



Department of Energy  
San Francisco Operations Office  
1333 Broadway  
Oakland, California 94612

October 18, 1988

Dr. Eugene Premusik  
Building 318  
Brookhaven National Laboratory  
Upton, New York 11973

Dear Gene:

I have forwarded to you by DHL Express Mail three samples taken at the Salton Sea brine pond site on October 13. These are grab samples of the brine and salt crust.

Samples are labeled G-1, G-2 and G-3. Sample G-1 consists of brine taken from the South end of the pond. Sample G-2 is typical salt crust, also taken from the South end of the pond, and sample G-3 is a salt crust that is less dense and more friable, that was taken approximately half-way up the bank of the South end.

Locations sampled are shown on the enclosed sketch. This sketch also shows the location of core samples previously taken.

We look forward to receiving information about the analyses of these samples.

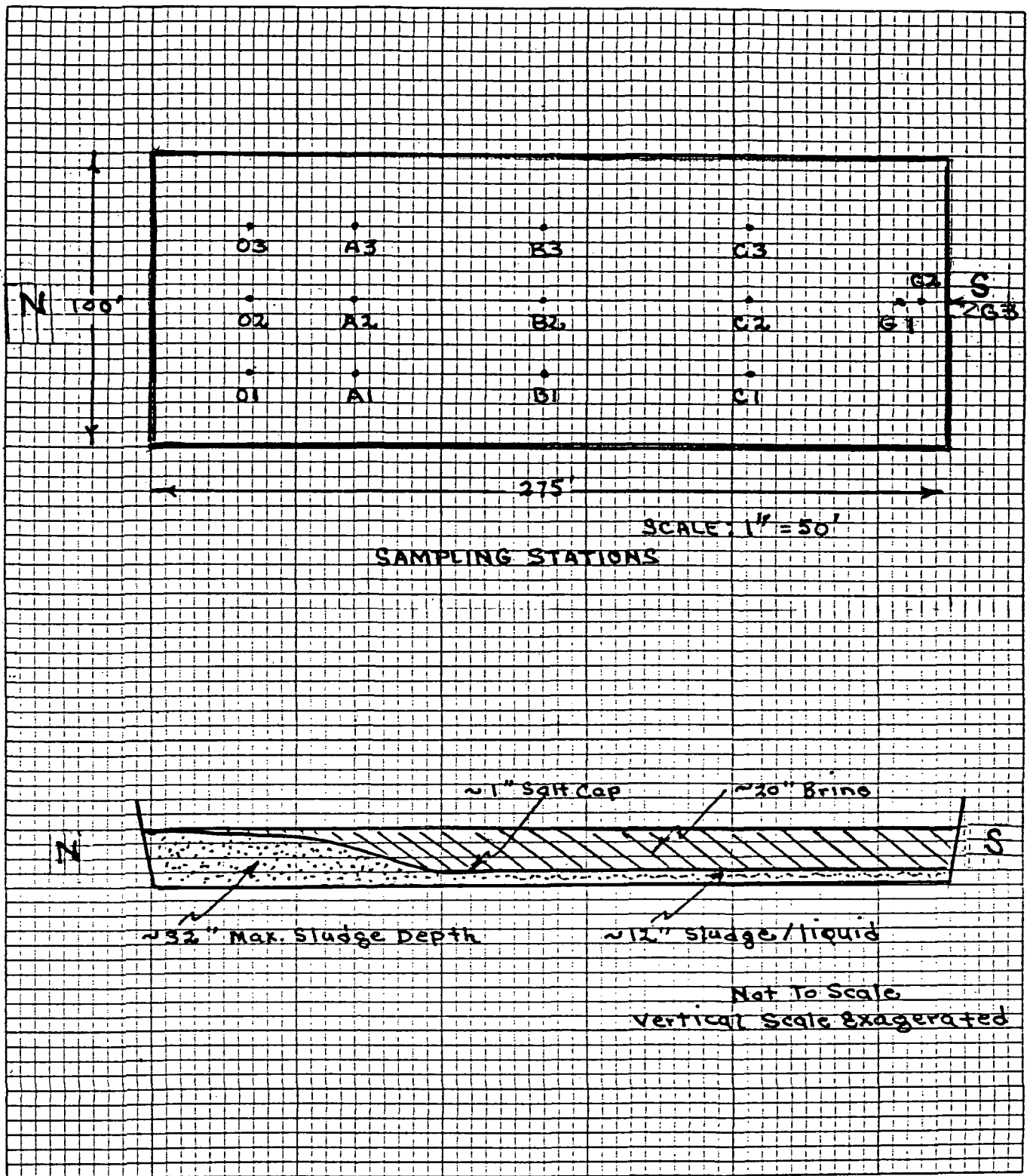
Sincerely,

A handwritten signature in black ink, appearing to read "John E. Crawford".

John E. Crawford  
Program Manager

cc: Allen Jelacic, GTD/HQ

Graph in Inches



SAMPLING PROGRAM - BRINE POND  
Kennecott-State 2-14 well  
Sept. 15, 1988

# Bechtel National, Inc.

Engineers - Constructors

Fifty Beale Street  
San Francisco, California

Mail Address: P.O. Box 3865, San Francisco, CA 94119



*Dec 14, 87*  
*Dec 14*

John Crawford  
U. S. Department of Energy  
San Francisco Operations Office  
1333 Broadway  
Oakland, CA 94612

Subject: DOE Contract No.: DE-AC03-84SF12194

Dear John:

As requested, Bechtel has determined the current cost to date and the estimated cost to complete our contract scope of work. The assumed schedule for start-up of the flow test for this estimate is mid-February owing to the fact that INEL and its subcontractor, University of Utah Research Institute have not issued the RFP for operation of the flow test. This RFP will likely not be issued until the FY88 budgets are established and a decision is made regarding the Department of Energy's commitment to conduct the injection tests using the SSSDP 2-14 well.

Based on the above assumptions, the following estimates have been made (all estimates are after cost-sharing):

- 1. Expenditures to date.....\$ 8,028,417
- 2. Estimated cost-to-complete contract scope of work.....\$ 441,689
- 3. Total estimated cost-to-complete.....\$ 8,470,107
- 4. Current Contractual Limit (after cost-share of \$28,105).....\$ 8,350,516
- 5. Estimated additional funds needed.....\$ 119,590

Our total estimated cost-to-complete (Line 3) has not increased over our estimate of October 14, 1987. This is in spite of the fact that we made

the decision not to complete the construction at this time (Reference letter of October 19, 1987, Owen to Crawford) because of the uncertainty of INEL's commitment to do the testing and the uncertainty of the DOE appropriations. Savings have been realized from:

- a reduction in materials and subcontract billings for the drilling effort (negotiated after drilling was completed);
- savings in construction labor costs; and
- savings in site utilities costs-to-date

These savings have offset the increase in costs caused by:

- shutting down the construction operation;
- adding the installation of the injection line to the Imperial well;
- extending the schedule by over three months.

Several items must be addressed in detail to fully understand the estimated costs provided above. These include the current status of flow-test facilities and the costs for site clean-up.

Status of Flow-test Facilities: The flow-test facilities construction was shut down on November 13 with DOE's concurrence because of uncertainties with regard to the start-up date for INEL's injection testing. The shut-down date was planned so that all major installation (requiring cranes or other heavy equipment) was complete (substantial completion). The remainder of the work to complete the facility includes installation of the instrumentation (not installed because of potential for corrosion and theft or vandalism), installation of the pumps and filter media, completion of the intake structure and several pipe supports, and hydro and in-service testing of the facility.

It should be noted that the facility was constructed as a temporary structure with the intent of final system testing followed immediately by the flow-test. Unstable foundation soils at the site are exacerbated by periods of extensive rain and the recent earthquake. These conditions coupled with a prolonged delay in start-up could result in shifts in the piping alignments leading to increased stress on all of the piping, especially on piping flanges and valves. We have included in our estimated cost-to-complete the facility an amount for inspection of alignments and for cold hydrotesting followed by in-service testing. We felt that these

measures would allow identification of functional problems. However, we have not included funds to repair the facility should extensive damage have occurred during this interim period.

The estimated costs provide herein assume a start date of mid-February for the flow-test and a flow-test program of 21 days as previously agreed. To provide adequate time to complete the facility, Bechtel will require notification to proceed four (4) weeks prior to the proposed start-up date. This will allow time for a new construction manager to familiarize himself with the requirements of the facility, for ordering additional materials and equipment, and for final testing.

Costs for Site Clean-up: The site clean-up estimate of \$164,500 is a budget estimate only; a site clean-up plan must be developed. Depending on the volume and classification of the brine pond sludge, the budget for site clean-up may not be sufficient. At this time, the pond contains drilling mud and geothermal fluid from flow-tests of the 2-14 well and the Imperial well. We recommend that Bechtel be authorized to conduct tests leading to development of a disposal plan as soon as possible. Development of this plan would require chemical laboratory analyses and tests for solidification techniques conducted on bottom sediment sample

The IT Corporation, which operates the local disposal site, recently issued a letter stating that, as of December 1, it will not accept liquid wastes. Therefore, tests on representative samples should be conducted to determine the best treatment to solidify the waste. More importantly, representative samples should be tested for heavy metals concentrations. It is possible that the sludge, when thickened or concentrated by filtering or adding thickeners, will concentrate heavy metals above allowable thresholds and thus become classified as a hazardous waste.

Results of tests conducted in June, prior to the drilling operation, indicated that the metals concentrations were below hazardous waste limits but close to the allowable limit for arsenic. However, brines from the 2-14 well contain heavy metals in solution, including arsenic, which will become concentrated in the sludge.

Our budget estimate for site clean-up assumes disposal of the brine pond sludge at a Class II disposal site--not at a Class I dump as hazardous

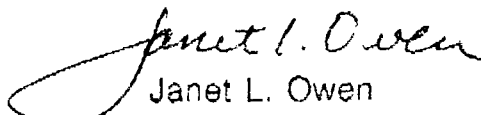
waste. The cost for hazardous waste disposal would be significantly higher. In addition, costs for extensive treatment to solidify the waste have not been included because of the uncertainty associated with treatment requirements.

Alternative Tests. If INEL does not conduct a 21 day flow test as is currently in our contract scope of work, a flow-test of the 2-14 well could still be conducted with our current budget. The INEL requirement for uninterrupted flow would be eliminated and would provide cost savings from not installing and operating the sand filters as well as the redundant pumps and flow lines. With these savings, Bechtel estimates that we could provide complete staff support for a 7 day flow test of the 2-14 well including use of the high pressure separator and injection of the brine into the Imperial within the estimated cost-to-complete shown on Line 3 herein.

In addition, EPRI has indicated its interest in testing their crystallizer unit during flow tests of the 2-14 well. The crystallizer is an experimental unit which may be effective for scale control or for selective removal of metals. This pilot equipment would be installed and operated at no additional cost to the DOE. EPRI could also make available their mobile laboratory for brine chemistry testing at no additional cost to DOE. The addition of EPRI projects would be to either the 21 day or the 7 day flow test. These projects would enhance the value of the SSSDP to industry.

I hope this information is sufficient for your planning purposes. Should you have questions or require additional information, please call.

Sincerely,

  
Janet L. Owen  
Project Manager

cc: Alan Jelacie - DOE/Wash  
A. D. Benz  
G. F. Cochrane  
J. C. Selover

November 19, 1987  
Report No. TP-20  
Report Period: June-August

Salton Sea Scientific Drilling Projects  
in the  
Salton Sea Geothermal Area  
Contract No. DE-JAC03-84-SF12194

Bechtel National, Inc.  
P.O. Box 3965  
San Francisco, California 94119

Contract Period: 10 September, 1984 through 15 January, 1987:

1) Contract Objective

On June 12, 1987, DOE issued a contract modification (A016) adding funds to initiate site cleanup, the last task of the Part A scope. On June 30, 1987, DOE modified the contract scope (A017) and authorized Bechtel to proceed with the work; full funding was subject to definitization. On August 29, 1987, the new scope of work and full costs were definitized and the contract was so modified (A018).

2) Technical Approach

In accordance with instructions from DOE, new tasks were added to Bechtel's scope of work. This "Part B Scope" includes:

- Task 1: Rework/Repair State 2-14 Well
- Task 2: Construct flow test facilities
- Task 3: Operation of flow test
- Task 4: Clean-upn site brine pond and mud sump
- Task 5: Provide site utilities
- Task 6: Management

3) Contract Tasks

The following technical discussion and reported costs are for the period June, 1987 through August, 1987.

Part A

Tasks 1-5 of Part A are completed

Task 6 - Well Abandonment and Site Cleanup

Upon execution of Contract Modification A016, on June 12, 1987, Bechtel proceeded with site cleanup: disposal of sludge from the mud sump and brine pond. The mud sump wastes were hauled to the dump for disposal. The volume of drilling mud was almost 600 tons, 400 tons greater than originally estimated. The brine pond sludge was determined to be too wet for disposal as solid waste and too dry/heavy for disposal as a liquid. Bechtel began testing with additives such as cement to absorb water. However, Bechtel was directed to stop cleanup activities to allow Kennecott to flow test their Wilson 1-12 well into the brine pond in early July. On June 30, 1987, Contract Mod A017 incorporated Part A Task 6 into Part B Task 4 with the modification that the task would not include plug and abandonment of the well, removal of equipment and facilities abandoned in place by DOE, nor decontamination of the brine pond and mud sump.

MUD SUMP

Part B

Task 1 - Wellbore Repair

The well repair program was begun on July 1, 1987. As directed by DOE, Bechtel accelerated procurement activities, placing over 40 subcontracts for drilling services and supplies in the period of approximately three weeks. Well workover began on August 1, 1987. After one section (5 joints) of damaged liner was pulled, Bechtel was directed to commence sidetracking the well as it was deemed impractical to pull the liner based on the condition of the 5 joints already pulled and with the limited budget available for well repair. Several attempts were made to sidetrack with both mud motors and a conventional whipstock. A depth of 7180 feet was reached when Bechtel was directed to stop drilling because of an obstruction in the hole. One additional day of milling was authorized. When this failed to improve the situation, Bechtel was directed to prepare for and conduct a flow test of the accessible zones (6100 - 7100 feet) to determine whether sufficient flow could be achieved to satisfy INEL's requirements for injection testing. This test, conducted on September 1, 1987, was observed



November 19, 1987  
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by INEL representatives. The well was flowed for 12 hours into the brine pond (to capacity); it sustained flows of over 750,000 lbs/hour and peaked at over 1,000,000 lbs/hour at over 400 psi and over 400°F. The well was deemed by INEL to be capable of supplying the required flows for their injection testing. Brine samples were taken by INEL, Kennecott/Bechtel, and representatives from U.C., Riverside. Task 1 was completed at this point. A report on the flow test results will be issued. A report on all Task 1 activities will be included in the Part B final report.

#### Task 2 - Construct Flow Test Facilities

The design of the flow test facilities required several meetings in El Centro, Idaho Falls and Salt Lake City. Among the issues to be resolved were the use of sand filters, redundant flow lines and pumps, on-site support, budgets, schedule, the Wilson 1-12 well vs. a new injection well (Imperial 1-13). During this period the high pressure separator was visually inspected by a qualified materials inspector and the vessel was hydro-tested (August 21). The vessel was deemed to be satisfactory for use in the flow test.

#### Task 3 - Flow Test

Bechtel was directed to install piping for connecting a new well, Imperial 1-13, to the brine pond for flow testing. The test period for long-term flow test was reduced from 30 days to 21 days.

#### Task 6 - Management

Bechtel was directed to attend and give a presentation on SSSDP at a program review meeting in Washington, D.C., on June 29-30. In addition, as mentioned in Task 2, numerous meetings were held to discuss flow test design.

#### Other Issues

During this period, Bechtel's contract with Kennecott was modified to transfer ownership of the well to Kennecott, to provide Bechtel access to the site and the 2-14 well, to provide Bechtel/DOE with an injection well, to provide a flow line between the Wilson 1-12 well and the brine pond, to provide a qualified drilling supervisor for Task 1, to modify the scope of work in accordance with the Bechtel/DOE contract, and to modify site cleanup requirements.

During the initial site cleanup, it became apparent that the brine pond sludge may require processing for disposal, may be larger in volume than originally estimated, and could become hazardous (toxic) waste if further concentrated or if significant volumes of brine are added.

**Table 4**  
**Cost Comparisons**  
**(Hazardous Waste Disposal)**

<u>Bidder</u>	<u>Cost</u>
SRS	\$305,549 <sup>1</sup>
Tracker	\$298,962 <sup>1</sup>
CE	\$418,220 <sup>1</sup> \$347,800 <sup>3</sup>

**Table 5**  
**Cost Comparisons**  
**(Nonhazardous Waste Disposal)**

<u>Bidder</u>	<u>Cost</u>
SRS	\$253,629 <sup>4</sup>
Tracker	\$251,005 <sup>4</sup>
VenVirotek	\$196,780 <sup>2</sup>
CE	\$347,380 <sup>3</sup>

1 Cost basis is 10,000 bbl, includes treatment, transportation and disposal at IT as hazardous waste

2 Bid for transportation to Ventura, processing and recycling nonhazardous waste

3 Bid for waste fixation of heavy metals and chlorides with disposal at Brawley dump

4 Cost basis is 10,000 bbl, includes treatment, transportation and disposal at IT as nonhazardous waste

MAY 28 1987

Attached is a copy of the Toxic Pits Cleanup Act of 1984 with 1985 and 1986 amendments.

Article 9.5, Chapter 6.5, Division 20 of the Health and Safety Code (TPCA)

Larry,

Here are 2 excerpts of the TPCA Law

Kenneth Conley

25208.4. (a) Notwithstanding any other provision of law, unless granted an exemption pursuant to subdivision (b) or Section 25208.13, a person shall not discharge liquid hazardous wastes or hazardous wastes containing free liquids into a surface impoundment after June 30, 1988, if the surface impoundment, or the land immediately beneath it, contains hazardous wastes and is within one-half mile upgradient from a potential source of drinking water.

A person who owns a surface impoundment which meets the conditions specified in this subdivision shall close the impoundment.

(b) A person may apply to a regional board to exempt a surface impoundment from subdivision (a) pursuant to this subdivision. A person shall submit the application for exemption to the regional board on or before January 1, 1986.

(1) A regional board shall either grant or deny an exemption from subdivision (a) on or before December 31, 1987. A regional board may grant an exemption from subdivision (a) only if the regional board makes both of the following findings:

(A) No extremely hazardous wastes are currently being discharged into the surface impoundment, and either one of the following applies:

(i) The records of the person applying for an exemption indicate that no extremely hazardous wastes have been discharged into the surface impoundment.

(ii) Extremely hazardous wastes are not present in the surface impoundment, in the vados zone, or in the waters of the state.

(B) The surface impoundment is in compliance with Section 25208.5, and a report has been filed pursuant to Section 25208.5.

08.3. (a) Unless granted an exemption pursuant to Division (c) of Section 25208.13, on or after January 1, 1980, no person shall discharge any liquid hazardous waste or hazardous waste containing free liquids into a surface impoundment, unless the surface impoundment is double lined, as specified in subdivision (b), equipped with a leachate collection system, and groundwater monitoring is conducted, in accordance with the federal Resource Conservation and Recovery Act of 1976, the regulations and guidance documents adopted pursuant thereto, and the regulations adopted by the state board and the department.

(b) Until the regulations and guidance documents specified in subdivision (a) relating to double liners for surface impoundments go into effect, the requirement of installing double liners in subdivision (a) may be satisfied by installing a top liner which is designed, operated, and constructed of materials to prevent the migration of any constituents into the top liner during the period the facility remains in operation, including any postclosure monitoring period, and by installing a lower liner which is designed, operated, and constructed to prevent the migration of any constituents through the lower liner during the same period, and is constructed of at least a three-foot thick layer of recompacted clay or other natural materials which have a permeability of not more than  $1 \times 10^{-7}$  centimeter per second.

(c) A person may apply for an exemption from subdivision (a) for a surface impoundment for which construction had begun on or before July 1, 1984, and which was issued waste discharge requirements by filing an application with the regional board on or before January 1, 1986. The initial application for exemption shall include a completed hydrogeological assessment report which contains the accurate data and documentation specified in Section 25208.8. An application for renewal of an exemption shall include the report only if required by the regional board. If the regional board has not granted the exemption by June 30, 1988, the person shall then comply with the requirements specified in subdivision (a), except that if the regional board denies the application for exemption but determines that a reasonable person would have applied for an exemption, the regional board may temporarily exempt the applicant from subdivision (a), for up to one year from the date of the denial of the exemption, for the sole purpose of bringing the surface impoundment into compliance with subdivision (a).

(d) The regional board may grant an exemption upon reviewing the application and making all of the following findings:

- (1) The applicant has fully complied with subdivision (c).
- (2) No hazardous waste constituents have migrated from the surface impoundment into the vadose zone or the waters of the state in concentrations which pollute or threaten to pollute the waters of the state.
- (3) Continuing the operation of the surface impoundment

Table 2

Sludge Physical Properties

Sludge Volume <sup>(1)</sup> :	7,600 bbl 318,000 gal	1,574 cu. yd. wet 1,831 cu. yd. dry.
Sludge Density <sup>(2)</sup> :	1.5 s.g. (wet sludge) 2.2 s.g. (dry solids)	
Percent Solids in Wet Sludge <sup>(3)</sup> :	30% (by weight)	
Sludge Weight:	12.5 lb/gal (wet) 3,980,000 lb (wet) 1,990 ton (wet) 1,200,000 lb (dry) 600 ton (dry)	
Water Content for Disposal <sup>(3)</sup> (to pass paint filter test)	approx. 40% by weight	
Sludge Weight With 40 percent Water: (after dewatering)	1,000 ton	
Sludge Inorganic Salt Content <sup>(3)</sup> :	10-15%	
Sludge Weight After Fresh Water Rinse: (assumed removal of salts; 10% of sludge weight)	900 ton	

(1) Estimated from pond measurements in Section III  
(2) Estimated from salt water sp. gr. of 1.2 and amorphous silica  
sp. gr. of 2.2  
(3) From contractor pre-bid evaluations of sludge samples

less than 6,000 mg/l. Fixation of the soluble constituents would be required to dispose of the waste at a Class III dump. HR

### Acid Soluble Salts

Carbonate content was analyzed in the 3/88 samples and found to be 1-2 percent (by weight) of the wet sludge. Carbonate salts could be dissolved by addition of acid to further reduce the volume of filtercake to be disposed. However, addition of acid would dissolve the metallic salts and could further exacerbate the problem of soluble heavy metal concentrations.

### Physical Properties

The physical properties of the sludge affect the estimated cost for treatment and disposal. Table 2 shows physical property assumptions. These have been determined from laboratory analyses and from information provided by waste management contractors who have sampled and analyzed the sludge.

Table 2  
**Assumed Physical Properties**

Sludge Volume:	10,000 bbl 420,000 gal = $2,079 \text{ cu. yds}$ $\times 27 = 56,144 \text{ cu ft}$
Sludge Density:	1.3 s.g. (wet sludge) 1.5 s.g. (dry solids)
Per Cent Solids in Wet Sludge:	30 per cent
Sludge Weight:	10.3 lb/gal (wet) 4,326,000 lb (wet) 2,163 ton (wet)  1,297,800 lb (dry) 649 ton (dry)
Allowable Water Content : (to pass paint filter test)	40 - 45 per cent
4	
Sludge Weight with 45 per cent Water: (after dewatering)	1,180 ton
Sludge Soluble Salt Content:	10 - 15 per cent (wet)
Sludge Weight After Fresh Water Rinse: (assumes removal of 10% salts)	1,062 ton

## 3SSDP Sludge Pond Removal Progress

Date	Item	Quantity*	Rate	Cost (K\$)
11/14	On-site mobilization begins			
11/17	Pond fluids pumping to site tanks begins for injection by Bechtel			
11/30	Direct removal, hauling, & disposal	47.85	213.65	10.2
12/01	Direct removal, hauling, & disposal	48.26	213.65	10.3
12/02	Direct removal, hauling, & disposal	50.30	213.65	10.7
12/05	Direct removal, hauling, & disposal	26.09	213.65	5.6
12/07	Initial pumping removal with 50% bypass to site tanks -cumulative quantity	240.00	137.94	33.1
12/07	Downtime caused by Bechtel	24.00	260.00	6.2
12/08	Reprocessing with polymer	58.00	137.94	8.0
12/08	Downtime caused by Bechtel	8.00	260.00	2.1
12/09	Reprocessing with polymer	34.00	137.94	4.7
12/09	Downtime caused by Bechtel	9.00	260.00	2.3
12/10	Reprocessing with polymer	82.45	137.94	11.4
12/10	Downtime caused by Bechtel	14.00	260.00	3.6
12/12	Reprocessing with polymer	18.62	137.94	2.6
12/12	Reprocessing with polymer	97.78	121.00	11.8
12/12	Direct removal, hauling, & disposal	74.02	213.65	15.8
12/13	Direct removal, hauling, & disposal	53.70	213.65	11.5
12/14	Direct removal, hauling, & disposal	49.38	213.65	10.6
12/14	Reprocessing with polymer	40.13	121.00	4.9
12/15	Direct removal, hauling, & disposal	55.57	213.65	11.9
12/15	Processing with polymer	15.63	121.00	1.9
12/16	Direct removal, hauling, & disposal	23.51	213.65	5.0
12/16	Hauling & disposal of processed solids	26.74	75.71	2.0
12/16	Processing with polymer	55.31	121.00	6.7
12/17	Processing with polymer	46.56	121.00	5.6
12/19	Direct removal, hauling, & disposal	38.28	196.71	7.5
12/19	Hauling & disposal of processed solids	12.50	75.71	0.9
12/19	Processing with polymer	24.58	121.00	3.0
12/20	Processing with polymer	40.21	121.00	4.9
12/20	Direct removal, hauling, & disposal	37.91	196.71	7.5
12/20	Hauling & disposal of processed solids	12.65	75.71	1.0
12/21	Hauling & disposal of processed solids	12.72	75.71	1.0
12/21	Direct removal, hauling, & disposal	38.94	196.71	7.7
12/21	Processing with polymer	48.75	121.00	5.9
12/22	Processing with polymer	59.48	121.00	7.2
12/22	Direct removal, hauling, & disposal	50.91	196.71	10.0
12/23	Processing with polymer	18.75	121.00	2.3
12/23	Work stopped at 1200 hours			
	Sludge/salt weight removed, less flyash	1069		
Jan 4 mod. →	(based on 449 tons initially removed)	1277		
	Cost subtotal			257.3
	Credit for flyash used	75.00	75.71	-5.7
	Total estimated subcontract cost: billed cost may vary			251.6

\* All quantities except delay times are in tons:  
delay times are in hours

## Salton Sea Scientific Drilling Project

### Objective

The objective of the Salton Sea Scientific Drilling Project was to investigate the "roots" of the Salton Sea hydrothermal system in southern California's Imperial Valley. This objective was to be reached by drilling a well as deep as funds would allow, and acquiring as much geological, geophysical and geochemical data as possible for evaluation by the National Labs and Universities.

### Funding

Congress initially appropriated \$5.3 million to DOE for the project in fy 84. These funds were for drilling the hole and ancillary support operations. Research was to be funded by the National Science Foundation, Geological Survey and DOE out of other appropriations. From fy 85 through fy 87 an additional \$2.9 million has been obligated for drilling, well rework, flow testing and associated operations.

### Time Frame

A contract was awarded to the Bechtel Corp., through the competitive bidding process, in Sept. '84. Bechtel proposed to conduct the project in cooperation with Kennecott Corp., a geothermal leaseholder in the Salton Sea area. Drilling was initiated in October 1985 and ended in March 1986 at a depth of 10,564 feet. Subsequently, it was determined that the well liner had parted or collapsed at about 6,380 feet, and in the ensuing period of time diagnostic tests of well damage and well rework have taken place. Currently, preparations are being made by the contractor for a 20-day flow test, which is scheduled for mid - November. Bechtel will clean the site in January or February 1988, turn remaining facilities over to Kennecott, and DOE's contract with Bechtel will then be terminated.

### Management

This project has been directed by the Geothermal Technology Division of DOE/HQ, with an Executive Steering Committee consisting of members from DOE, National Science Foundation and the Geological Survey. HQ assigned management of the project to SAN's Fossil, Geothermal and Solar Division. The attached chart shows some of the relationships. SAN was required to maintain a high degree of coordination between the scientists on one side and the contractor (Bechtel) on the other, This at times proved to be a sensitive issue, as drilling a geothermal well to these depths under adverse conditions is not an every day experience and some learning was involved.

HQ has made the decision to assign follow-on geothermal research at the Salton Sea site to the Idaho Operations Office, to be managed INEL staff.



## The Salton Sea Project

DOE/SAN has managed the Salton Sea Scientific Drilling Project since its inception in 1984. The Bechtel Corp., through the competitive bidding process, was awarded a contract in September of 1984 to conduct the drilling operations and associated site support services for the researchers from the National Labs, the Universities and the U. S. Geological Survey. The value of the original contract was \$5.3 million; however, to date some \$8.2 million has been obligated against the contract to complete the well drilling, carry out ancillary services, undertake well remedial work, and conduct a 20-day flow test of the well.

The project is based on a concept by Dr. Wilfred Elders, University of California - Riverside to conduct a scientific investigation of the roots of a known geothermal system in the Salton Sea area of the Imperial Valley, Ca. where magma is believed to have been intruded through a rift system to within 15,000 to 20,000 feet of the earth's surface. Dr. Elders successfully lobbied Congress for the original appropriation and was the project's Chief Scientist during Phase I.

The Salton Sea project is the first of a series of proposed deep continental scientific drilling projects to explore the earth's interior. Future projects will probably be conducted under the auspices of the National Science Foundation and managed by DOSECC, a private organization established for this purpose.

Unfortunately, insufficient funds were available to attempt to drill the Salton Sea hole to, or near, the magma source. The total depth of hole was 10,564 feet. The Russians recently have drilled a hole to more than 44,000 feet, which has provided much of the incentive for the U. S. deep drilling program and provoked the interest of certain members of the Congress.

Currently preparations are underway for a 20-day flow test of the Salton Sea well, to be conducted in November, after which Bechtel will carry out some limited site cleanup. Following this the remaining facilities and the well will be turned over to Kennecott Corp., the cooperating leaseholder. At that point in time, probably January or February 1988, Bechtel's contract with SAN will be terminated and SAN's management responsibilities for Salton Sea geothermal research will be taken over by DOE's Idaho Operations Office, who will sponsor continued investigations by the National Labs and Universities, in cooperation with Kennecott Corp. at the Salton Sea Site.

## Salton Sea Project

The Salton Sea Project (originally the Salton Sea Scientific Drilling Project) evolved from a concept of Dr. Wilfred Elders, University of California - Riverside to investigate the roots of a geothermal regime. The Salton Sea area, just north of the Gulf of California, represents the only known dry - land extension of a sea-floor rift, where magma from the earth's interior is free to move upwards to near the earth's surface. This heat source is probably the cause of the extensive geothermal fields of the Imperial Valley; and, the drilling of a hole into or near the source could provide considerable technical data on the impact of magma intrusions upon the earth's crust, and the formation of hydrothermal systems.

Dr. Elders actively lobbied for funds to undertake the project, and Congress appropriated \$5.3 million to DOE in FY-1984 for a "deep" drilling project in the Salton Sea area to study this unusual geologic/geothermal feature. The DOE's Geothermal Technology Division was directed to manage the drilling of the hole, and to coordinate the scientific activities by the National Labs, Universities and the U. S. Geological Survey, which were to parallel and follow the drilling. The Geothermal Technology Division assigned day-to-day management of the project to the San Francisco Operations Office. This office issued a Request for Proposals and the Bechtel Corp. was awarded a contract to manage the drilling and other support operations in Sept. 1984.

The Salton Sea well was drilled to a total depth of 10,564 feet, which was less than desired, but the best that could be attained within the budget limitations. A fluid temperature of 353° C was measured near total depth, a short flow test was performed, and fluid and core samples taken for analysis and evaluation.

To date a total of about \$8.2 million has been obligated against the Bechtel contract, as additional funds were appropriated by Congress to complete the drilling, conduct well rework, and finally conduct a long-term flow test of the well. These funds do not include actual expenditures for technical investigations by the National Labs, the Universities and the USGS. The flow test is scheduled for November of 1987, after which Bechtel will conduct some limited site cleanup and turn the remaining facilities over to Kennecott Corp., the cooperating geothermal leaseholder. At that point, the contract with Bechtel will be terminated and the San Francisco Operations Office role in the project will end. However, Headquarters, has assigned the Idaho Operations Office responsibility for managing continued geothermal research at the Salton Sea site, in cooperation with Kennecott.