MASTER

Waste Isolation Program Monthly Report

September 1978

Prepared for the United States
Department of Energy
Under Contract EY-77-C-06-1030

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**Rockwell Hanford Operations
Energy Systems Group
Richland, WA 99352**

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Informal Report

BASALT WASTE ISOLATION PROGRAM
MONTHLY REPORT

R. A. Deju, Director
Basalt Waste Isolation Program

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INTRODUCTION

In February 1976, the U. S. Energy Research and Development Administration (currently the U. S. Department of Energy) expanded the commercial radioactive waste management programs and established the National Waste Terminal Storage Program. Its mission was to provide multiple facilities in various deep geologic formations within the United States. The Office of Waste Isolation was established within the Union Carbide Corporation-Nuclear Division to provide program management to the National Waste Terminal Storage Program. The overall program consisted of investigating a number of geologic rock types to determine their suitability for terminal storage of radioactive waste. Basalts, such as the Columbia Plateau basalts which underlie a large portion of the Pacific Northwest and the Hanford reservation, were selected for initial geologic reconnaissance. Atlantic Richfield Hanford Company was asked in May 1976 by the Office of Waste Isolation to plan and execute a basalt feasibility study. Geologic exploration of Columbia Plateau basalts was needed to determine the feasibility of utilizing those formations as a site for terminal storage of commercial nuclear waste.

In September 1977, the National Waste Terminal Storage Program (now the U. S. Terminal Storage Program) was restructured. While emphasis was still on a salt repository, additional funds were given to support investigations of two U. S. Department of Energy sites (Hanford and Nevada). The Budget Reporting Classification Number for the Hanford study is AG-02-02-10.

The Hanford program is the responsibility of the U. S. Department of Energy-Richland Operations Office. Rockwell Hanford Operations (successor to the Atlantic Richfield Hanford Company) established the Basalt Waste Isolation Program and chartered it with the responsibility for conducting the basalt feasibility studies. Rockwell Hanford Operations is the prime contractor responsible for the Hanford basalt studies. The program is divided into five projects:

Site Studies;

Drilling;

Technology Development;

Near-Surface Test Facility;

Repository.

A summary of major program accomplishments during the reporting period follows.

REPORTING PERIOD

PROGRAM SUMMARY

SEPTEMBER 1-30, 1978

Approximately 3,500 square miles of Columbia River Basalt were mapped in northeastern Oregon and 1,500 square miles were mapped in the Yakima fold belt.

Drilling operations at DC-4 advanced from 1,664 feet to 2,333 feet, and the lowermost deviated hole in DC-2 has advanced from 2,370 feet (top of sidetrack plug) to 2,992 feet.

The characterization of deep basalt alteration products indicates that fractures and breccia zones usually contain smectitic clays and/or silica, while vesicles typically contain a complex assemblage of secondary minerals dominated by zeolite clinoptilolite.

Excavation of the east portal of the Near-Surface Test Facility is completed and the contractor is in the process of completing the rock bolt, mesh, and shotcrete installation. Approximately 20 feet of this 8-foot diameter tunnel have been developed and steel sets placed in the first 15 feet of tunnel. Excavation of the west and Phase II portals is approximately 60 percent complete. Rock bolting and steel mesh installation at these faces are initiated.

Work continued on the development of a mine design criteria document for the repository conceptual design.

The annotated outline for the Basalt Waste Isolation Program license application (formerly the Preliminary Safety Analysis Report) was completed and transmitted to the U. S. Department of Energy-Richland Operations Office on September 15, 1978 for review and transmittal to the U. S. Department of Energy-Headquarters and the U. S. Nuclear Regulatory Commission.

PROBLEM AREAS AND ACTION TAKEN

None.

REPORTING PERIOD

SITE STUDIES PROJECT

SEPTEMBER 1-30, 1978

OBJECTIVE

All site studies are provided to support site selection and evaluation as well as to prepare for the preliminary safety analysis report, environmental report, and draft environmental impact statement. These studies are aimed at establishing areas that potentially will provide geologic and hydrologic barriers adequate to prevent release of the waste to the biosphere. When a site is selected, site studies will thoroughly characterize that site geologically and hydrologically and provide service to construction activities during construction. At the same time, the studies will develop a monitoring plan that will be initiated as soon as a final site is selected and continue through the life of the repository. The monitoring is to continually evaluate natural risks and provide early warning of any potential hazard to the waste confinement.

DESCRIPTION OF WORK ACCOMPLISHED

Mapping of the late Cenozoic sediments of the northwestern Columbia Plateau has been completed by the Washington State Department of Natural Resources.

The U. S. Geological Survey has completed their mapping of Columbia River Basalt in two areas. Approximately 3,500 square miles were mapped in northeastern Oregon and 1,500 square miles were mapped in the Yakima fold belt, the region west of the Hanford Site between Sunnyside, Washington and Ellensburg, Washington.

Statements of work for all fiscal year 1979 subcontract work have been completed and several contracts have been emplaced, including the contract for detailed mapping of the basalts exposed in the eastern Pasco Basin and the contract for magnetotelluric surveying in the Pasco Basin.

The report on the fiscal year 1978 seismic reflection testing was completed and submitted for clearance prior to printing.

Fiscal year 1978 geologic investigations were completed by Rockwell Hanford Operations geologists. Results of these investigations have been summarized and are essentially ready to submit for clearance and publication.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

REPORTING PERIOD

DRILLING PROJECT

SEPTEMBER 1-30, 1978

The Drilling Project provides the boreholes necessary to investigate the subsurface geologic, hydrologic, and engineering properties of the Columbia River basalts. This investigation is being conducted to determine the suitability of the basalts for the construction of an environmentally acceptable waste repository. These studies are in direct support to the Site Studies Project for preliminary and final site characterization.

The Drilling Project will also provide services in the area of drilling technology which will assist the Repository Project and the Near-Surface Test Facility Project.

DESCRIPTION OF WORK ACCOMPLISHED

Drilling operations were conducted at two locations and hydrologic testing at one location during the reporting period.

The lowermost deviated hole in Borehole DC-2 has advanced from 2,370 feet (top of sidetrack plug) to 2,992 feet. The lower deviated core hole is 60 percent complete based upon the estimated total measured depth of 3,400 feet.

Core Hole DC-4 has advanced from 1,664 feet to 2,333 feet. The borehole is 58 percent complete based upon a revised total depth of 4,000 feet.

Sperry-Sun, Inc. ran a gyroscopic directional survey in Core Hole DC-5.

Lawrence Berkeley Laboratory finished hydrological testing in Borehole DC-6 on September 21, 1978. Twenty-one intervals were tested during the 26-day testing period.

PROBLEM AREAS AND ACTION TAKEN

None.

BASALT WASTE ISOLATION PROGRAM
DRILL HOLES AS OF 9/30/78

REPORTING PERIOD

TECHNOLOGY DEVELOPMENT PROJECT

SEPTEMBER 1-30, 1978

Technology Development supports the mission of building a repository by providing solutions to technical problems related to the design and monitoring of the repository. Data developed during solution of technical problems will also be used in the safety analysis report and the environmental report.

DESCRIPTION OF WORK ACCOMPLISHED

Underground mapping has begun on the Near-Surface Test Facility to develop basic information for the Phase I and Phase II tests. Data must be collected as mining progresses and before the rock surfaces are covered by shotcrete or tunnel supports. Standard operating procedures for conducting the mapping were prepared in draft form. The east tunnel open cut and approximately 20 feet of the east tunnel have been mapped and photographed.

The final report on testing components for a downhole laboratory indicates that the components require more design and testing before they will be acceptable.

A data report on borehole conditions was completed. Evaluation of the borehole plugging proposals is almost complete.

Low-temperature equilibrium experiments (25 degrees centigrade) which measure radionuclide distribution coefficients on basalt, heulandite, and nontronite have continued. Data from cesium and strontium which are not sensitive to changes in redox potential indicated that near-equilibrium conditions were not achieved in 60 or even 90 days. Variations in the measured K_d s for plutonium and technetium, the speciation of which is sensitive to changes in redox potential, indicate the need for close control of oxidation/reduction conditions in order to achieve meaningful results. Subcontractor reports on characterization of deep basalt alteration products indicate that fractures and breccia zones usually contain smectitic clays and/or silica, while vesicles typically contain a complex assemblage of secondary minerals dominated by zeolite clinoptilolite. Alteration products vary with depth, with smectite dominating the upper portion of the stratigraphic column and clinoptilolite dominating the lower portion. Characterization of repository simulation experiments at 200 and 300 degrees centigrade and equilibrium and kinetics studies are continuing.

PROBLEM AREAS AND ACTION TAKEN

None.

REPORTING PERIOD

NEAR-SURFACE TEST FACILITY PROJECT

SEPTEMBER 1-30, 1978

OBJECTIVE

To design and construct a multipurpose test facility for in situ testing of basalt.

DESCRIPTION OF WORK ACCOMPLISHED

Title II design effort for Phase I (electric heater testing) by Vitro Engineering continued during this period.

The Title I cost estimate was received from Vitro Engineering for review.

Approval of the revised functional design criteria for Phase II of the Near-Surface Test Facility was received from the U. S. Department of Energy-Richland Operations Office.

Atoms International initiated work on remote handling studies.

Wiring for the Near-Surface Test Facility electric distribution line has been placed on the 21 existing poles and the 5 new poles have been installed.

Excavation of the east portal of the Near-Surface Test Facility is completed and the contractor is in the process of completing the rock bolt, mesh, and shotcrete installation. Approximately 20 feet of this 8-foot diameter tunnel have been developed and steel sets placed in the first 15 feet of tunnel. Excavation of the west and Phase II portals is approximately 60 percent complete. Rock bolting and steel mesh installation at these faces have been initiated.

Construction of a waterline serving the Near-Surface Test Facility site was initiated and trenching activities completed.

The annotated outline for the Near-Surface Test Facility safety assessment document has been completed and planning activity for the preparation of the document initiated.

PROBLEM AREAS AND ACTION TAKEN

None.

REPORTING PERIOD

REPOSITORY PROJECT

SEPTEMBER 1-30, 1978

OBJECTIVE

The objectives of this program are to select and evaluate a repository site in basalt, establish design criteria, and design and construct a repository for storage of nuclear waste.

DESCRIPTION OF WORK ACCOMPLISHED

The contract for site selection has been placed with Woodward-Clyde Consultants. They have started a review of existing data for the repository site selection study. An area surrounding Boreholes DC-4 and DC-5 near the western edge of the Hanford Site was selected to conduct testing to establish geotechnical site evaluation techniques. Information gained during this testing effort will be applied to assist in the evaluation of candidate sites chosen at the conclusion of the repository site selection study in September of fiscal year 1979.

The fifth draft of RHO-BWI-CD-2 (unclassified), Staff, Basalt Engineering Unit, "Basalt Waste Isolation Program, Basalt Repository, Preconceptual Design Guidelines," has now been reviewed. The issue date is estimated to be early in November 1978.

A draft copy of the University of Minnesota-Dames and Moore final report for fiscal year 1978 was received. The report summarizes the progress made over fiscal year 1978 and adds some new studies in the following areas:

- A discussion of the treatment of joints in finite element modeling;
- The effects of interbeds on the regional stresses and displacements above and below the repository horizon, and;
- A simple seismic stability analysis of underground caverns.

A final copy of the University of Minnesota-Dames and Moore Phase I problem definition report was received. This report will be issued as a formal contractor document.

Work continued on the development of a mine design criteria document for the repository conceptual design. J. F. T. Agapito and Associates are currently reviewing those underground structures which have been constructed in basalt including the construction and support methods.

Repository Project (continued)

Vitro Engineering has started design planning for the surface facilities and the support systems. The project kickoff meeting was held on September 21, 1978. Vitro Engineering will furnish Rockwell Hanford Operations their estimate for design, the work statement, and a list of sub-milestones. This information is to be furnished by October 23, 1978.

Mutual agreement was reached between Woodward-Clyde Consultants and Rockwell Hanford Operations on a list of disruptive events to be evaluated. The anticipated completion date for the draft of the disruptive events report will be about October 31, 1978.

The annotated outline for the Basalt Waste Isolation Program license application (preliminary safety analysis report) was completed and transmitted to the U. S. Department of Energy-Richland Operations Office on September 15, 1978 for review and transmittal to the U. S. Department of Energy-Headquarters and the U. S. Nuclear Regulatory Commission.

Work is continuing on the preparation of the annotated outline for the Basalt Waste Isolation Program environmental report. It is estimated that the document is approximately 20 percent complete. Transmittal of the document to the U. S. Department of Energy-Headquarters and the U. S. Nuclear Regulatory Commission is anticipated in mid-October 1978.

PROBLEM AREAS AND ACTION TAKEN

None.

REPORTING PERIOD

MANPOWER SUMMARY

SEPTEMBER 1-30, 1978

	<u>Man-Months</u>
ROCKWELL HANFORD OPERATIONS	90.0
ATOMICS INTERNATIONAL	1.0
J. F. T. AGAPITO AND ASSOCIATES	3.0
R. BLACK	0.2
COLORADO SCHOOL OF MINES	8.0
FENIX & SCISSION, INC. AND SUBCONTRACTORS	28.0
GEOSCIENCE RESEARCH CONSULTANTS	4.0
IDAHO BUREAU OF MINES AND GEOLOGY	0.5
J. A. JONES CONSTRUCTION COMPANY	18.0
LAWRENCE BERKELEY LABORATORY	14.0
OREGON STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES	1.0
PACIFIC NORTHWEST LABORATORY	3.0
THE PENNSYLVANIA STATE UNIVERSITY	5.0
SENTURION SCIENCES, INC.	3.0
W. K. SUMMERS AND ASSOCIATES	1.0
TERRA-TEK	1.0
UNIVERSITY OF MINNESOTA	6.0
UNIVERSITY OF OREGON	3.0
U. S. GEOLOGICAL SURVEY-WESTERN DIVISION	5.0
U. S. GEOLOGICAL SURVEY-WATER RESOURCES	5.0
VITRO ENGINEERING	30.7
WASHINGTON STATE DEPARTMENT OF ECOLOGY	1.5
WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES	4.0
WASHINGTON STATE UNIVERSITY	3.0
WOODWARD-CLYDE CONSULTANTS	<u>1.0</u>
 TOTAL BASALT WASTE ISOLATION PROGRAM MANPOWER SUPPORT	 <u>239.9</u>

REPORTING PERIOD

VISITORS

SEPTEMBER 1-30, 1978

<u>Name</u>	<u>Affiliation</u>	<u>Date</u>	<u>Person Contacted</u>
R. E. Hanson	Jenny Geotechnical Corporation	September 1	A. D. Krug
R. E. Bucknam	Bucknam Associates	September 1	A. D. Krug
D. B. Sapik	U. S. Geological Survey	September 5	R. C. Arnett
R. Lingle	Terra-Tek	September 6	M. R. Kasper
D. Smith	U. S. Geological Survey	September 7	R. C. Edwards
D. West A. S. Patwardhan	Woodward-Clyde Consultants	September 13	D. R. St. Laurent
J. F. Allen	National Management Association	September 13	P. J. Reder
W. K. Eister	U. S. Department of Energy	September 15	G. C. Evans
G. Kost R. L. Olove1	EDAC	September 19	J. F. Marron
J. G. Asquith R. H. Chisworth	Norman Engineering	September 20	H. B. Dietz
J. E. Todd A. Wojtumn L. Klingler K. Gilbert	Monsanto Research Corporation	September 20	J. Eliason
H. Hatch	Hatch Drilling	September 20	D. J. Brown
B. Naft S. G. Lewstein P. E. Wilkins	NUS Corporation	September 25	G. J. Pilicy
J. R. Raymond	Pacific Northwest Laboratory	September 25	R. C. Arnett
D. E. Hansen	J. F. T. Agapito and Associates	September 26	A. D. Krug
R. B. Leachman	Office of Technology Assessment	September 26	D. A. Turner
F. L. Goldsberry	U. S. Department of Energy	September 26	D. A. Turner

REPORTING PERIOD

TRAVELERS

SEPTEMBER 1-30, 1978

<u>Name</u>	<u>To</u>	<u>Date</u>	<u>Reason</u>
M. R. Fox	Berkeley, California	September 6	Discuss statement of work for fiscal year 1979 Lawrence Berkeley Laboratory contract.
H. B. Dietz R. A. Deju	Berkeley, California	September 6	Fact find the status of the Lawrence Berkeley Laboratory work on the Near-Surface Test Facility.
P. E. Long	Eugene, Oregon	September 7	Visit the Department of Geology, University of Oregon, to discuss contract.
R. C. Arnett R. E. Gephart	Kirkland, Washington	September 8	Meeting at Golder Associates to discuss hydrology field testing services for fiscal year 1979.
J. R. Kowalyk	Canoga Park, California	September 12	Meeting at Atomics International to discuss the conceptual design of remote handling equipment related to the Near-Surface Test Facility.
H. B. Dietz J. T. Meyer M. P. Board R. A. Deju	Berkeley, California	September 13	Discuss the effects of change over of heater tests from Lawrence Berkeley Laboratory to Rockwell Hanford Operations.
R. C. Arnett G. C. Evans	Washington, D. C.	September 18	Attend National Academy of Science meeting.
M. P. Board	Berkeley, California	September 20	Discuss the re-design heater experiments with Lawrence Berkeley Laboratory based on decrease in number of boreholes.

REPORTING PERIOD

DOCUMENTS ISSUEDPREVIOUS MONTH

RHO-BWI-78-100 MAY (unclassified), May 31, 1978, R. A. Deju, "Basalt Waste Isolation Program Monthly Report"

RHO-BWI-C-10 (unclassified), March 1978, G. B. Tucker and J. G. Rigby, "Bibliography of the Geology of the Columbia Basin and Surrounding Areas of Washington with Selected References to Columbia Basin Geology of Idaho and Oregon"

RHO-BWI-LD-2 (unclassified), June 1978, M. P. Board, "Rock Mechanics Methods and In Situ Heater Tests for Design of a Nuclear Waste Repository in Basalt"

THIS MONTH

RHO-BWI-C-2 (unclassified), May 1978, G. J. McCarthy and B. E. Scheetz, "High-Level Waste-Basalt Interactions, Annual Progress Report for the Period February 1, 1977 to September 30, 1977"

RHO-BWI-C-7 (unclassified), February 1978, Fenix & Scisson, Inc., "Hole History, Rotary Hole DC-5, Hanford, Washington"

RHO-BWI-C-8 (unclassified), December 1977, Fenix & Scisson, Inc., "Hole History, Core Hole DC-10, Hanford, Washington"

RHO-BWI-C-9 (unclassified), January 1978, Fenix & Scisson, Inc., "Hole History, Core Hole DC-11, Hanford, Washington"

RHO-BWI-C-12 (unclassified), March 24, 1978, G. J. McCarthy, et al., "Simulated High-Level Waste-Basalt Interaction Experiments, First Interim Progress Report"

RHO-BWI-C-14 (unclassified), July 1978, H. H. Tanaka and L. Wildrick, "Hydrologic Bibliography of the Columbia River Basalts in Washington"

RHO-BWI-C-15 (unclassified), June 1978, W. K. Summers and G. E. Schwab, "Bibliography of the Geology and Ground Water of the Basalts of the Pasco Basin, Washington"

RHO-BWI-C-16 (unclassified), June 30, 1978, G. J. McCarthy, et al., "Simulated High-Level Waste-Basalt Interaction Experiments, Second Interim Progress Report"

RHO-BWI-C-17 (unclassified), June 30, 1978, M. Barnes, "Hanford and Columbia River Basin Basalts: X-Ray Characterization Before and After Hydrothermal Treatment"

Documents Issued (continued)

RHO-BWI-C-18 (unclassified), July 1978, M. E. Beck, D. C. Engebretson and P. W. Plumley, "Magnetostatigraphy of the Grande Ronde Sequence"

RHO-BWI-LD-3 (unclassified), April 25, 1978, C. E. Hodge and M. W. Grutzeck, "Preparation of Standard Umtanum Sample by Battelle-Northwest"

RHO-BWI-78-100 JUN (unclassified), June 1978, R. A. Deju, "Basalt Waste Isolation Program Monthly Report"

RHO-BWI-78-100 JUL (unclassified), July 1978, R. A. Deju, "Basalt Waste Isolation Program Monthly Report"

RHO-C-10 (unclassified), September 1977, Fenix & Scisson, Inc., "Hole History, Core Hole DC-2, Hanford, Washington"

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1	<u>CENTRAL WASHINGTON UNIVERSITY</u> Department of Geology
25	<u>CONSULTANTS AND SUBCONTRACTORS</u> J. F. T. Agapito Boeing Computer Services Richland, Inc. Colorado School of Mines Geoscience Research Consultants Idaho Bureau of Mines and Geology Lawrence Berkeley Laboratory Oregon State Department of Geology and Mineral Industries F. L. Parker The Pennsylvania State University I. Remson Seismograph Services Corporation Senturion Sciences, Inc. W. K. Summers and Associates U. S. Bureau of Mines-Spokane U. S. Geological Survey-Water Resources U. S. Geological Survey-Western Division University of Minnesota University of Oregon Vitro Engineering Washington State Department of Ecology Washington State Department of Natural Resources Washington State University A. C. Waters Western Washington University Woodward-Clyde Consultants

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