top of Fill (ft, bgs) (1)	Top of Alluvium (ft, bgs) (1)	Top of Barnwell Group (ft, bgs) (1)	Top of Utley Limestone (ft, bgs) (1)	Top of Blue Bluff Marl (ft, bgs) (1)	Top of Still Branch (ft, bgs) (1)	Top of Congaree Formation (ft, bgs) (1)	Top of Snapp Formation (ft, bgs) (1)
B-4013(C)	337153	WEST POWER BLOCK	1142842.72	621020.31	222.24	165.0	-	-	-	-	0.0	-	85.5	160.0	-	-
B-4014	200587	WEST POWER BLOCK	1142831.99	620950.23	220.74	158.6	-	-	-	-	0.0	77.0	87.2	156.8	-	-
B-4015	328848	WEST POWER BLOCK	1142773.04	621115.24	220.11	155.0	-	-	-	-	0.0	-	84.5	152.0	-	-
B-4016	328848	WEST POWER BLOCK	1142996.39	621112.90	221.23	149.6	-	-	0.0	-	1.5	-	86.5	-	-	-
B-4017	219907	WEST POWER BLOCK	1143034.80	620949.92	220.94	150.0	0.0	-	-	-	0.5	66.0	89.0	-	-	-
B-4018	270256	WEST POWER BLOCK	1142735.45	621315.51	220.30	160.0	-	-	0.0	-	1.5	82.0	86.5	155.5	-	-
B-4019	328848	WEST POWER BLOCK	1142975.89	621371.41	221.76	160.0	-	-	-	-	0.0	77.0	87.0	157.0	-	-
B-4020	100	WEST POWER BLOCK	1142969.39	621280.02	222.79	89.4	-	-	0.0	-	1.0	72.0	87.0	-	-	-
B-4020A	337153	WEST POWER BLOCK	1142973.73	621280.34	222.56	165.0	-	-	-	-	-	-	-	160.5	-	-
B-4021	200587	WEST POWER BLOCK	1143092.61	621247.38	224.55	150.0	-	-	-	-	0.0	72.0	86.5	-	-	-
B-4022	328848	WEST POWER BLOCK	1143081.30	621073.52	220.71	148.7	-	-	-	-	0.0	81.5	87.5	-	-	-
B-4023	328848	WEST POWER BLOCK	1143062.36	620879.81	220.71	150.0	-	-	0.0	-	8.0	-	88.3	-	-	-
B-4024	328848	CIRC. WATER LINE	1142904.78	620601.81	223.80	150.0	-	-	0.0	-	1.0	78.0	91.0	-	-	-
B-4025	211797	CIRC. WATER LINE	1142510.01	620625.03	220.80	150.0	-	-	0.0	-	1.0	87.0	91.8	-	-	-
B-4026	211797	CIRC. WATER LINE	1142330.16	620597.72	221.54	150.0	-	-	-	-	0.0	85.0	97.0	-	-	-
B-4027	328848	CIRC. WATER LINE	1142180.05	620633.45	217.73	150.0	-	-	-	-	0.0	72.0	87.0	-	-	-
B-4028	219505	CIRC. WATER LINE	1141984.20	620587.77	219.57	150.0	-	-	-	-	0.0	74.5	89.0	-	-	-
B-4029	328848	CIRC. WATER LINE	1141874.85	620699.95	220.28	150.0	-	-	0.0	-	1.2	-	91.0	-	-	-
B-4030	219505	COOLING TOWER	1141676.68	620698.48	222.35	150.3	-	-	-	-	0.0	-	97.0	-	-	-
B-4031	211797	COOLING TOWER	1141399.83	620975.03	222.13	150.0	-	-	-	-	0.0	-	96.8	-	-	-
B-4032	211797	COOLING TOWER	1141118.48	620794.64	220.24	38.5	-	-	-	-	0.0	-	-	-	-	-
B-4032A	211797	COOLING TOWER	1141123.72	620794.66	220.22	150.0	-	-	-	-	-	-	101.0	-	-	-
B-4033	219505	COOLING TOWER	1141398.11	620348.78	219.93	149.4	-	-	-	-	0.0	77.0	87.0	-	-	-
B-4034	219505	COOLING TOWER	1141375.68	620795.35	222.79	150.0	-	-	0.0	-	0.5	-	98.5	-	-	-
B-4035	328848	WEST POWER BLOCK	1142729.08	620876.27	220.52	164.8	-	-	0.0	-	1.5	82.0	86.0	162.0	-	-
B-4036	219907	WEST POWER BLOCK	1142457.21	620876.25	218.05	170.0	-	-	0.0	-	0.6	82.0	91.0	166.0	-	-
B-5001	331145	230 KV SWITCHYARD	1146177.05	621807.73	218.99	150.0	-	-	-	-	0.0	-	102.0	-	-	-
B-5002	337153	230 KV SWITCHYARD	1146339.76	621808.33	241.53	150.0	-	-	-	-	0.0	-	127.0	-	-	-
B-5003	337153	230 KV SWITCHYARD	1146386.61	621574.70	227.94	148.7	-	-	-	-	0.0	-	117.0	-	-	-
B-5004	331145	230 KV SWITCHYARD	1146547.79	621568.38	236.61	149.8	-	-	-	-	0.0	117.0	122.0	-	-	-
B-6002	331145	BATCH PLANT	1144134.10	619626.88	247.90	150.0	-	-	-	-	0.0	-	-	-	-	-
B-6003	331145	BATCH PLANT	1143925.02	619422.80	229.76	179.4	-	-	-	-	0.0	-	136.8	-	-	-
B-6004	331145	BATCH PLANT	1143718.15	619473.34	231.59	150.0	-	-	-	-	0.0	-	136.8	-	-	-
B-6005	331145	BATCH PLANT	1143717.98	619873.77	242.59	178.8	-	-	-	-	0.0	-	147.5	-	-	-
B-6006	331145	CONSTRUCTION WAREHOUSE	1143069.79	620301.79	248.22	50.0	-	-	0.0	-	27.0	-	-	-	-	-
B-6007	219907	CONSTRUCTION WAREHOUSE	1142730.73	620301.79	222.28	50.0	-	-	0.0	-	1.5	-	-	-	-	-
B-6008	331145	DECHLORINATION BUILDING	1145443.82	622676.36	240.11	150.0	-	-	-	-	0.0	-	92.5	-	-	-
B-6009	X02958	HEAVY HAUL ROAD	1144773.69	621748.18	246.04	100.0	-	-	-	-	0.0	92.0	-	-	-	-
B-6010	331145	500 KV SWITCHYARD	1143893.34	621059.21	263.39	169.3	-	-	-	-	0.0	-	126.5	-	-	-

TABLE 2A
TEST LOCATION SUMMARY (DEPTH BELOW GROUND SURFACE)
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Depth (ft, bgs) (1)	Top of Crushed Stone (ft, bgs) (1)	Top of Fill (ft, bgs) (1)	Top of Alluvium (ft, bgs) (1)	Top of Barnwell Group (ft, bgs) (1)	Top of Utley Limestone (ft, bgs) (1)	Top of Blue Bluff Marl (ft, bgs) (1)	Top of Still Branch (ft, bgs) (1)	Top of Congaree Formation (ft, bgs) (1)	Top of Snapp Formation (ft, bgs) (1)
B-6011	X02958	HEAVY HAUL ROAD	1144557.94	621261.73	244.00	120.0	-	-	-	-	0.0	92.0	107.0	-	-	-
B-6012	331145	HEAVY HAUL ROAD	1144256.66	620480.54	194.20	120.0	-	-	-	-	0.0	82.0	96.5	-	-	-
B-6013	331145	ACCESS ROAD	1143169.54	617234.87	251.14	50.0	-	-	-	-	0.0	-	-	-	-	-
B-6014	331145	ACCESS ROAD	1143168.15	618281.46	209.79	50.0	-	-	-	-	0.0	-	-	-	-	-
B-6015	331145	ACCESS ROAD	1143166.26	619317.85	221.52	50.0	-	-	-	-	0.0	-	-	-	-	-
B-6018	331145	LAY DOWN YARD	1142909.31	618366.55	204.66	50.0	-	-	-	-	0.0	-	-	-	-	-
B-6019	331145	LAY DOWN YARD	1142132.73	618344.49	163.94	50.0	-	-	-	-	0.0	-	-	-	-	-
B-6020	331145	LAY DOWN YARD	1142634.02	619555.91	221.48	130.0	-	-	0.0	-	3.0	112.0	122.0	-	-	-
B-6021	331145	LAY DOWN YARD	1142185.73	619103.41	209.80	120.0	-	-	-	-	0.0	97.0	113.0	-	-	-
B-6022	331145	LAY DOWN YARD	1142224.77	620040.33	216.23	90.0	-	-	0.0	-	10.5	79.8	82.0	-	-	-
B-6023	331145	LAY DOWN YARD	1141553.10	619177.88	202.77	50.0	-	-	0.0	-	8.5	-	-	-	-	-
B-6024	331145	LAY DOWN YARD	1141545.87	619997.72	216.07	50.0	-	-	0.0	-	3.5	-	-	-	-	-
B-6025	331145	LAY DOWN YARD	1140518.65	619189.73	172.69	50.0	-	-	0.0	-	1.5	-	47.0	-	-	-
B-6026	331145	LAY DOWN YARD	1140537.74	619900.15	215.46	50.0	-	-	0.0	-	1.0	-	-	-	-	-
B-6027	331145	NEW BARGE SLIP	1145779.35	626145.09	96.65	75.0	-	-	0.0	18.0	-	-	-	33.5	-	-
B-6028	331145	NEW BARGE SLIP	1145611.36	626062.41	95.70	50.0	-	-	0.0	18.5	-	-	-	-	-	-
B-6029	331145	NEW INTAKE ACCESS ROAD	1147771.71	623966.62	85.41	50.0	-	-	-	0.0	-	-	21.7	26.7	-	-
B-6030	331145	NEW INTAKE ACCESS ROAD	1147588.12	624222.62	88.37	50.0	-	-	-	0.0	-	-	-	42.0	-	-
C-1101	NA	HEAVY HAUL ROAD	1144357.46	620185.46	265.76	71.4	-	-	-	-	-	-	-	-	-	-
C-1102	NA	HEAVY HAUL ROAD	1144424.00	621333.43	267.61	51.4	-	-	-	-	-	-	-	-	-	-
C-1103	NA	HEAVY HAUL ROAD	1145011.61	622037.40	236.52	27.4	-	-	-	-	-	-	-	-	-	-
C-1104	NA	HEAVY HAUL ROAD	1145601.77	622746.95	230.19	77.1	-	-	-	-	-	-	-	-	-	-
C-1105	NA	HEAVY HAUL ROAD	1145483.00	623733.68	200.57	50.2	-	-	-	-	-	-	-	-	-	-
C-1106	NA	HEAVY HAUL ROAD	1145533.96	624748.08	138.02	20.0	-	-	-	-	-	-	-	-	-	-
C-1107	NA	PIPE LINE	1147233.91	624202.32	211.92	71.0	-	-	-	-	-	-	-	-	-	-
C-1108	NA	PIPE LINE	1147628.30	623753.23	200.89	59.6	-	-	-	-	-	-	-	-	-	-
C-1109	NA	PIPE LINE	1147622.11	623171.88	209.79	72.5	-	-	-	-	-	-	-	-	-	-
C-1110	NA	PIPE LINE	1147198.95	622740.32	242.39	72.3	-	-	-	-	-	-	-	-	-	-
C-1111	NA	PIPE LINE	1146753.15	622346.15	250.69	32.2	-	-	-	-	-	-	-	-	-	-
C-3001	NA	EAST POWER BLOCK	1142610.55	621726.54	218.37	70.1	-	-	-	-	-	-	-	-	-	-
C-3002	NA	EAST POWER BLOCK	1142606.51	621872.75	218.89	67.9	-	-	-	-	-	-	-	-	-	-
C-3003	NA	COOLING TOWER AREA	1141771.79	621801.62	221.38	82.0	-	-	-	-	-	-	-	-	-	-
C-3004	NA	COOLING TOWER AREA	1141542.00	621807.33	223.25	72.7	-	-	-	-	-	-	-	-	-	-
C-3005	NA	COOLING TOWER AREA	1141266.89	621792.33	221.27	101.1	-	-	-	-	-	-	-	-	-	-
C-4001	NA	WEST POWER BLOCK	1142599.87	620918.51	218.87	74.2	-	-	-	-	-	-	-	-	-	-
C-4002	NA	WEST POWER BLOCK	1142599.94	621063.82	219.08	82.2	-	-	-	-	-	-	-	-	-	-
C-4003	NA	COOLING TOWER AREA	1141784.64	620708.48	221.16	82.5	-	-	-	-	-	-	-	-	-	-
C-4004	NA	COOLING TOWER AREA	1141543.07	620597.67	219.99	77.1	-	-	-	-	-	-	-	-	-	-
C-4005	NA	COOLING TOWER AREA	1141249.90	620593.96	220.01	90.2	-	-	-	-	-	-	-	-	-	-

TABLE 2A
TEST LOCATION SUMMARY (DEPTH BELOW GROUND SURFACE)
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Depth (ft, bgs) (1)	Top of Crushed Stone (ft, bgs) (1)	Top of Fill (ft, bgs) (1)	Top of Alluvium (ft, bgs) (1)	Top of Barnwell Group (ft, bgs) (1)	Top of Utley Limestone (ft, bgs) (1)	Top of Blue Bluff Marl (ft, bgs) (1)	Top of Still Branch (ft, bgs) (1)	Top of Congaree Formation (ft, bgs) (1)	Top of Snapp Formation (ft, bgs) (1)
ER-1103CL	NA	SWITCHYARD	1144258.24	621799.94	279.61	NA	-	-	-	-	-	-	-	-	-	-
ER-1103N	NA	SWITCHYARD	1144706.50	621821.45	250.84	NA	-	-	-	-	-	-	-	-	-	-
ER-1103S	NA	SWITCHYARD	1143809.08	621785.19	258.96	NA	-	-	-	-	-	-	-	-	-	-
ER-1104CL	NA	SWITCHYARD	1143823.00	621536.77	257.11	NA	-	-	-	-	-	-	-	-	-	-
ER-1104E	NA	SWITCHYARD	1143820.75	621986.25	257.44	NA	-	-	-	-	-	-	-	-	-	-
ER-1104W	NA	SWITCHYARD	1143821.35	621086.95	258.33	NA	-	-	-	-	-	-	-	-	-	-
ER-1105	NA	230 KV SWITCHYARD	1146579.02	621622.05	243.09	NA	-	-	-	-	-	-	-	-	-	-
ER-1105	NA	230 KV SWITCHYARD	1146866.31	621276.81	226.62	NA	-	-	-	-	-	-	-	-	-	-
ER-1105	NA	230 KV SWITCHYARD	1146286.04	621961.60	226.63	NA	-	-	-	-	-	-	-	-	-	-
ER-1106	NA	230 KV SWITCHYARD	1146706.48	621999.64	256.15	NA	-	-	-	-	-	-	-	-	-	-
ER-1106	NA	230 KV SWITCHYARD	1146039.75	621401.84	164.68	NA	-	-	-	-	-	-	-	-	-	-
ER-1106	NA	230 KV SWITCHYARD	1146365.63	621702.00	237.53	NA	-	-	-	-	-	-	-	-	-	-
ER-3001	NA	COOLING TOWER	1141404.39	621932.86	223.41	NA	-	-	-	-	-	-	-	-	-	-
ER-3001	NA	COOLING TOWER	1141104.51	621935.56	219.44	NA	-	-	-	-	-	-	-	-	-	-
ER-3001	NA	COOLING TOWER	1141704.88	621929.94	221.43	NA	-	-	-	-	-	-	-	-	-	-
ER-3002	NA	COOLING TOWER	1141220.32	621725.95	220.47	NA	-	-	-	-	-	-	-	-	-	-
ER-3002	NA	COOLING TOWER	1141206.51	622025.58	220.02	NA	-	-	-	-	-	-	-	-	-	-
ER-3002	NA	COOLING TOWER	1141200.00	622324.03	220.49	NA	-	-	-	-	-	-	-	-	-	-
ER-4001	NA	COOLING TOWER	1141375.68	620795.35	222.79	NA	-	-	-	-	-	-	-	-	-	-
ER-4001	NA	COOLING TOWER	1141133.24	620798.50	220.41	NA	-	-	-	-	-	-	-	-	-	-
ER-4001	NA	COOLING TOWER	1141583.32	620797.68	223.47	NA	-	-	-	-	-	-	-	-	-	-
ER-4001	NA	COOLING TOWER	1140683.32	620798.70	215.33	NA	-	-	-	-	-	-	-	-	-	-
ER-4002	NA	COOLING TOWER	1141375.68	620795.35	222.79	NA	-	-	-	-	-	-	-	-	-	-
ER-4002	NA	COOLING TOWER	1141796.43	620333.57	220.73	NA	-	-	-	-	-	-	-	-	-	-
ER-4002	NA	COOLING TOWER	1140897.17	620349.94	219.86	NA	-	-	-	-	-	-	-	-	-	-
ER-4002CL	NA	COOLING TOWER	1141346.76	620341.65	219.84	NA	-	-	-	-	-	-	-	-	-	-
ER-4003	NA	CIRC. WATER LINE	1142180.05	620633.45	217.73	NA	-	-	-	-	-	-	-	-	-	-
ER-4003	NA	CIRC. WATER LINE	1142049.90	620629.66	219.61	NA	-	-	-	-	-	-	-	-	-	-
ER-4003	NA	CIRC. WATER LINE	1141575.77	620263.31	217.95	NA	-	-	-	-	-	-	-	-	-	-
ER-4003CL	NA	CIRC. WATER LINE	1141813.06	620446.25	220.68	NA	-	-	-	-	-	-	-	-	-	-
ER-4004	NA	CIRC. WATER LINE	1142060.89	621873.12	218.35	NA	-	-	-	-	-	-	-	-	-	-
ER-4004	NA	CIRC. WATER LINE	1142060.45	621423.14	218.46	NA	-	-	-	-	-	-	-	-	-	-
ER-4004	NA	CIRC. WATER LINE	1142057.75	620973.50	219.21	NA	-	-	-	-	-	-	-	-	-	-
REMI-1101CL	NA	UNIT 1 & 2 PROTECTED AREA	1143195.74	623156.24	217.83	NA	-	-	-	-	-	-	-	-	-	-
REMI-1101N	NA	UNIT 1 & 2 PROTECTED AREA	1143344.68	623156.02	218.60	NA	-	-	-	-	-	-	-	-	-	-
REMI-1101S	NA	UNIT 1 & 2 PROTECTED AREA	1143046.36	623156.23	217.87	NA	-	-	-	-	-	-	-	-	-	-
REMI-1102CL	NA	UNIT 1 & 2 PROTECTED AREA	1143432.28	623846.88	217.84	NA	-	-	-	-	-	-	-	-	-	-
REMI-1102E	NA	UNIT 1 & 2 PROTECTED AREA	1143433.70	623995.86	217.75	NA	-	-	-	-	-	-	-	-	-	-
REMI-1102W	NA	UNIT 1 & 2 PROTECTED AREA	1143431.62	623697.54	217.88	NA	-	-	-	-	-	-	-	-	-	-

TABLE 2A
TEST LOCATION SUMMARY (DEPTH BELOW GROUND SURFACE)
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Depth (ft, bgs) (1)	Top of Crushed Stone (ft, bgs) (1)	Top of Fill (ft, bgs) (1)	Top of Alluvium (ft, bgs) (1)	Top of Barnwell Group (ft, bgs) (1)	Top of Utley Limestone (ft, bgs) (1)	Top of Blue Bluff Marl (ft, bgs) (1)	Top of Still Branch (ft, bgs) (1)	Top of Congaree Formation (ft, bgs) (1)	Top of Snapp Formation (ft, bgs) (1)
REMI-3001EAST	NA	EAST POWER BLOCK	1142620.86	621877.24	218.54	NA	-	-	-	-	-	-	-	-	-	-
REMI-3001WEST	NA	EAST POWER BLOCK	1142620.58	621577.79	218.20	NA	-	-	-	-	-	-	-	-	-	-
REMI-4001EAST	NA	WEST POWER BLOCK	1142620.95	621150.17	218.71	NA	-	-	-	-	-	-	-	-	-	-
REMI-4001WEST	NA	WEST POWER BLOCK	1142624.08	620856.90	219.31	NA	-	-	-	-	-	-	-	-	-	-
TP-B-1108	NA	SWITCHYARD	1144312.49	621145.92	264.14	12.2	-	-	0.0	-	0.5	-	-	-	-	-
TP-B-1117	NA	SWITCHYARD	1143967.31	621627.50	269.50	9.0	-	-	0.0	-	2.0	-	-	-	-	-
TP-B-1121	NA	SWITCHYARD	1143591.74	620401.53	241.17	14.0	-	-	0.0	-	-	-	-	-	-	-
TP-B-1125	NA	SWITCHYARD	1143603.70	621685.81	240.61	11.0	-	-	0.0	-	-	-	-	-	-	-
TP-B-1185	NA	SWITCHYARD	1144634.18	622242.15	225.17	11.0	-	-	0.0	-	1.5	-	-	-	-	-
TP-B-1194	NA	BORROW AREA 4	1147500.59	621708.45	202.73	11.5	-	-	0.0	-	0.5	-	-	-	-	-
TP-B-1195	NA	BORROW AREA 4	1147648.39	622363.06	212.15	8.0	-	-	-	-	0.0	-	-	-	-	-
TP-B-1197	NA	BORROW AREA 4	1146874.40	622074.57	245.94	11.0	-	-	0.0	-	1.5	-	-	-	-	-

NOTES:

NA Not Applicable
bgs below ground surface
msl Mean Sea Level

(1) The layer depths tabulated are estimated depths based on the rig geologist/engineer's examination of samples under the direction of the Site Coordinator from depth intervals ranging from 2.5 to 10.0 feet. Other observations, including but not limited to drilling resistance and drilling fluid pressure were used to estimate the depth to layers between sample intervals. The elevations of certain layers encountered beneath alluvial soils in the floodplain of the Savannah River may not correlate to elevations of these layers in other areas of the site. This may be due to scouring and subsequent deposition of alluvial sediments by the Savannah River.

(2) Multiple drill rigs with different SPT Hammers were used to drill various portions of borings B-3001, B-3002, B-3003, B-4001, and B-3021. Please see the boring logs in Attachment B for details.

(3) Layer depth picks made by examination of geophysical logs in conjunction with samples.

Prepared By/Date: Alexandra Taylor/6-24-07 AT

Checked By/Date: Pieter DePree/6-25-07 PDP

TABLE 2B
TEST LOCATION SUMMARY (ELEVATION)
VOGTLE UNITS 3&4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Elevation (ft, msl)	Top of Crushed Stone Elevation (ft, msl)	Top of Fill Elevation (ft, msl)	Top of Alluvium Elevation (ft, msl)	Top of Barnwell Group Elevation (ft, msl)	Top of Utley Limestone Elevation (ft, msl)	Top of Blue Bluff Marl Elevation (ft, msl)	Top of Still Branch Elevation (ft, msl)	Top of Congaree Formation Elevation (ft, msl)	Top of Snapp Formation Elevation (ft, msl)
B-1105	165952	SWITCHYARD	1144168.36	620002.76	257.89	148.8	-	-	-	-	257.9	-	-	-	-	-
B-1107	X02958	SWITCHYARD	1144153.75	620916.11	266.66	150.0	-	-	-	-	266.7	138.2	130.2	-	-	-
B-1108	X02958	SWITCHYARD	1144214.07	621273.00	273.56	149.8	-	-	-	-	273.6	151.6	135.1	-	-	-
B-1109	165952	SWITCHYARD	1144180.46	621580.64	276.48	150.0	-	-	-	-	276.5	159.5	144.9	-	-	-
B-1110	165952	SWITCHYARD	1144170.91	622011.31	265.14	150.0	-	-	-	-	265.1	168.1	147.1	-	-	-
B-1111	331145	SWITCHYARD	1144212.59	622333.79	224.90	150.0	-	-	-	-	224.9	153.4	143.2	78.2	-	-
B-1112	331145	SWITCHYARD	1144223.37	622691.31	213.74	23.0	-	-	213.7	-	212.7	-	-	-	-	-
B-1112A	328848	SWITCHYARD	1144219.36	622561.49	227.14	150.0	-	-	-	-	227.1	-	145.1	80.1	-	-
B-1113	331145	SWITCHYARD	1143901.44	620217.17	249.99	170.0	-	-	-	-	250.0	113.0	98.2	-	-	-
B-1116	165952	SWITCHYARD	1143894.12	621264.65	261.82	138.5	-	-	-	-	261.8	144.8	134.8	-	-	-
B-1117	337153	SWITCHYARD	1143890.75	621628.43	263.89	149.3	-	-	-	-	263.9	-	140.4	-	-	-
B-1118	165952	SWITCHYARD	1143885.92	622007.97	257.91	149.4	-	-	-	-	257.9	-	144.9	-	-	-
B-1119	331145	SWITCHYARD	1143888.30	622333.77	223.57	150.0	-	-	-	-	223.6	156.8	141.8	-	-	-
B-1120	219505	SWITCHYARD	1143893.05	622558.49	227.18	149.8	-	-	227.2	-	225.7	145.2	140.4	-	-	-
B-1121	331145	SWITCHYARD	1143575.57	620216.27	241.33	150.0	-	-	-	-	241.3	114.3	98.8	-	-	-
B-1123	337153	SWITCHYARD	1143575.43	620921.98	241.27	150.0	-	-	-	-	241.3	144.3	132.8	-	-	-
B-1124	337153	SWITCHYARD	1143627.62	621421.59	241.21	150.0	-	-	241.2	-	239.7	-	144.2	-	-	-
B-1125	337153	SWITCHYARD	1143586.80	621628.20	240.97	150.0	-	-	-	-	241.0	154.2	144.5	-	-	-
B-1126	211797	SWITCHYARD	1143567.68	621980.43	219.88	150.0	-	-	219.9	-	219.4	-	141.4	77.9	-	-
B-1127	165952	SWITCHYARD	1143573.26	622332.29	219.67	150.0	-	-	219.7	-	217.7	-	141.7	76.7	-	-
B-1128	331145	SWITCHYARD	1143572.65	622682.42	218.26	73.0	-	-	-	-	218.3	202.3	-	-	-	-
B-1128A	331145	SWITCHYARD	1143573.71	622685.46	217.92	148.8	-	-	-	-	-	-	141.4	76.2	-	-
B-1129	211797	POWER BLOCK ROADS	1143278.22	621893.74	221.84	100.0	-	-	221.8	-	220.3	145.0	140.1	-	-	-
B-1130	337153	POWER BLOCK ROADS	1142482.76	622250.00	217.46	99.2	-	-	-	-	217.5	145.5	136.5	-	-	-
B-1131	211797	POWER BLOCK ROADS	1143172.99	621823.06	222.18	98.6	-	-	-	-	222.2	137.2	133.7	-	-	-
B-1132	211797	POWER BLOCK ROADS	1142614.19	621450.08	218.73	100.0	-	-	218.7	-	217.2	137.0	127.0	-	-	-
B-1133	100	POWER BLOCK ROADS	1142968.94	621451.15	221.20	100.0	-	-	-	-	221.2	-	140.2	-	-	-
B-1134	211797	POWER BLOCK ROADS	1143282.88	621104.27	222.04	100.0	-	-	222.0	-	221.5	155.0	135.3	-	-	-
B-1136	211797	POWER BLOCK ROADS	1143178.11	621023.00	221.65	100.0	-	-	221.6	-	221.0	-	129.9	-	-	-
B-1138	331145	HEAVY HAUL ROAD	1143469.69	619192.80	215.82	100.0	-	-	-	-	215.8	-	-	-	-	-
B-1139	211797	POWER BLOCK ROADS	1142289.86	621026.81	216.68	150.0	-	-	216.7	-	215.2	129.7	121.9	-	-	-
B-1140	211797	POWER BLOCK ROADS	1142290.16	621823.56	216.58	150.0	-	-	216.6	-	216.0	133.1	128.1	-	-	-
B-1142	331145	HEAVY HAUL ROAD	1144416.58	620649.58	224.69	100.0	-	-	-	-	224.7	-	-	-	-	-
B-1146	331145	HEAVY HAUL ROAD	1145428.36	622272.08	240.04	98.6	-	-	-	-	240.0	153.0	148.0	-	-	-
B-1148	331145	HEAVY HAUL ROAD	1145537.78	623236.50	218.94	100.0	-	-	218.9	-	215.9	-	149.4	-	-	-
B-1150	331145	HEAVY HAUL ROAD	1145467.29	624235.30	170.69	100.0	-	-	170.7	-	170.2	-	144.2	74.2	-	-
B-1152	331145	HEAVY HAUL ROAD	1145581.68	625227.34	117.05	100.0	117.0	116.5	114.0	-	-	-	110.2	45.0	-	-
B-1153	331145	HEAVY HAUL ROAD	1145568.97	625673.46	103.58	100.0	103.6	103.0	101.1	-	-	-	99.1	52.6	-	-
B-1154	331145	HEAVY HAUL ROAD	1145664.20	626216.06	95.08	98.8	-	-	95.1	73.6	-	-	-	28.6	-1.4	-

TABLE 2B
TEST LOCATION SUMMARY (ELEVATION)
VOGTLE UNITS 3&4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Elevation (ft, msl)	Top of Crushed Stone Elevation (ft, msl)	Top of Fill Elevation (ft, msl)	Top of Alluvium Elevation (ft, msl)	Top of Barnwell Group Elevation (ft, msl)	Top of Utley Limestone Elevation (ft, msl)	Top of Blue Bluff Marl Elevation (ft, msl)	Top of Still Branch Elevation (ft, msl)	Top of Congaree Formation Elevation (ft, msl)	Top of Snapp Formation Elevation (ft, msl)
B-1155	331145	PUMPHOUSE	1147390.34	624936.42	84.95	150.0	-	-	-	84.9	-	-	-	38.4	8.4	-
B-1156	331145	PUMPHOUSE	1147302.50	624571.69	85.70	99.2	-	-	-	85.7	-	-	-	59.2	19.2	-
B-1157	331145	PUMPHOUSE	1147209.56	625062.18	86.77	150.0	-	-	-	86.8	-	-	55.3	37.5	17.4	-
B-1158	331145	PUMPHOUSE	1145194.92	626669.12	88.74	149.5	-	-	-	88.7	-	-	-	37.2	2.2	-
B-1159	331145	PUMPHOUSE	1147285.78	624954.51	88.70	150.0	-	-	-	88.7	-	-	52.2	47.2	22.2	-
B-1161	337153	PUMPHOUSE	1147363.37	624862.14	86.10	150.0	-	-	-	86.1	-	-	-	39.3	14.6	-
B-1162	337153	PUMPHOUSE	1147234.91	624815.03	85.55	200.0	-	-	-	85.6	-	-	-	43.6	9.6	-93.3
B-1163	337153	PUMPHOUSE	1147170.58	624938.82	85.95	150.0	-	-	-	86.0	-	-	54.0	33.5	13.0	-
B-1164	337153	PIPE LINE	1146994.84	624518.63	220.05	150.0	-	-	-	-	220.5	158.0	152.0	83.7	-	-
B-1166	337153	PIPE LINE	1147452.97	623961.56	203.40	100.0	-	-	-	-	203.4	-	141.4	-	-	-
B-1168	100	PIPE LINE	1147688.45	623467.78	202.20	100.0	-	-	-	-	202.2	-	145.2	-	-	-
B-1170	100	PIPE LINE	1147423.85	622953.71	223.29	98.9	-	-	-	-	223.3	-	-	-	-	-
B-1172	100	PIPE LINE	1146983.44	622538.70	249.49	100.0	-	-	-	-	249.5	-	-	-	-	-
B-1174	100	PIPE LINE	1146476.06	622228.06	225.81	100.0	-	-	-	-	225.8	-	-	-	-	-
B-1176	100	PIPE LINE	1145876.27	622195.21	221.48	35.0	-	-	-	-	221.5	-	-	-	-	-
B-1176A	100	PIPE LINE	1145878.82	622196.80	221.51	100.0	-	-	-	-	-	-	149.0	-	-	-
B-1185	165952	SWITCHYARD	1144716.64	622232.17	226.78	148.9	-	-	-	-	226.8	173.3	143.8	83.8	-	-
B-1186	331145	BATCH PLANT	1144711.88	618818.88	277.51	178.8	-	-	-	-	277.5	-	-	-	-	-
B-1187	331145	BATCH PLANT	1144710.19	619259.61	277.68	150.0	-	-	-	-	277.7	-	-	-	-	-
B-1189	331145	BATCH PLANT	1144459.72	618997.50	279.98	150.0	-	-	-	-	280.0	-	-	-	-	-
B-1191	337153	BATCH PLANT	1144301.60	619490.75	260.30	150.0	-	-	-	-	260.3	-	-	-	-	-
B-1192	331145	BATCH PLANT	1144217.44	618840.90	243.17	179.5	-	-	-	-	243.2	-	85.7	-	-	-
B-1193	337153	BATCH PLANT	1144091.49	619277.79	254.11	178.8	-	-	-	-	254.1	-	92.1	-	-	-
B-1194	100	BORROW AREA 4	1147504.69	621630.15	199.35	50.0	-	-	-	-	199.3	-	-	-	-	-
B-1195	100	BORROW AREA 4	1147574.84	622478.35	220.60	50.0	-	-	-	-	220.6	-	-	-	-	-
B-1196	100	BORROW AREA 4	1147286.63	622017.51	217.52	50.0	-	-	-	-	217.5	-	-	-	-	-
B-1197	100	BORROW AREA 4	1146874.74	622003.82	245.60	50.0	-	-	-	-	245.6	-	-	-	-	-
B-3001(DH)	211797	EAST POWER BLOCK	1142599.50	621799.64	218.40	420.0	-	-	218.4	-	216.9	143.9	129.9	61.4	3.9 (3)	-125.6 (3)
B-3002(DH)	200587	EAST POWER BLOCK	1142599.97	621872.49	218.89	249.9	-	-	218.9	-	216.9	142.9	133.4	65.9	-1.1 (3)	-
B-3002A	X02958	EAST POWER BLOCK	1142597.90	621878.80	218.83	21.5	-	-	-	-	-	-	-	-	-	-
B-3003(DH)	211797	EAST POWER BLOCK	1142599.85	621727.30	218.29	250.0	-	-	218.3	-	216.8	151.8	129.8	66.3	3.3 (3)	-
B-3004	270256	EAST POWER BLOCK	1142447.42	621867.12	218.51	160.0	-	-	218.5	-	216.4	140.5	132.1	61.5	-	-
B-3005	337153	EAST POWER BLOCK	1142717.58	621749.10	219.20	155.0	-	-	-	-	219.2	137.2	132.2	68.7	-	-
B-3006	200587	EAST POWER BLOCK	1142425.58	621924.99	217.59	155.0	-	-	217.6	-	216.1	139.1	129.6	65.6	-	-
B-3007	200587	EAST POWER BLOCK	1142718.50	621876.74	220.78	159.8	-	-	220.8	-	219.8	162.8	134.3	63.3	-	-
B-3008	200587	EAST POWER BLOCK	1142425.35	621773.01	217.86	155.0	-	-	217.9	-	216.7	-	130.9	65.9	-	-
B-3009	211797	EAST POWER BLOCK	1142484.48	621956.58	217.85	153.9	-	-	-	-	217.8	140.8	129.3	69.3	-	-
B-3010	270256	EAST POWER BLOCK	1142634.86	622024.97	219.69	160.0	-	-	219.7	-	219.5	143.7	133.7	62.7	-	-
B-3011	211797	EAST POWER BLOCK	1142776.68	622024.86	220.57	165.0	-	-	-	-	220.6	133.6	128.6	58.6	-	-

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MACTEC ENGINEERING AND CONSULTING, INC.
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Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Elevation (ft, msl)	Top of Crushed Stone Elevation (ft, msl)	Top of Fill Elevation (ft, msl)	Top of Alluvium Elevation (ft, msl)	Top of Barnwell Group Elevation (ft, msl)	Top of Utley Limestone Elevation (ft, msl)	Top of Blue Bluff Marl Elevation (ft, msl)	Top of Still Branch Elevation (ft, msl)	Top of Congaree Formation Elevation (ft, msl)	Top of Snapp Formation Elevation (ft, msl)
B-3012	165952	EAST POWER BLOCK	1142772.53	621911.91	220.40	159.3	-	-	-	-	220.4	-	133.4	63.4	-	-
B-3013(C)	337153	EAST POWER BLOCK	1142842.89	621825.35	220.51	155.0	-	-	-	-	220.5	137.5	135.0	70.0	-	-
B-3014	X02958	EAST POWER BLOCK	1142799.43	621748.55	220.26	158.7	-	-	220.3	-	213.3	139.3	132.3	68.3	-	-
B-3015	328848	EAST POWER BLOCK	1142956.89	621823.95	221.78	150.0	-	-	-	-	221.8	137.0	134.8	72.8	-	-
B-3016	200587	EAST POWER BLOCK	1142978.42	621913.43	222.48	150.0	-	-	-	-	222.5	142.5	134.0	-	-	-
B-3017	270256	EAST POWER BLOCK	1143034.35	621749.86	222.10	150.0	-	-	-	-	222.1	138.6	136.1	-	-	-
B-3018	328848	EAST POWER BLOCK	1142738.11	622115.75	219.80	155.0	-	-	-	-	219.8	167.8	132.8	67.8	-	-
B-3019	219505	EAST POWER BLOCK	1142977.36	622167.48	222.42	153.8	-	-	-	-	222.4	145.4	135.7	74.4	-	-
B-3020	328848	EAST POWER BLOCK	1142977.94	622074.78	222.44	149.4	-	-	-	-	222.4	140.4	135.4	75.4	-	-
B-3021	311025	EAST POWER BLOCK	1143070.22	622033.23	223.19	154.5	-	-	-	-	223.2	146.2	137.2	75.2	-	-
B-3022	200587	EAST POWER BLOCK	1143069.84	621873.43	223.86	150.0	-	-	-	-	223.9	142.4	#VALUE!	77.4	-	-
B-3023	270256	EAST POWER BLOCK	1143061.11	621679.90	222.81	150.5	-	-	-	-	222.8	139.3	136.8	73.8	-	-
B-3024	337153	CIRC. WATER LINE	1142905.82	621399.65	220.16	150.0	-	-	-	-	220.2	-	138.2	-	-	-
B-3025	219907	CIRC. WATER LINE	1142460.42	621425.34	218.21	150.0	-	-	218.2	-	217.2	134.7	126.2	-	-	-
B-3026	219907	CIRC. WATER LINE	1142290.23	621403.73	215.76	149.2	-	-	215.8	-	215.3	137.3	130.3	-	-	-
B-3027	311025	CIRC. WATER LINE	1142058.69	621423.26	218.80	150.0	-	-	-	-	218.8	136.8	132.8	-	-	-
B-3028	311025	CIRC. WATER LINE	1141867.30	621408.76	220.12	150.0	-	-	-	-	220.1	133.1	128.1	-	-	-
B-3029	219505	CIRC. WATER LINE	1141881.50	621803.88	220.13	149.9	-	-	-	-	220.1	137.1	128.1	-	-	-
B-3030	311025	COOLING TOWER	1141699.94	621799.67	221.99	150.0	-	-	222.0	-	216.5	135.0	123.0	-	-	-
B-3031	219505	COOLING TOWER	1141398.73	622042.01	222.70	150.0	-	-	-	-	222.7	127.7	118.7	-	-	-
B-3032	219505	COOLING TOWER	1141158.18	621709.53	220.05	149.5	-	-	-	-	220.0	143.5	115.0	-	-	-
B-3033	219505	COOLING TOWER	1141405.26	621715.21	222.26	149.3	-	-	-	-	222.3	-	119.3	-	-	-
B-3034	219907	COOLING TOWER	1141399.76	621914.68	224.67	149.2	-	-	224.7	-	223.2	152.7	118.7	-	-	-
B-3035	328848	EAST POWER BLOCK	1142729.18	621675.37	219.34	150.5	-	-	-	-	219.3	141.3	129.3	69.3	-	-
B-3036	211797	EAST POWER BLOCK	1142441.55	621675.96	217.87	155.0	-	-	217.9	-	217.5	144.4	129.9	64.4	-	-
B-3037	270256	EAST POWER BLOCK	1143057.42	621768.87	222.94	150.0	-	-	-	-	222.9	139.9	135.9	73.9	-	-
B-3038	211797	CIRC. WATER LINE	1141882.97	621543.15	220.76	98.9	-	-	220.8	-	219.3	133.8	122.3	-	-	-
B-3039	331145	EAST POWER BLOCK	1142917.72	621753.54	219.17	150.0	-	-	-	-	219.2	162.7	137.7	72.2	-	-
B-4001(DH)	219907	WEST POWER BLOCK	1142599.53	621000.20	218.88	399.9	-	-	218.9	-	218.3	-	129.2	52.3	-0.1 (3)	-116.1 (3)
B-4002(DH)	219907	WEST POWER BLOCK	1142600.19	621072.22	219.06	250.0	-	-	219.1	-	218.3	-	127.1	57.4	-5.7 (3)	-
B-4003(DH)	219907	WEST POWER BLOCK	1142599.93	620927.13	218.99	249.8	-	-	219.0	-	218.4	-	127.0	53.0	-9.0 (3)	-
B-4004	219907	WEST POWER BLOCK	1142459.68	621046.56	218.45	150.0	-	-	218.5	-	217.5	131.0	127.5	-	-	-
B-4005	219907	WEST POWER BLOCK	1142714.97	620948.74	221.13	164.9	-	-	221.1	-	220.1	-	131.6	58.1	-	-
B-4006	219907	WEST POWER BLOCK	1142719.63	621076.36	220.98	165.0	-	-	-	-	221.0	-	131.5	61.0	-	-
B-4007	219907	WEST POWER BLOCK	1142426.19	621125.28	217.90	170.0	-	-	217.9	-	216.9	135.9	124.1	51.9	-	-
B-4008	219907	WEST POWER BLOCK	1142424.22	620973.78	218.08	169.4	-	-	218.1	-	217.3	131.1	126.1	53.1	-	-
B-4009	328848	WEST POWER BLOCK	1142486.09	621156.86	217.91	164.9	-	-	217.9	-	217.6	136.4	125.4	55.9	-	-
B-4010	328848	WEST POWER BLOCK	1142667.58	621249.04	219.09	160.0	-	-	-	-	219.1	137.1	129.3	62.1	-	-
B-4011	328848	WEST POWER BLOCK	1142773.07	621236.36	219.08	150.0	-	-	-	-	219.1	-	136.1	72.1	-	-

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B-4013(C)	337153	WEST POWER BLOCK	1142842.72	621020.31	222.24	165.0	-	-	-	-	222.2	-	136.7	62.2	-	-
B-4014	200587	WEST POWER BLOCK	1142831.99	620950.23	220.74	158.6	-	-	-	-	220.7	143.7	133.5	64.0	-	-
B-4015	328848	WEST POWER BLOCK	1142773.04	621115.24	220.11	155.0	-	-	-	-	220.1	-	135.6	68.1	-	-
B-4016	328848	WEST POWER BLOCK	1142996.39	621112.90	221.23	149.6	-	-	221.2	-	219.7	-	134.7	-	-	-
B-4017	219907	WEST POWER BLOCK	1143034.80	620949.92	220.94	150.0	220.9	-	-	-	220.4	154.9	131.9	-	-	-
B-4018	270256	WEST POWER BLOCK	1142735.45	621315.51	220.30	160.0	-	-	220.3	-	218.8	138.3	133.8	64.8	-	-
B-4019	328848	WEST POWER BLOCK	1142975.89	621371.41	221.76	160.0	-	-	-	-	221.8	144.8	134.8	64.8	-	-
B-4020	100	WEST POWER BLOCK	1142969.39	621280.02	222.79	89.4	-	-	222.8	-	221.8	150.8	135.8	-	-	-
B-4020A	337153	WEST POWER BLOCK	1142973.73	621280.34	222.56	165.0	-	-	-	-	-	-	-	62.1	-	-
B-4021	200587	WEST POWER BLOCK	1143092.61	621247.38	224.55	150.0	-	-	-	-	224.6	152.6	138.1	-	-	-
B-4022	328848	WEST POWER BLOCK	1143081.30	621073.52	220.71	148.7	-	-	-	-	220.7	139.2	133.2	-	-	-
B-4023	328848	WEST POWER BLOCK	1143062.36	620879.81	220.71	150.0	-	-	220.7	-	212.7	-	132.4	-	-	-
B-4024	328848	CIRC. WATER LINE	1142904.78	620601.81	223.80	150.0	-	-	223.8	-	222.8	145.8	132.8	-	-	-
B-4025	211797	CIRC. WATER LINE	1142510.01	620625.03	220.80	150.0	-	-	220.8	-	219.8	133.8	129.0	-	-	-
B-4026	211797	CIRC. WATER LINE	1142330.16	620597.72	221.54	150.0	-	-	-	-	221.5	136.5	124.5	-	-	-
B-4027	328848	CIRC. WATER LINE	1142180.05	620633.45	217.73	150.0	-	-	-	-	217.7	145.7	130.7	-	-	-
B-4028	219505	CIRC. WATER LINE	1141984.20	620587.77	219.57	150.0	-	-	-	-	219.6	145.1	130.6	-	-	-
B-4029	328848	CIRC. WATER LINE	1141874.85	620699.95	220.28	150.0	-	-	220.3	-	219.1	-	129.3	-	-	-
B-4030	219505	COOLING TOWER	1141676.68	620698.48	222.35	150.3	-	-	-	-	222.4	-	125.4	-	-	-
B-4031	211797	COOLING TOWER	1141399.83	620975.03	222.13	150.0	-	-	-	-	222.1	-	125.4	-	-	-
B-4032	211797	COOLING TOWER	1141118.48	620794.64	220.24	38.5	-	-	-	-	220.2	-	-	-	-	-
B-4032A	211797	COOLING TOWER	1141123.72	620794.66	220.22	150.0	-	-	-	-	-	-	119.2	-	-	-
B-4033	219505	COOLING TOWER	1141398.11	620348.78	219.93	149.4	-	-	-	-	219.9	142.9	132.9	-	-	-
B-4034	219505	COOLING TOWER	1141375.68	620795.35	222.79	150.0	-	-	222.8	-	222.3	-	124.3	-	-	-
B-4035	328848	WEST POWER BLOCK	1142729.08	620876.27	220.52	164.8	-	-	220.5	-	219.0	138.5	134.5	58.5	-	-
B-4036	219907	WEST POWER BLOCK	1142457.21	620876.25	218.05	170.0	-	-	218.0	-	217.4	136.0	127.0	52.0	-	-
B-5001	331145	230 KV SWITCHYARD	1146177.05	621807.73	218.99	150.0	-	-	-	-	219.0	-	117.0	-	-	-
B-5002	337153	230 KV SWITCHYARD	1146339.76	621808.33	241.53	150.0	-	-	-	-	241.5	-	114.5	-	-	-
B-5003	337153	230 KV SWITCHYARD	1146386.61	621574.70	227.94	148.7	-	-	-	-	227.9	-	110.9	-	-	-
B-5004	331145	230 KV SWITCHYARD	1146547.79	621568.38	236.61	149.8	-	-	-	-	236.6	119.6	114.6	-	-	-
B-6002	331145	BATCH PLANT	1144134.10	619626.88	247.90	150.0	-	-	-	-	247.9	-	-	-	-	-
B-6003	331145	BATCH PLANT	1143925.02	619422.80	229.76	179.4	-	-	-	-	229.8	-	93.0	-	-	-
B-6004	331145	BATCH PLANT	1143718.15	619473.34	231.59	150.0	-	-	-	-	231.6	-	94.8	-	-	-
B-6005	331145	BATCH PLANT	1143717.98	619873.77	242.59	178.8	-	-	-	-	242.6	-	95.1	-	-	-
B-6006	331145	CONSTRUCTION WAREHOUSE	1143069.79	620301.79	248.22	50.0	-	-	248.2	-	221.2	-	-	-	-	-
B-6007	219907	CONSTRUCTION WAREHOUSE	1142730.73	620301.79	222.28	50.0	-	-	222.3	-	220.8	-	-	-	-	-
B-6008	331145	DECHLORINATION BUILDING	1145443.82	622676.36	240.11	150.0	-	-	-	-	240.1	-	147.6	-	-	-
B-6009	X02958	HEAVY HAUL ROAD	1144773.69	621748.18	246.04	100.0	-	-	-	-	246.0	154.0	-	-	-	-
B-6010	331145	500 KV SWITCHYARD	1143893.34	621059.21	263.39	169.3	-	-	-	-	263.4	-	136.9	-	-	-

TABLE 2B
TEST LOCATION SUMMARY (ELEVATION)
VOGTLE UNITS 3&4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Elevation (ft, msl)	Top of Crushed Stone Elevation (ft, msl)	Top of Fill Elevation (ft, msl)	Top of Alluvium Elevation (ft, msl)	Top of Barnwell Group Elevation (ft, msl)	Top of Utley Limestone Elevation (ft, msl)	Top of Blue Bluff Marl Elevation (ft, msl)	Top of Still Branch Elevation (ft, msl)	Top of Congaree Formation Elevation (ft, msl)	Top of Snapp Formation Elevation (ft, msl)
B-6011	X02958	HEAVY HAUL ROAD	1144557.94	621261.73	244.00	120.0	-	-	-	-	244.0	152.0	137.0	-	-	-
B-6012	331145	HEAVY HAUL ROAD	1144256.66	620480.54	194.20	120.0	-	-	-	-	194.2	112.2	97.7	-	-	-
B-6013	331145	ACCESS ROAD	1143169.54	617234.87	251.14	50.0	-	-	-	-	251.1	-	-	-	-	-
B-6014	331145	ACCESS ROAD	1143168.15	618281.46	209.79	50.0	-	-	-	-	209.8	-	-	-	-	-
B-6015	331145	ACCESS ROAD	1143166.26	619317.85	221.52	50.0	-	-	-	-	221.5	-	-	-	-	-
B-6018	331145	LAY DOWN YARD	1142909.31	618366.55	204.66	50.0	-	-	-	-	204.7	-	-	-	-	-
B-6019	331145	LAY DOWN YARD	1142132.73	618344.49	163.94	50.0	-	-	-	-	163.9	-	-	-	-	-
B-6020	331145	LAY DOWN YARD	1142634.02	619555.91	221.48	130.0	-	-	221.5	-	218.5	109.5	99.5	-	-	-
B-6021	331145	LAY DOWN YARD	1142185.73	619103.41	209.80	120.0	-	-	-	-	209.8	112.8	96.8	-	-	-
B-6022	331145	LAY DOWN YARD	1142224.77	620040.33	216.23	90.0	-	-	216.2	-	205.7	136.4	134.2	-	-	-
B-6023	331145	LAY DOWN YARD	1141553.10	619177.88	202.77	50.0	-	-	202.8	-	194.3	-	-	-	-	-
B-6024	331145	LAY DOWN YARD	1141545.87	619997.72	216.07	50.0	-	-	216.1	-	212.6	-	-	-	-	-
B-6025	331145	LAY DOWN YARD	1140518.65	619189.73	172.69	50.0	-	-	172.7	-	171.2	-	125.7	-	-	-
B-6026	331145	LAY DOWN YARD	1140537.74	619900.15	215.46	50.0	-	-	215.5	-	214.5	-	-	-	-	-
B-6027	331145	NEW BARGE SLIP	1145779.35	626145.09	96.65	75.0	-	-	96.7	78.7	-	-	-	63.2	-	-
B-6028	331145	NEW BARGE SLIP	1145611.36	626062.41	95.70	50.0	-	-	95.7	77.2	-	-	-	-	-	-
B-6029	331145	NEW INTAKE ACCESS ROAD	1147771.71	623966.62	85.41	50.0	-	-	-	85.4	-	-	63.7	58.7	-	-
B-6030	331145	NEW INTAKE ACCESS ROAD	1147588.12	624222.62	88.37	50.0	-	-	-	88.4	-	-	-	46.4	-	-
C-1101	NA	HEAVY HAUL ROAD	1144357.46	620185.46	265.76	71.4	-	-	-	-	-	-	-	-	-	-
C-1102	NA	HEAVY HAUL ROAD	1144424.00	621333.43	267.61	51.4	-	-	-	-	-	-	-	-	-	-
C-1103	NA	HEAVY HAUL ROAD	1145011.61	622037.40	236.52	27.4	-	-	-	-	-	-	-	-	-	-
C-1104	NA	HEAVY HAUL ROAD	1145601.77	622746.95	230.19	77.1	-	-	-	-	-	-	-	-	-	-
C-1105	NA	HEAVY HAUL ROAD	1145483.00	623733.68	200.57	50.2	-	-	-	-	-	-	-	-	-	-
C-1106	NA	HEAVY HAUL ROAD	1145533.96	624748.08	138.02	20.0	-	-	-	-	-	-	-	-	-	-
C-1107	NA	PIPE LINE	1147233.91	624202.32	211.92	71.0	-	-	-	-	-	-	-	-	-	-
C-1108	NA	PIPE LINE	1147628.30	623753.23	200.89	59.6	-	-	-	-	-	-	-	-	-	-
C-1109	NA	PIPE LINE	1147622.11	623171.88	209.79	72.5	-	-	-	-	-	-	-	-	-	-
C-1110	NA	PIPE LINE	1147198.95	622740.32	242.39	72.3	-	-	-	-	-	-	-	-	-	-
C-1111	NA	PIPE LINE	1146753.15	622346.15	250.69	32.2	-	-	-	-	-	-	-	-	-	-
C-3001	NA	EAST POWER BLOCK	1142610.55	621726.54	218.37	70.1	-	-	-	-	-	-	-	-	-	-
C-3002	NA	EAST POWER BLOCK	1142606.51	621872.75	218.89	67.9	-	-	-	-	-	-	-	-	-	-
C-3003	NA	COOLING TOWER AREA	1141771.79	621801.62	221.38	82.0	-	-	-	-	-	-	-	-	-	-
C-3004	NA	COOLING TOWER AREA	1141542.00	621807.33	223.25	72.7	-	-	-	-	-	-	-	-	-	-
C-3005	NA	COOLING TOWER AREA	1141266.89	621792.33	221.27	101.1	-	-	-	-	-	-	-	-	-	-
C-4001	NA	WEST POWER BLOCK	1142599.87	620918.51	218.87	74.2	-	-	-	-	-	-	-	-	-	-
C-4002	NA	WEST POWER BLOCK	1142599.94	621063.82	219.08	82.2	-	-	-	-	-	-	-	-	-	-
C-4003	NA	COOLING TOWER AREA	1141784.64	620708.48	221.16	82.5	-	-	-	-	-	-	-	-	-	-
C-4004	NA	COOLING TOWER AREA	1141543.07	620597.67	219.99	77.1	-	-	-	-	-	-	-	-	-	-
C-4005	NA	COOLING TOWER AREA	1141249.90	620593.96	220.01	90.2	-	-	-	-	-	-	-	-	-	-

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VOGTLE UNITS 3&4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Elevation (ft, msl)	Top of Crushed Stone Elevation (ft, msl)	Top of Fill Elevation (ft, msl)	Top of Alluvium Elevation (ft, msl)	Top of Barnwell Group Elevation (ft, msl)	Top of Utley Limestone Elevation (ft, msl)	Top of Blue Bluff Marl Elevation (ft, msl)	Top of Still Branch Elevation (ft, msl)	Top of Congaree Formation Elevation (ft, msl)	Top of Snapp Formation Elevation (ft, msl)
ER-1103CL	NA	SWITCHYARD	1144258.24	621799.94	279.61	NA	-	-	-	-	-	-	-	-	-	-
ER-1103N	NA	SWITCHYARD	1144706.50	621821.45	250.84	NA	-	-	-	-	-	-	-	-	-	-
ER-1103S	NA	SWITCHYARD	1143809.08	621785.19	258.96	NA	-	-	-	-	-	-	-	-	-	-
ER-1104CL	NA	SWITCHYARD	1143823.00	621536.77	257.11	NA	-	-	-	-	-	-	-	-	-	-
ER-1104E	NA	SWITCHYARD	1143820.75	621986.25	257.44	NA	-	-	-	-	-	-	-	-	-	-
ER-1104W	NA	SWITCHYARD	1143821.35	621086.95	258.33	NA	-	-	-	-	-	-	-	-	-	-
ER-1105	NA	230 KV SWITCHYARD	1146579.02	621622.05	243.09	NA	-	-	-	-	-	-	-	-	-	-
ER-1105	NA	230 KV SWITCHYARD	1146866.31	621276.81	226.62	NA	-	-	-	-	-	-	-	-	-	-
ER-1105	NA	230 KV SWITCHYARD	1146286.04	621961.60	226.63	NA	-	-	-	-	-	-	-	-	-	-
ER-1106	NA	230 KV SWITCHYARD	1146706.48	621999.64	256.15	NA	-	-	-	-	-	-	-	-	-	-
ER-1106	NA	230 KV SWITCHYARD	1146039.75	621401.84	164.68	NA	-	-	-	-	-	-	-	-	-	-
ER-1106	NA	230 KV SWITCHYARD	1146365.63	621702.00	237.53	NA	-	-	-	-	-	-	-	-	-	-
ER-3001	NA	COOLING TOWER	1141404.39	621932.86	223.41	NA	-	-	-	-	-	-	-	-	-	-
ER-3001	NA	COOLING TOWER	1141104.51	621935.56	219.44	NA	-	-	-	-	-	-	-	-	-	-
ER-3001	NA	COOLING TOWER	1141704.88	621929.94	221.43	NA	-	-	-	-	-	-	-	-	-	-
ER-3002	NA	COOLING TOWER	1141220.32	621725.95	220.47	NA	-	-	-	-	-	-	-	-	-	-
ER-3002	NA	COOLING TOWER	1141206.51	622025.58	220.02	NA	-	-	-	-	-	-	-	-	-	-
ER-3002	NA	COOLING TOWER	1141200.00	622324.03	220.49	NA	-	-	-	-	-	-	-	-	-	-
ER-4001	NA	COOLING TOWER	1141375.68	620795.35	222.79	NA	-	-	-	-	-	-	-	-	-	-
ER-4001	NA	COOLING TOWER	1141133.24	620798.50	220.41	NA	-	-	-	-	-	-	-	-	-	-
ER-4001	NA	COOLING TOWER	1141583.32	620797.68	223.47	NA	-	-	-	-	-	-	-	-	-	-
ER-4001	NA	COOLING TOWER	1140683.32	620798.70	215.33	NA	-	-	-	-	-	-	-	-	-	-
ER-4002	NA	COOLING TOWER	1141375.68	620795.35	222.79	NA	-	-	-	-	-	-	-	-	-	-
ER-4002	NA	COOLING TOWER	1141796.43	620333.57	220.73	NA	-	-	-	-	-	-	-	-	-	-
ER-4002	NA	COOLING TOWER	1140897.17	620349.94	219.86	NA	-	-	-	-	-	-	-	-	-	-
ER-4002CL	NA	COOLING TOWER	1141346.76	620341.65	219.84	NA	-	-	-	-	-	-	-	-	-	-
ER-4003	NA	CIRC. WATER LINE	1142180.05	620633.45	217.73	NA	-	-	-	-	-	-	-	-	-	-
ER-4003	NA	CIRC. WATER LINE	1142049.90	620629.66	219.61	NA	-	-	-	-	-	-	-	-	-	-
ER-4003	NA	CIRC. WATER LINE	1141575.77	620263.31	217.95	NA	-	-	-	-	-	-	-	-	-	-
ER-4003CL	NA	CIRC. WATER LINE	1141813.06	620446.25	220.68	NA	-	-	-	-	-	-	-	-	-	-
ER-4004	NA	CIRC. WATER LINE	1142060.89	621873.12	218.35	NA	-	-	-	-	-	-	-	-	-	-
ER-4004	NA	CIRC. WATER LINE	1142060.45	621423.14	218.46	NA	-	-	-	-	-	-	-	-	-	-
ER-4004	NA	CIRC. WATER LINE	1142057.75	620973.50	219.21	NA	-	-	-	-	-	-	-	-	-	-
REMI-1101CL	NA	UNIT 1 & 2 PROTECTED AREA	1143195.74	623156.24	217.83	NA	-	-	-	-	-	-	-	-	-	-
REMI-1101N	NA	UNIT 1 & 2 PROTECTED AREA	1143344.68	623156.02	218.60	NA	-	-	-	-	-	-	-	-	-	-
REMI-1101S	NA	UNIT 1 & 2 PROTECTED AREA	1143046.36	623156.23	217.87	NA	-	-	-	-	-	-	-	-	-	-
REMI-1102CL	NA	UNIT 1 & 2 PROTECTED AREA	1143432.28	623846.88	217.84	NA	-	-	-	-	-	-	-	-	-	-
REMI-1102E	NA	UNIT 1 & 2 PROTECTED AREA	1143433.70	623995.86	217.75	NA	-	-	-	-	-	-	-	-	-	-
REMI-1102W	NA	UNIT 1 & 2 PROTECTED AREA	1143431.62	623697.54	217.88	NA	-	-	-	-	-	-	-	-	-	-

TABLE 2B
TEST LOCATION SUMMARY (ELEVATION)
VOGTLE UNITS 3&4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Boring/CPT/Test Pit Number	Hammer Serial Number	Location/Remarks	Northing	Easting	Surface Elevation (ft, msl)	Total Depth (ft, bgs)	Top of Concrete Elevation (ft, msl)	Top of Crushed Stone Elevation (ft, msl)	Top of Fill Elevation (ft, msl)	Top of Alluvium Elevation (ft, msl)	Top of Barnwell Group Elevation (ft, msl)	Top of Utley Limestone Elevation (ft, msl)	Top of Blue Bluff Marl Elevation (ft, msl)	Top of Still Branch Elevation (ft, msl)	Top of Congaree Formation Elevation (ft, msl)	Top of Snapp Formation Elevation (ft, msl)
REMI-3001EAST	NA	EAST POWER BLOCK	1142620.86	621877.24	218.54	NA	-	-	-	-	-	-	-	-	-	-
REMI-3001WEST	NA	EAST POWER BLOCK	1142620.58	621577.79	218.20	NA	-	-	-	-	-	-	-	-	-	-
REMI-4001EAST	NA	WEST POWER BLOCK	1142620.95	621150.17	218.71	NA	-	-	-	-	-	-	-	-	-	-
REMI-4001WEST	NA	WEST POWER BLOCK	1142624.08	620856.90	219.31	NA	-	-	-	-	-	-	-	-	-	-
TP-B-1108	NA	SWITCHYARD	1144312.49	621145.92	264.14	12.2	-	-	264.1	-	263.6	-	-	-	-	-
TP-B-1117	NA	SWITCHYARD	1143967.31	621627.50	269.50	9.0	-	-	269.5	-	267.5	-	-	-	-	-
TP-B-1121	NA	SWITCHYARD	1143591.74	620401.53	241.17	14.0	-	-	241.2	-	-	-	-	-	-	-
TP-B-1125	NA	SWITCHYARD	1143603.70	621685.81	240.61	11.0	-	-	240.6	-	-	-	-	-	-	-
TP-B-1185	NA	SWITCHYARD	1144634.18	622242.15	225.17	11.0	-	-	225.2	-	223.7	-	-	-	-	-
TP-B-1194	NA	BORROW AREA 4	1147500.59	621708.45	202.73	11.5	-	-	202.7	-	202.2	-	-	-	-	-
TP-B-1195	NA	BORROW AREA 4	1147648.39	622363.06	212.15	8.0	-	-	-	-	212.1	-	-	-	-	-
TP-B-1197	NA	BORROW AREA 4	1146874.40	622074.57	245.94	11.0	-	-	245.9	-	244.4	-	-	-	-	-

NOTES:

NA Not Applicable
bgs below ground surface
msl Mean Sea Level

(1) The layer elevations tabulated are from estimated depths based on the rig geologist/engineer's examination of samples under the direction of the Site Coordinator from depth intervals ranging from 2.5 to 10.0 feet. Other observations, including but not limited to drilling resistance and drilling fluid pressure were used to estimate the depth to layers between sample intervals. The elevations of certain layers encountered beneath alluvial soils in the floodplain of the Savannah River may not correlate to elevations of these layers in other areas of the site. This may be due to scouring and subsequent deposition of alluvial sediments by the Savannah River.

(2) Multiple drill rigs with different SPT Hammers were used to drill various portions of borings B-3001, B-3002, B-3003, B-4001, and B-3021. Please see the boring logs in Attachment B for details.

(3) Layer depth picks made by examination of geophysical logs in conjunction with samples.

Prepared By/Date: Alexandra Taylor/6-24-07 AT

Checked By/Date: Pieter DePree/6-25-07 PdP

SOIL LAYER	DESCRIPTION
FILL	Man-placed fill soils of varying type and quality placed during previous construction activities on the site. This layer may include layers or zones of asphalt, concrete, or crushed stone.
ALLUVIUM	Soil formed by deposition from water after erosion and transportation from higher ground; typically occurs on the sides and bottom of drainage features. Most of these soils were encountered in or near the floodplain of the Savannah River.
CONCRETE	Concrete encountered at or near the surface that was placed for roadways and/or building slabs during previous construction activities at the site.
CRUSHED STONE	Crushed stone base material placed beneath concrete pavement encountered in borings (B-1152 and B-1153) drilled in the existing river intake access road.
BARNWELL GROUP • Tobacco Road Sand • Dry Branch Formation	Upper Eocene aged unit generally encountered near ground surface in most areas of the site, with the exception of boreholes drilled in low-lying areas along the floodplain of the Savannah River, where the Barnwell Soils had been eroded away. Soils most likely belonging to the Tobacco Road Sand and/or the Dry Branch Formation are reported as "Barnwell Group" on the soil test boring records and in the tables contained in this report. The Dry Branch Formation consists of three lithofacies, which include the Twiggs Clay, The Irwinton Sand, and the calcareous and fossiliferous Griffins Landing Member. The three Dry Branch lithofacies were observed in the soil test borings performed for this exploration. However, due to the interlayered nature of the Dry Branch lithofacies, and the generally wide sample intervals in the boreholes, identification of layer contacts was not practical. Therefore, the Dry Branch Formation lithofacies are reported as Barnwell Group on the soil test boring records and in the tables of this report. The Barnwell Group soils encountered during this investigation generally consist of very fine to very course grained sands with varying silt and clay content (SP, SP-SM, SM, SC, SP-SC, SC-SM) with some layers and zones of silt and clay (CL and ML). The Barnwell Group soils generally range in color from varying shades of red, yellow and brown. Distinct subhorizontal structure consisting of clay laminae, clay wisps, sand lenses and color banding is characteristic in many samples. The lower portion of the Barnwell Group section includes some calcareous soils which were generally sampled as sand with varying silt and clay content, silts, and clays. Large oyster shells, and other unidentified shell and phosphatic fragments were frequently observed. Layers contained an appreciable concentration of shells sampled as gravels with varying silt, clay, and sand content, due to breakage of the shells by the split spoon sampler. The bottom portion of the Barnwell Group often consists of pale olive green clayey silt with abundant distinct, very thin, subhorizontal yellowish brown sand lenses. Soft zones and zones of drilling fluid loss were occasionally encountered in the Barnwell Group.
BARNWELL GROUP • Clinchfield Formation-**Utley Limestone Member**	The Utley Limestone is a mostly calcareous sub-unit of the Barnwell Group, generally encountered below the Tobacco Road Sand and Dry Branch. This sub-unit of the Barnwell Group is reported as "Utley Limestone" on the soil test boring records and in the tables of this report. The Utley Limestone was

TABLE 3
Soil Layer Descriptions
Page 1 of 4

SOIL LAYER	DESCRIPTION
	present sporadically throughout the site. The Utley Limestone was exposed briefly during the excavation for the nearby VEGP Units 1 and 2 and was generally described as a grayish-yellow, well indurated, fossiliferous limestone which grades locally into coquina. Due to the well indurated nature of the Utley, split spoon sample recovery was generally low. The Utley was typically broken down by the split spoon sampler and classified as a gravel (GP, GC, GM), or a sand with varying silt and clay content (SP, SM, SC). Minor amounts of silt and clay soils (CL and ML) were encountered in the Utley. Fossils consisting of large oyster shells and other unidentified shell and phosphatic fragments were also encountered. Well cemented zones were encountered which generally consisted of quartz sand and/or shell fragments with a carbonate cement matrix. Soft zones were also encountered in this layer and drilling fluid circulation loss occurred frequently. The Utley Limestone soils encountered during this exploration generally range in color from varying shades of yellow, brown, gray and green. Faint to distinct subhorizontal structure consisting of clay laminae and sand lenses are characteristic, especially in softer zones of the formation.
CLAIBORNE GROUP • Lisbon Formation – **Blue Bluff Member**	The Blue Bluff Member is a fine grained, calcareous sub-unit of the middle Eocene Lisbon Formation within the Claiborne Group, encountered below the Utley Limestone. This unit is referred to as the Blue Bluff Marl on the soil test boring records and in the tables of this report. The Blue Bluff Marl was present in most areas of the site, with the main exception being in low-lying areas along the floodplain of the Savannah River, where it had been eroded away. The Blue Bluff Marl encountered at the site is typically a very stiff to hard carbonate-rich clayey silt to silty clay with trace amounts of very fine to fine grained sand. One of the most distinguishing features of this formation is its dark greenish gray color, usually forming a distinct contact where captured in the split spoon samples. Faint to distinct, very thin laminations were observed in most samples. Other distinguishing features of the Blue Bluff Marl are the presence of shell and phosphatic fragments in localized vertical horizons and the abundance of partially cemented, well indurated layers consisting of very fine grained to fine grained quartz sand with carbonate mud cement. Well indurated zones were often sampled as gravel due to mechanical breakage by the split spoon sampler.
CLAIBORNE GROUP • Still Branch Sand	The Still Branch Sand, also part of the middle Eocene Claiborne Group and underlying the Blue Bluff Member of the Lisbon Formation, is referred to as the Still Branch Formation on the soil test boring records and in the tables of this report. The Still Branch Formation observed in the test borings generally consists of dense to very dense, fine to medium grained sand with varying amounts of silt and clay (typically SM). The Still Branch Formation encountered at the site is also characterized by its dark greenish gray to almost black color most likely due to the presence of glauconite, resulting in a typically well-defined contact between it and the overlying Blue Bluff Marl where captured in the split spoon samples. In general, the sands become less glauconitic and therefore lighter in color with depth. The

TABLE 3
Soil Layer Descriptions
Page 2 of 4

SOIL LAYER	DESCRIPTION
	lower part of the formation is typically more silt and/or clay rich. Occasional zones containing scattered shell fragments are encountered in the upper section of the Still Branch Formation.
CLAIBORNE GROUP • Congaree Formation	The Congaree Formation is also part of the middle Eocene Claiborne Group and is generally encountered immediately below the Still Branch Sand. It is referred to as the Congaree Formation on the soil test boring records and in the tables of this report. The Congaree Formation was encountered in the deeper borings within the proposed power block area and in the borings located in the Savannah River floodplain. The Congaree Formation observed in the test borings generally consists of dense to very dense, medium to coarse grained sand with layers of clay and silt. Occasional micaceous zones and thin beds of white kaolinitic clay are also present. Few of the borings contain minor amounts of carbonate in the form of carbonate mud and/or coarse grained calcareous concretions. Colors generally range in shades of green, gray, brown and white.. The contact between the Congaree Formation and the overlying Still Branch Formation is not well defined but is typically identified by a significant increase in density or hardness and grain size. Where available, borehole geophysical logs were used in conjunction with the samples to pick the top of the Congaree Formation.
SNAPP FORMATION	The Snapp Formation is Upper Paleocene in age and generally underlies the middle Eocene Congaree Formation. It is referred to as the Snapp Formation on the soil test boring records and in the tables of this report. The Snapp Formation was encountered in two of the deep test borings, B-3001 and B-4001, and in one of the borings located in the Savannah River floodplain, B-1162. The Snapp Formation observed in the test borings generally consists of hard, iron-stained, oxidized kaolinitic clay to very dense, fine to medium grained sand with minor amounts of clay. Colors generally range in shades of gray, brown, red and white. The contact between the Snapp Formation and the overlying Congaree Formation is typically identified by a significant increase in hardness and the presence of white kaolinitic clay with reddish brown to yellowish brown iron-staining. Where available, borehole geophysical logs were used in conjunction with the samples to pick the top of the Snapp Formation.

REFERENCES:

Huddleston, P.F., and Summerour, J.H., 1996, "The Lithostratigraphic Framework of the Uppermost Cretaceous and Lower Tertiary of Eastern Burke County, Georgia, Georgia Department of Natural Resources Bulletin 127, 94 p.

Appendix 2B, "Geology", from "Final Safety Analysis Report" (FSAR) prepared for Vogtle Electric Generating Plant Units 1 and 2.

TABLE 3
Soil Layer Descriptions
Page 3 of 4

NOTES:

The layer descriptions contained in Table 3 were prepared from the rig geologist's/engineer's examination of samples under the direction and review of the Site Coordinator taken at depth intervals ranging from 1.5 to 10 feet. MACTEC also visited nearby type localities of the Blue Bluff Marl, Utley Limestone, and Griffins Landing Member of the Dry Branch Formation exposed in bluffs along the Savannah River. The estimated depth and elevation to the layers encountered in the soil test borings are contained in Tables 2A and 2B of this report.

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Checked By: Alexandra Taylor/7-31-07 AT

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	GRAVEL, well graded
			GP	GRAVEL, poorly graded
		GRAVELS WITH FINES (Appreciable amount of fines)	GM	GRAVEL, sand and silt
			GC	GRAVEL, clay
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	SAND, well graded
			SP	SAND, poorly graded
		SANDS WITH FINES (Appreciable amount of fines)	SM	SAND, silty
			SC	SAND, clayey
FINE GRAINED SOILS (More than 50% of material is SMALLER than the No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	SILT, sandy or clayey, low plasticity
			CL	CLAY, low plasticity
			OL	SILT, organic or CLAY organic, low plasticity
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	SILT, sandy or clayey, high plasticity
			CH	CLAY, high plasticity
			OH	CLAY, organic, or SILT, organic, high plasticity

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

Correlation of Penetration Resistance with Relative Density and Consistency			
SAND & GRAVEL		SILT & CLAY	
No. of Blows	**Relative Density**	**No. of Blows**	**Consistency**
0 - 4	Very Loose	0 - 1	Very Soft
5 – 10	Loose	2 – 4	Soft
11 – 30	Medium Dense	5 – 8	Medium Stiff
31 - 50	Dense	9 – 15	Stiff
Over 50	Very Dense	16 - 30	Very Stiff
		Over 31	Hard

TABLE 4 (Page 1 of 2)
CERTAIN TERMS USED FOR SOIL DESCRIPTIONS ON gINT BORING LOGS IN ATTACHMENT B

MOISTURE CONDITION:

Dry	Absence of moisture, dusty, dry to the touch.
Damp	Slight moisture content, difficult to mold fines into ball.
Moist	Moisture evident but no visible water, fines can be molded into ball.
Wet	Visible free water, soil is usually below water table.

SAMPLE TYPE

SS	Split spoon sample
UD	Undisturbed sample (direct push or pitcher)
BK	Bulk Sample
AU	Hand Auger Cuttings

LINE TYPE

- - - - - - - - - -	Soil layer contact where contact was not observed in samples
————————	Soil layer contact where contact was observed in samples
. . . .	Soil layer contact above and below samples with no recovery

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Checked By/Date: Alexandra Taylor/7-31-07 AT

TABLE 4 (2 of 2)
CERTAIN TERMS USED FOR SOIL DESCRIPTIONS ON gINT BORING LOGS IN ATTACHMENT B

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

			Sample					0.005 mm		Compaction		Natural Moisture Content (%) at e_o									Dry Density (pcf) at e_o						Wet			
Source of	Sample	Depth	Type	Gravel (1)	Sand (1)	Fines (1)	Silt (1)	Clay (1)	USCS(2)	Optimum Moisture	Maximum Dry Density	SPT	Triaxial, Compression or Direct Shear			Consolidation	Avg.	LL	PL	G_s	SPT	Triaxial, Compression or Direct Shear			Consolidation	Avg.	Density Avg.	pH	Chloride	Sulfate
Sample	No.	(ft)		(%)	(%)	(%)	(%)	(%)		(%)	(pcf)		1	2	3							1	2	3			(pcf)		(mg/kg)	(mg/kg)
B-1105	SS-1	0.0	SS	0.0	87.5	12.5			SM			8.3					8.3													
B-1105	SS-3	3.5	SS	0.0	66.7	33.3			SM			18.5					18.5													
B-1105	SS-4	6.0	SS	0.2	82.1	17.7			SM			12.5					12.5													
B-1106	SS-6	11.0	SS	0.0	80	20			SM			12.9					12.9													
B-1106	SS-8	18.5	SS	0.0	66.2	33.8			SC			23.8					23.8	69	19											
B-1105	SS-9	23.5	SS	0.0	77.5	22.5			SC			16.4					16.4													
B-1105	SS-11	33.5	SS	0.9	74.3	24.8			SM			14.8					14.8													
B-1105	SS-13	43.5	SS	0.7	89.8	9.5			SP-SM			15.1					15.1													
B-1108	SS-2	1.5	SS	0.2	75.6	24.2			SM																					
B-1108	SS-3	3.5	SS	NA	NA	8.8			SP-SM																					
B-1108	SS-4	6.0	SS	0.0	94.1	5.9			SP-SM																					
B-1108	SS-6	11.0	SS	0.0	88.9	11.1			SP-SC									41	20											
B-1108	SS-8	18.5	SS	1.0	69.8	29.2			SM																					
B-1108	SS-9	23.5	SS	NA	NA	8.4			SP-SM																					
B-1108	SS-11	33.5	SS	NA	NA	7.7			SP-SM																					
B-1108	SS-12	38.5	SS	0.0	83.4	16.6			SC									45	16											
B-1113	SS-2	1.5	SS	0.0	93.5	6.5			SP-SM																					
B-1113	SS-4	6.0	SS	NA	NA	6.1			SP-SM																					
B-1113	SS-5	8.5	SS	0.0	94.1	5.9			SP-SM																					
B-1113	SS-6	11.0	SS	NA	NA	6.0			SP-SM																					
B-1113	SS-8	18.5	SS	0.0	95.9	4.1			SP																					
B-1113	SS-10	28.5	SS	NA	NA	4.9			SP																					
B-1113	SS-11	33.5	SS	0.0	18.4	81.6	16.9	64.7	CL																					
B-1116	SS-2	1.5	SS	0.0	90.5	9.5			SP-SM			2.4					2.4													
B-1116	SS-4	6.0	SS	0.0	92.8	7.2			SP-SM			8.3					8.3													
B-1116	SS-6	11.0	SS	0.0	81.5	18.5			SC			8.5					8.5													
B-1116	SS-7	13.5	SS	0.0	75.1	24.9			SC			8.8					8.8													
B-1116	SS-9	23.5	SS	0.0	78.5	21.5			SC			17.1					17.1													
B-1116	SS-11	33.5	SS	0.4	84.6	15.0			SC			14.4					14.4													
B-1118	SS-5	8.5	SS	0.0	75.4	24.6			SC																					
B-1118	SS-8	18.5	SS	0.0	82.1	17.9			SC																					
B-1118	SS-10	28.5	SS	0.0	82.1	17.9			SC									83	32											
B-1121	SS-1	0.0	SS	0.0	81.6	18.4			SM			10.2					10.2													
B-1121	SS-3	3.5	SS	1.5	85.1	13.4			SM			13.3					13.3													
B-1121	SS-4	6.0	SS	0.0	75.0	25.0			SM			12.6					12.6													
B-1121	SS-6	11.0	SS	0.0	72.4	27.6			SC			18.6					18.6	35	13											
B-1121	SS-9	23.5	SS	0.0	84.6	15.4			SC			20.8					20.8	77	27											
B-1123	SS-2	1.5	SS	NA	NA	12.4			SM																					
B-1123	SS-3	3.5	SS	0.0	85.1	14.9			SM																					
B-1123	SS-4	6.0	SS	NA	NA	9.6			SP-SM																					
B-1123	SS-6	11.0	SS	0.0	78.3	21.7			SC									31	13											
B-1123	SS-7	13.5	SS	NA	NA	27.5			SC																					
B-1123	SS-8	18.5	SS	NA	NA	27.5			SC																					
B-1123	SS-10	28.5	SS	0.0	73.9	26.1			SC																					
B-1123	SS-12	38.5	SS	0.0	85.9	14.1			SC									63	23											
B-1124	SS-3	3.5	SS	NA	NA	10.8			SP-SM																					
B-1124	SS-5	8.5	SS	0.0	93.2	6.8			SP-SM																					
B-1124	SS-7	18.5	SS	NA	NA	20.5			SC																					
B-1124	SS-8	18.5	SS	0.0	75.2	24.8			SC			14.6					14.6	35	20											

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Source of Sample	Sample No.	Depth (ft)	Sample Type	Gravel (1) (%)	Sand (1) (%)	Fines (1) (%)	Silt (1) (%)	0.005 mm Clay (1) (%)	USCS(2)	Compaction Optimum Moisture (%)	Compaction Maximum Dry Density (pcf)	Natural Moisture Content (%) at e_o SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	LL	PL	G_s	Dry Density (pcf) at e_o SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	Wet Density Avg. (pcf)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
B-1124	SS-10	28.5	SS	NA	NA	25.3			SC																					
B-1125	SS-2	1.5	SS	0.8	85.6	13.6			SM																					
B-1125	SS-4	6.0	SS	NA	NA	8.2			SP-SM																					
B-1125	SS-6	11.0	SS	NA	NA	13.5			SM																					
B-1125	SS-8	18.5	SS	0.0	82.7	17.3			SC									35	22											
B-1125	SS-10	28.5	SS	NA	NA	77.6			MH									121	58											
B-1127	SS-3	3.5	SS	0.0	77.1	22.9			SC			13.5					13.5	32	20											
B-1127	SS-6	11.0	SS	0.0	77.6	22.4			SC			16.1					16.1	46	22											
B-1127	SS-8	18.5	SS	0.0	90.5	9.5			SP-SM			9.7					9.7													
B-1127	SS-9	23.5	SS	0.0	80.6	19.4			SM			15.1					15.1													
B-1130	UD-1	28.5	UD	NA	NA	16.5			SC																					
B-1130	UD-2	33.5	UD						CL				33.5	29.4	28.9		30.6					85.1	90.8	91.4		89.1	116			
B-1130	UD-3	38.5	UD	NA	NA	6.7			SP-SC				16.9	16.9			16.9					96.8	96.4			96.6	113			
B-1131	UD-1	28.5	UD						SM				36.2	18.6			27.4					85.7	110.3			98.0	124			
B-1132	UD-2	33.5	UD						CL				34.3				34.3					88.2				88.2	118			
B-1132	UD-3	38.5	UD						CH				35.2			51.0	43.1	85	33			82.8			70.0	76.4	109			
B-1133	UD-1	28.0	UD	0.0	60.9	39.1			SM				25.0	27.2	17.3		23.2					97.2	89.3	100.9		95.8	118			
B-1133	UD-2	33.0	UD	NA	NA	14.4			SM				19.0				19.0					93.9				93.9	112			
B-1133	UD-3	38.5	UD	NA	NA	66.2			CL				38.2	42.9	42.9		41.3					79.5	77.0	75.8		77.4	109			
B-1136	UD-2	33.5	UD	NA	NA	19.9			SC-SM				20.9	18.1			19.5					95.8	104.9			100.4	120			
B-1136	UD-3	38.5	UD	NA	NA	36.9			SC							71.1	71.1	107	58						55.0	55.0	94			
B-1136	UD-4	43.5	UD						CL				68.5				68.5					58.5				58.5	99			
B-1138	SS-2	1.5	SS	0.0	65.5	34.5			SC			18.0					18.0													
B-1138	SS-4	6.0	SS	0.0	87.7	12.3			SM			13.0					13.0													
B-1138	SS-6	11.0	SS	0.0	94.4	5.6			SP-SM			13.3					13.3													
B-1138	SS-8	18.5	SS	1.1	81.1	17.8			SM			20.0					20.0													
B-1138	SS-10	28.5	SS	0.0	67.3	32.7			SC			31.4					31.4													
B-1139	UD-1	28.5	UD	0.0	81.9	18.1			SM			19.8					19.8													
B-1139	UD-2	33.5	UD	NA	NA	16.1			SM				19.3	25.0			22.2					106.3	88.7			97.5	119			
B-1139	UD-3	38.5	UD	NA	NA	30.7			SM									65	24											
B-1155	SS-3	3.5	SS	19.4	78.0	2.6			SP																					
B-1155	SS-6	11.0	SS						ML									37	22											
B-1155	SS-10	28.5	SS						SP									NV	NP											
B-1155	SS-11	33.5	SS						CL									55	41											
B-1155	SS-14B	48.5	SS	0.0	95.7	4.3			SP			23.9					23.9													
B-1155	SS-18	68.5	SS	0.0	92.3	7.7	1.5	6.2	SP-SC			25.2					25.2													
B-1155	SS-21	83.5	SS	0.0	95.7	4.3			SP			14.0					14.0													
B-1155	SS-22	88.5	SS						CL									112	39											
B-1155	SS-25	103.5	SS	0.2	91.8	8.0	2.8	5.2	SP-SC			20.8					20.8													
B-1155	SS-27	113.5	SS						SP-SM									NV	NP											
B-1155	SS-34	148.5	SS						CL									34	18											
B-1156	SS-4	6.0	SS	0.0	9.1	90.9	32.4	58.5	CH									100	39											
B-1156	SS-6	11.0	SS						CL-ML									44	34											
B-1156	SS-10	28.5	SS	0.0	93.5	6.5			SP-SC																					
B-1156	SS-13	53.5	SS	0.0	92.5	7.5			SP-SM																					
B-1156	SS-16	68.5	SS	0.0	94.9	5.1	1.9	3.2	SP-SC																					
B-1156	SS-18	78.5	SS	0.6	93.1	6.3			SP-SM																					
B-1156	SS-21	98.5	SS	4.4	83.5	12.1	6.1	6.0	SC-SM																					
B-1157	SS-3	3.5	SS	0.0	98.9	1.1			SP			17.5					17.5													
B-1157	SS-6	11.0	SS						ML									39	26											

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Source of Sample	Sample No.	Depth (ft)	Sample Type	Gravel (1) (%)	Sand (1) (%)	Fines (1) (%)	Silt (1) (%)	0.005 mm Clay (1) (%)	USCS(2)	Compaction: Optimum Moisture (%)	Compaction: Maximum Dry Density (pcf)	Natural Moisture Content (%) at e_o: SPT	Natural Moisture Content: Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	LL	PL	G_s	Dry Density (pcf) at e_o: SPT	Dry Density: Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	Wet Density Avg. (pcf)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
B-1157	SS-8	18.5	SS						ML									59	42											
B-1157	SS-11	33.5	SS						ML									56	22											
B-1157	SS-14A	48.5	SS						CL									44	17											
B-1157	SS-16	58.5	SS	0.0	76.7	23.3			SC			32.9					32.9													
B-1157	SS-19	73.5	SS	0.0	88.7	11.3	1.8	9.5	SP-SC			33.7					33.7													
B-1157	SS-21	83.5	SS	0.5	96.2	3.3			SP			25.1					25.1													
B-1157	SS-25	103.5	SS	0.0	73.4	26.6	14.4	12.2	SC-SM			32.8					32.8													
B-1157	SS-26	108.5	SS						CL-ML									43	20											
B-1159	SS-3	3.5	SS						ML									58	30	2.78										
B-1159	SS-6	11.0	SS						CL-ML									50	28	2.58										
B-1159	SS-5	18.5	SS						ML									NV	NP	2.59										
B-1159	SS-12	38.5	SS	45.1	34.5	20.4			GM																					
B-1159	SS-14	48.5	SS	0.0	84.8	15.2			SC																					
B-1159	SS-16	58.5	SS	0.0	88.3	11.7			SP-SC																					
B-1161	SS-3	3.5	SS						CL-ML									56	32											
B-1161	SS-4	6.0	SS						CL-ML									36	23											
B-1161	SS-6	11.0	SS						CL-ML									40	25											
B-1161	SS-10	28.5	SS	0.9	94.9	4.2			SP											2.70										
B-1161	SS-11	33.5	SS						MH									78	41											
B-1161	SS-12	38.5	SS						MH									86	47	2.59										
B-1161	SS-14	48.5	SS	0.0	91.5	8.5			SP-SM																					
B-1161	SS-22	88.5	SS						CL									69	27											
B-1162	SS-3	3.5	SS						CL-ML									58	28											
B-1162	SS-4	6.0	SS						CL-ML									50	29											
B-1162	SS-6	11.0	SS						ML									NV	NP	2.76										
B-1162	SS-10	33.5	SS						CL									33	20											
B-1162	SS-11	38.5	SS						CL									37	20											
B-1162	SS-13A	48.5	SS	0.0	89.2	10.8			SP-SM																					
B-1162	SS-16	73.5	SS	0.0	93.9	6.1			SP-SC																					
B-1162	SS-26	138.5	SS	0.2	85.9	13.9			SM																					
B-1162	SS-29	158.5	SS	1.6	63.6	34.8			SC																					
B-1162	SS-31	188.5	SS						CH									51	25											
B-1162	UD-1	13.5	UD						ML				45.5	38.7	38.1		40.8					74.4	82.8	82.4		79.9	112			
B-1162	UD-2	53.5	UD	NA	NA	4.8			CL-ML							21.9	21.9	50	19	2.68					102.3	102.3	125			
B-1162	UD-7	168.5	UD						SC							9.5	9.5	56	21	2.65					110.8	110.8	121			
B-1163	SS-2	1.5	SS						MH									65	35											
B-1163	SS-3	3.5	SS						CH									58	33											
B-1163	SS-10	28.5	SS						CH									68	29											
B-1163	SS-11	33.5	SS						CL-ML									60	25											
B-1163	SS-12	38.5	SS						CL-ML									64	30											
B-1163	SS-15	53.5	SS	0.0	95.3	4.7			SP																					
B-1163	SS-19	73.5	SS	0.2	91.8	8.0			SP-SM																					
B-1163	SS-22	88.5	SS						CL-ML									98	38											
B-1164	UD-1	28.0	UD						SP-SC									95	25											
B-1164	UD-2	38.0	UD	0.0	66.7	33.3			SC				25.5	25.4	34.2		28.4	70	27			88.2	91.3	82.7		87.4	112			
B-1164	UD-3	73.0	UD						CL				30.2				30.2					90.3				90.3	118			
B-1164	UD-4	98.0	UD	6.4	27.4	66.2			MH							26.4	26.4	66	34						90.8	90.8	115			
B-1164	UD-5	103.0	UD						CL				19.5				19.5					110.8				110.8	132			
B-1185	SS-2	1.5	SS	0.0	89.9	10.1			SP-SM			7.8					7.8													
B-1185	SS-4	6.0	SS	0.4	79.1	20.5			SC			11.0					11.0	46	15											

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Source of Sample	Sample No.	Depth (ft)	Sample Type	Gravel [1] (%)	Sand [1] (%)	Fines [1] (%)	Silt [1] (%)	0.005 mm Clay [1] (%)	USCS[2]	Compaction: Optimum Moisture (%)	Compaction: Maximum Dry Density (pcf)	Natural Moisture Content (%) at e_o: SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	LL	PL	G_s	Dry Density (pcf) at e_o: SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	Wet Density Avg. (pcf)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
B-1185	SS-6	11.0	SS	0.0	72.0	28.0			SC			16.3					16.3	75	26											
B-1185	SS-11	33.5	SS	0.2	77.5	22.3			SC			34.4					34.4	96	33											
B-1186	SS-1	0.0	SS	0.0	90.8	9.2			SP-SM			6.9					6.9													
B-1186	SS-3	3.5	SS	0.0	90.6	9.4			SP-SM			8.8					8.8													
B-1186	SS-5	8.5	SS	0.0	76.2	23.8			SC			15.6					15.6													
B-1186	SS-7	13.5	SS	0.0	67.6	32.4			SC			19.3					19.3	57	22											
B-1186	SS-12	38.5	SS	0.0	78.2	21.8			SC-SM			23.6					23.6													
B-1189	SS-2	1.5	SS	0.0	92.6	7.4			SP-SM																					
B-1189	SS-4	6.0	SS	NA	NA	4.1			SP																					
B-1189	SS-6	11.0	SS	NA	NA	21.8			SC																					
B-1189	SS-7	13.5	SS	4.5	56.2	39.3			SC									53	27											
B-1189	SS-8	18.5	SS	NA	NA	37.6			SC									59	25											
B-1189	SS-10	28.5	SS	0.0	76.3	23.7			SM																					
B-1189	SS-12	38.5	SS	NA	NA	28.7			SC									42	22											
B-1189	SS-14	48.5	SS	0.0	91.4	8.6			SP-SM																					
B-1194	SS-1	0.0	SS	0.0	93.4	6.6			SP-SM																					
B-1194	SS-3	3.5	SS	0.0	92.9	7.1			SP-SM									NV	NP											
B-1194	SS-5	8.5	SS	0.0	77.9	22.1			SM									NV	NP											
B-1194	SS-7	13.5	SS	0.0	70.5	29.5			SM																					
B-1194	SS-9	23.5	SS	0.0	79.3	20.7			SC																					
B-1194	SS-11	33.5	SS	0.0	89.2	10.8			SP-SM																					
B-1194	SS-13	43.5	SS	0.0	88.2	11.8			SP-SC																					
B-1195	SS-2	1.5	SS	0.0	92.9	7.1			SP-SM			5.4					5.4	NV	NP											
B-1195	SS-4	6.0	SS	0.0	93.2	6.8			SP-SM			7.2					7.2	NV	NP											
B-1195	SS-6	11.0	SS	0.0	81.6	18.4			SC			14.5					14.5													
B-1195	SS-8	18.5	SS	0.0	77.2	22.8			SC			13.5					13.5													
B-1195	SS-10	28.5	SS	0.0	80.7	19.3			SC			19.7					19.7													
B-1195	SS-12	38.5	SS	0.0	74.8	25.2			SC			33.1					33.1													
B-1195	SS-14	48.5	SS	0.0	64.4	35.6			SC			39.8					39.8													
B-1196	SS-1	0.0	SS	0.0	93.0	7.0			SP-SM																					
B-1196	SS-3	3.5	SS	0.0	92.6	7.4			SP-SM																					
B-1196	SS-5	8.5	SS	0.0	93.3	6.7			SP-SM																					
B-1196	SS-7	13.5	SS	0.0	82.6	17.4			SM									NV	NP											
B-1196	SS-9	23.5	SS	0.6	81.0	18.4			SM									NV	NP											
B-1196	SS-11	33.5	SS	0.0	68.3	31.7			SC																					
B-1196	SS-13	43.5	SS	0.0	78.4	21.6			SC																					
B-1197	SS-2	1.5	SS	0.0	90.1	9.9			SP-SM			5.6					5.6	NV	NP											
B-1197	SS-4	6.0	SS	0.0	87.7	12.3			SM			14.2					14.2													
B-1197	SS-6	11.0	SS	0.0	86.2	13.8			SM			11.9					11.9	NV	NP											
B-1197	SS-8	18.5	SS	0.0	91.6	8.4			SP-SM			13.5					13.5													
B-1197	SS-10	28.5	SS	0.0	89.5	10.5			SP-SM			17.1					17.1													
B-1197	SS-12	38.5	SS	0.0	91.9	8.1			SP-SM			5.9					5.9													
B-1197	SS-14	48.5	SS	0.0	56.7	43.3			SM			48.5					48.5													
B-3001	SS-2	1.5	SS	NA	NA	25.1			SM																					
B-3001	SS-4	6.0	SS	NA	NA	7.4			SP-SM																					
B-3001	SS-6	11.0	SS	0.0	69.7	30.3			SM																					
B-3001	SS-7	13.5	SS	NA	NA	27.7			SM																					
B-3001	SS-8	18.5	SS	0.0	80.0	20.0			SM																					
B-3001	SS-10	28.5	SS	0.0	71.5	28.5			SM																					
B-3001	SS-11	33.5	SS	NA	NA	34.2			SM			29.7					29.7													

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Source of Sample	Sample No.	Depth (ft)	Sample Type	Gravel (1) (%)	Sand (1) (%)	Fines (1) (%)	Silt (1) (%)	0.005 mm Clay (1) (%)	USCS(2)	Compaction Optimum Moisture (%)	Compaction Maximum Dry Density (pcf)	Natural Moisture Content (%) at e_o SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	LL	PL	G_s	Dry Density (pcf) at e_o SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	Wet Density Avg. (pcf)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
B-3001	SS-12	38.5	SS	0.0	74.3	25.7			SC																					
B-3001	SS-13	43.5	SS	NA	NA	6.1			SP-SM																					
B-3001	SS-15	53.5	SS	0.0	95.2	4.8			SP																					
B-3001	SS-16	58.5	SS	0.0	93.6	6.4			SP-SM																					
B-3001	UD-3	108.5	UD						CL							27.2	27.2								94.9	94.9	121			
B-3001	UD-4	113.5	UD	NA	NA	57.8			CH				23.9	33.1			28.5	63	33	2.66		94.3	86.7			90.5	116			
B-3001	UD-5	133.5	UD	NA	NA	67.5			CL				25.8			29.7	27.8	47	23	2.61		97.2			91.6	94.4	121			
B-3001	UD-6	153.5	UD						CL				24.8	26.6			25.7					99.3	97.5			98.4	124			
B-3001	UD-8	173.5	UD	NA	NA	11.6			SP-SC							24.2	24.2	43	24	2.65					99.1	99.1	123			
B-3001	UD-9	193.5	UD						SP-SC				28.1				28.1					95.0				95.0	122			
B-3001	UD-10	208.5	UD	NA	NA	17.0			SP-SC				21.2	21.5	21.5		21.4	74	28			106.0	105.4	99.4		103.6	126			
B-3002	SS-3	3.5	SS	NA	NA	18.7			SM																					
B-3002	SS-4	6.0	SS	NA	NA	35.2			SC-SM																					
B-3002	SS-8	18.5	SS	NA	NA	17.5			SC-SM																					
B-3002	SS-12	38.5	SS	NA	NA	11.7			SP-SC																					
B-3002	SS-15	53.5	SS	NA	NA	6.3			SP-SC																					
B-3002	SS-17	63.5	SS	0.0	84.3	15.7			SC			47.0					47.0	137	31											
B-3002	SS-22	88.5	SS	0.0	2.5	97.5			MH			47.9					47.9	93	46											
B-3002	SS-25	108.5	SS	0.0	29.8	70.2			CH			33.4					33.4	93	35											
B-3002	UD-1	97.0	UD	NA	NA	75.1			MH				41.2	41.2	38.0		40.1	94	40			73.0	74.8	77.8		75.2	105			
B-3002	UD-2	113.5	UD	NA	NA	46.1			SC							39.3	39.3	76	35	2.65					73.0	73.0	102			
B-3003	SS-2	1.5	SS	NA	NA	33.3			SC																					
B-3003	SS-4	6.0	SS	NA	NA	18.9			SM																					
B-3003	SS-9	23.5	SS	NA	NA	14.7			SM																					
B-3003	SS-11	33.5	SS	NA	NA	55.3			ML																					
B-3003	SS-15	53.5	SS	NA	NA	10.1			SP-SM																					
B-3003	SS-16	58.5	SS	NA	NA	15.4			SM																					
B-3003	SS-22	88.5	SS	0.0	4.6	95.4			MH			42.3					42.3	98	45											
B-3003	SS-23	93.5	SS	0.0	11.7	88.3			MH			48.8					48.8	95	43											
B-3003	SS-24	113.5	SS	37.0	22.2	40.8			GC			22.0					22.0	60	32											
B-3003	SS-27	128.5	SS	0.0	23.3	76.7			CL			28.5					28.5	49	27											
B-3003	UD-2	103.0	UD						CL				33.9	24.4		37.6	32.0					84.7	99.8		75.0	86.5	114			
B-3003	UD-5	148.0	UD	NA	NA	63.7			CH				30.0	27.4	17.7		25.0	55	21			89.1	96.2	108.8		98.0	122			
B-3003	UD-6	163.0	UD	NA	NA	20.8			SC				20.4	19.9	20.0		20.1					99.4	101.2	102.7		101.1	121			
B-3004	SS-3	3.5	SS	NA	NA	24.1			SC																					
B-3004	SS-5	8.5	SS	NA	NA	27.6			SC																					
B-3004	SS-8	18.5	SS	NA	NA	7.3			SP-SM																					
B-3004	SS-12	38.5	SS	0.0	77.2	22.8			SC			28.2					28.2	63	31											
B-3004	SS-14	48.5	SS	NA	NA	13.9			SC																					
B-3004	SS-16	58.5	SS	NA	NA	5.3			SP-SM																					
B-3004	SS-23	98.5	SS	0.0	7.4	92.6			MH			32.2					32.2	80	43											
B-3004	SS-26	118.5	SS	0.0	27.2	72.8			MH			39.1					39.1	60	32											
B-3004	UD-1	93.0	UD						CL				42.0	39.9	31.2		37.7	97	53			74.6	76.1	79.5		76.7	106			
B-3004	UD-2	113.0	UD						CL				21.6				21.6					102.2				102.2	124			
B-3005	SS-3	3.5	SS	0.0	76.5	23.5			SC			14.1					14.1	34	18											
B-3005	SS-6	11.0	SS	0.0	86.0	14.0			SM			5.9					5.9	NV	NP											
B-3005	SS-9	23.5	SS	0.0	87.2	12.8			SC			12.2					12.2	47	21											
B-3005	SS-14	48.5	SS	0.0	90.4	9.6			SP-SM			19.2					19.2	NV	NP											
B-3005	SS-23	103.5	SS	0.0	10.4	89.6			MH			38.5					38.5	109	47											
B-3005	SS-25	123.5	SS	1.4	23.5	75.1			CH			29.8					29.8	50	24											

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Source of Sample	Sample No.	Depth (ft)	Sample Type	Gravel (1) (%)	Sand (1) (%)	Fines (1) (%)	Silt (1) (%)	0.005 mm Clay (1) (%)	USCS(2)	Compaction: Optimum Moisture (%)	Compaction: Maximum Dry Density (pcf)	Natural Moisture Content (%) at e_o: SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	LL	PL	G_s	Dry Density (pcf) at e_o: SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	Wet Density Avg. (pcf)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
B-3005	UD-1	93.0	UD	NA	NA	92.7			CL-ML				46.8	49.6	55.0		50.5					69.2	69.7	66.2		68.4	103			
B-3005	UD-3	118.0	UD						CL-ML				42.4	38.4	27.6		36.1					77.5	81.0	95.2		84.6	115			
B-3005	UD-4	138.0	UD	NA	NA	65.0			CL-ML				16.8	27.0	25.0		22.9	52	24			103.0	97.3	100.1		100.1	123			
B-3006	SS-4	6.0	SS	NA	NA	31.1			SC-SM																					
B-3006	SS-7	13.5	SS	NA	NA	30.5			SC-SM																					
B-3006	SS-9	23.5	SS	NA	NA	19.1			SM																					
B-3006	SS-15	53.5	SS	NA	NA	7.1			SP-SC																					
B-3006	SS-23	93.5	SS	0.0	29.3	70.7			MH			31.9					31.9	67	39											
B-3006	SS-25	103.5	SS	0.0	8.8	91.2			MH			42.2					42.2	80	42											
B-3006	SS-30	128.5	SS	0.0	22.1	77.9			CL			27.9					27.9	43	26											
B-3006	SS-33	143.5	SS	46.0	24.6	29.4			GC			14.3					14.3	49	20											
B-3007	SS-5	8.5	SS	NA	NA	20.1			SM																					
B-3007	SS-9	23.5	SS	NA	NA	19.7			SM																					
B-3007	SS-14	48.5	SS	NA	NA	10.5			SP-SC																					
B-3007	SS-23	93.5	SS	0.0	8.6	91.4			MH			42.2																		
B-3007	SS-26	108.5	SS	0.0	10.8	89.2			CH			41.6					41.6	112	64											
B-3008	SS-2	1.5	SS	0.0	77.8	22.2			SC																					
B-3008	SS-3	3.5	SS	10.4	62.0	27.6			SC																					
B-3008	SS-4	6.0	SS	0.0	75.5	24.5			SC																					
B-3008	SS-6	11.0	SS	0.0	79.1	20.9	1.9	19.0	SC			15.1					15.1											5.09	140.0	19.0
B-3008	SS-9	23.5	SS	0.0	89.6	10.4			SP-SM																					
B-3008	SS-10	28.5	SS	0.0	73.4	26.6			SC									55	25											
B-3008	SS-11	33.5	SS	NA	NA	31.5			SC-SM																					
B-3008	SS-12	38.5	SS	NA	NA	31.1			SC-SM																					
B-3008	SS-13	43.5	SS	0.0	85.5	14.5			SC-SM									42	23											
B-3008	SS-15	53.5	SS	NA	NA	5.4			SP-SC																					
B-3008	SS-16	58.5	SS	0.0	84.4	15.6	1.1	14.5	SC			31.4					31.4											5.53	390.0	14.0
B-3008	SS-27	113.5	SS						MH									58	36											
B-3008	SS-29	123.5	SS						MH									61	30									7.49	150.0	2400.0
B-3009	SS-4	6.0	SS	NA	NA	21.3			SM																					
B-3009	SS-9	23.5	SS	NA	NA	6.8			SP-SM																					
B-3009	SS-13	43.5	SS	NA	NA	14.8			SM																					
B-3009	SS-24	98.5	SS	0.0	28.6	71.4			CH			32.4					32.4	65	31											
B-3009	SS-30	128.5	SS	0.0	34.1	65.9			CL			24.8					24.8	46	22											
B-3010	SS-3	3.5	SS	NA	NA	21.6			SC																					
B-3010	SS-5	8.5	SS	NA	NA	39.3			SC																					
B-3010	SS-8	18.5	SS	NA	NA	8.3			SP-SM																					
B-3010	SS-25	108.5	SS	0.0	9.2	90.8			CL			36.8					36.8													
B-3010	SS-28	123.5	SS	9.5	34.4	56.1			CL			22.0					22.0	41	21											
B-3010	SS-31	143.5	SS	1.1	36.7	62.2			CL			24.7					24.7	45	21											
B-3010	UD-1	103.5	UD						CL				6.0	43.3	41.3		30.2					103.4	76.4	78.7		86.2	110			
B-3010	UD-2	128.5	UD	NA	NA	75.4			CL				28.6				28.6					93.0				93.0	120			
B-3013	UD-1	98.5	UD	NA	NA	60.4			MH							31.4	31.4	66	37	2.66					84.2	84.2	111			
B-3013	UD-2	101.0	UD						CL-ML				10.6	40.2	26.9		25.9			2.66		100.2	77.2	84.5		87.3	109			
B-3013	UD-3	118.5	UD						GP				15.2				15.2					94.0				94.0	108			
B-3013	UD-4	121.0	UD						CL-ML				41.5	28.9	23.8		31.4					86.6	92.4	91.4		90.1	118			
B-3015	SS-3	3.5	SS	NA	NA	16.0			SM			12.4					12.4													
B-3015	SS-5	8.5	SS	NA	NA	42.1			SC			15.0					15.0													
B-3015	SS-12	38.5	SS	NA	NA	29.0			SC-SM			38.2					38.2													
B-3015	SS-14	48.5	SS	NA	NA	9.8			SP-SM			24.0					24.0													

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Source of Sample	Sample No.	Depth (ft)	Sample Type	Gravel [1] (%)	Sand [1] (%)	Fines [1] (%)	Silt [1] (%)	0.005 mm Clay [1] (%)	USCS[2]	Compaction		Natural Moisture Content (%) at e_o						LL	PL	G_s	Dry Density (pcf) at e_o						Wet Density Avg. (pcf)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
										Optimum Moisture (%)	Maximum Dry Density (pcf)	SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.				SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.				
B-3015	SS-25	103.5	SS	0.0	14.5	85.5			MH			42.4					42.4	50	30											
B-3015	UD-1C	121.5	UD	NA	NA	62.2			CL-ML				30.4			27.6	29.0	52	27			89.1			91.1	90.1	116			
B-3015	UD-2	143.5	UD						CL-ML				17.6				17.6					111.7				111.7	131			
B-3017	SS-1	0.0	SS	0.0	85.6	14.4			SC																					
B-3017	SS-3	3.5	SS	NA	NA	15.8			SC																					
B-3017	SS-5	8.5	SS	0.0	81.0	19.0			SM																					
B-3017	SS-7	13.5	SS	NA	NA	31.6			SC																					
B-3017	SS-9	23.5	SS	NA	NA	95.5			MH									107	52											
B-3017	UD-1	93.0	UD	NA	NA	68.7			MH							34.3	34.3	65	36	2.63					84.9	84.9	114			
B-3017	UD-2	113.5	UD						CL				21.7	24.1	24.5		23.4					102.1	99.6	99.0		100.2	124			
B-3018	SS-4	6.0	SS	NA	NA	13.9			SC			8.1					8.1													
B-3018	SS-7	13.5	SS	NA	NA	19.9			SC			15.9					15.9													
B-3018	SS-10	28.5	SS	NA	NA	19.3			SM			20.1					20.1													
B-3018	SS-25	108.5	SS	0.0	30.9	69.1			MH			32.0					32.0	66	33											
B-3018	SS-28	128.5	SS	NA	NA	75.1			CL			24.9					24.9	46	22											
B-3018	SS-31	143.5	SS	1.8	22.6	75.6			CL-ML			28.3					28.3	34	23											
B-3018	UD-2	113.5	UD	NA	NA	75.7			MH				21.4				21.4	63	37			99.7				99.7	121			
B-3018	UD-3	148.5	UD						CL-ML				23.1				23.1					102.2				102.2	126			
B-3019	SS-3	3.5	SS	NA	NA	34.5			SM																					
B-3019	SS-8	18.5	SS	0.5	81.7	17.8			SM																					
B-3019	SS-25	108.5	SS	0.0	15.1	84.9			MH			38.9					38.9	71	35											
B-3019	SS-26	123.5	SS	0.0	14.4	85.6			CH			38.4					38.4	55	28											
B-3019	UD-1	93.5	UD						ML				55.1	43.4	43.8		47.4					68.4	75.2	75.2		72.9	107			
B-3019	UD-2	113.5	UD	NA	NA	30.3			GM							45.5	45.5								71.2	71.2	104			
B-3019	UD-3	118.5	UD						GM				28.8				28.8					92.4				92.4	119			
B-3020	UD-1	103.5	UD						CL-ML				32.8				32.8					83.4				83.4	111			
B-3020	UD-2	133.5	UD						CL-ML				52.9	28.9	29.2		37.0					80.1	91.6	93.0		88.2	120			
B-3021	UD-1	103.5	UD						CL-ML				30.2				30.2					88.6				88.6	115			
B-3021	UD-2	148.5	UD	0.5	91.6	7.9			SP-SM																					
B-3021	UD-3	153.5	UD	0.0	87.5	12.5			SM			19.3					19.3													
B-3023	UD-1	93.0	UD						CL				29.9				29.9					89.3				89.3	116			
B-3023	UD-2	103.0	UD	NA	NA	44.8			CH							32.4	32.4	62	26						87.1	87.1	115			
B-3023	UD-3	113.0	UD						CL				38.5	25.6			32.1					80.4	94.5			87.5	115			
B-3023	UD-4	148.0	UD						SP-SM				24.5				24.5					102.1				102.1	127			
B-3024	SS-3	3.5	SS	NA	NA	13.5			SM																					
B-3024	SS-6	11.0	SS	NA	NA	24.9			SM																					
B-3024	SS-8	18.5	SS	NA	NA	30.8			SC																					
B-3024	SS-11	33.5	SS	NA	NA	41.6			SC																					
B-3024	SS-15	53.5	SS	NA	NA	13.2			SC																					
B-3024	SS-17	63.5	SS	NA	NA	8.4			SP-SC																					
B-3024	UD-1	97.0	UD						CL-ML				40.0	40.1	36.7		38.9					80.0	76.7	80.8		79.2	110			
B-3024	UD-2	117.5	UD	NA	NA	69.1			CL-ML							45.9	45.9	67	32						73.1	73.1	107			
B-3025	SS-4	6.0	SS	NA	NA	22.8			SC																					
B-3025	SS-7	13.5	SS	NA	NA	24.0			SC																					
B-3025	SS-10	28.5	SS	NA	NA	15.2			SC																					
B-3025	SS-11	33.5	SS	NA	NA	38.3			SC																					
B-3025	UD-1	103.5	UD						ML				38.6				38.6					78.6				78.6	109			
B-3025	UD-2	133.5	UD	NA	NA	64.9			CH				22.7				22.7	53	23			99.0				99.0	122			
B-3026	UD-1	28.5	UD	NA	NA	24.0			SC				19.1	30.8	12.8		20.9					97.8	81.5	100.7		93.3	112			
B-3026	UD-2	33.5	UD						SC				25.9	26.1	29.8		27.3					89.0	88.8	86.9		88.3	112			

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Source of Sample	Sample No.	Depth (ft)	Sample Type	Gravel (1) (%)	Sand (1) (%)	Fines (1) (%)	Silt (1) (%)	0.005 mm Clay (1) (%)	USCS(2)	Compaction: Optimum Moisture (%)	Compaction: Maximum Dry Density (pcf)	Natural Moisture Content (%) at e_o: SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	LL	PL	G_s	Dry Density (pcf) at e_o: SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	Wet Density Avg. (pcf)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
B-3026	UD-3	38.5	UD	NA	NA	20.6			SC				23.3	22.4	18.5		21.4					94.1	99.1	101.4		98.2	119			
B-3030	UD-1	30.0	UD	0.0	91.9	8.1			SP-SM																					
B-3030	UD-2	35.0	UD						SM											2.72										
B-3031	UD-1	30.0	UD	0.0	95.7	4.3			SP			22.0					22.0													
B-3031	UD-2	33.5	UD	0.0	76.6	23.4			SM			17.4					17.4													
B-3033	UD-1	13.5	UD	0.0	91.5	8.5			SP-SM											2.69										
B-3033	UD-2	28.5	UD	0.0	85.3	14.7			SM			24.9					24.9													
B-3033	UD-3	33.5	UD	0.0	90.4	9.6			SP-SM			18.3					18.3													
B-3033	UD-4	38.5	UD						SM											2.72										
B-3034	UD-1	28.5	UD	0.0	89.5	10.5			SP-SM			17.2					17.2													
B-3034	UD-2	33.5	UD	0.0	85.8	14.2			SM																					
B-3034	UD-4	118.5	UD	0.4	30.6	69.0			MH				32.8	27.2	28.3		29.4	68	36			87.5	95.0	90.9		91.1	118			
B-3034	UD-5	138.5	UD	0.1	84.4	15.5			SC							16.4	16.4	40	19	2.65					95.8	95.8	111			
B-3035	UD-1	95.5	UD	NA	NA	90.8			MH							42.5	42.5	93	47						75.8	75.8	108			
B-3035	UD-2	103.5	UD						CL-ML				30.1	25.9	26.3		27.4					84.1	88.4	86.1		86.2	110			
B-3035	UD-3	133.5	UD						CL-ML							28.3	28.3								93.3	93.3	120			
B-3035	UD-4	148.5	UD						CL-ML				17.9				17.9					109.8				109.8	129			
B-3036	SS-3	3.5	SS	1.0	79.8	19.2			SM			13.3					13.3													
B-3036	SS-6	11.0	SS	2.0	82.2	15.8			SM			13.3					13.3													
B-3036	SS-11	33.5	SS	0.0	53.1	46.9	7.8	39.1	SC																					
B-3036	SS-13	43.5	SS	0.0	87.1	12.9			SM			39.5					39.5													
B-3036	SS-18	68.5	SS	0.0	76.5	23.5	5.6	17.9	SC																					
B-3036	SS-21	83.5	SS	0.4	37.5	62.1			ML			60.1					60.1													
B-3036	SS-22	88.5	SS	8.2	45.4	46.4			SM			48.4					48.4													
B-3036	SS-24	98.5	SS						MH									69	37											
B-3036	SS-27	113.5	SS						CH									51	26											
B-3036	SS-35	153.5	SS	9.4	81.1	9.5			SP-SC			20.0					20.0													
B-4001	SS-2	1.5	SS	NA	NA	12.6			SM																					
B-4001	SS-5	8.5	SS	0.0	74.6	25.4			SC									49	24											
B-4001	SS-7	13.5	SS	0.0	91.8	8.2			SP-SM																					
B-4001	SS-9	23.5	SS	NA	NA	57.2			CL-ML									110	49											
B-4001	SS-11	33.5	SS	NA	NA	21.2			SC																					
B-4001	SS-13	43.5	SS	0.0	72.3	27.7			SM									50	30											
B-4001	SS-23	93.5	SS	0.9	17.4	81.7			MH			45.3					45.3	101	54											
B-4001	SS-25	108.5	SS	0.0	33.0	67.0			MH			29.8					29.8	51	29											
B-4001	SS-28	138.5	SS	0.0	20.2	79.8			ML			26.7					26.7	38	25											
B-4001	SS-29	143.5	SS	0.0	25.8	74.2			CH			30.2					30.2	56	26											
B-4001	SS-31	153.5	SS	0.0	26.8	73.2			CL			28.2					28.2	44	22											
B-4001	UD-3	148.5	UD	NA	NA	44.1			SM				15.2				15.2	96	59			111.0				111.0	128			
B-4001	UD-5	133.5	UD	NA	NA	57.1			ML				15.4				15.4	50	28			114.9				114.9	133			
B-4001	UD-6	158.5	UD						ML				25.9				25.9					97.1				97.1	122			
B-4001	UD-7	178.5	UD	0.9	73.9	25.2			SM				40.0	25.4			32.7					78.8	96.9			87.8	116			
B-4001	UD-8	198.5	UD	NA	NA	19.7			SM																					
B-4001	UD-9	238.5	UD	NA	NA	69.6			ML				18.6				18.6	45	27			112.5				112.5	133			
B-4001	UD-10	248.5	UD						SP							16.5	16.5			2.65					106.7	106.7	124			
B-4001	UD-12	298.5	UD	NA	NA	13.7			SM																					
B-4001	UD-13	308.5	UD	NA	NA	67.4			CL							16.7	16.7	49	22	2.68					114.2	114.2	133			
B-4001	UD-14	348.5	UD						CH				19.9				19.9					106.1				106.1	127			
B-4002	SS-4	6.0	SS	NA	NA	8.0			SP-SM																					
B-4002	SS-7	13.5	SS	NA	NA	47.2			SC																					

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

Source of Sample	Sample No.	Depth (ft)	Sample Type	Gravel (1) (%)	Sand (1) (%)	Fines (1) (%)	Silt (1) (%)	0.005 mm Clay (1) (%)	USCS(2)	Compaction: Optimum Moisture (%)	Compaction: Maximum Dry Density (pcf)	Natural Moisture Content (%) at e_o: SPT	Natural Moisture Content: Triaxial, Compression or Direct Shear 1	2	3	Natural Moisture Content: Consolidation	Natural Moisture Content: Avg.	LL	PL	G_s	Dry Density (pcf) at e_o: SPT	Dry Density: Triaxial, Compression or Direct Shear 1	2	3	Dry Density: Consolidation	Dry Density: Avg.	Wet Density Avg. (pcf)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
B-4002	SS-9	23.5	SS	NA	NA	13.3			SM																					
B-4002	SS-11	33.5	SS	NA	NA	36.2			SC																					
B-4002	SS-16	58.5	SS	NA	NA	10.2			SP-SM																					
B-4002	SS-19	73.5	SS	NA	NA	6.2			SP-SM																					
B-4002	SS-23	103.5	SS	0.0	19.3	80.7			MH			40.2					40.2	81	38											
B-4002	SS-26	118.5	SS	0.0	13.0	87.0			CH			38.9					38.9	78	35											
B-4002	SS-30	143.5	SS	0.0	30.4	69.6			CL			30.3					30.3	49	23											
B-4002	UD-1	98.5	UD						ML				40.4	33.1	41.7		38.4					75.5	80.3	75.1		77.0	106			
B-4002	UD-2	123.5	UD						ML							40.9	40.9			2.65					76.4	76.4	108			
B-4002	UD-3	173.5	UD	NA	NA	5.4			SP-SM				17.5	18.3			17.9					105.0	104.8			104.9	124			
B-4002	UD-4	233.5	UD						CL				27.7				27.7					94.1				94.1	120			
B-4003	SS-4	11.0	SS	NA	NA	20.8			SC																					
B-4003	SS-10	28.5	SS	0.0	71.2	28.8			SC			22.4					22.4													
B-4003	SS-14	48.5	SS	NA	NA	20.3			SC																					
B-4003	SS-24	98.5	SS	NA	NA	94.1			MH			50.8					50.8	98	51											
B-4003	SS-26	108.5	SS	1.6	35.4	63.0			MH			30.2					30.2	61	32											
B-4003	SS-32	148.5	SS	0.0	25.7	74.3			CL			25.5					25.5	45	25											
B-4003	UD-1	117.0	UD						ML				25.2				25.2					98.4				98.4	123			
B-4003	UD-2	136.0	UD						ML							34.3	34.3								85.4	85.4	115			
B-4003	UD-5	201.0	UD	NA	NA	18.3			SM																					
B-4003	UD-6	248.5	UD	NA	NA	17.8			SM																					
B-4004	SS-5	8.5	SS	0.0	75.1	24.9			SM			14.7					14.7			2.75										
B-4004	SS-6	11.0	SS	NA	NA	22.5			SM																					
B-4004	SS-8	18.5	SS	0.0	92.8	7.2			SP-SM			12.6					12.6			2.69										
B-4004	SS-11	33.5	SS	0.0	43.1	56.9	9.3	47.6	CL																					
B-4004	SS-14	48.5	SS	0.0	74.0	26.0	5.8	20.2	SC																			5.47	150.0	20.0
B-4004	SS-16	58.5	SS	NA	NA	11.3			SP-SC																					
B-4004	SS-17	63.5	SS	10.5	70.9	18.6			SC			31.5					31.5													
B-4004	SS-19	73.5	SS	2.1	81.4	16.5			SM			24.2					24.2											8.89	130.0	20.0
B-4004	SS-22	88.5	SS	9.5	82.3	8.2			SW-SM			24.0					24.0											9.24	130.0	30.0
B-4004	SS-24	98.5	SS						MH			46.2					46.2	95	50											
B-4004	SS-25	103.5	SS	0.0	5.7	94.3			MH			50.7					50.7	97	50											
B-4004	SS-28	118.5	SS						MH									57	32									7.62	150.0	2600.0
B-4004	SS-31	133.5	SS						CL									66	33											
B-4004	SS-34	148.5	SS	0.0	26.3	73.7			CL			31.0					31.0	49	25											
B-4005	SS-5	8.5	SS	NA	NA	13.3			SM																					
B-4005	SS-8	18.5	SS	NA	NA	31.9			SC																					
B-4005	SS-12	38.5	SS	NA	NA	36.9			SC																					
B-4005	SS-24	98.5	SS	0.0	3.1	96.9			MH			52.2					52.2	92	45											
B-4005	SS-26	113.5	SS	1.4	33.7	64.9			MH			31.6					31.6	63	34											
B-4005	SS-29	128.5	SS	0.0	12.1	87.9			MH			45.1					45.1	68	33											
B-4005	SS-32	143.5	SS	0.0	28.5	71.5			CL			21.3					21.3	41	23											
B-4006	SS-6	11.0	SS	NA	NA	24.5			SC																					
B-4006	SS-9	23.5	SS	NA	NA	18.5			SC																					
B-4006	SS-15	53.5	SS	NA	NA	19.3			SM																					
B-4006	SS-29	123.5	SS	0.0	17.8	82.2			MH			45.2					45.2	73	35											
B-4006	SS-33	143.5	SS	0.0	35.3	64.7			CH			17.7					17.7	53	23											
B-4007	SS-3	3.5	SS	NA	NA	19.0			SC																					
B-4007	SS-10	28.5	SS	NA	NA	15.6			SC																					
B-4007	SS-16	58.5	SS	NA	NA	12.5			SC																					
B-4007	SS-25	108.5	SS	0.0	26.0	74.0			MH			40.3					40.3	87	48											

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

			Sample					0.005 mm		Compaction		Natural Moisture Content (%) at e_o									Dry Density (pcf) at e_o						Wet			
Source of Sample	Sample No.	Depth (ft)	Type	Gravel (1) (%)	Sand (1) (%)	Fines (1) (%)	Silt (1) (%)	Clay (1) (%)	USCS(2)	Optimum Moisture (%)	Maximum Dry Density (pcf)	SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	LL	PL	G_s	SPT	Triaxial, Compression or Direct Shear 1	2	3	Consolidation	Avg.	Density Avg. (pcf)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
B-4007	SS-28	128.5	SS	1.7	22.8	75.5			MH			38.3					38.3	66	34											
B-4007	UD-1	98.5	UD	NA	NA	59.3			MH				30.7	45.2			38.0	95	52			80.2	71.7			76.0	104			
B-4007	UD-2	118.5	UD	9.4	39.5	51.1			CH							18.8	18.8	53	27						102.1	102.1	121			
B-4007	UD-3	153.5	UD						ML				32.2	26.6	24.6		27.8					87.9	95.6	100.2		94.6	121			
B-4008	SS-4	6.0	SS	NA	NA	26.8			SC																					
B-4008	SS-7	13.5	SS	NA	NA	18.0			SM																					
B-4008	SS-12	38.5	SS	0.0	65.4	34.6			SM			45.9					45.9	81	53											
B-4008	SS-24	108.5	SS	0.0	20.7	79.3			MH			46.4					46.4	96	43											
B-4008	SS-31	153.5	SS	0.0	32.3	67.7			CL			26.6					26.6	47	23											
B-4008	UD-1	98.5	UD						ML				32.6				32.6					71.8				71.8	95			
B-4008	UD-2	103.5	UD						ML				38.1				38.1					80.7				80.7	111			
B-4008	UD-3	123.5	UD						CH							44.6	44.6	76	35	2.61					72.8	72.8	105			
B-4008	UD-4	128.5	UD						ML				27.2				27.2					95.8				95.8	122			
B-4009	SS-5	8.5	SS	NA	NA	19.9			SM																					
B-4009	SS-8	18.5	SS	NA	NA	17.9			SC-SM																					
B-4009	SS-12	38.5	SS	0.0	57.8	42.2			SM			47.0					47.0	45	27											
B-4009	SS-17	63.5	SS	0.0	90.2	9.8			SP-SM																					
B-4009	SS-24	98.5	SS	0.0	6.7	93.3			MH			45.4					45.4	109	62											
B-4009	SS-28	123.5	SS	0.0	20.9	79.1			MH			31.0					31.0	62	32											
B-4009	SS-34	158.5	SS	0.6	29.5	69.9			CH			26.5					26.5	60	26											
B-4009	UD-1	108.0	UD	NA	NA	89.1			MH				41.7	42.5	40.9		41.7	89	48			77.4	76.8	78.1		77.4	110			
B-4009	UD-2	148.0	UD						CL-ML				28.7	27.3	30.4		28.8					93.1	95.9	92.6		93.8	121			
B-4010	SS-5	8.5	SS	NA	NA	19.1			SM																					
B-4010	SS-10	28.5	SS	NA	NA	21.4			SC-SM																					
B-4010	SS-14	48.5	SS	NA	NA	23.7			SC-SM																					
B-4010	SS-25	108.5	SS	0.0	17.9	82.1			MH			38.2					38.2	67	39											
B-4010	SS-29	143.5	SS	0.0	30.1	69.9			CH			31.1					31.1	56	26											
B-4011	SS-5	8.5	SS	NA	NA	23.9			SM																					
B-4011	SS-9	23.5	SS	NA	NA	18.4			SC-SM																					
B-4011	SS-15	53.5	SS	NA	NA	10.2			SP-SM																					
B-4011	SS-23	93.5	SS	0.0	24.0	76.0			MH			30.8					30.8	71	46											
B-4011	SS-26	108.5	SS	0.0	15.9	84.1			MH			37.2					37.2	65	36											
B-4013	SS-4	6.0	SS	NA	NA	12.4			SM																					
B-4013	SS-10	21.0	SS	NA	NA	31.1			SC																					
B-4013	SS-16	36.0	SS	NA	NA	56.6			CL																					
B-4013	SS-22	51.0	SS	NA	NA	13.1			SC																					
B-4013	UD-2	101.0	UD						CL-ML				38.0				38.0					80.6				80.6	111			
B-4013	UD-3	128.5	UD						CL-ML				27.5	29.6	30.0		29.0					91.3	87.8	85.4		88.2	114			
B-4014	SS-2	1.5	SS	0.0	90.8	9.2			SP-SM																					
B-4014	SS-4	6.0	SS	NA	NA	4.5			SP																					
B-4014	SS-6	11.0	SS	NA	NA	25.7			SC																					
B-4014	SS-8	18.5	SS	0.3	74.2	25.5			SC-SM									51	19											
B-4014	SS-10	28.5	SS	0.0	64.5	35.5			SC-SM																					
B-4014	SS-12	38.5	SS	NA	NA	67.4			MH									95	49											
B-4014	SS-14	48.5	SS	NA	NA	13.1			SC																					
B-4014	SS-16	58.5	SS	0.0	87.2	12.8			SC																					
B-4014	SS-25	103.5	SS	0.0	32.2	67.8			MH			29.9					29.9	56	35											
B-4015	SS-3	3.5	SS	NA	NA	14.9			SM																					
B-4015	SS-16	58.5	SS	NA	NA	6.8			SP-SM																					
B-4015	SS-22	88.5	SS	4.8	13.6	81.6			MH			41.1					41.1	83	49											

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

			Sample					0.005 mm		Compaction		Natural Moisture Content (%) at e_o									Dry Density (pcf) at e_o						Wet			
Source of	Sample	Depth	Type	Gravel (1)	Sand (1)	Fines (1)	Silt (1)	Clay (1)	USCS(2)	Optimum Moisture	Maximum Dry Density	SPT	Triaxial, Compression or Direct Shear			Consolidation	Avg.	LL	PL	G_s	SPT	Triaxial, Compression or Direct Shear			Consolidation	Avg.	Density Avg.	pH	Chloride	Sulfate
Sample	No.	(ft)		(%)	(%)	(%)	(%)	(%)		(%)	(pcf)		1	2	3							1	2	3			(pcf)		(mg/kg)	(mg/kg)
B-4015	SS-25	103.5	SS	0.0	17.9	82.1			CH			34.8					34.8	86	37											
B-4015	SS-32	138.5	SS	0.0	25.0	75.0			CL			21.0					21.0	44	21											
B-4016	SS-24	98.5	SS	1.2	19.1	79.7			MH			44.3					44.3	88	45											
B-4017	SS-4	6.0	SS	NA	NA	27.1			SC																					
B-4017	SS-9	23.5	SS	NA	NA	17.0			SC																					
B-4017	SS-30	138.5	SS	0.0	25.3	74.7			CL			34.7					34.7	40	24											
B-4017	UD-1	96.0	UD						ML				62.1				62.1					69.4				69.4	113			
B-4017	UD-3	116.0	UD						ML				23.5				23.5					99.3				99.3	123			
B-4018	UD-1	93.5	UD						CL				42.5	43.9	44.0		43.5					74.4	75.1	95.5		81.7	117			
B-4018	UD-3	103.0	UD						CL				28.2	24.8			26.5					92.2	99.3			95.7	121			
B-4018	UD-4	128.5	UD	NA	NA	81.8			CL							21.3	21.3	35	23			35.0	23.0		97.8	97.8	119			
B-4018	UD-5	138.5	UD						CL				28.9	23.6	24.0		25.5					91.8	98.6	99.3		96.5	121			
B-4022	SS-6	11.0	SS	NA	NA	24.8			SC																					
B-4022	SS-15	53.5	SS	NA	NA	11.4			SP-SC																					
B-4023	SS-3	3.5	SS	NA	NA	30.4			SC																					
B-4023	SS-9	23.5	SS	NA	NA	19.3			SC																					
B-4026	SS-4	6.0	SS	NA	NA	11.0			SP-SM																					
B-4026	SS-7	13.5	SS	NA	NA	28.4			SC-SM																					
B-4026	SS-11	33.5	SS	NA	NA	22.8			SM																					
B-4026	SS-15	53.5	SS	NA	NA	23.8			SC-SM																					
B-4030	UD-1	13.5	UD	0.0	89.3	10.7			SP-SM				12.2	9.7			11.0			2.72		100.5	97.4			99.0	110			
B-4030	UD-2	28.5	UD	0.0	91.5	8.5			SP-SM			12.5					12.5													
B-4030	UD-3	33.5	UD	0.0	90.4	9.6			SP-SM																					
B-4030	UD-5	103.0	UD						CL											2.68										
B-4030	UD-6	105.0	UD						CL				29.8	30.7	35.6		32.0					91.7	89.4	112.8		97.9	130			
B-4031	UD-1	28.5	UD	0.0	82.4	17.6			SM																					
B-4031	UD-2	33.5	UD						SM				15.8	13.5	13.8		14.4					103.7	107.2	107.2		106.0	121			
B-4031	UD-3	38.5	UD						SM				21.1	17.6			19.4					96.7	94.7			95.7	114			
B-4032	UD-1	28.5	UD	0.0	77.1	22.9			SM																					
B-4032	UD-2	33.5	UD	NA	NA	11.1			SM				27.3	11.6			19.5					96.3	108.1			102.2	122			
B-4032A	UD-1	38.5	UD	0.0	96.7	3.3			SP			19.2					19.2													
B-4033	UD-1	28.5	UD	0.0	88.9	11.1			SP-SM				15.7	19.4			17.6					92.2	90.2			91.2	107			
B-4033	UD-2	33.5	UD	0.0	63.4	36.6			SC-SM			22.8					22.8													
B-4033	UD-3	38.5	UD						SP-SC				26.8	26.0	22.4		25.1					82.1	81.5	88.0		83.9	105			
B-4034	UD-1	28.5	UD	0.0	86.6	13.4			SM			18.0					18.0													
B-4034	UD-3	38.5	UD						SP-SC									NV	NP											
B-4034	UD-4	108.5	UD						CL-ML				28.5				28.5					92.7				92.7	119			
B-4034	UD-5	113.5	UD	23.9	19.9	56.2			MH				33.5	29.7	20.5		27.9	53	31			87.1	90.2	108.4		95.2	121			
B-4034	UD-6	143.5	UD	0.0	38.1	61.9			CL-ML							26.4	26.4	47	26	2.74					94.2	94.2	119			
B-4035	UD-1	98.5	UD						CL-ML				46.3	43.1	37.3		42.2					70.5	74.1	79.9		74.8	106			
B-4035	UD-2	103.5	UD	NA	NA	83.8			MH				36.4			37.2	36.8	86	50			79.9			79.6	79.7	109			
B-4035	UD-3	148.5	UD	0.0	33.6	66.4			CL			24.3					24.3	43	22		98.7					98.7	123			
B-6020	SS-2	1.5	SS	0.0	70.9	29.1			SC									53	27											
B-6020	SS-4	6.0	SS	0.0	90.1	9.9			SP-SM									NV	NP											
B-6020	SS-6	11.0	SS	0.0	76.6	23.4			SC-SM									47	25											
B-6020	SS-14	48.5	SS	0.0	58.4	41.6			SM			44.3					44.3	111	60											
B-6020	SS-16	58.5	SS	0.0	65.7	34.3			SM			46.1					46.1	139	78											
B-6021	SS-4	6.0	SS	0.0	73.3	26.7			SC									41	22											
B-6021	SS-7	13.5	SS	0.0	66.4	33.6			SM									47	28											
B-6022	SS-12	38.5	SS	0.0	52.7	47.3			SM			41.8					41.8	82	41											

TABLE 5 (ALSO TABLE F-1, ATTACHMENT F)
SUMMARY OF SOIL TESTS
VOGTLE UNITS 3 & 4 COL PROJECT
MACTEC ENGINEERING AND CONSULTING, INC.
MACTEC PROJECT No. 6141-06-0286

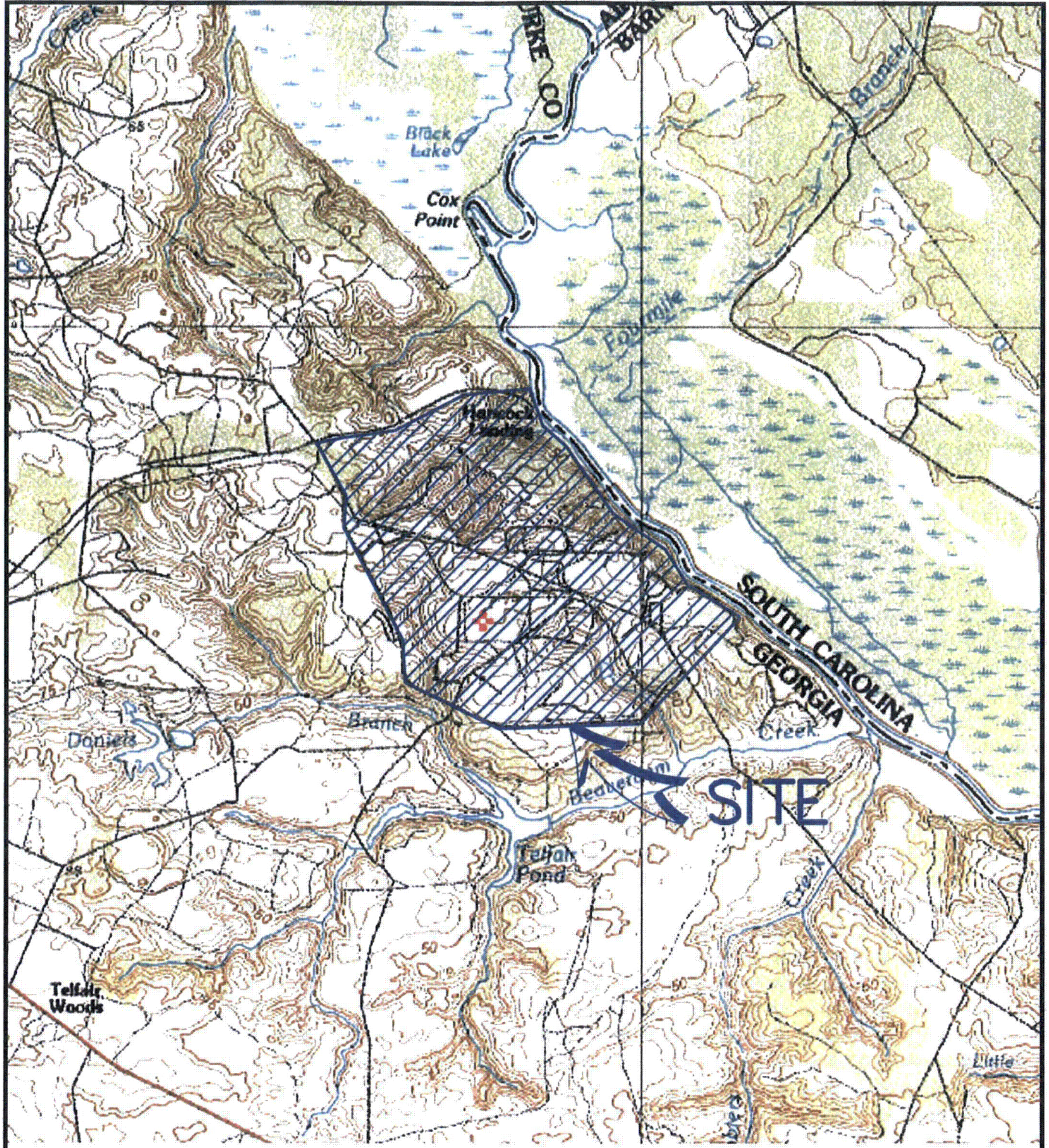
Source of Sample	Sample No.	Depth (ft)	Sample Type	Gravel [1] (%)	Sand [1] (%)	Fines [1] (%)	Silt [1] (%)	0.005 mm Clay [1] (%)	USCS[2]	Compaction: Optimum Moisture (%)	Compaction: Maximum Dry Density (pcf)	Natural Moisture Content (%) at e_o: SPT	Natural Moisture Content (%) at e_o: Triaxial, Compression or Direct Shear 1	2	3	Natural Moisture Content (%) at e_o: Consolidation	Natural Moisture Content (%) at e_o: Avg.	LL	PL	G_s	Dry Density (pcf) at e_o: SPT	Dry Density (pcf) at e_o: Triaxial, Compression or Direct Shear 1	2	3	Dry Density (pcf) at e_o: Consolidation	Dry Density (pcf) at e_o: Avg.	Wet Density Avg. (pcf)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
B-6022	SS-14	48.5	SS	0.0	81.9	18.1			SC			27.4					27.4	68	29											
B-6023	SS-5	8.5	SS	0.0	83.0	17.0			SC									36	17											
B-6027	SS-3	7.5	SS	7.4	85.0	7.6			SP-SM			21.2					21.2													
B-6027	SS-5	12.5	SS	15.4	74.7	9.9			SP-SM			16.3					16.3													
B-6027	SS-7	20.0	SS	0.0	52.2	47.8			SM			24.3					24.3													
B-6027	SS-8	23.5	SS	1.7	51.8	46.5			SM			22.9					22.9													
B-6027	SS-10	33.5	SS	0.0	78.2	21.8			SM			17.3					17.3													
B-6027	SS-11	38.5	SS	0.0	93.3	6.7			SP-SM			23.8					23.8													
B-6027	SS-13	48.5	SS	0.5	90.8	8.7			SP-SM			29.5					29.5													
B-6027	SS-14	53.5	SS	0.0	77.5	22.5			SM			23.8					23.8	46	29											
B-6027	SS-15	58.5	SS	0.0	78.8	21.2			SM			32.4					32.4	45	29											
B-6027	SS-16	63.5	SS	0.0	91.2	8.8			SW-SM			24.8					24.8													
B-6028	SS-3	3.5	SS	0.0	89.2	10.8			SP-SM			9.5					9.5													
B-6028	SS-5	8.5	SS	0.0	88.4	11.6			SP-SM			8.1					8.1													
B-6028	SS-6	11.0	SS	0.0	91.0	9.0			SP-SM			14.4					14.4													
B-6028	SS-8	18.5	SS	0.0	2.6	97.4			ML			33.0					33.0	49	28											
B-6028	SS-10	28.5	SS	0.3	97.3	2.4			SP			25.6					25.6													
B-6028	SS-12	38.5	SS	0.0	98.4	1.6			SP			19.8					19.8													
B-6028	SS-14	48.5	SS	4.9	88.3	6.8			SW-SM			19.6					19.6													
B-6029	SS-3	3.5	SS	0.0	57.1	42.9			SC			33.2					33.2	43	20											
B-6029	SS-5	8.5	SS	1.7	42.5	55.8			CL			37.1					37.1	42	20											
B-6029	SS-6	11.0	SS	10.1	44.1	45.8			SM			32.7					32.7													
B-6029	SS-8	18.5	SS	2.6	27.6	69.8			CH			46.2					46.2	76	26											
B-6029	SS-12	38.5	SS	0.0	89.1	10.9			SP-SM			23.4					23.4													
B-6030	SS-2	1.5	SS	0.0	30.0	70.0			CL			31.4					31.4	42	23											
B-6030	SS-4	6.0	SS	0.0	70.9	29.1			SC			26.4					26.4	69	22											
B-6030	SS-6	11.0	SS	0.0	67.0	33.0			SM			31.1					31.1													
B-6030	SS-8	18.5	SS	0.0	50.7	49.3			SM			47.7					47.7	NV	NP											
B-6030	SS-9	23.5	SS	0.0	53.1	46.9			SM			42.5					42.5	42	28											
B-6030	SS-12	38.5	SS	0.0	92.1	7.9			SP-SM			23.1					23.1													
B-6030	SS-13	43.5	SS	0.0	44.5	55.5			CH			35.9					35.9	54	22											
TP-B-1108	B1	8.5	Bulk	0.0	75.1	24.9			SM	14.8	120.0																	5.14	80.0	8.6
TP-B-1117	B1	6.0	Bulk	0.0	92.2	7.8			SP-SM	5.1	111.3																	5.30	71.0	11.0
TP-B-1121	B1	6.0	Bulk	0.1	87.6	12.3			SM	13.7	116.3							NV	NP									6.40	450.0	13.0
TP-B-1125	B1	6.0	Bulk	0.0	95.0	5.0			SP-SM	7.3	107.1							NV	NP									7.89	71.0	8.1
TP-B-1185	B1	6.0	Bulk	0.0	26.7	73.3			MH	63.3								91	46											
TP-B-1194	B1	5.0	Bulk	0.0	91.6	8.4			SP-SM	5.4	112.8																	5.23	74.0	18.0
TP-B-1194	B2	8.0	Bulk	0.0	71.9	28.1			SC-SM	15.1	120.7							37	22									5.25	91.0	16.0
TP-B-1197	B1	5.0	Bulk	0.0	89.9	10.1			SP-SM	6.6	113.2							NV	NP									5.69	250.0	15.0

(1) Due to computer roundoff, particle size fractions may total 100 ± 1. Fines include silt plus clay.
(2) USCS Symbol is based on visual-manual method where incomplete classification testing was performed.

Prepared By/Date: Alexandra Taylor/7-31-07 AT
Checked By/Date: Gautham Pillappa/7-31-07 GSP

List of Figures

P:\EngineeringConstruction\6138-J\2006 Jobs\6141-06-0286 Plant Vogtle\Figures\Figure 1.dwg - Layout1 05/22/2007



SOURCE: USGS SHELL BLUFF LANDING (GA, SC) QUADRANGLE

SCALE IN MILES
0 0.50 1 2

VOGTLE ELECTRIC GENERATING PLANT UNITS 3 AND 4 COL PROJECT BURKE COUNTY, GEORGIA	MACTEC Mactec Engineering and Consulting, Inc. 396 PLASTERS AVENUE, N.E. ATLANTA, GEORGIA 30324 (404)873-4761	SITE LOCATION MAP JOB NO.: 6141-06-0286 DATE: MAY 17, 2007 FIGURE: 1 TASK: 19 DRAWN: AAT APPROV.: MFC SCALE: AS SHOWN

List of Attachments (Submitted Under Separate Covers on Various Dates)

Attachment	
A	Survey Data and Test Locations
B	Geotechnical Boring Logs, Geotechnical Test Pit Logs, and SPT Energy Ratio Measurements
C	Cone Penetrometer Test Results
D	Geophysical Test Data (Downhole), Field Electrical Resistivity
E	ReMi Seismic Shear Wave Velocity Measurements
F	Laboratory Testing Data (Geotechnical)
G	Resonant Column Torsional Shear (RCTS) Test Results

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ATTACHMENT A – SURVEY DATA AND TEST LOCATIONS

MACTEC

July 31, 2007

Mr. Tom McCallum
Georgia Power Company
C/O Southern Nuclear Operating Company, Inc.
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201
Phone: (205) 992-6697
e-mail: tomccall@southernco.com

Subject: **Geotechnical Data Report Attachment A – Survey Data and Test Locations**
Vogtle Units 3 & 4 COL Project
Vogtle Electric Generating Plant
Burke County, Georgia
MACTEC Project Number 6141-06-0286

Dear Mr. McCallum:

MACTEC Engineering & Consulting, Inc. is pleased to submit Attachment A of the Final Data Report for the geotechnical exploration and laboratory testing for the Vogtle Units 3 & 4 COL Project located adjacent to the existing Vogtle Electric Generating Plant near Waynesboro, Burke County, Georgia.

It has been a pleasure to perform the work described in the attached report. If you have any questions, or if we may be of further service, we hope that you will contact us at your convenience.

Sincerely,

MACTEC ENGINEERING & CONSULTING, INC.

Matthew F. Cooke WITH PERMISSION
Senior Geologist
Site Superintendent
Registered, Georgia 1887

Wm. Allen Lancaster
Project Manager
Civil Engineer
Registered, Georgia 7075

Pieter J. DePree
Principal Geotechnical Engineer
Registered, Georgia 19637

BY KJB WITH PERMISSION.

DCN VGCOL 324
Revision 1, 7/31/07

ATTACHMENT A

This Attachment is one of a number of attachments that are part of the following report which was prepared by MACTEC Engineering & Consulting Inc.:

Geotechnical Data Report
Vogtle Units 3 & 4 COL Project
Vogtle Electric Generating Plant
Burke County, Georgia
Subsurface Investigation and Laboratory Testing
SNC Subcontract No. 7074425
MACTEC Job No. 6141-06-0286

For background and a description of scope of work contained in the report, please refer to the above referenced report. The report was addressed as follows:

Mr. Tom McCallum
Georgia Power Company
C/O Southern Nuclear Operating Company, Inc.
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201
Phone: (205) 992-6697
e-mail: tomccall@southernco.com

The following list shows other Attachments to the above report and their included information:

Geotechnical Boring Logs..See Attachment B

Cone Penetrometer Test Results..See Attachment C

Geophysical Test Data (Downhole and Field Electrical Resistivity) ....See Attachment D

ReMi Seismic Shear Wave Velocity Measurements ....See Attachment E

Laboratory Testing Data (Geotechnical)..See Attachment F

Resonant Column Torsional Shear (RCTS) Test Results...........................See Attachment G

ATTACHMENT A

Survey Data and Test Locations

CONSISTS OF:

Toole Surveying Company, Inc. Report dated July 30, 2007
Toole Surveying Company, Inc. Report dated May 15, 2007

Volume 1 of 1

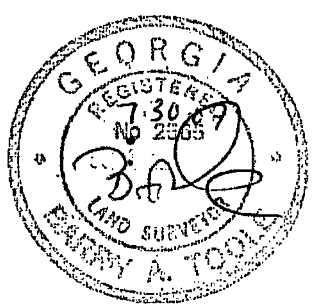
Toole Surveying Company, Inc. Report dated July 30, 2007

GA Power Company
Plant Vogtle Units 3 & 4 COL Project

Borehole Surveyor Report

Subsurface Investigation Location
Last Revised 07/30/07

Project Surveyor
Registered Land Surveyor
Barry A. Toole, RLS
GA #2565



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PROJECT LAYOUT

Project Control

The project control was provided by Donnie Dryden with Georgia Power Company (GPC) to Greg Schlein with Toole Surveying Co., Inc. (TSC). The project coordinates are based on NAD 27 – horizontal and NGVD 1929 – vertical. The following are the control points used as the basis for the as-built borehole coordinates:

CP-1 (GPC)	N 1,141,970.366 E 623,363.196 Elev 223.776
CP-2 (GPC)	N 1,141.915.275 E 623,953.193 Elev 244.00
CP-8000 (GPC)	N 1,146,604.206 E 624,026.366 Elev 236.26
CP-8006 (GPC)	N 1,146776.401 E 624,448.844 Elev 225.22

These points were tied together with a baseline traverse which was used for all measurements. The length of the baseline traverse was 8,347.78 linear feet with a horizontal coordinate error of 0.11' with a resulting precision of 1 in 75,888. The control coordinates were also checked with two Trimble 5700 RTK units, using the GPC monuments as a base. The resulting accuracy was 0.10' +/- of relative positional accuracy.

Bore Site Locations

The borehole locations to be staked were provided by Mr. Greg Lee with Southern Nuclear Operating Company in the following Subsurface Investigation location Plans:

23162-000-CY-0000-00001 new.tif;
23162-000-CY-0000-00002 new.tif

Field Staking and As-built Location

Boreholes were staked and as-built located using Trimble 5700 RTK – GPS (sub-centimeter accuracy) where possible. Conventional surveying methods were used in all other areas. Traverses lines were established to tie in the remaining borehole locations inaccessible by RTK-GPS. These traverse lines tied back to the main project control baseline described above for quality control checks on all horizontal loops. A Nikon DTM-530 Total station (serial # 020396) was used for staking and as-built location of the boreholes. The same traverse lines and procedures were used to perform the as-built locations of the boreholes. A differential level loop was also established (using a DINI 22 Trimble digital level) on all traverse points using the elevations provided with the GPC control points. Level loops were run through as-built borehole locations and back to known control points for quality assurance. An excel spreadsheet was prepared showing the variation between proposed and as-built coordinates.

Daily Survey Activities

Pre & Post Data Collection Checks were performed on a daily basis for staking and as-built location of the completed boreholes. These procedures are briefly described as follows:

RTK-GPS daily location was preceded by checks on at least one of the GPC control points listed under "Project Control" above. A "check shot" was stored using a different point number for inverse comparison. Any separate traverse lines used to stake or locate out-lying boreholes were looped back to the original baseline traverse (at a different point). A new point number was stored at the original control points. Subsequent inverse comparison of those coordinates was made for quality assurance.

EQUIPMENT

DESCRIPTION	SERIAL #
Trimble Zephyr Ant.	#12214559
Trimble Zephyr Geodetic Ant.	#11909699
Trimble Base 5700 Receiver	#440101198
Trimble Rover 5700 Receiver	#440102656
Trimble TS C1 using Ver. 10.70 Software	#220256429
2 meter Fixed Height Tripod 5119-00-yel	N/A
2 meter Fixed Height Carbon Fiber Rod	N/A
Bi Pod	N/A
5700 To Cell Phone Cable	N/A
48 MB Flash Card	N/A
DINI 22 - Digital Level	#700075 A
Digital Barcode Leveling Rod	N/A
Data Collector: Recon & TDS Software	#FS29A13023
Survey Pro (TDS) Software	Version 4.1.6
Nikon DTM-530 Total station	# 020396

RAW DATA FILES

Field Data Acquisition Dates

1) 01/04/07
2) 01/15/07
3) 01/16/07
4) 03/19/07
5) 03/20/07
6) 03/21/07
7) 03/22/07
8) 03/27/07
9) 04/02/07
10) 04/16/07
11) 04/017/07
12) 04/18/07

QUALITY ASSURANCE REPORTS

Borehole Location and Staking Comparison by Coordinate Comparison

Last Revised 05-15-07

AS-BUILT COORDINATES					STAKED COORDINATES		
Point #	Northing	Easting	Elevation	Description	Description	North	East
192	1144168.36	620002.76	257.89	B-1105	B-1105	1144169.50	620005.80
189	1144153.75	620916.11	266.66	B-1107	B-1107	1144153.20	620912.50
186	1144214.07	621273.00	273.56	B-1108	B-1108	1144213.10	621274.80
182	1144180.46	621580.64	276.48	B-1109	B-1109	1144170.50	621634.10
176	1144170.91	622011.31	265.14	B-1110	B-1110	1144170.50	622050.70
327	1144212.59	622333.79	224.90	B-1111	B-1111	1144213.10	622333.00
326	1144223.37	622691.31	213.74	B-1112	B-1112	1144213.10	622574.00
325	1144219.36	622561.49	227.14	B-1112A	B-1112A	1144213.10	622574.00
367	1143901.44	620217.17	249.99	B-1113	B-1113	1143893.09	619858.06
187	1143894.12	621264.65	261.82	B-1116	B-1116	1143893.10	621274.80
443	1143890.75	621628.43	263.89	B-1117	B-1117	1143893.10	621627.50
177	1143885.92	622007.97	257.91	B-1118	B-1118	1143893.10	622050.70
168	1143888.30	622333.77	223.57	B-1119	B-1119	1143893.10	622333.00
324	1143893.05	622558.49	227.18	B-1120	B-1120	1143893.10	622574.00
446	1143575.57	620216.27	241.33	B-1121	B-1121	1143573.10	620216.70
342	1143575.43	620921.98	241.27	B-1123	B-1123	1143573.10	620922.10
345	1143627.62	621421.59	241.21	B-1124	B-1124	1143650.20	621422.30
348	1143586.80	621628.20	240.97	B-1125	B-1125	1143573.10	621627.50
116	1143567.68	621980.43	219.88	B-1126	B-1126	1143573.10	621980.30
166	1143573.26	622332.29	219.67	B-1127	B-1127	1143573.10	622333.00
329	1143572.65	622682.42	218.26	B-1128	B-1128	1143573.10	622635.69
330	1143573.71	622685.46	217.92	B-1128A	B-1128A	1143573.10	622635.69
117	1143278.22	621893.74	221.84	B-1129	B-1129	1143283.00	621891.00
319	1142482.76	622250.00	217.46	B-1130	B-1130	1142485.00	622280.00
292	1143172.99	621823.06	222.18	B-1131	B-1131	1143174.00	621823.50
263	1142614.19	621450.08	218.73	B-1132	B-1132	1142639.00	621452.00
262	1142968.94	621451.15	221.20	B-1133	B-1133	1142969.00	621452.00
333	1143282.88	621104.27	222.04	B-1134	B-1134	1143283.00	621104.00
332	1143178.11	621023.00	221.65	B-1136	B-1136	1143174.00	621023.00
488	1143469.69	619192.80	215.82	B-1138	B-1138	1143469.50	619191.89
249	1142289.86	621026.81	216.68	B-1139	B-1139	1142290.00	621023.50
137	1142290.16	621823.56	216.58	B-1140	B-1140	1142290.00	621823.50
369	1144416.58	620649.58	224.69	B-1142	B-1142	1144422.40	620831.00
163	1145428.36	622272.08	240.04	B-1146	B-1146	1145428.20	622272.00
210	1145537.78	623236.50	218.94	B-1148	B-1148	1145539.30	623238.50
196	1145467.29	624235.30	170.69	B-1150	B-1150	1145467.50	624235.00
199	1145581.68	625227.34	117.05	B-1152	B-1152	1145577.60	625227.20
202	1145568.97	625673.46	103.58	B-1153	B-1153	1145570.40	625727.10
206	1145664.20	626216.06	95.08	B-1154	B-1154	1145678.70	626215.20
58	1147390.34	624936.42	84.95	B-1155	B-1155	1147397.38	624948.45
64	1147302.50	624571.69	85.70	B-1156	B-1156	1147322.90	624521.23
55	1147209.56	625062.18	86.77	B-1157	B-1157	1147219.64	625075.77
205	1145194.92	626669.12	88.74	B-1158	B-1158	1145231.34	626689.50
62	1147285.78	624954.51	88.70	B-1159	B-1159	1147283.63	624943.36
63	1147363.37	624862.14	86.10	B-1161	B-1161	1147361.34	624854.27
57	1147234.91	624815.03	85.55	B-1162	B-1162	1147228.35	624798.04
56	1147170.58	624938.82	85.95	B-1163	B-1163	1147168.53	624936.34
208	1146994.84	624518.63	220.05	B-1164	B-1164	1147039.33	624487.08

Point #	Northing	Easting	Elevation	Description
453	1147452.97	623961.56	203.40	B-1166
452	1147688.45	623467.78	202.20	B-1168
485	1147423.85	622953.71	223.29	B-1170
482	1146983.44	622538.70	249.49	B-1172
475	1146476.06	622228.06	225.81	B-1174
161	1145876.27	622195.21	221.48	B-1176
162	1145878.82	622196.80	221.51	B-1176A
114	1144716.64	622232.17	226.78	B-1185
422	1144711.88	618818.88	277.51	B-1186
425	1144710.19	619259.61	277.68	B-1187
421	1144459.72	618997.50	279.98	B-1189
412	1144301.60	619490.75	260.30	B-1191
449	1144217.44	618840.90	243.17	B-1192
357	1144091.49	619277.79	254.11	B-1193
389	1147504.69	621630.15	199.35	B-1194
385	1147574.84	622478.35	220.60	B-1195
388	1147286.63	622017.51	217.52	B-1196
390	1146874.74	622003.82	245.60	B-1197
125	1142599.50	621799.64	218.40	B-3001
126	1142599.97	621872.49	218.89	B-3002
536	1142597.90	621878.80	218.83	B-3002A
124	1142599.85	621727.30	218.29	B-3003
300	1142447.42	621867.12	218.51	B-3004
284	1142717.58	621749.10	219.20	B-3005
122	1142425.58	621924.99	217.59	B-3006
156	1142718.50	621876.74	220.78	B-3007
135	1142425.35	621773.01	217.86	B-3008
123	1142484.48	621956.58	217.85	B-3009
297	1142634.86	622024.97	219.69	B-3010
154	1142776.68	622024.86	220.57	B-3011
119	1142772.53	621911.91	220.40	B-3012
286	1142842.89	621825.35	220.51	B-3013
285	1142799.43	621748.55	220.26	B-3014
288	1142956.89	621823.95	221.78	B-3015
118	1142978.42	621913.43	222.48	B-3016
290	1143034.35	621749.86	222.10	B-3017
296	1142738.11	622115.75	219.80	B-3018
295	1142977.36	622167.48	222.42	B-3019
294	1142977.94	622074.78	222.44	B-3020
293	1143070.22	622033.23	223.19	B-3021
120	1143069.84	621873.43	223.86	B-3022
291	1143061.11	621679.90	222.81	B-3023
261	1142905.82	621399.65	220.16	B-3024
264	1142460.42	621425.34	218.21	B-3025
265	1142290.23	621403.73	215.76	B-3026
233	1142058.69	621423.26	218.80	B-3027
232	1141867.30	621408.76	220.12	B-3028
230	1141881.50	621803.88	220.13	B-3029
228	1141699.94	621799.67	221.99	B-3030
322	1141398.73	622042.01	222.70	B-3031
221	1141158.18	621709.53	220.05	B-3032
223	1141405.26	621715.21	222.26	B-3033

Description	North	East
B-1166	1147457.80	623999.10
B-1168	1147701.00	623461.30
B-1170	1147423.70	622944.90
B-1172	1146981.70	622539.10
B-1174	1146576.52	622249.13
B-1176	1145876.50	622195.50
B-1176A	1145876.50	622195.50
B-1185	1144712.61	622235.93
B-1186	1144711.23	618821.49
B-1187	1144711.23	619257.47
B-1189	1144461.65	619000.00
B-1191	1144302.74	619486.81
B-1192	1144215.60	618833.80
B-1193	1144089.10	619279.90
B-1194	1147505.20	621631.60
B-1195	1147574.40	622481.30
B-1196	1147286.60	622013.90
B-1197	1146872.90	622002.10
B-3001(DH)	1142600.00	621800.00
B-3002(DH)	1142600.00	621872.50
B-3002A	TBD	TBD
B-3003(DH)	1142600.00	621727.50
B-3004	1142460.00	621849.00
B-3005	1142718.00	621750.00
B-3006	1142718.00	621876.50
B-3007	1142425.50	621925.00
B-3008	1142425.50	621773.00
B-3009	1142484.00	621957.00
B-3010	1142645.50	622025.00
B-3011	1142773.00	622025.00
B-3012	1142773.00	621912.00
B-3013(C)	1142843.00	621823.50
B-3014	1142831.00	621750.00
B-3015	1142957.00	621823.50
B-3016	1142996.50	621912.00
B-3017	1143035.00	621750.00
B-3018	1142738.00	622116.00
B-3019	1142975.50	622171.00
B-3020	1142975.50	622079.00
B-3021	1143069.00	622031.00
B-3022	1143069.00	621874.00
B-3023	1143062.00	621680.00
B-3024	1142904.57	621400.00
B-3025	1142460.00	621425.00
B-3026	1142290.00	621400.00
B-3027	1142148.00	621425.00
B-3028	1142000.00	621400.00
B-3029	1141874.00	621800.00
B-3030	1141675.00	621800.00
B-3031	1141400.00	622075.00
B-3032	1141125.00	621800.00
B-3033	1141400.00	621525.00

Point #	Northing	Easting	Elevation	Description
225	1141399.76	621914.68	224.67	B-3034
283	1142729.18	621675.37	219.34	B-3035
136	1142441.55	621675.96	217.87	B-3036
289	1143057.42	621768.87	222.94	B-3037
231	1141882.97	621543.15	220.76	B-3038
287	1142917.72	621753.54	219.17	B-3039
254	1142599.53	621000.20	218.88	B-4001
252	1142600.19	621072.22	219.06	B-4002
255	1142599.93	620927.13	218.99	B-4003
251	1142459.68	621046.56	218.45	B-4004
273	1142714.97	620948.74	221.13	B-4005
129	1142719.63	621076.36	220.98	B-4006
248	1142426.19	621125.28	217.90	B-4007
250	1142424.22	620973.78	218.08	B-4008
247	1142486.09	621156.86	217.91	B-4009
259	1142667.58	621249.04	219.09	B-4010
276	1142773.07	621236.36	219.08	B-4011
271	1142842.72	621020.31	222.24	B-4013
272	1142831.99	620950.23	220.74	B-4014
270	1142773.04	621115.24	220.11	B-4015
149	1142996.39	621112.90	221.23	B-4016
275	1143034.80	620949.92	220.94	B-4017
260	1142735.45	621315.51	220.30	B-4018
280	1142975.89	621371.41	221.76	B-4019
279	1142969.39	621280.02	222.79	B-4020
533	1142973.73	621280.34	222.56	B-4020A
148	1143092.61	621247.38	224.55	B-4021
150	1143081.30	621073.52	220.71	B-4022
151	1143062.36	620879.81	220.71	B-4023
152	1142904.78	620601.81	223.80	B-4024
257	1142510.01	620625.03	220.80	B-4025
244	1142330.16	620597.72	221.54	B-4026
243	1142180.05	620633.45	217.73	B-4027
240	1141984.20	620587.77	219.57	B-4028
239	1141874.85	620699.95	220.28	B-4029
237	1141676.68	620698.48	222.35	B-4030
314	1141399.83	620975.03	222.13	B-4031
309	1141118.48	620794.64	220.24	B-4032
310	1141123.72	620794.66	220.22	B-4032A
306	1141398.11	620348.78	219.93	B-4033
311	1141375.68	620795.35	222.79	B-4034
274	1142729.08	620876.27	220.52	B-4035
258	1142457.21	620876.25	218.05	B-4036
406	1146177.05	621807.73	218.99	B-5001
405	1146339.76	621808.33	241.53	B-5002
401	1146386.61	621574.70	227.94	B-5003
400	1146547.79	621568.38	236.61	B-5004
354	1144134.10	619626.88	247.90	B-6002
353	1143925.02	619422.80	229.76	B-6003
352	1143718.15	619473.34	231.59	B-6004
351	1143717.98	619873.77	242.59	B-6005
337	1143069.79	620301.79	248.22	B-6006

Description	North	East
B-3034	1141400.00	621800.00
B-3035	1142728.70	621676.00
B-3036	1142441.70	621676.00
B-3037	1143058.10	621769.50
B-3038	1141883.00	621542.00
B-3039	TBD	TBD
B-4001(DH)	1142600.00	621000.00
B-4002(DH)	1142600.00	621072.50
B-4003(DH)	1142600.00	620927.50
B-4004	1142460.00	621049.00
B-4005	1142718.00	620950.00
B-4006	1142718.00	621076.50
B-4007	1142425.50	621125.00
B-4008	1142425.00	620973.00
B-4009	1142484.00	621157.00
B-4010	1142645.50	621225.00
B-4011	1142773.00	621225.00
B-4013(C)	1142843.00	621023.50
B-4014	1142831.00	620950.00
B-4015	1142773.00	621112.50
B-4016	1142996.50	621112.50
B-4017	1143035.00	620950.00
B-4018	1142738.00	621316.00
B-4019	1142975.50	621371.00
B-4020	1142975.50	621279.00
B-4020A	TBD	TBD
B-4021	1143069.00	621231.00
B-4022	1143069.00	621074.00
B-4023	1143062.00	620880.00
B-4024	1142904.57	620600.00
B-4025	1142510.00	620625.00
B-4026	1142330.00	620600.00
B-4027	1142148.00	620625.00
B-4028	1142000.00	620600.00
B-4029	1141874.00	620700.00
B-4030	1141675.00	620700.00
B-4031	1141400.00	620975.00
B-4032	1141125.00	620740.00
B-4032A	TBD	TBD
B-4033	1141400.00	620365.00
B-4034	1141378.00	620719.00
B-4035	1142728.70	620876.00
B-4036	1142457.00	620876.00
B-5001	TBD	TBD
B-5002	TBD	TBD
B-5003	TBD	TBD
B-5004	TBD	TBD
B-6002	TBD	TBD
B-6003	TBD	TBD
B-6004	TBD	TBD
B-6005	TBD	TBD
B-6006	TBD	TBD

Point #	Northing	Easting	Elevation	Description
338	1142730.73	620301.79	222.28	B-6007
383	1145443.82	622676.36	240.11	B-6008
379	1144773.69	621748.18	246.04	B-6009
372	1143893.34	621059.21	263.39	B-6010
376	1144557.94	621261.73	244.00	B-6011
363	1144256.66	620480.54	194.20	B-6012
494	1143169.54	617234.87	251.14	B-6013
492	1143168.15	618281.46	209.79	B-6014
487	1143166.26	619317.85	221.52	B-6015
491	1142909.31	618366.55	204.66	B-6018
640	1142132.73	618344.49	163.94	B-6019
601	1142634.02	619555.91	221.48	B-6020
607	1142185.73	619103.41	209.80	B-6021
613	1142224.77	620040.33	216.23	B-6022
628	1141553.10	619177.88	202.77	B-6023
510	1141545.87	619997.72	216.07	B-6024
633	1140518.65	619189.73	172.69	B-6025
616	1140537.74	619900.15	215.46	B-6026
620	1145779.35	626145.09	96.65	B-6027
619	1145611.36	626062.41	95.70	B-6028
644	1147771.71	623966.62	85.41	B-6029
643	1147588.12	624222.62	88.37	B-6030
435	1144357.46	620185.46	265.76	C-1101ALT
375	1144424.00	621333.43	267.61	C-1102
380	1145011.61	622037.40	236.52	C-1103
460	1145601.77	622746.95	230.19	C-1104
465	1145483.00	623733.68	200.57	C-1105
457	1145533.96	624748.08	138.02	C-1106ALT
469	1147233.91	624202.32	211.92	C-1107
454	1147628.30	623753.23	200.89	C-1108
472	1147622.11	623171.88	209.79	C-1109
481	1147198.95	622740.32	242.39	C-1110
393	1146753.15	622346.15	250.69	C-1111
440	1142610.55	621726.54	218.37	C-3001
439	1142606.51	621872.75	218.89	C-3002
229	1141771.79	621801.62	221.38	C-3003
224	1141542.00	621807.33	223.25	C-3004
222	1141266.89	621792.33	221.27	C-3005
256	1142599.87	620918.51	218.87	C-4001
253	1142599.94	621063.82	219.08	C-4002
238	1141784.64	620708.48	221.16	C-4003
241	1141543.07	620597.67	219.99	C-4004
242	1141249.90	620593.96	220.01	C-4005
576	1144258.24	621799.94	279.61	ER-1103CL
580	1144706.50	621821.45	250.84	ER-1103N
591	1143809.08	621785.19	258.96	ER-1103S
590	1143823.00	621536.77	257.11	ER-1104CL
592	1143820.75	621986.25	257.44	ER-1104E
589	1143821.35	621086.95	258.33	ER-1104W
542	1146579.02	621622.05	243.09	ER-1105
543	1146866.31	621276.81	226.62	ER-1105
544	1146286.04	621961.60	226.63	ER-1105

Description	North	East
B-6007	TBD	TBD
B-6008	TBD	TBD
B-6009	TBD	TBD
B-6010	TBD	TBD
B-6011	TBD	TBD
B-6012	TBD	TBD
B-6013	TBD	TBD
B-6014	TBD	TBD
B-6015	TBD	TBD
B-6018	TBD	TBD
B-6019	TBD	TBD
B-6020	TBD	TBD
B-6021	TBD	TBD
B-6022	TBD	TBD
B-6023	TBD	TBD
B-6024	TBD	TBD
B-6025	TBD	TBD
B-6026	TBD	TBD
B-6027	TBD	TBD
B-6028	TBD	TBD
B-6029	TBD	TBD
B-6030	TBD	TBD

Point #	Northing	Easting	Elevation	Description	Description	North	East
545	1146706.48	621999.64	256.15	ER-1106			
559	1146039.75	621401.84	164.68	ER-1106			
560	1146365.63	621702.00	237.53	ER-1106			
520	1141404.39	621932.86	223.41	ER-3001			
521	1141104.51	621935.56	219.44	ER-3001			
522	1141704.88	621929.94	221.43	ER-3001			
518	1141220.32	621725.95	220.47	ER-3002			
519	1141206.51	622025.58	220.02	ER-3002			
525	1141200.00	622324.03	220.49	ER-3002			
312	1141375.68	620795.35	222.79	ER-4001			
513	1141133.24	620798.50	220.41	ER-4001			
514	1141583.32	620797.68	223.47	ER-4001			
515	1140683.32	620798.70	215.33	ER-4001			
313	1141375.68	620795.35	222.79	ER-4002			
506	1141796.43	620333.57	220.73	ER-4002			
509	1140897.17	620349.94	219.86	ER-4002			
508	1141346.76	620341.65	219.84	ER-4002CL			
315	1142180.05	620633.45	217.73	ER-4003			
504	1142049.90	620629.66	219.61	ER-4003			
507	1141575.77	620263.31	217.95	ER-4003			
505	1141813.06	620446.25	220.68	ER-4003CL			
528	1142060.89	621873.12	218.35	ER-4004			
529	1142060.45	621423.14	218.46	ER-4004			
530	1142057.75	620973.50	219.21	ER-4004			
553	1143195.74	623156.24	217.83	REMI-1101CL			
551	1143344.68	623156.02	218.60	REMI-1101N			
552	1143046.36	623156.23	217.87	REMI-1101S			
555	1143432.28	623846.88	217.84	REMI-1102CL			
556	1143433.70	623995.86	217.75	REMI-1102E			
554	1143431.62	623697.54	217.88	REMI-1102W			
267	1142620.86	621877.24	218.54	REMI-3001EAST			
266	1142620.58	621577.79	218.20	REMI-3001WEST			
268	1142620.95	621150.17	218.71	REMI-4001EAST			
269	1142624.08	620856.90	219.31	REMI-4001WEST			
584	1144312.49	621145.92	264.14	TP-B-1108			
577	1143967.31	621627.50	269.50	TP-B-1117			
596	1143591.74	620401.53	241.17	TP-B-1121			
593	1143603.70	621685.81	240.61	TP-B-1125			
539	1144634.18	622242.15	225.17	TP-B-1185			
573	1147500.59	621708.45	202.73	TP-B-1194			
568	1147648.39	622363.06	212.15	TP-B-1195			
565	1146874.40	622074.57	245.94	TP-B-1197			

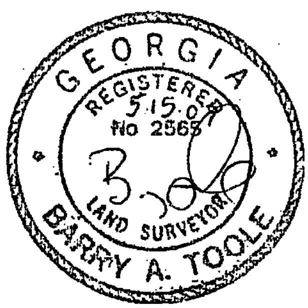
Toole Surveying Company, Inc. Report dated May 15, 2007

GA Power Company
Plant Vogtle Units 3 & 4 COL Project

Borehole Surveyor Report

Subsurface Investigation Location
Last Revised 05/15/07

Project Surveyor
Registered Land Surveyor
Barry A. Toole, RLS
GA #2565



Prepared By
Toole Surveying Company, Inc.
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www.toolesurveying.com

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PROJECT LAYOUT

Project Control

The project control was provided by Donnie Dryden with Georgia Power Company (GPC) to Greg Schlein with Toole Surveying Co., Inc. (TSC). The project coordinates are based on NAD 27 – horizontal and NGVD 1929 – vertical. The following are the control points used as the basis for the as-built borehole coordinates:

CP-1 (GPC)	N 1,141,970.366 E 623,363.196 Elev 223.776
CP-2 (GPC)	N 1,141.915.275 E 623,953.193 Elev 244.00
CP-8000 (GPC)	N 1,146,604.206 E 624,026.366 Elev 236.26
CP-8006 (GPC)	N 1,146776.401 E 624,448.844 Elev 225.22

These points were tied together with a baseline traverse which was used for all measurements. The length of the baseline traverse was 8,347.78 linear feet with a horizontal coordinate error of 0.11' with a resulting precision of 1 in 75,888. The control coordinates were also checked with two Trimble 5700 RTK units, using the GPC monuments as a base. The resulting accuracy was 0.10' +/- of relative positional accuracy.

Bore Site Locations

The borehole locations to be staked were provided by Mr. Greg Lee with Southern Nuclear Operating Company in the following Subsurface Investigation location Plans:

23162-000-CY-0000-00001 new.tif;
23162-000-CY-0000-00002 new.tif

Field Staking and As-built Location

Boreholes were staked and as-built located using Trimble 5700 RTK – GPS (sub-centimeter accuracy) where possible. Conventional surveying methods were used in all other areas. Traverses lines were established to tie in the remaining borehole locations inaccessible by RTK-GPS. These traverse lines tied back to the main project control baseline described above for quality control checks on all horizontal loops. A Nikon DTM-530 Total station (serial # 020396) was used for staking and as-built location of the boreholes. The same traverse lines and procedures were used to perform the as-built locations of the boreholes. A differential level loop was also established (using a DINI 22 Trimble digital level) on all traverse points using the elevations provided with the GPC control points. Level loops were run through as-built borehole locations and back to known control points for quality assurance. An excel spreadsheet was prepared showing the variation between proposed and as-built coordinates.

Daily Survey Activities

Pre & Post Data Collection Checks were performed on a daily basis for staking and as-built location of the completed boreholes. These procedures are briefly described as follows:

RTK-GPS daily location was preceded by checks on at least one of the GPC control points listed under "Project Control" above. A "check shot" was stored using a different point number for inverse comparison. Any separate traverse lines used to stake or locate out-lying boreholes were looped back to the original baseline traverse (at a different point). A new point number was stored at the original control points. Subsequent inverse comparison of those coordinates was made for quality assurance.

EQUIPMENT

DESCRIPTION	SERIAL #
Trimble Zephyr Ant.	#12214559
Trimble Zephyr Geodetic Ant.	#11909699
Trimble Base 5700 Receiver	#440101198
Trimble Rover 5700 Receiver	#440102656
Trimble TS C1 using Ver. 10.70 Software	#220256429
2 meter Fixed Height Tripod 5119-00-yel	N/A
2 meter Fixed Height Carbon Fiber Rod	N/A
Bi Pod	N/A
5700 To Cell Phone Cable	N/A
48 MB Flash Card	N/A
DINI 22 - Digital Level	#700075 A
Digital Barcode Leveling Rod	N/A
Data Collector: Recon & TDS Software	#FS29A13023
Survey Pro (TDS) Software	Version 4.1.6
Nikon DTM-530 Total station	# 020396

1-800-251-1280 931-684-0555 931-685-9505 fax **90 DAY WARRANTY** ON TOTAL STATION REPAIRS	*HAYES INSTRUMENT CO.* *SERVICE DEPARTMENT* *502 S. CANNON BLVD.* *SHELBYVILLE, TN 37160*	WORK ORDER# 150866 TECHNICIAN T. D.

MODEL OF INSTRUMENT DTM-530   CUSTOMER ID#: TOOL03
SERIAL NUMBER 020396   CUSTOMER NAME: Toole Surveying
E-8000020

DATE RECEIVED 1/23/07   WARRANTY REPAIR ☐ TOPCON ☐ NIKON ☐ SOKKIA
DATE RETURNED 2/01/07   NON-WARRANTY REPAIR ☐   HAYES WARRANTY ☐

OPTICAL & MECHANICAL COLLIMATION CHECK LIST

	CHECK	ADJUST	ERROR
LASER/OPT. PLUMMET		✓	.001
PLATE LEVEL VIAL			5
BULLS EYE BUBBLE		✓	Removed
MECH. COMPENSATOR		N/A	
TILT SENSOR(S)			
X SENSOR		✓	-15"
Y SENSOR		✓	20"

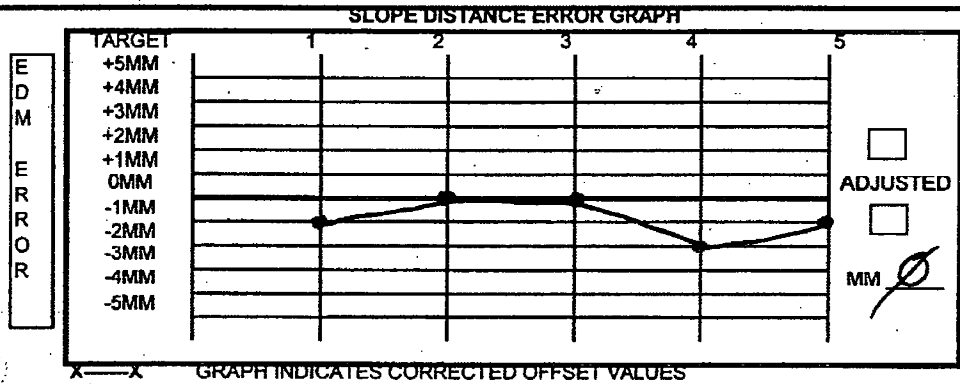
Robotic Inst
Tracking Axis

	CHECK	ADJUST	ERROR
DOUBLE CENTERING		✓	2"
90 DEGREE POSITION		✓	6"
PLUNGE	✓		
PEEP SIGHTS	✓		

0/180 Rev/plunge   H. ANGLE ACCURACY 2 SECS
90/270 Rev/plunge   V. ANGLE ACCURACY 2 SECS

COLLIMATION STAND #1   **EDM BASELINE TEST**   COLLIMATION STAND #1

SLOPE DISTANCE ERROR GRAPH



X——X GRAPH INDICATES CORRECTED OFFSET VALUES

OLD MC CONSTANT ______mm
NEW MC CONSTANT ______mm
CYCLIC ERROR
2 MMSPREAD
Customer PSM constant
30
In Instrument when received

TARGET #	ACTUAL	1	ACTUAL	2	ACTUAL	3	ACTUAL	4	ACTUAL	5
V.ANG	90.40.20	90.40.18	90.48.15	90.48.14	90.01.05	90.01.07	84.20.10	84.20.12	85.38.35	85.38.35
H.ANG	264.01.15	264.01.14	266.21.20	266.21.22	273.04.25	273.04.24	61.46.00	61.46.02	97.04.25	97.04.28
SD/MTR	132.154	153	136.380	380	47.108	108	11.659	657	13.065	064
SD/MTR ERROR		-1	ERROR	Ø	ERROR	Ø	ERROR	-2	ERROR	-1
Corrected SD/MTR										

PARTS NEEDED FOR THE REPAIR

PART NUMBER	QNTY
Recell Batt	2

DESCRIPTION OF REPAIRS PERFORMED

Collimation	☐
Dust & Adjust	☐
Clean & Collimation	☒
Adjusted Compensators	☐
Adjusted Plunge	☐
Installed Key Pads	☐
Rebuilt Tribrach	☐
Repaired Tangents	☐
Relubed Focus	☐
EDM ALIGNMENT	☐
EDM MOTORS	☐

Additonal LABOR Description:
Replaced ATTN Motor
Recelled Both Batteries

REPAIR LABOR HOURS ☐

FREIGHT
(GROUND - 2nd Day - NDA) PICKUP @ OFFICE

RAW DATA FILES

Field Data Acquisition Dates

1) 01/04/07
2) 01/15/07
3) 01/16/07
4) 03/19/07
5) 03/20/07
6) 03/21/07
7) 03/22/07
8) 03/27/07
9) 04/02/07
10) 04/16/07
11) 04/017/07
12) 04/18/07

Raw Data files (Pages 22 through 202) have been omitted and are available upon request.

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