GL04505

CURRENT DATE: 1/12/88

DATES OF PREVIOUS REVISIONS: 6/5/87
10/1/87, 11/18/87
P.I.:
GRDO:
CURATION:
OTHER: none
DATE:

DRILLING PROJECT DATA SHEET
GEOSCIENCES PROGRAM
UNITED STATES DEPARTMENT OF ENERGY
OFFICE OF BASIC ENERGY SCIENCES

1. Title and Location of Project:
VC-2B (Baca Flats) Drilling Project, Valles Caldera, NM

2. Purpose and Scientific Justification: Jamie N. Gardner and J. B. Hulen, Principal Investigators.

SUMMARY: Magmatic activity of silicic calderas constitutes a major mechanism for heat and mass transfer into the continental crust. Calderas are important because they present prime geothermal targets and potential volcanic hazards, and older calderas are widely exploited for the ore deposits that they host. The Valles caldera in New Mexico is young (1.1 MA), a designated Known Geothermal Resource Area, and considered to be the classic resurgent caldera. CSDP/OBES efforts in the Valles caldera are currently focused on the Sulphur Springs area which overlies an active hydrothermal system, consisting of vapor and liquid zones, locally separated by a boiling interface. VC-2A, drilled in 1986, was a shallow (528 m) research core hole designed primarily for study of the Sulphur Springs vapor cap. Data indicate that the present hydrothermal system has evolved from a structurally controlled liquid dominated precursor which deposited a suite of metallic sulfides, including molybdenite, at temperatures over 200C at near surface levels. Designed as a companion to VC-2A, VC-2B will pass through the vapor zone, the boiling interface, the liquid zone, and the underlying conductive thermal regime. VC-2B will provide a continuous record of explosive caldera volcanism, development of vapor-dominated geothermal systems, and samples of hydrothermal fluids actively depositing ores; additionally, VC-2B will provide important data regarding structural development of the caldera and its hydrothermal system. Results from VC-2B will influence strategies for exploration and exploitation of caldera-related energy and mineral resources, advance our physical/chemical understanding of transport and concentration of chemical species in hydrothermal systems, refine general predictive models of explosive silicic volcanism, and add substantially

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2. Purpose and Scientific Justification: (Cont.)

to understanding the physics and mechanisms of heat transfer from a cooling intrusion to the overlying conductive and convective thermal regimes. To meet the prime scientific objectives continuous core and a stable borehole, lined or cased to total depth of about 1.75-2 km are required. This target depth should insure that the bottom of the hole will be 200 m into Precambrian basement rock. The core hole must remain accessible to downhole instruments and tools for a minimum of four years following completion. In summary, the VC-2B effort seeks to answer the following questions:

a. What are the geometries and physical/chemical conditions of the liquid-dominated zone below the vapor zone?

b. What are the specific fluid and rock compositions in the deep liquid dominated system?

c. How have the resurgent dome, ring faults, deep basement structures and hydraulic fracturing interacted to create fracture permeability in the caldera?.

d. Is the transition between the vapor dominated and liquid dominated zones a distinct boiling interface?

e. How has the two-phase hydrothermal system developed through time?

f. Do deep magmatic or basement pore fluids contribute to the overlying high-temperature hydrothermal system? If not, what is the nature of the conductive thermal regime?

g. Is the shallow molybdenum mineralization discovered in VC-2A indicative of deeper actively-forming ore bodies?

h. Is there a young contact metamorphic aureole beneath the liquid-dominated zone?

i. Are there small, pre-Bandelier Tuff calderas completely concealed by Valles Caldera fill?

j. Is hydrothermal alteration in the pre-caldera basement partially inherited from prior thermal events?

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3. Schedules:

a. Date Start of Site Preparation: Spring 1988

b. Date Drilling Starts: July 1988

c. Date Drilling Ends: November 1988

d. Hole/Site abandonment: about, 1991

4. Financial Schedule:

Financial Schedule:	Fiscal Year	BA OBES			Total
		OBES	OTHER DOE	OTHER*	
Estimate of incremental costs	1988	$1000K	none	none	$1000K
to be incurred by the GRDO	1989	708K	none	none	708K
for the Baca Flats Project.	1990, 1991[1]	200K	none	none	200K
					$1908K

(1) GRDO out-year incremental costs are dependent on the scientific results obtained in FY88 and FY89. Thus out-year costs are less certain than those of earlier program years.

Note: From a logistical point of view, it is possible that the program's first-year costs could be shared between FY88 and FY89 by conducting the operations in the fall of 1988. One financial schedule is illustrated above.

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5. Brief Physical Description of Project	Responsible Institution	Estimated Cost FY88,89	Estimated Cost FY90,91
(a) Land Clearance, Roads and Utilities Road and drill pad construction, electricity, telephone and miscellaneous services by construction company.	GRDO-Sandia (Contract)	$50K	--
(b) Drilling Diamond core drilling to 1.75 km. Hole design and casing schedule is given in Item 12.	GRDO-Sandia (Contract)	$1140K	--
(c) Casing Included in Item 5(b).		--	--
(d) Coring Included in Item 5(b).		--	--
(e) Logging			
(i) Temperature logs during and after drilling until equilibrium is reached.	GRDO-Sandia (Service)	$15K	--
(ii) Measurement of the neutron absorption cross-section of selected core specimens to aid in the calibration of neutron porosity logs.		$10K	30K
(f) Science and Engineering Support for Out-year Activities Perforation of casing, flow testing and fluid sampling of selected zones. Use of GRDO logging truck.		--	100K
(g) Supplemental Tools and Research Equipment Development of a high-temperature (300 C) perforation tool.		$10K	50K

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5. Brief Physical Description of Project (Cont.)	Responsible Institution	Estimated Cost FY88,89	Estimated Cost FY90,91
(h). Site Safety Hydrogen Sulfide monitoring using four or more detectors located in and around the drill rig. Scott air packs and training in their use will be provided by the GRDO.	GRDO-Sandia (Service)	$10K	--
(i). Permits No incremental costs will be incurred by the DOE/OBES, c.f. Item 9.	LANL	--	--
(j). Curation On site description and core storage facility. Transportation of core to Grand Junction, Colorado.	Curation Office-LANL	(LANL curation funds not included in this project sheet)	
(k). Site Restoration	GRDO-Sandia (Contract)	--	20K
(l). Abandonment The well will be given to the landowner at the completion of the overall experiment per legal agreement between LANL and the Baca Land and Cattle Company.		--	--

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6. Summary of Cost Estimate

(a)	First project year (FY88, 89), items 5(a) through 5(l)	$1235K
(b)	Contingency at 25% of 6(a)	$309K
(c)	Sandia Surcharge[1] of 11% on contracts: items 5(a) and 5(b)	$164K[2]

[1]Overhead on purchasing/legal/bookkeeping fees.
[2]Overhead computed on costs plus contingency of Sandia purchase items.

TOTAL ESTIMATED DRILLING COST (FY88, 89)	$1708K
OUT-YEAR PROJECT COSTS (FY90, 91)	200K
TOTAL ESTIMATED GRDO INCREMENTAL COSTS (FY88-FY91)	$1908K

7. GRDO Comments

An initial cost estimate of $1300K for diamond coring a 2 km hole was based on preliminary discussions with two drilling companies; Tonto Drilling and Longyear Drilling. Both companies gave similar estimates. The current estimate of 1140K for a 1.75 km hole is based on data obtained in costing the 2 km hole. The drilling operations will take about 120 days and it could span the fiscal year boundary.

The GRDO will be responsible for hole design, site management, site safety, drilling logistics and for maintaining the field operations budget. The GRDO will work closely with the principal investigators to insure that the scientific goals of the project are achieved.

Site safety will be governed by rules put forth in SNL Standard Operating Procedures 12300-8705, 12100-8705, 12200-8705 and a site specific plan (to be written). The GRDO will train well sitters and drilling crews in proper operational procedures.

The GRDO involvement in the Baca Flats Operation will continue through the life of the project. Usual operational expenses are covered through the yearly GRDO FTP; incremental costs are included in this DPDS.

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8. Method of Performance (include name of geoscientists and GRDO Personnel who will be on-site throughout the drilling)

A representative of the GRDO (P. Lysne, R. Jacobson or A. Sattler) and a Principal Investigator (J. N. Gardner, LANL; J. B. Hulen UURI) will be present or on call at the site at all times during the operation. The Principal Investigator will assure that personnel (well sitters) will be present during all coring operations to log and handle core as it is recovered. Logging and use of the core will follow DOE curatorial protocol. A site specific protocol will be issued by the Curator prior to the start of drilling. The Prinipal Investigators will log the core for their scientific objectives; the Curatorial Office will provide a standardized log. The management plan involving the interrelationship between the various participants is given in a separate document.

9. Brief Narrative Description of Permit Processes

Two permits have been negotiated in order to core VC-2B. The first is a legal agreement between the University of California (Los Alamos) and the Land Owner (Baca Land and Cattle, CO.). It has been approved by DOE, Albuquerque Operations Office and final signature of the land owners is imminent. The second is an "Application for Permit to Explore the Underground Waters in the State of New Mexico" already obtained from the New Mexico State Engineer's Office. In addition, Los Alamos has completed the normal Action Description Memo concerning environmental impacts and has completed an air pollution regulatory compliance review regarding air emissions. These permits have been obtained without incremental cost to the DOE/OBES.

10. Arrangements for Drillhole Use upon Completion of Drilling

FY'89-'91

(a) Fluid Testing in VC-2B will be conducted in similar fashion to VC-2A. That is, mud return samples will be collected periodically and any fluids produced during coring operations will be collected. After completion of the corehole, samples will be collected during flow tests and, possibly, downhole samples will be collected.

(b) Flow Testing of VC-2B will be conducted in similar fashion to VC-2A using a flowline and weirbox. Flow, Pressure, and Temperature are recorded as functions of time. Also, pressure build-up tests are completed at the end of all flow tests.

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10. Arrangements for Drillhole Use Upon Completion of Drilling (Cont)

(c) Temperature, pressure, and flow logging devices are available and will be used during the flow testing of VC-2B. Other logging devices will be used to identify fluid zones. If openhole conditions are satisfactory, these logs will include resistivity, natural gamma, gamma density and neutron porosity. It is likely that the entire hole will require casing, thereby precluding the use of electrical logging tools. Then fluid zones will be identified through the usage of neutron porosity tools. Calibration of these tools will be undertaken by the GRDO.

11. Scientific, Engineering and Budgeting Factors for Termination of the Drilling Operations

The borehole will be terminated when one of the following conditions have been met.

(a) The objectives of the project have been achieved when the hole penetrates a depth of 200 meters into Precambrian basement rock. Achieving these bottom hole targets, will take the hole beneath the hydrothermal system while allowing onsite determination of the termination of operations and achievment of major scientific objectives.
(b) In the event the hole has not attained objective (a) at 1.75 km, coring will stop unless special approval is obtained from OBES.
(c) Budgeted drilling amount is expended.
(d) If the operation becomes unsafe beyond correction or permit constraints are imposed.
(e) Drilling problems are so severe that continuation of the operation is unrealistic.

12. Hole Design

The hole design used in contract negotiations is illustrated on the following page. This design is likely to change as the program progresses.

First the conductor pipe will be set to 100 feet. Then the surface casing will be set to 700 feet, or 10% of the maximum plausible hole depth per standard practice of the geothermal industry. The 2,000 foot casing will be set to stabilize the hole after it traverses the upper portion of the formation that was sloughy in past drilling operations. Likewise the casing to 4900 feet will wall off the sloughy Abo Formation. Total depth is estimated to be 5750 feet and hole conditions will determine location of the final casing string.

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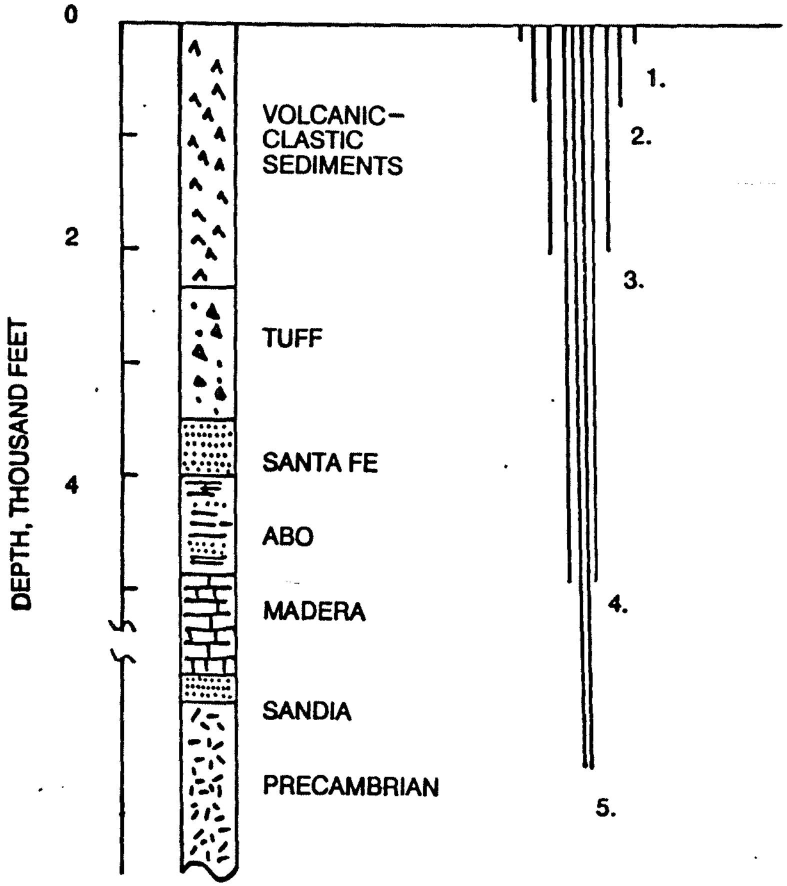
12. Hole Design (Cont)



1. ROTARY TO 100', CEMENT 10 5/8" CASING AND RIG INITIAL BOP.
2. CORE CHD-134 TO 700', REAM, CEMENT 7 7/8" CASING AND RIG MAIN BOP.
3. CORE CHD-134 TO 2000', REAM AND CEMENT 5 7/8" CASING.
4. CORE CHD-101 TO 4900', SET RODS.
5. CORE CHD-76 OR NQ TO T.D. (ESTIMATE 5750' = 1.75 KM).

Note: CHD-134 yields a 134 mm diameter hole, etc.