RHO-BWI-78-100 APR

Basalt Waste Isolation Program Monthly Report

April 1978

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

Rockwell International

Atomics International Division
Rockwell Hanford Operations
Richland, WA 99352

Rockwell International

Atomics International Division
Rockwell Hanford Operations
Richland, WA 99352

PREPARED FOR THE UNITED STATES DEPARTMENT OF ENERGY
UNDER CONTRACT EY-77-C-06-1030

PRELIMINARY REPORT

This Report contains information of a preliminary nature. It is subject to revision or correction and therefore does not represent a final Report. It was prepared primarily for internal use within The Rockwell Hanford Operations. Any expressed views and opinions are those of the Author and not necessarily of the Company.

NOTICE

DISCLAIMER

RHO-BWI-78-100 APR

Informal Report

WASTE ISOLATION PROGRAM

MONTHLY REPORT

R. A. Deju, Director
Waste Isolation Program

April 30, 1978

Rockwell International
Atomics International Division
Rockwell Hanford Operations
Richland, Washington 99352

TABLE OF CONTENTS

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 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 APRIL 1-31, 1978

During the month, mapping of Late Cenozoic sediments and underlying basalt continued. Field work is well under way. Specific geologic maps (scale 1:24,000) covering 100 square miles in the Umtanum Ridge/Saddle Mountain area of the Western Pasco Basin were completed. Data from wells penetrating basalt were organized so that they can be used in the three-dimensional modeling of the Columbia Plateau hydrology.

Drilling operations were conducted in three locations during the month of April. Cable tool operations at Well DC-4 progressed from 300 feet to 544 feet with a planned total depth of 600 feet. Coring advanced from 3,143 feet to 3,916 feet in Well DC-6 and from 1,530 feet to 1,612 feet in well DC-8. The planned depth at Wells DC-6 and DC-8 are 4,300 and 4,100 feet, respectively.

A testing report on the mechanical and thermal properties of the Pomona basalt flow was completed. A program for borehole plugging for Hanford was written. This program is specific to the physical and chemical conditions found in boreholes penetrating the basalt and sedimentary rock sequence at Hanford. Reconnaissance hydrothermal experiments have been completed utilizing waste/basalt mixtures. The analysis of these runs is continuing with particular attention being given to recognizing trends within given pairs of waste/basalt mixtures as a function of temperature. A series of long-duration experiments with waste/basalt pairs has also been initiated. Some high-temperature equilibrium experiments using basalt and a simulated ground water composition have been completed. Design of the full- and time-scale heater tests for the Near-Surface Test Facility was also completed.

Final design revisions were accomplished on the tunnels and excavations document for the Near-Surface Test Facility. Site-survey staking was completed and the approved design of the electric distribution line was released as ready for construction.

Effort on preparation of function and design criteria for the repository was continued. When complete, the document will contain a statement of the functions of the repository and design criteria suitable for concept design considerations.

MAJOR PROBLEMS AND ACTION TAKEN

No major problem areas have been encountered.

BUDGET VARIANCE

Funding for the fiscal year 1978 Waste Isolation Program has increased from $12,000,000 to $15,300,000. This increase and the status of our major subcontractors were evaluated during the mid-year budget review. Costs as of April are less than 1 percent under the new budget projection. All major contracts are in place and all work will be completed by the end of the year.

REPORTING PERIOD

SITE STUDIES PROJECT APRIL 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

Preliminary Site Characterization

A surface geologic map (scale 1:24,000) covering 100 square miles in the Umtanum Ridge/Saddle Mountains area of the western Pasco Basin was completed one month ahead of schedule.

Logging of fractures in Grande Ronde Basalt core from Boreholes DDH-3, DH-4 and DH-5 and in surface exposures at Sentinel Gap (northwest of Hanford) has been completed. This work finishes the data-gathering phase of the fracture-evaluation pilot study.

Paleomagnetic sampling of Umtanum Ridge (northwest of Hanford) was completed.

Washington State Department of Natural Resources personnel have completed 75 percent (1,200 square miles) of a reconnaissance map (scale: 1:250,000) of the Late Cenozoic sediments overlying the Columbia River Basalt within the southwestern quarter of the Columbia Plateau, Washington State.

An evaluation of existing geologic mapping and measured section data was completed by the U. S. Geological Survey. Field work necessary to complete a reconnaissance map (scale: 1:250,000) of the Columbia River Basalt of the Columbia Plateau area has been initiated.

Battelle-Northwest personnel have completed 50 percent of the work required to produce a compilation map of linears plotted in available Columbia River Basalt remote sensing literature.

Preliminary Site Characterization (continued)

Contacts were made with the U. S. Department of Agriculture, Soil Conservation Service regarding the availability of recent land use classification data for the Columbia Plateau. This information is important for studying the plateau's demography as well as constructing a regional water budget. Adams, Lincoln, Douglas and Grant counties comprising the northern portion of the Plateau have good, recent land use coverage. Little up-to-date information is available for Franklin and Benton counties within the Pasco Basin. Methods are now being examined to acquire these additional data.

Data from 300 basalt wells within the Columbia Plateau were extracted from the files of the Washington State Department of Ecology and coded on forms for keypunching into the hydrologic data bank of the U. S. Geological Survey. This work is for compiling and organizing that information used for evaluating the regional hydrology of the Columbia Plateau.

The three-dimensional Rockwell Hanford Finite Element ground water flow model is now a prime candidate for application to the regional ground water modeling effort. This model is operational and has the versatility to handle three-dimensional flow through a non-homogeneous medium. The model which the U. S. Geological Survey was planning to use would require extension from two-dimensional to three-dimensional flow before it would be considered operational. Application of the Rockwell Hanford Operations model should minimize delays in the modeling program.

PROBLEM AREAS AND ACTION TAKEN

No significant problem areas have been encountered.

PLANNED WORK FOR SUBSEQUENT MONTHS

Acquisition of field equipment and services for hydrologic field testing, geologic surface and subsurface mapping, X-ray fluorescence analyses, and remote sensing studies will continue. Fracture logging data reduction, ground water sampling and potentiometric measurements in Core Hole DC-2, analysis of paleomagnetic samples, and seismic testing will begin in May. Permeability measurements in Core Hole DC-2 and magnetotelluric testing will begin in June.

REPORTING PERIOD

DRILLING PROJECT

APRIL 1-30, 1978

OBJECTIVE

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 characterizations.

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

Drilling operations were conducted at three locations during the month of April. Cable tool operations at DC-4 progressed from 300 feet to 544 feet with a planned total depth of 600 feet. Coring advanced from 3,143 to 3,916 feet in DC-6, and from 1,530 to 1,612 feet (82 feet of coring and 892 feet of reaming) in DC-8. Planned depth for DC-6 and DC-8 are 4,300 and 4,100 feet, respectively.

Geophysical Logging

The bid and award procedure is complete for fiscal year 1978 geophysical logging services. Contracts were awarded to EDCON and Holosonics on April 7 and to Welex on April 21. Logging will commence in mid-May.

Hydrologic Testing

The bid and award procedure is complete for fiscal year 1978 hydrologic testing services. ENTEC Corporation is under contract to provide a hydrology support rig starting on May 8. Science Applications, Inc. was awarded a contract to provide packer services on April 26. Testing will commence in early May.

PROBLEM AREAS AND ACTION TAKEN

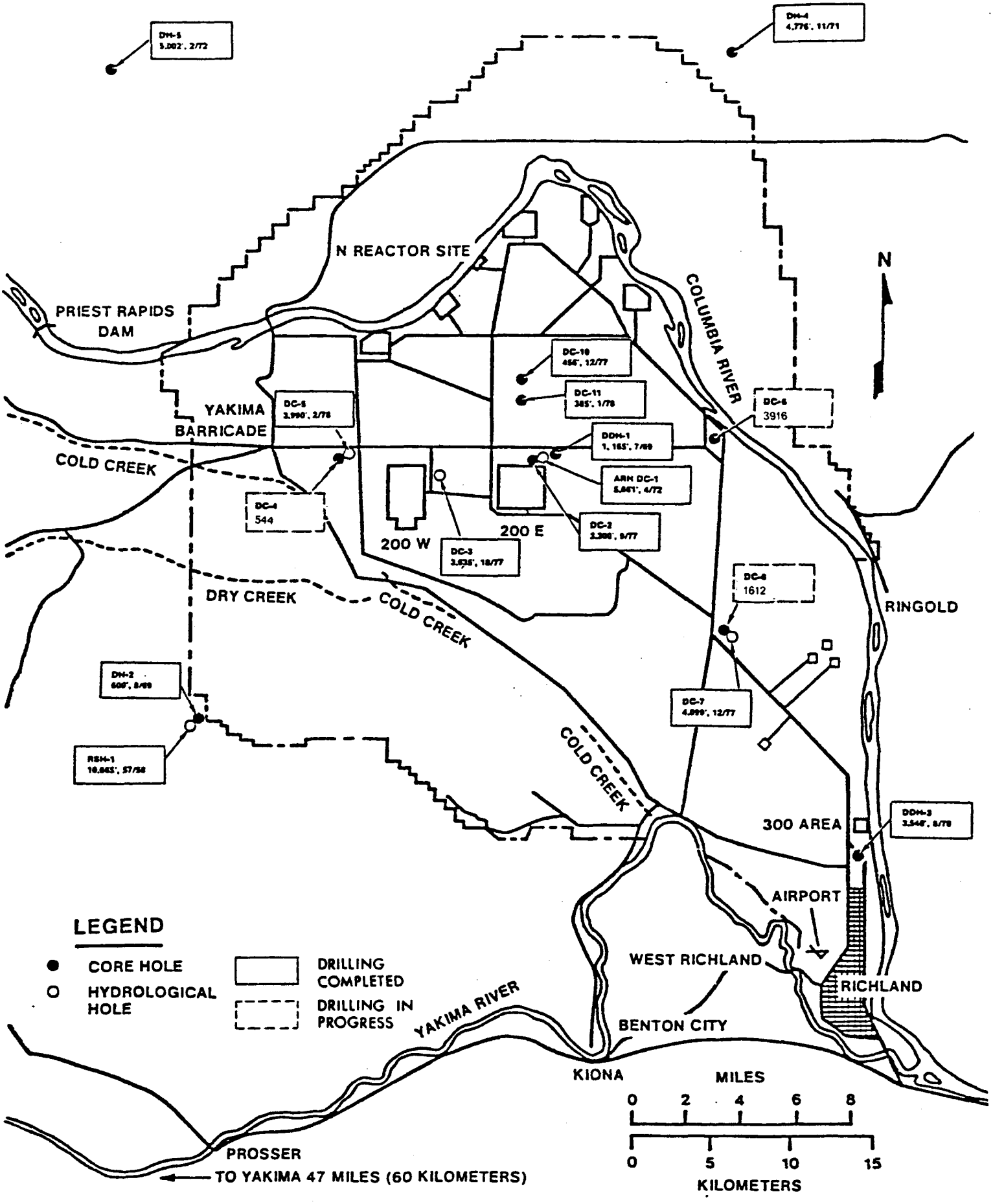
No significant problem areas have been encountered.

PLANNED WORK FOR SUBSEQUENT MONTHS

Coring will commence at DC-4 in mid-May following the completion of DC-6. Coring will continue as scheduled on DC-8.

Hydrologic testing services for fiscal year 1978 will commence at DC-2 (original hole) during the week of May 8.

Geophysical logging services for fiscal year 1978 will commence at DC-7 and DC-8 during the week of May 22.



WASTE ISOLATION PROGRAM DRILL HOLES AS OF APRIL 30, 1978

REPORTING PERIOD

TECHNOLOGY DEVELOPMENT PROJECT APRIL 1-30, 1978

OBJECTIVE

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

Rock Testing

A complete testing report on the mechanical and thermal properties of the Pomona Basalt Flow, Drill Hole DC-10, was received from the Colorado School of Mines, Earth Excavation Institute. The report includes a detailed geologic characterization of the core, the testing data, and appendices including photographs of typical basalt failure modes. Some of the significant findings of the testing include:

a. Basalt uniaxial compressive strength is very high (average $\sim$ 45,000 pounds per square inch) and exhibits brittle failure;

b. Confining pressures of up to 2,000 pounds per square inch have little effect on basalt compressive strength;

c. There is little change in thermal conductivity and thermal expansion coefficients with temperature; however, there is a slight dependence upon density;

d. Specific heat of the Pomona Basalt increases with temperature over the range of temperature (32°C to 300°C) tested;

e. Jointing has a large effect upon physical properties; this effect is random and difficult to characterize from laboratory tests.

Downhole Laboratory

The revised contract with ENSCO, Inc. for completion of their work on the Downhole Laboratory was approved by the U. S. Department of Energy and has been signed by ENSCO, Inc. The new contract calls for testing of specific parts of the tool and full documentation of their work. The testing will be conducted at ENSCO, Inc. facilities in Springfield, Virginia and is scheduled to be completed by June 30, 1978.

Borehole Plugging

A program for borehole plugging at Hanford was submitted to the U. S. Department of Energy. This program is specific to the physical and chemical conditions found in boreholes located in the basalt and sedimentary rock sequence at Hanford. It is designed to fit the Waste Isolation Program Plan for building a repository in basalt.

Multiple Barrier Studies

Reconnaissance hydrothermal experiments at The Pennsylvania State University have been completed. The analysis of these runs is continuing with particular attention being given to recognizing trends within given pairs of waste/basalt mixtures as a function of temperature. One obvious trend is the lack of any identifiable zinc silicate phase at temperatures lower than 400°C. Microprobe analysis of this zinc silicate phase indicates that it is most likely willemite.

Scanning electron microscope/energy dispersive X-ray characterization of the 300°C/300-bar and 38-day runs has been completed. Reactions have been studied between both basalts (DDH-3, BCR-1) plus PW-7a calcine and Battelle-Northwest's 76-68 glass. No unusual phase formation has been determined, with the possible exception of what appears to be an as yet unidentified phase formed in the reactions of glass with both basalts. This phase, labeled "unknown A," is composed of Na, K, Ca, Zn, and Si and appears as crystalline spherical clusters.

A series of long-duration experiments in which a matrix similar to the reconnaissance experiments have been initiated at 300°C/300 bars for 6 or 9 months duration. Scanning electron microscope/energy dispersive X-ray characterization of a run of 58 days duration is being used to study reactions between both basalts plus calcine and glass similar to the 30-day experiments. Some new crystalline phases were noted in supercalcine plus basalt runs, but the bulk of the supercalcine appeared to be unaltered. The new phases may originate from hydrothermal crystallization of the amorphous portion of the supercalcine. Careful hand-picking of individual grains for examination with the Gandolfi camera technique has identified $Na_2MoO_4 \cdot 2H_2O$ as an alteration product of hydrothermally treated calcine. Tincalconite, possibly borax, and several mixed borates have been identified in three individual grains in the reaction of glass with DDH-3. In addition, a second hydrous alkali uranyl silicate base, boltwoodite, has been identified by this technique.

Battelle-Northwest reported initial results of equilibrium sorption measurements which show the distribution between solids and synthetic ground water. These measurements were made with Umtanum Basalt, Poona heulandite (clay), Garfield nontronite, ^{137}Cs, ^{85}Sr, and ^{95m}Tc. The ^{95m}Tc sorption coefficient values reached equilibrium very rapidly. However, some of the other radioisotope sorption coefficient values apparently do not attain equilibrium very rapidly. Consequently, a 56-day equilibrium is presently under way. Longer equilibrations will be used when necessary, because inherent in the use of sorption coefficient values for modeling migration behavior of the radionuclides is the assumption that equilibrium sorption coefficient values were obtained.

Multiple Barrier Studies (continued)

Some high-temperature equilibrium experiments using basalt and a simulated ground water composition have been completed. These experiments showed a rapid disappearance of calcium and gradual disappearance of potassium from solution which indicates the formation of one or more mineral phases under the conditions of 300°C, 2,400 pounds per square inch N_2 and a solution to solids content of 600 milliliters per 30 grams.

The basalt sample has been recovered and will be examined for phase changes and the development of new phases. As long as the potassium and calcium content of the solutions is changing, the distribution of the chemically similar cesium and strontium radioisotopes between basalt and solution will also change.

In Situ Tests

Design of the full- and time-scaled heaters for the Near-Surface Test Facility was completed by the Lawrence Berkeley Laboratory. The second draft of the instrument borehole arrays for the Near-Surface Test Facility was received from Lawrence Berkeley Laboratory. These borehole arrays include monitoring holes for cross-hole geophysics, as well as for the basic rock instrumentation.

PROBLEM AREAS AND ACTION TAKEN

No significant problem areas have been encountered.

PLANNED WORK FOR SUBSEQUENT MONTHS

A review of the Lawrence Berkeley Laboratory heater and borehole liner designs for the Near-Surface Test Facility heater experiments will be completed. The instrument borehole array for the Near-Surface Test Facility heater experiments will be finalized. The characterization of core from Boreholes DH-4 and DH-5 will be completed at the Colorado School of Mines. The statement of work for the fiscal year 1979 laboratory rock testing will be completed. Four additional basalt/glass and basalt/spent unreprocessed fuel runs have just been completed after hydrothermal treatment of 200°C/300 bars/28 days and 300°C/300 bars/28 days. Analysis of these new runs is just getting under way. Work will continue on determining the lengths of time required to achieve equilibrium in both low- and high-temperature sorption systems.

REPORTING PERIOD

NEAR-SURFACE TEST FACILITY PROJECT APRIL 1-30, 1978

OBJECTIVE

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

DESCRIPTION OF WORK ACCOMPLISHED

Facility Design

Final design revisions were accomplished on the tunnels and excavations construction documents for the Near-Surface Test Facility-Electric Heater Tests on April 12, 1978. Final design revisions were accomplished on the tunnels and excavations construction documents for the Near-Surface Test Facility-Spent Fuel Tests on April 21, 1978.

Site-survey staking of the entire Near-Surface Test Facility was completed on April 7, 1978. This consisted of staking out all test room and tunnel centerlines and portal headings on the ground surface above the intended location of these structures. This survey staking allows a comparison and reference to be made between the physical location and the design documents. Further staking will be required prior to construction.

The approved design of the electric distribution line was completed on April 14, 1978 and released as ready for construction. The electric distribution line is an electric utility overhead power line which will provide electrical power to the Near-Surface Test Facility. The power will be provided at 13.8 kilovolts which requires that three-quarters of a mile of existing 2.4-kilovolt line be upgraded to 13.8 kilovolts and approximately one and one-quarter miles of new overhead line constructed to reach the Near-Surface Test Facility.

A kick-off meeting was held with Vitro Engineering on April 4, 1978 to begin extended conceptual design for the Near-Surface Test Facility-Electric Heater Tests Facility requirements. The facility requirements consist of the mechanical systems and electrical systems. The mechanical systems provide ventilation for the facility, climate control for test system computer and instrumentation enclosures, and dewatering capabilities for the facility. The electrical systems provide a facility substation and standby generator for both normal and standby power which will service general facility electrical utility needs as well as the electrical power for the electric heater tests.

A meeting between Lawrence Berkeley Laboratory and Rockwell Hanford Operations' Basalt Engineering Group was held on April 5, 1978 and the electrical requirements for the electric heater tests were discussed and a tentative schedule for further input agreed to. Lawrence Berkeley Laboratory is responsible to Rockwell Hanford Operations to conduct the in situ heater tests within the Near-Surface Test Facility.

Facility Design (continued)

The in situ heater tests consist of emplacing electric heaters approximately 30 feet deep in the basalt flow, collecting data from instruments located within the same flow, and analyzing that data to determine the characteristics of basalt in situ subjected to heat input.

The conceptual outline of the required site work is essentially complete. Covered under the category of site work are the necessary access roads to the Near-Surface Test Facility and parking areas, exterior facilities and lighting, underground structures and facilities such as enclosures, ladders and walkways, and portal structures for access control to underground from above ground.

Work on the Near-Surface Test Facility-Spent Fuel Phase Tests functional design criteria was initiated and is expected to be issued in early May. This is to include a canister recommendation.

Remote Handling

Primary effort on the remote handling systems was directed to preconceptual studies of the shielded mobile transporter which would emplace the spent fuel in the storage hole. Secondary effort was given toward the underground cask transfer system which would remove the shipping cask from the highway transporter and place it in a position for the removal of spent fuel.

Construction

The J. A. Jones Construction Company, using the specifications and drawings prepared by Rockwell Hanford Operations' Basalt Engineering Group, issued a bid package for the Near-Surface Test Facility-Tunnels and Excavations. This package included a basic bid for the electric heater phase and an alternative bid for the combined electric heater and spent fuel phases.

Safety and Environmental Analysis

Informal comments on the Near-Surface Test Facility Environmental Assessment (Electric Heater Phase) were received from the U. S. Department of Energy-Headquarters. These minor revisions will be incorporated and the environmental assessment resubmitted in early May.

PROBLEM AREAS AND ACTION TAKEN

The Directive Authorization for the Near-Surface Test Facility has not been issued by the U. S. Department of Energy.

- Vitro Engineering has initiated extended conceptual design work in order to maintain the schedule.

PLANNED WORK FOR SUBSEQUENT MONTHS

The functional design criteria for the Near-Surface Test Facility-Spent Fuel Tests will be issued in May and trade studies and conceptual design will be initiated. An environmental assessment supplement covering the Spent Fuel Phase is to begin in May. Vitro Engineering is to continue Near-Surface Test Facility design activity, beginning Title I design upon receipt of the Directive Authorization. A construction contract for the tunnels and excavations is expected to be awarded in June.

REPORTING PERIOD

REPOSITORY PROJECT

APRIL 1-30, 1978

OBJECTIVE

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

DESCRIPTION OF WORK ACCOMPLISHED

Repository Siting

The final drafts of the statement of work and instructions to bidders for site selection have been prepared and are in the review process. Site selection will be conducted in two separate but parallel studies. One study will investigate the Hanford area; the other study will include the remaining portion of the Columbia River Basalt Group. Results of the subcontractor dual screening and ranking process will be analyzed and several candidate sites will be chosen for detailed site evaluation.

Engineering Studies

A literature review of the effects of temperature on the clay material found in basalt joints was initiated at the University of Minnesota. This review will aid in the modeling of the stability of the jointed rock when subjected to high temperatures. Work has also started on parametric modeling studies for repository design.

Effort on preparation of "Functions and Design Criteria" for the repository was accelerated. A detailed outline has been prepared and a team consisting of Rockwell Hanford Operations, Vitro Engineering, and Atomics International has been organized to accomplish the work. When completed, the document will contain a definitive statement of the functions of the repository, and also will provide design criteria suitable for use by an architect/engineer in preparation of the conceptual design. In addition, the Functions and Design Criteria will provide a basis for the development of the preliminary safety analysis report and the environmental report.

Safety and Environmental Analysis

A compilation of the program research efforts and their relationship to the licensing requirements has begun. This material will be summarized in a letter discussing the essential facets of a licensing plan for the repository.

A review of U. S. Nuclear Regulatory Commission Regulatory Guides 1.28, 5.54, 5.55, and 5.56 was completed to determine their applicability to the repository licensing process.

PROBLEM AREAS AND ACTION TAKEN

No significant problem areas have been encountered.

PLANNED WORK FOR SUBSEQUENT MONTHS

A contract will be placed for the nuclear waste repository disruptive events analyses task. An outline of the safety analysis report of the repository will be prepared for review. A letter describing the program research efforts and their relationship to the licensing effort will be completed and incorporated into the initial draft of the nuclear waste disposal repository licensing plan.

A performance review of the University of Minnesota mine modeling studies will be held at Minneapolis, Minnesota on May 11. Information on the parametric design studies to date will be acquired at this time. A statement of work for the fiscal year 1979 University of Minnesota modeling of a nuclear waste repository in basaltic rock will be completed.

MANPOWER SUMMARY

REPORTING PERIOD
APRIL 1-30, 1978

	Man-Months
ROCKWELL HANFORD OPERATIONS	55.0
J. F. T. AGAPITO	2.0
BATTELLE-NORTHWEST	5.0
BOEING COMPUTER SERVICES RICHLAND, INC.	1.0
COLORADO SCHOOL OF MINES	2.0
ENSCO, INCORPORATED	6.0
FENIX & SCISSON, INC. AND SUBCONTRACTORS	23.0
GEOSCIENCE RESEARCH CONSULTANTS	3.0
J. A. JONES CONSTRUCTION COMPANY	.5
LAWRENCE BERKELEY LABORATORY	12.0
THE PENNSYLVANIA STATE UNIVERSITY	2.5
W. K. SUMMERS AND ASSOCIATES	2.0
UNIVERSITY OF MINNESOTA	3.0
UNITED STATES GEOLOGICAL SURVEY-WESTERN DIVISION	2.0
VITRO ENGINEERING	3.0
WASHINGTON STATE DEPARTMENT OF ECOLOGY	2.0
WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES	4.0
WASHINGTON STATE UNIVERSITY	2.0
TOTAL WASTE ISOLATION PROGRAM MANPOWER SUPPORT	130.0

REPORTING PERIOD

VISITORS

APRIL 1-30, 1978

Name	Affiliation	Date	Person Contacted
R. H. Chesworth L. I. Barker	Norman Engineering Company	April 3	H. B. Dietz
D. J. Rondeau E. P. Binnall A. W. Stromdahl	Lawrence Berkeley Laboratory	April 5	M. P. Board
A. O. Dubois T. Doe J. Long C. Wilson	Lawrence Berkeley Laboratory	April 6	Review
P. Cronin M. Hughes	Bethlehem Steel Corporation	April 11	V. H. Stiessberger
L. A. Rubin W. J. Still	ENSCO, Inc.	April 12	F. Stong
D. R. Nelson	Parsons Engineering	April 18	R. A. Deju
G. E. Fitzgerald	Beckman Instruments	April 19	D. T. Mildon
H. Ewoldsen	Woodward-Clyde	April 21	B. H. Richard
F. Nunes	Cayo Crane and Hoist	April 25	V. H. Stiessberger
P. I. Yanev C. Otto D. B. Cunningham R. B. Edwards N. Owen	URS/Blume	April 26	H. B. Dietz
W. Gustavson	Layne Western	April 26	R. L. Biggerstaff

REPORTING PERIOD

TRAVELERS

APRIL 1-30, 1978

Name	To	Date	Reason
R. C. Arnett	Lawrence Berkeley Laboratory	April 6	Coordination Meeting on Ground Water Modeling
B. H. Richard	University of Washington	April 9	Debate with Public Interest Group and Attend Lecture
R. A. Deju	University of Washington	April 9	Debate with Public Interest Group and Give Lecture
R. A. Deju	Albuquerque, New Mexico	April 10	Attend Waste Isolation Pilot Plant Hearings
W. P. Kunkel	Sandia Laboratory	April 13	Attend Waste Isolation Pilot Plant Hearings
M. P. Board G. C. Evans P. R. Dahlberg	Denver, Colorado	April 23	Performance Review of Colorado School of Mines and Discuss Bacon Tunnel Extensometer Readings with U. S. Bureau of Reclamation
B. H. Richard	Washington, D.C.	April 23	U. S. Geological Survey Meeting and Borehole Plugging Review

REPORTING PERIOD

DOCUMENTS ISSUED

APRIL 1-30, 1978

PREVIOUS MONTH

RHO-ST-8 (unclassified), September 1977, R. A. Deju, M. W. Grutzeck, and C. W. Myers, "Environmental Factors Needed to Establish the Geotechnical Feasibility of Storing Radioactive Waste in Columbia River Basalt."

RHO-ST-9 (unclassified), September 30, 1977, Staff, Department of Waste Isolation, Research and Engineering, "Basalt Waste Isolation Program Annual Report."

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

RHO-BWI-78-100 FEB (unclassified), February 28, 1978, R. A. Deju, "Basalt Waste Isolation Program Monthly Report."

THIS MONTH

RHO-BWI-ST-2 (unclassified), January 1978, C. W. Myers, et al., "Paleomagnetism of the Grande Ronde (Lower Yakima) Basalt Exposed at Sentinel Gap: Potential Use for Stratigraphic Correlation."

DISTRIBUTION

Number of Copies	
1	Battelle Columbus Laboratories
	J. Batch
4	Battelle-Northwest
	T. W. Ambrose (2) A. M. Platt (2)
1	Central Washington University
	Department of Geology
20	Consultants and Subcontractors
	J. F. T. Agapito Boeing Computer Services Richland, Inc. Colorado School of Mines ENSCO, Inc. Fenix & Scisson, Inc. (2) Geoscience Research Consultants Lawrence Berkeley Laboratory F. L. Parker The Pennsylvania State University I. Remson 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 Washington State Department of Ecology Washington State Department of Natural Resources Washington State University A. C. Waters
1	Eastern Washington University
	Department of Geology
1	The Geological Society of America, Inc.
	J. C. Frye
1	Idaho Bureau of Mines and Geology
	M. Miller
1	Kansas State Geological Survey
	W. W. Hambleton

Number of Copies	
1	Lawrence Livermore Laboratories L. Ramspott
1	Oregon State Department of Geology and Mineralogy V. C. Newton
3	Sandia Laboratories O. E. Jones R. W. Lynch W. D. Weart
5	Union Carbide Corporation, Nuclear Division Office of Waste Isolation A. L. Boch T. F. Lomenick W. C. McClain A. S. Quist C. D. Zerby
1	United Nuclear Industries, Inc. R. K. Robinson
1	U. S. Army Corps of Engineers Walla Walla District Geologist
1	U. S. Bureau of Reclamation Columbia Basin Project Geologist
2	U. S. Department of Energy-Albuquerque Operations Office D. Davis D. T. Schueler
13	U. S. Department of Energy-Headquarters C. R. Cooley J. M. Deutch K. P. Donovan W. K. Eister M. W. Frei C. H. George J. L. Gilbert C. A. Heath C. Klingsberg R. N. Ng R. Stein D. L. Vieth J. B. Work

Number of Copies

1 U. S. Department of Energy-Nevada Operations Office

D. G. Jackson

1 U. S. Department of Energy-Oak Ridge Operations Office

J. J. Schreiber

13 U. S. Department of Energy-Richland Operations Office

J. W. Anttonen
T. A. Bauman
J. C. Cummings
O. J. Elgert
R. B. Goranson
P. G. Harris
A. G. Lassila
D. J. Squires (4)
F. R. Standerfer
M. W. Tiernan
P. S. Van Loan

3 U. S. Environmental Protection Agency

R. Kaufman
G. L. Meyers
J. Sceva

3 U. S. Geological Survey

G. D. DeBuchanne
P. R. Stevens
W. S. Twenhofel

3 U. S. Nuclear Regulatory Commission

W. P. Bishop
J. C. Malaro
E. P. Regnier

1 University of Idaho

Department of Geology

1 University of Washington

Department of Geology

1 Washington Public Power Supply System, Inc.

D. D. Tillson

1 Westinghouse Advanced Energy Systems

T. Hakl

Number of Copies

1 Westinghouse Hanford Company

A. G. Blasewitz

84 Rockwell Hanford Operations

H. Babad
D. C. Bartholomew
M. Bellofatto
R. L. Biggerstaff
J. M. Carey
D. J. Cockeram
T. A. Curran
R. A. Deju
H. B. Dietz
J. W. Donahue
G. C. Evans
R. A. Freeman
P. J. Fritch
R. J. Gimera
R. D. Hammond
W. F. Heine
D. E. Kelley
J. E. Kinzer
E. J. Kosiancic
A. D. Krug
W. J. Kurzeka
J. F. Marron
J. T. Meyer
B. H. Richard
R. C. Roal
J. H. Roecker
D. A. Turner
R. T. Wilde
D. D. Wodrich
H. A. Zweifel
Waste Isolation Program Library (50)
Document Services (4)