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WSRC-RP--91-552

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QUATERNARY INVESTIGATION (U)

by

A. Stieve

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

REC-11
MAY 1 1992

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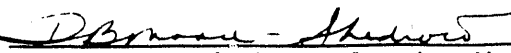
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**Westinghouse Savannah River Co.
Task Technical Plan**

WSRC-RP-91-552
keywords: geology, fault,
Quaternary, neotectonics


D. B. Moore-Shedrow, Section Manger
Authorized Derivative Classifier

May 15, 1991

To: D. S. Kaback, group manager

From: A. Stieve, task leader *A.S.*

TITLE: QUATERNARY INVESTIGATION.

Introduction

The primary purpose of the Quaternary investigation is to provide information on the location and age of Quaternary deposits for use in evaluating the presence or absence of neotectonic deformation or paleoliquefaction features within the SRS region. The investigation will provide a basis for evaluating the potential for capable faults and associated deformation in the SRS vicinity. Particular attention will be paid to the Pen Branch fault.

The investigations are designed to address the following:

- Identify Quaternary deposits and surfaces that may be used as strain gauges to assess or demonstrate the absence of fault displacement that has occurred in a time-span pertinent to hazard assessment.
- Provide age estimates of Quaternary deposits using absolute and relative age-dating techniques.
- Conduct detailed topographic and tectonic geomorphic analyses to evaluate regional indications of the presence or absence of neotectonic deformation, focusing on the Pen Branch fault vicinity.
- Integrate the Quaternary geology investigations with other Pen Branch fault studies.
- To develop a preliminary Quaternary geology data base for the SRS that can be used for subsequent geologic and geotechnical interpretations at SRS.

Discussion

The SRS is located on the Atlantic Coastal Plain, which is an essentially flat-lying, undeformed wedge of unconsolidated marine and fluvial sediments. The sediments are stratified sand, clay, limestone, and gravel that dip gently seaward and range in age from Late Cretaceous to Recent. The sedimentary sequence

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thickens from zero at the Fall Line to more than 4,000 feet at the coast. There are about 600 to 1,200 feet of Coastal Plain sediments at SRS. The Coastal Plain section is divided into several groups based principally on age and lithology.

Beneath the Coastal Plain section is a pre-Cretaceous unconformity that developed on a basement consisting of two geologic terranes; 1) Triassic-Jurassic rift basin, the Dunbarton basin, filled with lithified terrigenous and lacustrine sediments with minor amounts of mafic volcanic and intrusive rock (Marine, 1974; Marine and Siple, 1974) and 2) crystalline terrane of metamorphosed sedimentary and igneous rock that may range in age from Precambrian to late Paleozoic.

The Pen Branch fault is a recently discovered feature in the Coastal Plain and basement at SRS. A program has been underway since January 1989 to evaluate the ability of this fault to release seismic energy (earthquake energy).

Because the PBF is located near operating nuclear facilities, public perception and federal regulations indicate that a thorough investigation of the fault is appropriate to determine whether any seismic hazard exists.

A phased program has been developed to investigate the PBF and to satisfy NRC regulatory guidelines represented in 10 CFR 100 Appendix A. The program will be conducted over a period of 3 years. The objectives of the PBF program are to fully characterize the nature of the PBF; that is to provide information on the existence, location, geologic history, capability, and earthquake potential of the fault. The program has so far completed a standard depth and a shallow, high-resolution seismic reflection survey. Other subsurface control has come from 6 paired boreholes bracketing the fault and the extension of two boreholes through the Triassic rock into metamorphosed crystalline rock.

In order to fully evaluate the capability of the Pen Branch fault additional studies are required to document the recency of fault displacement and the age of the oldest unfaulted stratigraphic units. In particular, an assessment of the potential for Quaternary displacement is required to evaluate the capability of the fault, and an assessment of the potential for possible Quaternary deformation on other tectonic structures in the SRS vicinity is required for the Safety Analysis Report for the NPR facility.

Task Description

Customers

Environmental Sciences Section
K-Reactor Restart
NPR organization

Task deliverables

Westinghouse Savannah River Co.
Task Technical Plan

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Task 1. Compilation of regional Quaternary geologic data: review and compilation of the literature, written report.

Task 2. Quaternary mapping: conduct reconnaissance and detailed field mapping of Quaternary deposits and geomorphic surfaces. Deliverables: Variously scaled Quaternary maps.

Task 3. Age Dating: Numerical dating, relative and correlative dating of deposits. Deliverable written report, data, age dates.

Task 4. Quantitative Morphometric Analyses: Stream and terrace profiling, sinuosity ratios, scarp morphology, envelope, subenvelope, and residual maps, drainage basin asymmetry and evolution, and structure contour reconstruction of geomorphic surfaces. Deliverables: written report of analysis, maps, profiles, data.

Task 5. Integration with other studies.

Task 6. Final and compiled report.

Optional Task 1. Paleoliquefaction investigation

Optional Task 2. Structural analysis of Quaternary deformation

Task requirements

Task prerequisites

key parameters. Qualifications of personnel

accuracy of measurements. Base mapping at a scale of 1:24,000.

Task Activities

- Site use and site clearance for the mapping project portion of program
- Interim and final reports

References

Signatures

Alice Stieve
Task Leader

Alice L. Stieve

6/17/91
Date

Dawn Kaback
Group Manager

8/19/91
Date

TASK QA PLAN

Task Title: Quaternary InvestigationTask Leader: Alice Stieve

Key Parameter Listing (number each parameter and enter number on checklist):

Qualifications of Key personnel and the maps turned in as deliverables.

Additional Comments (explanation of exceptions or additions to existing procedures):

Documents Requiring Customer Approval:

Interim and final reports, all maps

Records:

- Program Plan or Task Assignment SRL-ESS-89-395
- Task Technical Plan WSRC-RP-91-552
- Task QA Plan SRL-ESS-91-637
- Uniquely Identified Notebooks
- Results of Independent Technical Reviews
- Supporting Documentation
- List any other anticipated records Final report

Approvals:

Alice Stieve

Task Leader

Alice L. Stieve6/17/91

Date

Karen Kaback

Group Manager

8/2/91

Date

Debra Shadron

Section Manager

8/29/91

Date

J.R. Lofgren

Cognizant Quality Function

9/14/91

Date

END

**DATE
FILMED**

4 / 23 / 92

