

May 9, 2011

MEMORANDUM: Jeff Cruz, Chief  
AP1000 Projects Branch 1  
Division of New Reactor Licensing  
Office of New Reactors

FROM: Joseph Sebrosky, Senior Project Manager */RA/*  
AP1000 Projects Branch 1  
Division of New Reactor Licensing  
Office of New Reactors

SUBJECT: TRIP REPORT – APRIL 18 – 19, 2011, GEOLOGY SITE VISIT AND AUDIT  
IN SUPPORT OF THE V.C. SUMMER COMBINED LICENSE APPLICATION

This report summarizes the NRC site visit to the V.C. Summer Nuclear Station (VCSNS) Units 2 and 3 excavations and the surrounding area during the period of April 18, and 19, 2011. An audit plan was developed to support the site visit in accordance with the Office of New Reactors (NRO) Office Instruction NRO-REG-108, "Regulatory Audits." The Audit plan is available in Agencywide Documents Access and Management System (ADAMS) under accession number ML110871115. The purpose of the site visit was to:

- Directly examine the geologic features exposed in the walls and floor of the VCSNS Unit 2 excavation and determine whether those features were consistent with descriptions of geologic features at the site as provided in Final Safety Analysis Report (FSAR) Section 2.5, "Geology, Seismology and Geotechnical Engineering," of the VCSNS COL application.
- Review geologic maps of the walls and floor of the Unit 2 excavation, and the associated supporting data, prepared by the applicant and ensure that the maps and the data were consistent with the commitments contained in VCSNS COL FSAR Section 2.5.
- Examine the sound rock comprising the foundation materials for the VCSNS Unit 2 nuclear island and verify that the foundation rock units were not damaged by the controlled blasting that was done to remove the rock units lying above the foundation grade level. An additional purpose for this site visit was to determine that the sound rock comprising the foundation materials will provide an adequate foundation for VCSNS Unit 2 consistent with descriptions in VCSNS COL FSAR Section 2.5.

The attendance list for the site visit is provided in Enclosure 1. The agenda for the site visit can be found in Enclosure 2. Images of the Unit 2 excavation are provided in Enclosure 3.

During the site visit South Carolina Electric and Gas (SCE&G) provided 5 presentations as follows:

- Geology site visit overview (Enclosure 4)
- Geologic program overview parts 1 and 2 (Enclosure 5 and 6)
- Overview of the wall mapping process (Enclosure 7)
- Preliminary results and observations from the geologic mapping activities (Enclosures 8, 9, and 10)
- Geologic mapping lessons learned and plans for future work (Enclosure 11)

The presentations are available in ADAMS under accession numbers ML111150597, ML111150614, ML111150695, ML111150846, ML111150885, ML111150999, ML111151188, and ML111151205, respectively. In some of the presentations pictures have been removed because SCE&G considered certain images to be proprietary.

### **Geologic Mapping Lessons Learned and Plans for Future Work**

In the presentation materials provided as enclosure 11 to this report, the applicant proposed that, based on lessons learned from the geologic mapping activities associated with the Unit 2 excavation, the amount of detailed geologic mapping of the saprolitic walls in the Unit 3 power block excavation could possibly be scaled back. (Saprolite is soft, typically clay-rich, thoroughly decomposed, bedrock that is formed in place by chemical weathering. It is characterized by preservation of the geologic structures present in the unweathered rock and typically overlies sound bedrock in the site region.) The applicant stated that mapping the entire saprolite section of the Unit 3 power block walls is not likely to provide data that would result in a different interpretation of potentially detrimental geologic features in the excavation. The applicant stated that the tentative plan to reduce the amount of detailed geologic mapping for the saprolitic power block walls in Unit 3 meets all applicable regulatory requirements and FSAR commitments. The applicant also provided the following information related to geologic mapping of the Unit 3 excavation:

- Detailed geologic mapping of the Unit 3 saprolitic power block walls has been done for the first and second lifts of the excavation. (Wall height of a lift is approximately 5 feet.)
- Detailed geologic mapping will be done for the lowest lift in the saprolite once the sound rock surface is reached, and the sound rock walls will be mapped both above and at foundation grade level.
- Detailed geologic mapping of potentially important lithologic and structural features observed throughout the rest of the Unit 3 power block excavation, and in excavations elsewhere on site, will be done. Any observed features that could substantially change the interpretations about potentially detrimental features in the excavation will be reported to the NRC and evaluated in sufficient detail to characterize these features.

- The applicant's contractor performing the geologic mapping suggested another option for geologic mapping of saprolitic walls of the Unit 3 power block excavation. The option involved mapping all saprolitic walls in the Unit 3 excavation, but not producing finished geologic maps of all walls from the GIS database since generation of these finished maps has proven to be very time-consuming. The data would be archived to document what geologic features and rock types were encountered in the saprolitic walls

The staff did not initially identify any issues of potential concern associated with either of the proposed options for geologic mapping of the saprolitic walls in the Unit 3 power block excavation (i.e., either partial mapping of the saprolitic walls, or mapping of all saprolitic walls without producing final geologic map products for the walls). However, the staff did state that it is the responsibility of the applicant to ensure that the chosen approach for geologic mapping of saprolitic walls for the Unit 3 power block meets all applicable regulatory requirements. The staff also indicated that the applicant is obligated to review the commitments in the FSAR and ensure that these commitments will be met and that no changes to the FSAR would be necessary as a result of the geologic mapping approach implemented.

### **Examination of Geologic Features in VCSNS Unit 2 Excavation**

The April 18-19, 2011, site visit was the second site visit conducted by NRC staff to examine rock units and geologic features in the Unit 2 excavation. The first site visit, performed on August 23-24, 2010, is documented in a trip report dated August 30, 2011 (ADAMS accession number ML102380451). This first site visit was undertaken to allow the staff to examine the sound rock materials exposed after removal of the overlying saprolite. Subsequent to the August 2010 site visit, the applicant removed approximately 15 feet of additional rock material in some parts of the excavation to reach the top of sound bedrock that will serve as the foundation unit for the VCSNS Unit 2 nuclear island. Removal of this additional rock material was accomplished using carefully controlled blasting techniques.

Figures 1 through 4 of Enclosure 3 are images provided to the NRC staff by SCE&G prior to the April 18-19, 2011, NRC site visit. Figures 1 through 3 are overview images showing rock units exposed in the Unit 2 excavation in April 2011, looking west, east, and north, respectively. Figure 4 of Enclosure 3 is a close-up image of a probable minor shear zone that was determined by the applicant to be the same shear zone as that which NRC staff identified in Figure 5 of the NRC's August 30, 2010, trip report. Specifically, as removal of rock materials above the foundation grade level progressed, the applicant was able to trace the shear zone vertically downward from the sound rock surface examined during the August 2010 site visit to the foundation grade level examined by the staff during the April 2011 site visit. (The staff observed and confirmed the field relationships used by the applicant to determine that the shear zone extended vertically downward from the higher level to foundation grade level during the April 2011 site visit.) In addition, similar to the observations presented in the August 30, 2010, trip report, based on geologic field relationships related to cross-cutting igneous veins that are not offset by the shear zone, the staff concludes that the minor shear zone shown in Figure 4 of Enclosure 3 does not represent a capable tectonic structure in the foundation bedrock. The applicant also indicated that radiometric age dates would be acquired on undeformed minerals growing in the shear zone that represent deep-seated hydrothermal conditions which are very much older than

Quaternary (26 Ma to present). The images in Enclosure 3, Figures 5 through 9, illustrate the following geologic features:

- Figure 5 – Three-dimensional view of the minor shear zone in foundation bedrock, designated as Shear Zone 1 by the applicant, which extends vertically down the Unit 2 excavation wall, passing from the sound rock surface examined during the August 2010 site visit to the foundation grade level surface examined by the staff during the April 2011 site visit.
- Figure 6 – Another minor shear zone, designated Shear Zone 3 by the applicant, which occurs in foundation bedrock. Although this shear zone has a different orientation than Shear Zone 1, it exhibits similar geologic characteristics. Based on observed field relationships, the staff concludes that this shear zone also does not represent a capable tectonic structure in the foundation bedrock.
- Figure 7 – Complex intrusive relationships between the different igneous intrusions which comprise the foundation bedrock as observed in the vertical wall of the Unit 2 excavation. Three phases of igneous intrusions are shown in this image, all of which are around 307 Ma in age: Intrusive Phase I (dark-colored diorite), Intrusive Phase II (light-colored quartz monzonite), and late-stage, narrow cross-cutting igneous veins.
- Figure 8 – Late-stage igneous vein (a light-colored aplite dike) cross-cutting dark-colored Phase I diorite.
- Figure 9 – Pinch-out of a zone of weathered diorite lying above a light-colored aplite dike, which clearly illustrates that these weathered rock horizons are not laterally continuous layers extending across the site. Borehole data also indicate that weathered horizons are not laterally continuous across the site. Such weathered zones most likely reflect local percolation of ground water, in this case seemingly controlled by the position of the aplite dike.
- Figure 10 – Minor blast-induced fracturing in quartz monzonite bedrock which occurs around a borehole used to place charges for controlled blasting to remove sound rock overlying foundation grade level bedrock in the Unit 2 excavation. The fractures extend radially out from the borehole and die out over a very short distance both vertically and laterally, leading to the assessment by staff that these minor fractures, which resulted from the controlled blasting, do not detrimentally affect the foundation rock materials.
- Figure 11 – Geologic map showing rock types, fractures, and shear zones which occur at the top of sound rock (i.e., not the foundation grade level) in the Unit 2 excavation. All geologic features observed and mapped are consistent with the geologic characteristics discussed in VCSNS FSAR Section 2.5.

After careful direct examination of the Unit 2 excavation and the geologic maps and data sets developed by the applicant for the excavation, as well as discussions with the applicant and its contractors who performed the geologic mapping activities, the staff concludes that the geologic features exposed and mapped in that excavation are consistent with the geologic characteristics described by the applicant in VCSNS COL FSAR Section 2.5.

Also during the April 18-19, 2011, site visit, the applicant provided the staff an opportunity to examine saprolitic materials in the uppermost parts of the Unit 3 excavation. Excavation activities had not progressed to the point where all weathered saprolitic bedrock had been removed and geologic mapping of sound bedrock at the foundation grade level had been performed. However, the staff did not observe any geologic features in the uppermost saprolitic walls of the Unit 3 excavation that would call into question the conclusion made by staff that no capable tectonic structures or other potentially detrimental geologic features occur in the Unit 2 excavation.

### **Review of Geologic Mapping Activities**

The staff reviewed the SCE&G geologic mapping activities to ensure that these activities were performed in accordance with the commitments in VCSNS COL FSAR Section 2.5, and the following requirements, and guidance:

- Title 10 of the *Code of Federal Regulations*, 10 CFR 100.23, "Geologic and Seismic Siting Criteria"
- Regulatory Guide 1.208 "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," (Rev. 0, March 2007)

In VCSNS COL FSAR Section 2.5, SCE&G committed to perform all geologic mapping activities in accordance with Regulatory Guide 1.208. Based on the direct examination of foundation rock units exposed in the Unit 2 excavation, review of geologic maps of the excavation and associated data, and discussions with the applicant regarding the geologic mapping during the two site visits, the staff concludes that the applicant performed the geologic mapping activities for the Unit 2 excavation in accordance with Regulatory Guide 1.208. By following Regulatory Guide 1.208, the applicant also fully implemented the requirements stated in 10 CFR 100.23.

### **Quality Assurance Observations**

Staff chose two Shaw sub-contractors involved with the geologic mapping as a sample to review for compliance with applicable Quality Assurance requirements. The two sub-contractors were Fugro-William Lettis & Associates (FWLA) and Glenn Associates Surveyors, Inc (Glenn Associates). The documents that the staff reviewed included the following:

- SCE&G NND Quality Assurance Plan (QAP) for VCSNS Units 2 and 3, Revision 1, dated May 28, 2009
- Shaw Engineering Services Scope of Work (ESSOW) 132177-E-G-004-0, Consulting Services for Geologic Mapping for SCE&G Corporation V.C. Summer Nuclear Station, Units 2 & 3 By William Lettis & Associates, Dated July 23, 2009
- Shaw ESSOW No. 12403801-E-C-001 for Surveying and Mapping of Early Site Development Items, Rev. 1, Dated September 25, 2007
- Shaw Audit No. V2010-15 of WLA dated August 30, 2010
- Fugro Project Planning Document (PPD) No. 2091-PPD, Geologic Mapping Services Ref: ESSOW No. 132177-E-G-004-0, Rev. 2, Dated November 30, 2010

- William Lettis & Associates (WLA) Project Instruction (PI) No. 2091-PI-01, Geologic Mapping Data Collection Plan for V.C. Summer Nuclear Station, Units 2 & 3, Revision 2, Dated June 28, 2010
- WLA Project Instruction (PI) No. 2091-PI-02, Laboratory Testing Plan for V.C. Summer Nuclear Station, Units 2 & 3, Revision 3, Dated April 08, 2011
- WLA Project Instruction (PI) No. 2091-PI-03, Geoscience Evaluation and Analysis Plan for V.C. Summer Nuclear Station, Units 2 & 3, Revision 0, Dated January 25, 2010
- Fugro-William Lettis & Associates (FWLA) Internal Surveillance Reports No. 2091-SR-2010-01, Dated April 14, 2010, and No. 2091-SR-2010-07, Dated May 4 2010
- FWLA Work Instructions (2091-WI-01 thru 09)
- Fugro Quality Assurance Procedure (QAP) No. QAP-16, Revision 3
- FWLA Corrective Action Request No. 2091-CAR-2010-27, Observations from Shaw audit V2010-15
- FWLA Audit No. 2091-AR-2011-02

#### FWLA - Observations

Shaw subcontracted FWLA to perform activities associated with the geologic mapping for Units 2 and 3. Shaw Engineering Services Statement of Work (ESSOW) No. 132177-E-G-004-0, Consulting Services for Geologic Mapping for SCE&G Corporation, V.C. Summer Nuclear Station, Units 2 & 3 By William Lettis & Associates, dated July 23, 2009, required FWLA to establish and implement a QA Program (QAP) that conforms to all of the applicable requirements of 10 CFR 50 Appendix B for all QA Category I work. The ESSOW also requires FWLA to comply with the provisions of 10 CFR Part 21 and have a procedure in place that addresses evaluation and reporting responsibilities. The staff noted that Fugro Quality Assurance Procedure No. QAP-16, Revision 3, satisfies the procedural requirement of Part 21. The staff verified the posting requirements of Part 21 and found it to be adequate.

The staff reviewed results from the geologic mapping that has been performed to date. In addition to reviewing the documents, the staff performed visual observations at the excavation for Unit 2. At the excavation, the staff had discussions with members of Shaw, SCE&G, and FWLA regarding geologic mapping of the foundation rock.

The staff reviewed FWLA's geographical information system (GIS) mapping final product, field processes, field notes and field books for compliance with the ESSOW, Project Planning Document, Project Instructions, Work Instructions, and the ARC INFO software validation package for the geologic mapping. The staff selected two areas to observe. One area was located on the wall of the excavation where the mapping was complete. The second area was on the foundation floor and the initial field mapping was complete.

For the first area, FWLA provided the photographs (annotated), field books, field notes, and the final GIS product. For the second area, FWLA provided the annotated field photographs and field books, however, the GIS database was not completed at the time of the audit. In addition, FWLA demonstrated to the staff how the data and records were stored and controlled. The staff

observed that the geologic mapping activities performed by FWLA were in accordance with the ESSOW and Work Instructions.

#### Glenn Associates - Observations

For the Unit 2 excavation, surveying was provided by Glenn Associates Surveyors, Inc (Glenn Associates), a subcontractor of Shaw. The NRC staff reviewed the calibration of a sample of the survey equipment and the QA/QC program for the surveying services.

Representatives of Glenn Associates met with staff to discuss the surveying associated with the geological mapping. Three different types of surveying instruments were used for the geological mapping: 1) Global Positioning Satellite (GPS) units; 2) Total Station units; and 3) A Light Detection and Ranging (LIDAR) unit. During the discussions, the staff observed a survey activity for foundation rock mapping with a GPS unit. The surveyors explained that the GPS units cannot be calibrated, because the GPS units were a direct function of satellites. However, Total Station survey equipment was used to survey the pile locations in Unit 2 and these instruments do require calibration. In Section 4.4 of the Glenn Associates Program Requirements Document (PRD) for Measuring and Test Equipment (M&TE), Revision 1, Dated October 12, 2007, calibration of the Total Station equipment calibration was required prior to commencement of work by the subcontract or purchase order and stated, in part, "...each calibration will not exceed three months during the specific scope of work."

The staff reviewed calibration documentation for two separate Total Stations. Total Station model Topcon GPT 7500, serial number 7W1194, was observed and did not have a calibration sticker or tag indicating the last calibration. The most recent calibration report associated with this piece of equipment was dated October 23, 2009. The staff also observed Total Station model Topcon GPT 8201-A, serial number 560072, with calibration sticker affixed that indicated the most recent calibration was performed on August 26, 2010, and calibration was due August 26, 2011. The staff reviewed the calibration certificate for this unit, which was performed by Earl Dudley, Inc. The surveyor stated that the survey equipment was required to be calibrated annually, which was not in accordance with Glenn Associates PRD referenced above. The surveyor also stated that the Topcon GPT 7500, which was last calibrated 17 months prior to this observation, was not a unit that was used on this site because it did not have the proper affixed tags. Further review revealed that this unit was used on this project in January 2011. To address this issue, Shaw initiated a Corrective Action Report (CAR) No. 2011-0022, titled "A subcontractor (Glenn & Associates) performing surveying for rock mapping of the nuclear island foundation was discovered to have an out of calibration surveying instrument." An immediate action stated as completed in the CAR was a Shaw representative visited Glenn Associates facilities and verified that three similar Total Station units exhibited proper calibration due date stickers and associated calibration documentation was on file. This immediate corrective action did not specify if the calibrations were verified to occur at an annual frequency or every three months in accordance with the Shaw reviewed and approved Glenn Associates PRD for M&TE.

As a result from discussions of the NRC identified issue regarding survey equipment calibration, Shaw initiated CAR 2011-0021 titled "Failure to identify the need for the required Quality Assurance/Quality Control review of the Subcontract Extension and Engineering Services Scope of Work (ESSOW) Addition for Glenn Associates Surveying, Inc. Subcontract 1321770104-1160." This CAR states the requisition (subcontracts) titled, "Subcontract Extension and ESSOW Addition," dated October 22, 2010, added ESSOW No. 12403801-E-C-001, Revision 1, dated

September 25, 2007, to the original subcontract to Glenn Associates Surveying Inc. The addition of this "QA Category II" ESSOW to the original "QA Category N/A" subcontract mandated the required review by QA/QC in accordance with Shaw procedure NEPG 4-26, titled "Engineering Input To Subcontracts," Rev. 1, Section 6.14. However, the required review by QA/QC was not identified and was listed as "N/A" by the responsible engineer.

The staff determined that the ESSOW for Glenn Associates, dated September 27, 2007, was approved under the Shaw Standard Nuclear Quality Assurance Program (SWSQAP) as QA Category II activities. The Glenn Associates PRD for M&TE was reviewed and approved by Shaw on October 15, 2007. Shaw performed a surveillance of Glenn Associates to verify the implementation of the QA Category II ESSOW and documented the results in Shaw QA Surveillance Report No. S-12403801-07-005 dated November 26, 2007. Attribute C.1 of the surveillance referenced Section 4.4 of the Glenn Associates PRD for M&TE. The report provided the following comment for this attribute:

"Total Station was calibrated prior to use but was not utilized during the observed activities. Calibration due date of Dec. 28, 2007 did not exceed the 3 months and is within the expected completion of this work activity."

No additional surveillances or audits were documented following this November 26, 2007, report.

Shaw Requisition No. 1321771104, dated October 22, 2010, was issued to allow Glenn Associates to perform surveying activities associated with the geologic mapping for Units 2 and 3. No additional surveillances or audits after this change in QA requirements were documented following this October 22, 2010, requisition.

In accordance with Office Instruction NRO-REG-108, the QA observations associated with Glenn Associates have been communicated to NRO and Region II management for appropriate follow-up actions.

### Geologic Mapping Conclusions

The staff concluded that the geologic mapping activities were fully consistent with RG 1.208, as discussed above, and properly documented the lithologies, geologic structures, and other geologic features that were observed in the Unit 2 excavation. The geologic mapping data were incorporated into an interactive GIS database, which renders the database retrievable, and specific data can be cross-referenced to the location where those data were collected. With the exception of the surveying issues, the geologic mapping, including database development, meet the requirements of 10 CFR 50 Appendix B.

SCE&G stated that a report would be prepared to consolidate the geologic mapping observations and results for the Unit 2 excavation. This report will be prepared by SCE&G's contractors under SCE&G's quality assurance program. The target date for issuing the report is July 2011. The staff indicated that, during future site visits to review the geologic mapping activities for the Unit 3 excavation, it would be necessary to review the completed geologic mapping report for Unit 2. Any staff observations regarding the Unit 2 completed report will be documented in the staff's Unit 3 report as appropriate (i.e., either in an audit report if the Unit 3 excavation site visit is performed before a combined license (COL) is issued, or in an inspection report if the Unit 3 site visit is performed after a COL is issued).

### **Examination of Foundation Rock**

The staff carefully examined the sound rock comprising the foundation materials for the VCSNS Unit 2 nuclear island and observed that the foundation rock units were not detrimentally damaged by the controlled blasting which was done to remove the rock materials overlying the foundation grade level. The staff observed only a few locations where relatively minor radial fractures had formed around blast holes (e.g., Figure 10). Given the large volume of excavated sound rock and the minimal lateral and vertical extent of these blast-induced fractures, the staff concludes that these fractures will have no impact on the stability of Seismic Category 1 structures. The sound rock comprising the foundation material provides an adequate foundation for VCSNS Unit 2, consistent with descriptions in the VCSNS COL FSAR Section 2.5. The applicant confirmed that detailed discussion of the foundation rock will be documented in the geologic mapping report being developed for VCSNS Unit 2. As discussed above, any observations regarding the final Unit 2 report that may be related to the quality of foundation rock will be documented during the staff's next site visit, possibly at the same time as the site visit to examine the Unit 3 excavation, and will be documented in a report prepared by the staff.

The staff also evaluated the variation in elevation of the top of sound rock encountered in the Unit 2 excavation. The staff concludes that this variation in elevation is somewhat inconsistent with descriptions provided by the applicant in the VCSNS COL FSAR Section 2.5. For example, FSAR Section 2.5.4.12 states: "The NI areas will be excavated in sound rock to approximately EL. 357 ft, where required, to allow a minimum 3 ft thickness of fill concrete and mud mat beneath the NI basemats. The fill concrete will be approximately 17 ft thick beneath the northeastern corner of the Unit 2 basemat". According to the actual sound rock elevations encountered at the site, the maximum concrete fill thickness will be more than 25 feet.

Subsequent to the site visit, the applicant informed the staff that it has issued CAR, L-11-0089, "Apparent discrepancy between FSAR and field condition." The purpose of the CAR is to determine whether or not a change to the FSAR is needed because of the difference in the thickness of the fill concrete. The final determination for any corrective action will not be made until after the geologic mapping report is finalized for VCSNS Unit 2. (The resolution will rely on information in the final report). Therefore, any corresponding FSAR revision may not be made until after the COL is issued. The staff believes that its conclusions in the VCSNS COL FSER are acceptable based on the 17 feet thick fill concrete description for the following reasons:

- The staff expected to see variations in the depth of the excavation because the top of rock description developed in the FSAR was based on limited borehole data.
- The staff's preliminary assessment is that for purposes of the FSAR commitments associated with the fill concrete (e.g., the commitment to develop a thermal monitoring plan in accordance with American Concrete Institute code) a difference between 17 and 25 feet of this concrete does not affect the commitments.
- There is a clear process for updating the FSAR post COL if it is determined that such an update is needed (i.e., 10 CFR 50.59).

Conclusions

Based on the observations made by NRC staff, the staff concludes the following:

- After directly examining the walls and floor of the Unit 2 excavation, the staff concludes that the geologic features observed and mapped in the excavation by the applicant are consistent with geologic characteristics of the site as described in VCSNS COL FSAR Section 2.5. The staff draws this conclusion because strong field evidence indicates that no capable tectonic structures, or other potentially detrimental geologic features, occur in the Unit 2 excavation.
- After reviewing the geologic maps and the associated supporting data produced by the applicant, and comparing a sample of these maps with field observations in the excavation, the staff concludes that the geologic maps and associated supporting data produced by the applicant for the Unit 2 excavation are consistent with the commitments contained in VCSNS COL FSAR Section 2.5. The staff draws this conclusion because the geologic maps were prepared at a scale sufficient to document a lack of capable tectonic structures, or other potentially detrimental geologic features, in the Unit 2 excavation.
- After examining the floor of the Unit 2 excavation, the staff concludes that the sound rock comprising the foundation materials for the VCSNS Unit 2 nuclear island was not detrimentally damaged by the controlled blasting performed to remove the rock units overlying the foundation grade level, and that the sound rock which occurs in the excavation will provide an adequate foundation consistent with descriptions in the VCSNS COL FSAR. The staff draws this conclusion because careful visual examination of the rock units in the Unit 2 excavation did not reveal any detrimental blast damage of the foundation rock units.

Docket Nos.: 52-027 and 52-028

CONTACT: Joseph Sebrosky, NRO/DNRL/NWE1  
(301) 415-1132

Enclosures:  
As stated

Conclusions

Based on the observations made by NRC staff, the staff concludes the following:

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- After reviewing the geologic maps and the associated supporting data produced by the applicant, and comparing a sample of these maps with field observations in the excavation, the staff concludes that the geologic maps and associated supporting data produced by the applicant for the Unit 2 excavation are consistent with the commitments contained in VCSNS COL FSAR Section 2.5. The staff draws this conclusion because the geologic maps were prepared at a scale sufficient to document a lack of capable tectonic structures, or other potentially detrimental geologic features, in the Unit 2 excavation.
- After examining the floor of the Unit 2 excavation, the staff concludes that the sound rock comprising the foundation materials for the VCSNS Unit 2 nuclear island was not detrimentally damaged by the controlled blasting performed to remove the rock units overlying the foundation grade level, and that the sound rock which occurs in the excavation will provide an adequate foundation consistent with descriptions in the VCSNS COL FSAR. The staff draws this conclusion because careful visual examination of the rock units in the Unit 2 excavation did not reveal any detrimental blast damage of the foundation rock units.

Docket Nos.: 52-027 and 52-028

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Enclosures:

As stated

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DATE	05/09/11	05/09/2011	05/09/2011	05/09/2011	05/09/2011
OFFICE	PM:DNRL:NWE1				
NAME	JSebrosky				
DATE	05/09/2011				

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April 18 – 19, 2011 Site Visit to the Summer Unit 2 and Unit 3 Site  
To View Unit 2 Excavation  
Attendance List

<b>Name</b>	<b>Organization</b>
Gerry Stirewalt*	NRC/NRO/DSER/RGS2
Frankie Vega*	NRC/NRO/DSER/RGS1
Joe Sebrosky*	NRC/NRO/DNRL/NWE1
Anthony Masters*	NRC/RII/CCI/DCI/CIB2
Chad Oelstrom*	NRC/RII/CCI/DCI/CIB2
Mina Sheikh* - part time on 4/18, and all day on 4/19	NRC/RII/CCI/DCP/CPB4
Jerry Wilson – part time on 4/18	NRC/NRO
Don Habib – part time on 4/18	NRC/NRO/DNRL/NWE1
Al Paglia*	South Carolina Electric and Gas (SCE&G)
Amy Monroe*	SCE&G
Bob Whorton*	SCE&G
Kyle Young*	SCE&G
Joe Gillespie	SCE&G
Julie Giles*	SCE&G
Patrick Gibbons	SCE&G
John Todd*	SCE&G
Roosevelt Word*	SCE&G
Ron Clary* - present during exit only	SCE&G
Ryder Thompson* - present during exit only	SCE&G
Brad Stokes	SCE&G
Duane Carter	Shaw
Gina Ferrugia	Shaw
Matt Cooke*	Shaw
Nathan Cooke	Shaw
Everett Washer*	Shaw
John L. Strack	Shaw
Michael Goyda	Shaw
Jan Andersen* - present during exit only	Shaw
Dave Taggart* – present during exit only	Shaw
Robert Hoak* - present during exit only	Shaw
Mark Glover* - present during exit only	Shaw
Will Huff	Fugro William Lettis and Associates (FWLA)
Scott Lindvall	FWLA
Randy Cumbest*	FWLA
Frank Syms*	FWLA
Clint Eldridge	FWLA
Stephanie Briggs*	FWLA
Don Secor	RET

1. Attendance list reflects individuals that were present during the morning presentations on April 18, 2011
2. \* denotes individuals present during the exit meeting on April 19, 2011

## Agenda for April 18 – 19, Summer Site Visit

### **MONDAY – APRIL 18, 2011**

<b>TIME</b>	<b>PRESENTATION / ACTIVITY</b>	<b>LEAD</b>
8:00	NRC Staff Arrival at SCE&G NND Office (Coffee)	
8:30	Welcome & Introductions – NND Logistics & Safety	SCE&G (A. Monroe, B. Whorton)
8:40	Agenda, Construction Safety Brief, Site Overview	SCE&G (B. Whorton, K. Young)
9:00	Geologic Program Overview <ul style="list-style-type: none"> <li>• Program Outline, Technical Staff, Procedures &amp; QA</li> </ul>	Shaw (M. Cooke)
9:15	Excavation Sequence, Geologic Mapping Technical Approach and Data Management <ul style="list-style-type: none"> <li>• Mapping Reconnaissance Program</li> <li>• Excavation Process and Wall Mapping</li> <li>• NI – Top of Rock Floor Mapping</li> </ul>	Shaw (M. Cooke)
9:45	BREAK	
10:00	Preliminary Geologic Results and Observations <ul style="list-style-type: none"> <li>• Regional and Local Geologic Setting</li> <li>• Lithologic/Structural Age Relationships</li> <li>• Preliminary Observations and Conclusions</li> <li>• Demonstration of Final Products (Maps, GIS)</li> </ul>	William Lettis & Associates (R. Cumbest)
11:00	LUNCH - NND Office	
12:00	Unit 2 – Excavation Inspection	All
4:00	Return to NND Offices <ul style="list-style-type: none"> <li>• Discussion on Preliminary Observations</li> <li>• Strategy/Requests/Logistics for Tuesday Visit</li> </ul>	All

### **TUESDAY – APRIL 19, 2011**

<b>TIME</b>	<b>PRESENTATION / ACTIVITY</b>	<b>LEAD</b>
8:00	NRC Staff Arrival at SCE&G NND Office (Coffee)	
8:30*	Unit 3 Excavation Inspection – Back to Unit 2*	All
12:00	LUNCH - NND Office	
1:00*	Unit 2 /Other Areas – Excavation Inspection*	All
4:00	Return to NND Office <ul style="list-style-type: none"> <li>• Discussion on Observations / Actions (NRC Exit)</li> </ul>	All

\* Time allotments flexible for inspections of Unit 2, Unit 3, and other areas

## V. C. Summer Unit 2 Excavation Photos April 2011

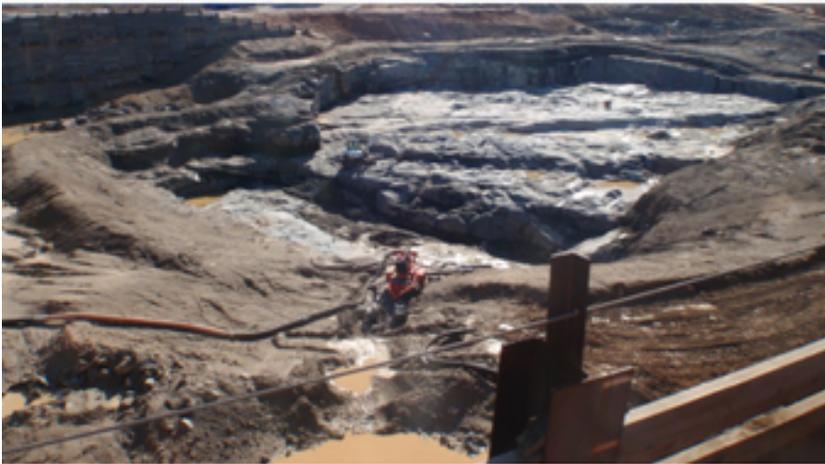


Figure 1 – Unit 2 Excavation View Looking West



Figure 2 – Unit 2 Excavation Looking East



Figure 3 – Unit 2 Excavation Looking North

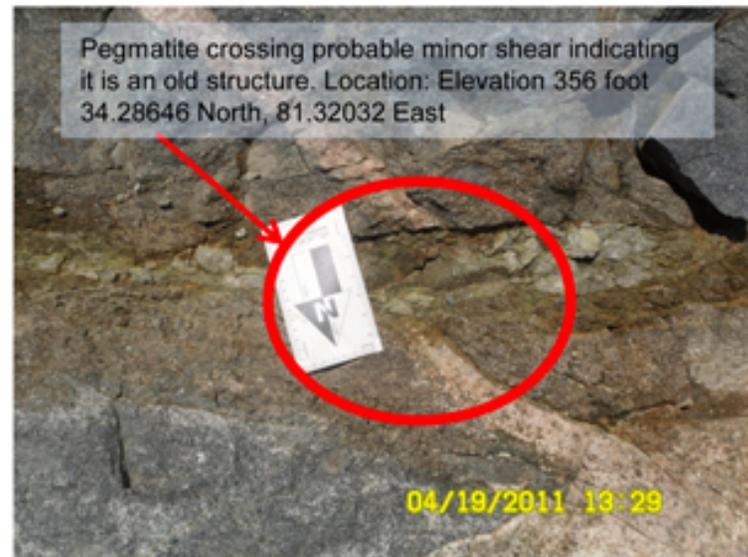


Figure 4 – Unit 2 Probable Minor Shear

## V. C. Summer Unit 2 Excavation Photos April 2011



Figure 5 – Three Dimensional Minor Offset Shear



Figure 7 – Complex Intrusive Relationship



Figure 6 – Another Example of a Probable Minor Shear Zone

## V. C. Summer Unit 2 Excavation Photos April 2011



Figure 8 – Igneous Dike Crosscutting Unit 2 Foundation



Figure 9 – Pinch Out of Weathered Horizon



Figure 11 - V. C. Summer Unit 2 Top of Rock Geologic Mapping

