

**SALTON SEA SCIENTIFIC DRILLING PROJECT
CLOSE-OUT REPORT**

**GEOHERMAL TECHNOLOGY DIVISION
U.S. DEPARTMENT OF ENERGY**

DRAFT

SEPTEMBER 21, 1989

SALTON SEA SCIENTIFIC DRILLING PROJECT CLOSEOUT

INTRODUCTION

The Salton Sea Scientific Drilling Project (SSSDP) was the first major drilling project to be performed by supplement to the Interagency Accord on Continental Scientific Drilling, but involving all three signatories (the U.S. Department of Energy (DOE), U.S. Geological Survey (USGS), and the National Science Foundation (NSF)). The purpose of the interagency accord is to achieve a better basic understanding of the earth's continental crust. The project was designed to investigate (through drilling and testing) the subsurface thermal, chemical, and mineralogical environments of the Salton Sea geothermal area, located in California's Imperial Valley. It was initially conceived by researchers to collect subsurface scientific information and evaluate the geothermal potential beneath the known hydrothermal system of the Salton Sea Geothermal Field.

DOE's FY-1989 budget provided no funds for new SSSDP research. Therefore, the project close-out was initiated. The close-out required a methodical process to insure that the valuable technical data and information obtained during the life of the project were retrieved, maintained, and organized for long-term accessibility.

The purpose of this task was to archive the scientific information and other pertinent materials associated with the SSSDP. This archiving process insured that a historical record of the project was maintained in the event an accurate accounting of the project is needed. This paper describes the background of the project and the process used for archiving the materials.

SUMMARY OF THE SALTON SEA SCIENTIFIC DRILLING PROJECT

Goals

The goals of the SSSDP were established based upon the common interests of the participating signatories. These interests relate directly to solving certain national problems, such as insuring adequate supplies of energy, efficient development of water and mineral resources, basic understanding of the earth's thermal systems, and protection against natural hazards.

Specifically, the goals of the deep scientific drilling project within the Salton Sea geothermal system were to:

- Better define the volume of the Salton Sea hydrothermal system and test for an extension of the system to greater depths.
- Improve hydrothermal energy resources estimates.
- Develop better understanding of the genesis of hydrothermal ore deposits.
- Investigate the possibility of natural occurrence of "superconvection."
- Study the origin, nature, and occurrence of earthquake swarms generated during hydrothermal convection.
- Evaluate the productivity of the deep hydrothermal system.

Background

The project evolved from efforts by researchers and geothermal industry scientists who believed that significant benefits could be derived from drilling deeper into the Salton Sea geothermal system. Two of these researchers, Dr. Wilfred A. Elders of the University of California, Riverside (UCR), and Dr. Robert W. Rex of Republic Geothermal, Inc., presented the merits of such a drilling effort to various members of Congress. In cooperation with UCR, Republic initially proposed the deepening of one of their wells at Niland,

California, from 12,000 to 18,000 feet to study a high-pressure/high temperature environment never before encountered by geothermal wells.

At the time of the proposal, it was recognized that neither the NSF nor DOE had a clear mandate to fund the activity, nor were sufficient funds available. DOE's Geothermal Technology Division (DOE/GTD) initiated several meetings with NSF, USGS, and DOE's Office of Basic Energy Sciences (DOE/OBES). They agreed that DOE/GTD had the management skills and technological expertise to pursue the engineering aspects of the project, while the NSF, USGS, and DOE/OBES had sufficient mandate to pursue the scientific aspects.

By December of 1983, DOE/GTD determined that under federal procurement regulations, a contract could be granted only through the competitive bidding process. DOE/GTD set up a Federal Steering Committee, comprised of DOE/GTD, DOE/OBES, NSF, and USGS, and developed guidelines for soliciting outside participation. Project responsibilities were delegated to DOE's San Francisco Operations Office (DOE/SAN).

A request for proposals (RFP) was issued in March of 1984 by DOE/SAN, which solicited industry participation in the drilling and engineering phase of the project. The RFP called for drilling to a depth 6,000 feet below the depth at which a temperature of 300°C was first encountered. It also required proposers to provide extensive opportunities for scientific investigations while drilling, followed by a period of 12 months of further well availability for downhole scientific experiments. Proposers could offer to deepen an existing well or to drill a new well, provided that the 300°C horizon was no deeper than 12,000 feet.

Congressional funding for the drilling and engineering phase was appropriated in FY 1984 to DOE/GTD based upon the original proposal by Republic Geothermal to deepen the Niland hole from 12,000 to 18,000 feet. Congress

appropriated \$5.9 million for the project. Due to federal procurement regulations and time constraints placed upon Republic and its field development partner (Parsons Engineering), Republic withdrew its offer for deepening the Niland well. Bechtel National, Inc. was selected as prime contractor, after Republic withdrew its offer.

Test Site

The site selected for the deep test well, designated as "State 2-14," was located on a Kennecott Corporation exploration prospect situated approximately 4 miles southwest of the town of Niland, California. The drilling phase began on October 23, 1985. The scientific test well was drilled to a total depth of 10,564 feet, reached on March 17, 1986.

Industry Contractors

Industry contractors for the SSSDP and their associated responsibilities were:

- Bechtel National, Inc. - (a subsidiary of Bechtel Engineers and Constructors). Responsible for overall project management; reporting to DOE; permit application; site preparation; design and drilling of the wells; surface facilities design and construction; site support and maintenance; environmental monitoring; data acquisition; and resource evaluation.
- Berkeley Group, Inc. - Responsible for providing well designs and specifications to Bechtel.
- GeothermEx, Inc. - Responsible for developing and supervising the tests and measurements plan, and providing preliminary analysis of geothermal resource potential to Bechtel.
- Kennecott Corporation - (an operating company of the Standard Oil Company, Ohio). Responsible for providing two permitted well sites for the scientific and injection wells.
- Well Production Testing, Inc. - Responsible for providing on-site drilling and engineering consulting services to the U.S. Department of Energy's San Francisco Operations Office, including review of well designs and specifications.

Accomplishments of the SSSDP

Major objectives of the SSSDP which were achieved include:

- Drilling the well to a depth greater than 10,000 ft.
- Attempting to core 10 percent of the borehole and obtaining 722.1 ft of core.
- Conducting two successful flow tests.
- Obtaining logging data.
- Testing new downhole wireline tools.
- Preparation of a final project report by Bechtel National, Inc.
- AGU meeting highlighting the scientific results.

These achievements are covered in more detail in a final report entitled "Analysis of Operational Times and Technical Aspects of the Salton Sea Scientific Drilling Project," prepared by Robert W. Nicholson of Well Production Testing, Inc.

The two short-term flow tests conducted indicated flow-zones with commercial reservoir potential. The first flow test produced uncontaminated formation fluid, but the second test produced formation fluids from several zones that were contaminated with large volumes of drilling fluid and additives required to control lost circulation. The long term flow test and the remaining experiments were precluded by a lack of funds for a flow-test facility and brine injection well, as well as a liner failure within the well.

Archiving Process

Materials documenting DOE/GTD's management of the SSSDP were gathered at DOE Headquarters. These materials included the files, reports, correspondence, notes and related materials of three DOE project managers - Mr. Ronald Toms, Mr. Raymond Wallace and Mr. Allen Jelacic, who replaced Mr. Wallace to close-

out the project (See figure 1). The materials also contained distribution copies of reports sent to the managers. From all accounts, the materials collected essentially constitute a near complete management history of the SSSDP.

DOE/GTD was assisted in organizing and archiving these materials by Meridian Corporation. The materials were separated by Meridian into two distinct groups - management materials and research materials. The larger group, management materials, contains materials related to the management of the project. The second group, research materials, contains research reports, presentation of research information, and research proposals.

Because of the large amount of material, each group was divided further.

The management group contains 8 sub-topics:

- Issues - contains questions, referrals, etc. from industry representatives, the public, and congressional members about the SSSDP. Most inquiries are from congressional members.
- Interagency Relations - contains materials dealing with organization, management, and activities of participating groups outside DOE/GTD.
- Public Relations - published nontechnical reports/news items about the SSSDP.
- Site Operations - information, from all sources involved in the project, dealing with management activities at the site.
- Progress Reports - all relevant management reports from sources within the project.
- Contracts - RFPs, proposals and contractual documents associated with performance of the project.
- Planning/Scheduling/Organization - information from all sources within the project - especially referring to meetings.

- Budget - contains all information on the budget for the SSSDP from planning through conclusion of the project.

The research group of materials contains 2 sub-topics:

- Reports - contains all research-oriented documentation of results from SSSDP research.
- Proposals - proposals for SSSDP research, regardless of whether or not the proposal was accepted.

All documents are sorted chronologically by the original date of the document. In other words, a letter written on the 6th of the month, but received on the 10th of the month, is filed under the 6th day of the month. Undated materials are included in the back of each respective file.

All materials are held at Meridian in a dedicated file cabinet for easy access. All inquiries will be handled on a manual basis using the best descriptive category to find a particular piece of information. Inquiries should be referred to:

Lynn McLarty
Meridian Corporation
4300 King Street, Suite 400
Alexandria, VA 22302
(703) 998-3600

The core samples and well logs are stored at the DOE Core and Sample Repository in Grand Junction Colorado. The contact person there is:

Richard Dayvault, Curator
DOE Core and Sample Repository
P.O. Box 2567
Grand Junction, CO 81502
(303) 248-6375

SALTON SEA SCIENTIFIC DRILLING PROGRAM MANAGEMENT PLAN

SALTON SEA GEOTHERMAL DRILLING & ENGINEERING PROGRAM

SALTON SEA SCIENTIFIC EXPERIMENTS PROGRAM

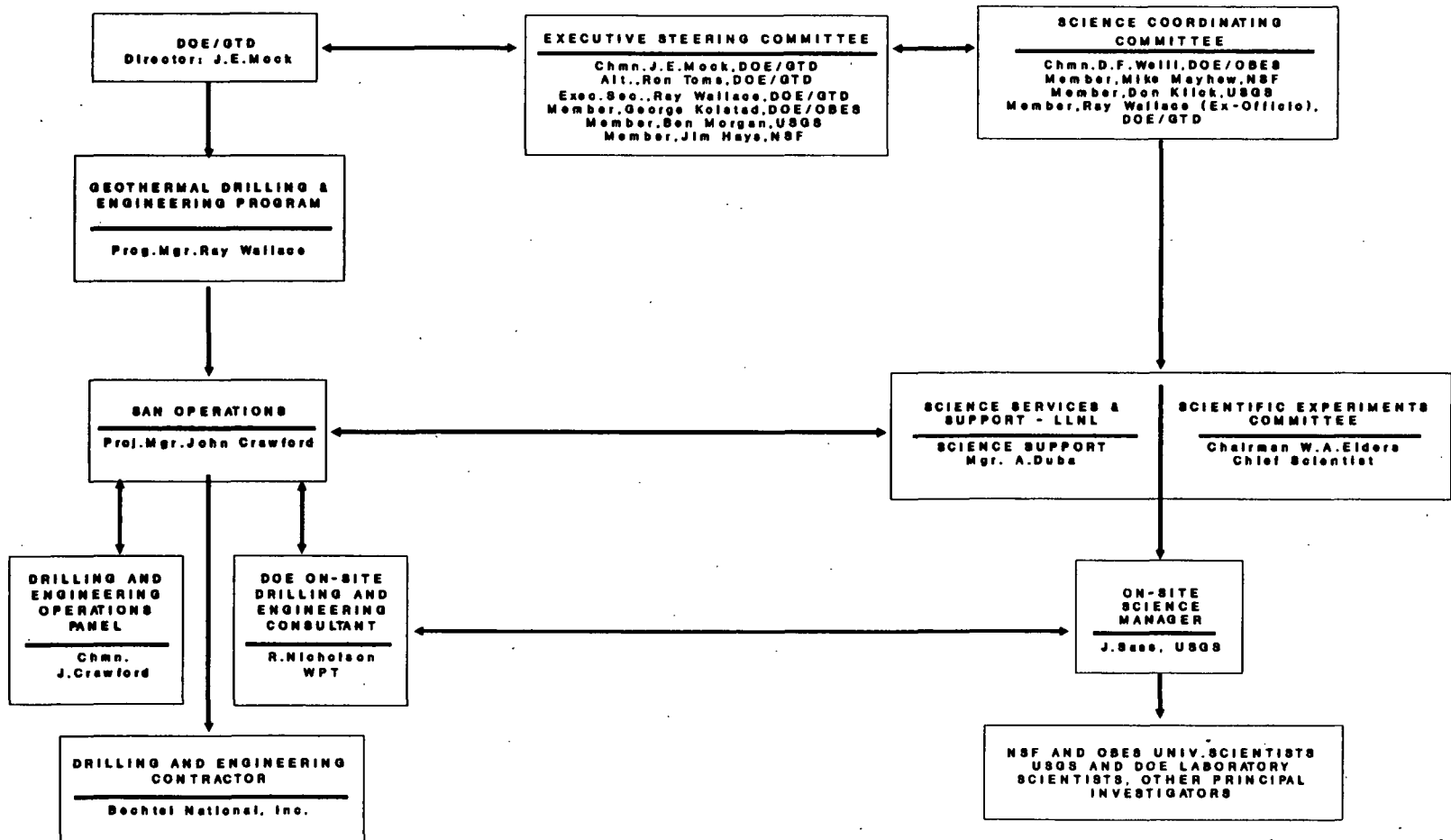


FIGURE 1

(AS OF 1986)