

VOLCANIC HAZARD INVESTIGATIONS
WORK PLAN

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VOLCANIC HAZARD INVESTIGATIONS

1. PURPOSE

The principal objective of this work is to complete an assessment (begun in FY-1978) of the hazards of volcanism with respect to geologic isolation of radioactive waste in the southwestern region of the Nevada Test Site (NTS) for the NNWSI project.

2. WORK DESCRIPTION

Volcanic hazard investigations are concerned with identifying the potential for future volcanic activity and the possible range of disruptive effects on an underground repository due to silicic and basaltic volcanism. These studies are being conducted by the Los Alamos National Laboratory and the U.S. Geological Survey under the Tectonics, Seismicity and Volcanism work task. Los Alamos has the primary responsibility for volcanism studies. Major tasks of the volcanism investigations include:

- Geochemical comparison of the Black Mountain and Silent Canyon silicic volcanic centers.
- Evaluation of the geology, petrology, and history of Late Cenozoic basaltic volcanism in the south central Great Basin with emphasis on the NTS region.
- Assessment of the risk of volcanism with respect to the siting of a repository for storage of high-level radioactive waste at Yucca Mountain (Risk assessment is the product of probability times consequences).

3. FACILITIES AND EQUIPMENT

- 3.1 Polarizing microscopes
- 3.2 Sample preparation equipment (TWS-ESS-DP-04, Sample Preparation Laboratory Procedures; TWS-CNC-DP-23, Preparation of Thin Sections for Geologic Materials).
- 3.3 Electron microprobe (TWS-ESS-DP-07, Microprobe Operating Procedure).
- 3.4 X-ray fluorescence equipment (procedure to be developed).
- 3.5 Equipment for instrumental neutron activation analyses (procedure to be developed).

4. QUALITY ASSURANCE

4.1 The following detailed quality assurance and technical procedures apply to this work plan:

Document Control Procedure

TWS-CMBQA-QP-03

Handling, Storage, and Shipping Procedure

TWS-CMBQA-QP-04

NNWSI Procurement Procedures

TWS-CMBQA-QP-06

Procedure for Technical Review of Publications

TWS-CMBQA-QP-07

X-Ray Powder Diffraction Analysis

TWS-ESS-DP-01

NTS Core Petrography Procedure

TWS-ESS-DP-03

Sample Preparation Laboratory Procedures

TWS-ESS-DP-04

Operating Instructions for DV-502 Vacuum Evaporator
Used in Carbon Coating Thin Sections for Microprobe
Analysis

TWS-ESS-DP-06

Microprobe Operating Procedure

TWS-ESS-DP-07

Siemens X-Ray Diffraction Procedure

TWS-ESS-DP-16

Sample Preparation: Rock Powders

TWS-ESS-DP-19

Preparation of Fused Beads for Electron Microprobe
Analysis of Rock Powders

TWS-ESS-DP-20

Preparation of Thin Sections for Geologic Materials

TWS-CNC-DP-23

4.2 Only qualified personnel shall be allowed to perform this work. Evidence of qualification shall be documented in a certification record kept in the ESS-Division resident file and in the INC-Division resident file.

4.3 Identification and traceability is addressed in sections 5.1, 5.2, and 5.3.

5. REPORTING, REVIEW, AND RECORDS

5.1 Field Studies

Field studies including geologic mapping and sampling are conducted at sites of Late Cenozoic volcanism throughout the south central Great Basin. Field notes are recorded, and xerox copies are placed in the resident file. Results of geologic mapping and documentation of sampling sites are recorded on topographic quadrangle maps and aerial photographs, which are stored at Room 308, RC1, TA-48. Xerox copies of the aerial photographs including the date, scale, and photo number (source information recorded in field notes) and of the topographic quadrangle maps are placed with the xeroxed field notes in the resident file. Permanent maps are compiled and issued with formal publications.

5.2 Sample Selection and Preparation

Geologic samples obtained from field studies are shipped to Los Alamos following sample Handling, Storage, and Shipping Procedure (TWS-CMBQA-QP-04). The samples are logged into a Quality Assurance Notebook (Field Book #1, TWS-G6-5/79-16) stored at Room 308, RC1, TA-48. During the sample logging procedure, samples are screened for further studies in order to insure selection of a representative sample suite and to choose the most suitable samples for petrologic and geochemical studies. The major criteria used for the screening are a comparison of the sample suite with known geologic units to check for completeness and a megascopic examination of the degree of weathering and alternation of samples so that samples most likely to yield representative petrologic and geochemical data will be chosen. The samples selected for further studies (thin section, microprobe, and geochemical) are noted in the Quality Assurance Notebook

and the samples are prepared and analyzed following the procedures listed under section 4. Thin sections are labeled by etching the sample number on the back of the section. Thin sections are filed in a labeled container and kept in the offices of certified project workers. When not in use, they are stored at Room 308, RC1, TA-48.

5.3 Microprobe Analysis and Documentation

Electron microprobe analyses are completed for fused bead samples and individual mineral grains in thin sections following procedure TWS-ESS-DP-07. Analyses are screened for accuracy based on major-element totals and the chemical stoichiometry of mineral constituents. Probe results are documented in the form of computer print-outs. Working print-outs are maintained in a loose-leaf binder stored at Room 4, Bldg. 438, TA-33 (print-outs not in current use are placed in the resident file). Entries are dated and signed by project workers. Separate informal records of analyses are kept by individual workers in loose-leaf notebooks.

5.4 Geochemical Studies

Major and trace element chemical analyses are made for selected samples using instrumental neutron activation and x-ray fluorescence techniques. These techniques will be described in separate procedures.

5.5 Probability Studies

Evaluations of the probability of disruption of an underground repository are made by applying standard probabilistic techniques to data from the geologic studies. The suitability of conditional probability techniques is tested for acceptance through publication of results in the open scientific literature and peer review.

5.6 Consequence Analyses

Consequence analyses of repository disruption include evaluation of the scenario development and of the potential radiological release levels due to a particular

scenario. The latter studies are conducted by Sandia National Laboratory. Scenario development studies involve prediction from the geologic data of the most likely type of effects due to future volcanism. These studies are speculative; therefore, the results are tested for acceptance through formal peer review and publication in the open scientific literature.

5.7 Publication of Results

Results of volcanic hazard studies are published routinely. These reports become formal compilations of the data gathered, interpretations, and conclusions of the work. Published reports are subject to independent review in accordance with the NNWSI Procedure for Technical Review of Publications (TWS-CMBQA-QP-07).

6. REFERENCE

Not applicable.