

**GTHT - \_\_\_\_002\_\_\_\_**

**CORE HOLE  
VC-2A**

AFFIDAVIT OF RESPONSIBILITY  
CONVERSION TO CORE HOLE

STATE OF NEW MEXICO ) ss.  
County of Los Alamos )

Wayne Morris, being first duly sworn according to law, upon his oath deposes and says:

1. That he is Group Leader, ESS-1 of Los Alamos National Laboratory  
(Title) (Operator)

whose address is P.O. Box 1663, ESS-1, Mail Stop D462, Los Alamos, NM 87545

2. That Los Alamos National Laboratory is the operator of a hole cored on  
(Operator)

land belonging to John Corbin, whose address is P.O. Box 78, Mountain Route,  
(Landowner)

Jemez Springs, NM 87025, said well being drilled to test for geothermal scientific information and described as the VC-2A, being located 2000 feet from the South line and 1625 feet from the East of the NE corner line of Section 4, Township 19 N., Range 3E., NMPM, Sandoval County, New Mexico.

3. That said well was drilled to a total depth of 1741 feet from the ground level, and that casing has been set and cemented as follows:

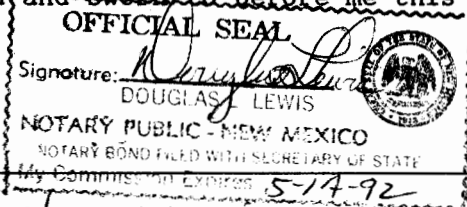
See attached letter to John Corbin, 11-18-88, from Wayne Morris, ESS-1.

4. That operator has back filled the cellar with gravel and cleared the site of all junk. Operator has left all casing in the core hole and has relinquished the core hole to landowner for his use as a heat source via a downhole heat exchanger. (See Attached.)

Los Alamos National Laboratory  
(Operator)

By Wayne Morris

Subscribed and sworn to before me this 18<sup>th</sup> day of November, A. D. 19 88



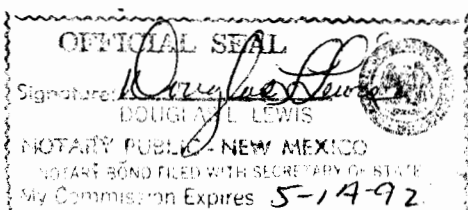
Sandoval  
Notary Public in and for the County of

STATE OF New Mexico ) ss.  
County of Sandoval )

John W. Corbin, being first duly sworn according to law upon his oath deposes and says that the provisions of Paragraphs 3 and 4 above have been complied with, he accepts the above-described core hole for his personal use as noted on the Attachments, and that he assumes all responsibility for the core hole, the location, and the conversion of the core hole to such personal use.

John W. Corbin  
(Landowner)

Subscribed and sworn to before me this 18<sup>th</sup> day of November, A. D. 19 88



Sandoval  
Notary Public in and for the County of

AFFIDAVIT OF RESPONSIBILITY  
CONVERSION TO CORE HOLE

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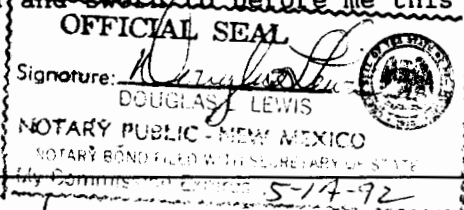
See attached letter to John Corbin, 11-18-88, from Wayne Morris, ESS-1.

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Los Alamos National Laboratory  
(Operator)

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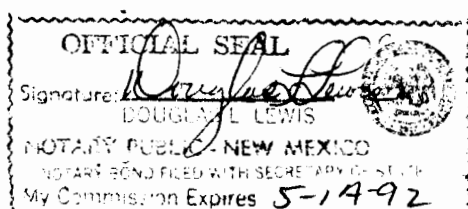
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John W. Corbin  
(Landowner)

Subscribed and sworn to before me this 18<sup>th</sup> day of November, A. D. 19 88



Sandoval  
Notary Public in and for the County of

# Los Alamos

Los Alamos National Laboratory  
Los Alamos, New Mexico 87545

January 10, 1989  
ESS-1, Geology/Geochemistry  
MS D462  
(505) 667-7200

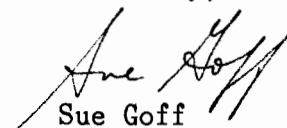
Roy Johnson  
Oil Conservation Division  
P.O. Box 2088  
Santa Fe, NM 87501

Dear Roy:

Tom Turner informs me that I should file two copies of the enclosed report with you. Thank you again for your assistance at Sulphur Springs.

Happy New Year!

Sincerely,

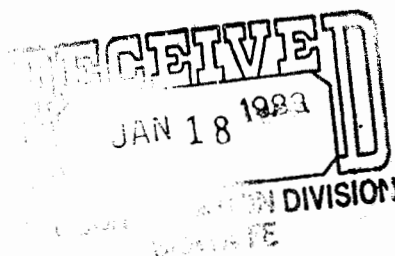


Sue Goff

SG/mm

Enc. a/s

Cy: W. A. Morris, ESS-1, MS D462  
C. W. Myers, ESS-D0, MS D446  
CRM-4, MS A150  
ESS-1, MS D462



STATE OF NEW MEXICO  
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION

P. O. BOX 2088

SANTA FE, NEW MEXICO 87501

Form G-103  
Adopted 10-1-74  
Revised 10-1-78

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U. S. G. S.	
Operator	
Land Office	

SUNDRY NOTICES AND REPORTS  
ON  
GEOTHERMAL RESOURCES WELLS

5. Indicate Type of Lease  
State ☐ Mining ☒ Claim Fee ☐

5.a State Lease No.  
\* See below

Do Not Use This Form for Proposals to Drill or to Deepen or Plug Back to a Different Reservoir. Use "Application For Permit -" (Form G-101) for Such Proposals.)

1. Type of well Geothermal Producer <input type="checkbox"/> Low-Temp Thermal <input type="checkbox"/>	Temp. Observation <input type="checkbox"/> Injection/Disposal <input type="checkbox"/>	Stratigraphic Test <input checked="" type="checkbox"/> Borehole <input type="checkbox"/>	7. Unit Agreement Name N/A
2. Name of Operator Los Alamos National Laboratory			8. Farm or Lease Name Corbin/Sulphur Springs
3. Address of Operator P.O. Box 1663, ESS-1, Mail Stop D462, Los Alamos, NM 87545			9. Well No. VC-2A
4. Location of Well Unit Letter 2000 Feet From The South Line and 1625 Feet From The East of the NE Corner Line, Section 4 Township 19N. Range 3E. NMPM.			10. Field and Pool, or Wildcat Stratigraphic Test
15. Elevation (Show whether BP, RF, GR, etc.) 8344 feet above sea level			12. County Sandoval

16. Check Appropriate Box To Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:

PERFORM REMEDIAL WORK ☐ PLUG AND ABANDON ☐  
TEMPORARILY ABANDON ☐  
PULL OR ALTER CASING ☐ CHANGE PLANS ☐  
OTHER ☐

SUBSEQUENT REPORT OF:

REMEDIAL WORK ☒ ALTERING CASING ☐  
COMMENCE DRILLING OPNS. ☐ PLUG & ABANDONMENT ☐  
CASING TEST AND CEMENT JOB ☐  
OTHER and transference of well ownership to land owner ☐

17. Describe Proposed or completed Operations (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work) SEE RULE 203.

\*Patented mining claims MS-553, Sulphur Bank Mining Claim, and M.S. 1019 Sulphur Bank No. 2, Placer Mining Claim No. 2.

See attached "History and Report of Remedial Work to Repair Primary Annular Cement Job"

18. I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNED Thomas A. Turner TITLE Drilling Consultant DATE 1/10/89

APPROVED BY Roy E. Johnson TITLE District Supervisor DATE 2-3-89

CONDITIONS OF APPROVAL, IF ANY:

12-20-88

## History of Remedial Work

Borehole VC-2A

Corbin/Sulphur Springs - Sandoval County, NM

(all depths refer to ground level)

The 4½" X 6-5/8" annulus primary cement was found to be leaking and allowing the flow of steam and gas containing high levels of hydrogen sulfide gas to the surface with a shut-in annular pressure of approximately 45 psig. In order to repair the 4½" X 6-5/8" annular cement job, the annulus was squeezed with cement as follows:

November 17, 1988

Moved in and rigged up cementing equipment to the annulus and 3½" tubing. Cementing equipment consisted of a pump truck, bulk dry cement transport, sodium silicate transport and a vacuum truck with Farmington city water. Using centrifugal pumps, killed the 3½" tubing with 10 bbl. of fresh water and killed the annulus with 12 bbl. of fresh water. Bore hole dead or on vacuum at 11:16 am. The initial kill fluid injection rate was 1¼ bbl. per min. which stabilized at ¾ bbl. per min. after 4 bbl. of injection.

Followed the kill water with 5 bbl. of calcium chloride water to gel sodium silicate in the lost circulation zone at approximately 188'. Mixed calcium chloride water with 30 lbs. of calcium chloride per bbl. of fresh water. Pumped calcium chloride water at a stable rate of 1¼ bbl. per min. and followed with a 8 bbl. fresh water spacer which was injected at a stabilized rate of 0.90 bbl. per min.

Began pumping sodium silicate at 11:50 am. Pumped 10 bbl. of sodium silicate at a relatively constant rate of 0.6 bbl. per min. and a wellhead pressure of 35 psig. Tubing pressure increased from 10 psig to 35 psig while pumping sodium silicate. Followed the sodium silicate with 8 bbl. of fresh water at a beginning rate of 0.83 bbl. per min. diminishing to 0.44 bbl. per min. at the eighth bbl.

Followed the water spacer with 3½ bbl. (19.64 cu. ft.) of Tierras Valley, API Class "H" sulfate resistant cement, premixed 1:1 with pozzolan, 2% Gel, 35% silica flour, ½ of 1% friction reducer (D-65) and 5.76 gal. of water per sack of cement. The cement mixture yielded 1.43 cu. ft. of slurry per sack of cement and had a thickening time of 2 hr. and 5 min. at 200 degrees F.. The cement pumping rate decreased rapidly at a constant centrifugal pump rpm and wellhead squeeze pressure of 30 psig until a squeeze was achieved at 30 psig and no more cement could be pumped at 12:40 pm. C.I.P. at 12:40 pm, 11/17/88.

Over flushed cement with 1 gal. of water at 50 psig after clearing the lines of cement. Rigged down cementing equipment and shut in the borehole overnight.

11-18-88

Bleed down the 3½" tubing and opened the annulus valve. A slight blow of steam was noted at the surface due to boiling of the one gallon of water left on top of the annular squeeze cement because of the high wellhead temperatures which were induced while bleeding down the 3½" tubing. The steam from the annulus was checked for hydrogen sulfide and no measurable amounts were found, indicating that the annular seal integrity was good and that no communication presently exists in the annulus between the surface and the flow and lost circulation zones below the shoe of the 6-5/8" casing at 148'. The well head was allowed to cool down and no further annular steam flow was noted. The annulus was then pressured with air to 65 psig and when all minor surface piping coupling leaks were tightened, the annulus held 65 psig for 15 min. with no measurable leak-off, further substantiating the integrity of the annular squeeze cement job. Pressure testing equipment was rigged down, the wellhead was shut-in and ownership of the borehole was relinquished to the land owner.

Note: The squeeze cementing operation conducted 11-17-88 was witnessed and aproved by Roy Johnson, District Supervisor, New Mexico Oil Conversation Div.

# Los Alamos

Los Alamos National Laboratory  
Los Alamos, New Mexico 87545

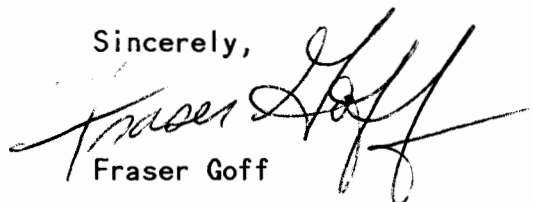
October 5, 1988  
ESS-1, Geology/Geochemistry  
MS D462  
(505) 667-8060

Mr. Roy Johnson  
New Mexico Oil Conservation Division  
P.O. Box 2088  
Santa Fe, NM 87501

Dear Roy:

Enclosed is a copy of a memo by our Don Dreesen regarding remedial action to repair core hole VC-2A, Sulphur Springs. We would appreciate your input as we want to start repairs as soon as possible. Please call Wayne Morris (505-667-7590) with your thoughts.

Sincerely,

A handwritten signature in black ink, appearing to read 'Fraser Goff', with a stylized, flowing script.

Fraser Goff

FG:mj

Enc. a/s

Cy: W. Morris, ESS-1, MS D462  
CRM-4, MS A150  
ESS-1 File

Fraser Goff

# Los Alamos

Los Alamos National Laboratory  
Los Alamos, New Mexico 87545

## memorandum

TO: Distribution  
FROM: Don S. Dreesen  
SYMBOL: ESS-4-88-149  
SUBJECT: BRADENHEAD SQUEEZE OF VC-2A

DATE: September 23, 1988  
MAIL STOP/TELEPHONE: J981/7-4318

Roy Johnson, with the NMOCC has requested that a bradenhead cement squeeze of the 4 1/2" OD x 6 5/8" OD casing annulus be completed and tested. This will have to be done prior to returning the well to the land owners. I have reviewed the VC-2 well records and log book. George Cocks, Jim Moore (CJC welder) and Ron Jacobson (SNL) have also helped me prepare the schematic of the well. Some details I have shown on the schematic need to be confirmed by Larry Pisto, the Tonto Drilling Manager.

Assuming that the schematic is correct the following procedure is proposed:

1. Conduct an injection rate test down the 4 1/2" x 6 5/8" annulus using a 2" x 3" (gasoline) trash pump (40 psi max) and a 40 bbl tank. (CJC with Fenton Hill equipment.)
2. If the injection rate is greater than 20 gpm design a 50 cubic ft. cement squeeze. If the injection rate is less than 20 gpm design a smaller squeeze.
3. Obtain verbal approval for the cementing procedure from SNL and Roy Johnson. Schedule a time for the cementing so he can witness the job.
4. Prepare a PR for cementing and have MAT place the order. The order should provide for two cement jobs in case the first job is not successful.
5. Conduct the cement job.
  - a) Mix cement on the fly.
  - b) Pump cement with a 40 psi maximum pressure.
  - c) Add accelerator to cement after 2/3 of the cement is pumped.
  - d) Stop pumping when riser pipe flows, break out lines and wash out outlet valve on well head. Otherwise, over displace cement with 2 gallons of water if all of the cement is injected. Shut in annulus.
  - e) Wait on cement overnight and test cement job by checking for flow and then pumping on annulus. If cement holds 20 psi\* for 15 minutes\*, the job is completed. If injection rate is established, repeat steps 2, 3, and 5.

\* Tentative values -- actual values will be determined in step 3.

The estimated cost for the injection testing and cementing is:

1. Mobilize trash pump, tank and water (CJC)	\$ 700.00
2. 1st injection test (CJC)	500.00
3. 1st cement job (Farmington Contractor)	2500.00
4. Pressure test cement (CJC)	500.00
5. 2nd cement job (if needed)	2500.00
6. Pressure test cement (CJC)	500.00
7. Wireline run to check drill rods (Farmington contractor or LANL slick line)	1000.00
8. Demobe and clean up	600.00
	<u>\$8800.00</u>

Concerns and contingencies are as follows:

1. The badly corroded wellhead will fail during the proposed operations and the well will have to be killed and the wellhead replaced. (I have not estimated a cost)
2. The lower outlet valve is not connected to annulus as shown in the schematic. Larry Pisto should confirm that the schematic is correct. If it is not, the well will have to be blown down and killed, the wellhead removed and a fixture installed to connect to the annulus. (I have not worked out a cost estimate for this!)
3. The injection rate at 40 psi is less than 5 gpm. A small volume of quick setting cement will have to be used and the volume will have to be approved by Roy Johnson.
4. The seal on the HQ rods will leak -- the HQ rods will be cemented in shallow and the NMOCC should assure us that the well can be plugged to their satisfaction with the HQ rods cemented-in at the surface.
5. The HQ rods will collapse during cementing -- contingency to plug the well if this occurs should be agreed to in step 3 of the proposed procedure.
6. The well will be cemented successfully but the annulus will pressure up and flow sometime in the next several years. This is a likely outcome. George Cocks believes that the cement will be subject to chemical attack and serious corrosion of the steel casing will continue in the low pH water.

DSD:esm

Distribution: Frazer Goff, ESS-1, MS D462  
Wayne Morris, ESS-1, MS D462  
James Albright, ESS-4, MS J981  
George Cocks, ESS-4, MS J979  
Joe Skalski, ESS-4, MS J981  
ESS-4 file

Master valve

889-

Upper outlet

Lower outlet

VC-2 Well

Diagram

HQ Rods welded to the riser

4 1/2" riser

Casing Hanger & Seal welded to the outside of the HQ Rods

12" hole

10" OD conductor

31 ft

40 ft<sup>3</sup> cement

8 3/4" hole

6 5/8" OD casing

148 ft

Place 20 to 50 cubic ft of cement in this annulus

Lost circulation zone at 188 ft.

Cement is probably channelled

311 ft.

Bottom shoe joint on 4 1/2" casing un-screwed

HQ Drill rods  
1700 ft PBD  
1731 ft  
1736 ft TD

BH Drilling assembly

42 SHEETS 3 SQUARE  
42 SHEETS 3 SQUARE  
42 SHEETS 3 SQUARE



STATE OF NEW MEXICO  
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION

P. O. BOX 2088  
SANTA FE, NEW MEXICO 87501

Form G-103  
Adopted 10-1-74  
Revised 10-1-78

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Operator	
Land Office	

SUNDRY NOTICES AND REPORTS  
ON  
GEOTHERMAL RESOURCES WELLS

5. Indicate Type of Lease State <input type="checkbox"/> Mining <input checked="" type="checkbox"/> Fee <input type="checkbox"/>
5.a State Lease No. *See below

Do Not Use This Form for Proposals to Drill or to Deepen or Plug Back to a Different Reservoir. Use "Application For Permit --" (Form G-101) for Such Proposals.)

1. Type of well	Geothermal Producer <input type="checkbox"/>	Temp. Observation <input type="checkbox"/>	Stratigraphic Test <input type="checkbox"/>
	Low-Temp Thermal <input type="checkbox"/>	Injection/Disposal <input type="checkbox"/>	Borehole <input checked="" type="checkbox"/>

7. Unit Agreement Name N/A
-------------------------------

2. Name of Operator Los Alamos National Laboratory
---

8. Farm or Lease Name Corbin/Sulphur Springs
---

3. Address of Operator P.O. Box 1663, ESS-1, Mail Stop D462, Los Alamos, NM 87545
--

9. Well No. VC-2A
----------------------

4. Location of Well Unit Letter 2000 Feet <del>XXXXXX</del> South <del>XXX</del> and 1625 Feet <del>XXXX</del>
---

10. Field and Pool, or Wildcat Stratigraphic Test
--

<del>XXX</del> East of / the NE corner 4 Township 19 N. Range 3E. NMPM.
---

15. Elevation (Show whether <del>DP</del> , <del>RT</del> , <del>GR</del> etc.) 8344 feet above sea-level
--

12. County Sandoval
------------------------

16. Check Appropriate Box To Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:

PERFORM REMEDIAL WORK <input checked="" type="checkbox"/>	PLUG AND ABANDON <input type="checkbox"/>
TEMPORARILY ABANDON <input type="checkbox"/>	
PULL OR ALTER CASING <input type="checkbox"/>	CHANGE PLANS <input type="checkbox"/>
OTHER <input type="checkbox"/>	

SUBSEQUENT REPORT OF:

REMEDIAL WORK <input type="checkbox"/>	ALTERING CASING <input type="checkbox"/>
COMMENCE DRILLING OPNS. <input type="checkbox"/>	PLUG & ABANDONMENT <input type="checkbox"/>
CASING TEST AND CEMENT JOB <input type="checkbox"/>	
OTHER <input type="checkbox"/>	

17. Describe Proposed or completed Operations (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work) SEE RULE 203.

\*Patented mining claims MS-553, Sulphur Bank Mining Claim, and M.S. 1019, Sulphur Bank No. 2 Placer Mining Claim No. 2

(All depths refer to ground level).

Present Condition of Well:

10 in. conductor pipe cemented at 36 ft in 12-1/4 in. hole.  
6-5/8 in. casing cemented from 153 ft to surface in 8-5/8 in. hole; shoe at 153 ft.  
4-1/2 in., BH drill rods, cemented at 316 ft in 5-7/8 in. hole. Fair cement from approximately 193 ft to the casing shoe at 316 ft. Poor or no cement from 193 ft to the surface.  
3-1/2 in., HQ drill rods landed at T.D. at 1741 ft open ended and hung in donut in the wellhead flange.

Proposal

In order to repair the primary cement job in the 4-1/2 in. x 5-7/8 in. and the 4-1/2 in. x 6-5/8 in. casing annulus, it is proposed to down or "Bradenhead" squeeze the open annulus with cement from the surface to the top of the presently existing cement and lost circulation zone at 193 ft. The annulus will be injection rate tested prior to cementing and lost circulation will be mitigated by injecting LCM and sodium silicate gel prior to pumping

(see Attachment "A" for Proposal continuation)

18. I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNED [Signature] TITLE Drilling Consultant DATE 11-3-88

APPROVED BY [Signature] TITLE DISTRICT SUPERVISOR DATE 11-3-88

## ATTACHEMENT "A"

### Proposal (continued)

low density, high temperature, salt and sulphate resistant cement. The final integrity of the remedial cement job will be tested by demonstrating that the annulus will hold a column of water and by testing the annulus for shutin pressure buildup. (Present annulus gas pressure is approximately 45 psig.)

# Los Alamos

Los Alamos National Laboratory  
Los Alamos, New Mexico 87545

November 23, 1988  
ESS-1, Geology/Geochemistry  
D462  
(505) 667-7200

Roy Johnson  
District Supervisor  
Oil Conservation Division  
P.O. Box 2088  
Santa Fe, NM 87501

Dear Roy:

Enclosed is an original and a copy of the "Affidavit of Responsibility." I understand that Tom Turner informed you of the successful integrity tests performed on VC-2A, and the transfer of the core hole to John Corbin (and co-owners) on Friday, November 18, 1988.

I would like to thank you for your assistance and for taking the time to witness the "Bradenhead" squeeze operation at Sulphur Springs.

Sincerely yours,

  
Sue J. Goff

SG/jo

Enc. a/s

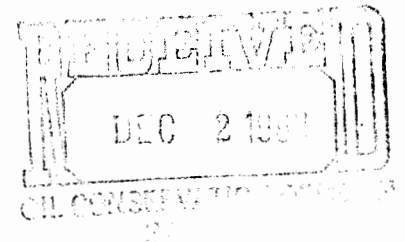
Cy: CRM-4, MS A150  
ESS-1, MS D462

# Los Alamos

Los Alamos National Laboratory  
Los Alamos, New Mexico 87545

November 18, 1988  
ESS-1, Geology/Geochemistry  
MS D462  
(505) 667-7590

Mr. John Corbin  
P.O. Box 78, Mountain Route  
Jemez Springs, NM 87025



Dear John (and co-owners):

We are pleased to inform you that the Laboratory has completed the scientific experiments and objectives of the Continental Scientific Drilling Program core hole VC-2A, drilled on your property at Sulphur Springs, New Mexico. Pursuant to Item 11 in the May 5, 1986 AGREEMENT between yourselves and the Los Alamos National Laboratory, we are relinquishing to the four of you the completed core hole, which includes the casing valves, wellhead, and any other hardware now on it.

The VC-2A core hole was originally designed to have a useful lifetime of about five years to pursue the scientific objectives of our project. VC-2A was not designed or intended to be a geothermal production well. Inasmuch as full responsibility for, and entitlement to, the core hole is now yours, there are several characteristics of the core hole and the fluids within it that may require caution during future use to avoid personal injury or damage to the core hole.


- Because, prior to the remedial action noted below, we could pump water through the "annulus" valve below the wellhead into the annulus of the HQ-liner, there is apparent failure of one of two mechanical seals or at least one of the three primary cement seals in the cased portion of the core hole (0 - 316 ft depth).
- After a series of log-inject-log operations conducted in June 1988 in which temperature logs were obtained before and after cold water was pumped down the annulus of the HQ-liner, communication was found to exist between the annulus at the surface and geothermal aquifers at about 450 ft and 1605 ft. This occurs because there may have been no cement seal in the annulus of the 4-1/2 in. (BH) liner and/or due to a lack of pressure integrity at the 3-1/2 in. (HQ) x 4-1/2 in. (BH) casing hanger and seal.
- In order to comply with State Oil Conservation Division requirements and to repair this core hole and preclude migration of fluids from zones behind pipe to the surface via the 4-1/2 in. x 6-5/8 in. annulus or the 3-1/2 in. x 4-1/2 in. annulus pressure seal/hanger, the following work was designed by an experienced independent geothermal drilling production engineer, performed by LANL, and approved by the New Mexico State Oil Conservation Division prior to relinquishing the core hole to you.

- The integrity of the pressure seal between the 3-1/2 in. (HQ) tubing and the 4-1/2 in. riser and 4-1/2 in. x 6-5/8 in. and/or 3-1/2 in. x 4-1/2 in. annular spaces was tested November 9, 1988 and was found to be sound by killing the zone at 1605 ft with cold water and establishing a vacuum in the 3-1/2 in. tubing while a positive pressure existed in the annulus with either no pressure or a vacuum in the 3-1/2 in. tubing.
- In order to stop communication of pressure and fluids from behind pipe to the surface via the 4-1/2 in. x 6-5/8 in. or 3-1/2 in. x 4-1/2 in. annular spaces, they were bradenhead squeezed with low density, high temperature, salt and sulphate resistant cement. The cement was preceded with sodium silicate gel to mitigate cement losses to highly porous vugular or fractured intervals and the final integrity of the repair was tested by monitoring the annulus access valve for pressure build up. Little or no pressure build-up or annular flow was noted, demonstrating the integrity of the repair. Due to the limited annular space between casing strings, the cement integrity may be severely jeopardized by any future thermal cycling of the borehole. It is recommended that the borehole not be flowed at high rates in the future.
- In addition, we have filled the cellar with pea-size gravel to prevent anyone from falling into the open space.
- The wellhead assembly and valves are corroded on their exterior to an unknown extent due to reaction with corrosive waters and gases prevailing at the surface in the Sulphur Springs area. On the other hand, the geothermal fluid at 1605 ft is non-corrosive and has not formed any scale or deposits on the inside of the HQ-tubing or the inside of the wellhead.
- Pressures as high as 110 psig and temperatures as high as 160°C (320°F) have been measured at the wellhead during our short-term flow experiments. Under certain conditions, it may be possible to generate higher transient pressures and temperatures at the wellhead during flow.
- Core hole VC-2A can self flow without stimulation if static wellhead pressures of 45 to 55 psig are maintained and if this pressure is suddenly released by opening the valves on the wellhead. If the static wellhead pressure is bled to less than 30 psig, VC-2A will not self flow.
- The fluid in the perforated zone at 1605 ft has a measured temperature of 210°C (410°F). Please be aware that this fluid contains about 3 ppm arsenic and about 25 ppm boron; thus, the State Engineer's Office and the New Mexico Oil Conservation Division in Albuquerque should be notified of any long-term flow (i.e., greater than one day) of the well. As mentioned to you before, however, due to limited permeability in the 1605 ft zone, long-term flow will probably result in boiling in the formation and eventual plugging of the formation or cementing in any down hole equipment with calcite and silica. Long-term or continuous flow from the 1605 ft aquifer cannot be recommended.

We realize that you would like to use the available heat in VC-2A for the personal use of you and your co-owners. For the reasons stated above, the well should not be flowed and your idea of a downhole heat exchanger seems to be the most prudent method of utilizing and conserving this heat.

We would still like to monitor the gas composition and fluid chemistry of VC-2A on occasion, if these samples can be obtained with our surface sampling equipment. Like the other data obtained on this project, copies would be forwarded to you. In no way will we attempt to conduct any more downhole tests or experiments in the well after the date of this letter.

Yours truly,



Wayne Morris

WM:mj

Enc.:

1. Legal Agreement of May 5, 1986
2. Casing Schedule, VC-2A
3. Wellhead diagram, VC-2A
4. Chemistry of fluids, VC-2A
5. Example flow data of August 28, 1986, VC-2A
6. Permit for remedial action
7. Affidavit of responsibility

Cy: (all w/enc. except where noted)

R. Johnson, New Mexico Oil Conservation Division, P.O. Box 2988, Santa Fe, NM 87501  
D. Esparza, District 1-State Engineer's Office, 2340 Menaul NE, Suite 206, Albuquerque, NM 87107-1884  
G. Kolstad, USDOE, OBES, MS ER15, J-315 GTN, Washington, DC 20545  
J. Coleman, USDOE, OBES, MS ER15, J-315 GTN, Washington, DC 20545  
C. Gilbert, USDOE, OBES, MS ER15, J-315 GTN, Washington, DC 20545  
G. McLaren, Tonto Drilling Services, 2701 West 900 South, Salt Lake City, UT 84104  
T. Turner, 18764 S. Russell Park Rd., Salt Lake City, UT 84121  
P. Lysne, SNL, Div. 6242, MS A904  
G. L. Bergman, LC-General, MS A187  
C. W. Myers, ESS-DO, MS D446  
N. G. Ellington, MAT-DO, MS P274  
W. Morris, ESS-1, MS D462  
J. N. Gardner, ESS-1, MS D462  
S. Goff, ESS-1, MS D462  
J. Musgrave, ESS-1, MS D462  
CRM-4, MS A150 (w/o enc.)  
ESS-1 File (w/o enc.)  
F. Goff, ESS-1, MS D462

## A G R E E M E N T

This Agreement is by and between the Regents of the University of California, operating Los Alamos National Laboratory for the United States Department of Energy ("Los Alamos"), and John Corbin, Ken Corbin, Henry McHarney, and Caryl McHarney (the "OWNERS").

### WITNESSETH:

WHEREAS Los Alamos is participating in the Continental Scientific Drilling Program, which is a collaborative effort of the United States Department of Energy ("DOE"), U.S. Geological Survey ("USGS") and the National Science Foundation, (NSF),

WHEREAS such program includes a plan to study the Valles Caldera of North-Central New Mexico, such plan envisioning core-drilling operations and initial scientific investigation extending over a seven-year period from 1985 to 1993,

WHEREAS a Valles Caldera Scientific Drilling Team of principal and collaborating investigators has been organized to carry out such plan, Los Alamos being heavily represented on such team,

WHEREAS scientific drilling in the Valles Caldera would expand knowledge of heat/mass transfer processes associated with magmatic and volcanic phenomena and their role in the evolution of the Earth's crust,

WHEREAS application of the basic scientific knowledge gained would enhance discovery and definition of energy resources associated with geothermal systems,

WHEREAS Los Alamos has no commercial interests in this program. All activities of this program are only for scientific knowledge and the data and information obtained from this program will become part of the public domain,

WHEREAS the OWNERS hereinbefore noted own in aggregate the surface rights and certain geothermal rights of a tract within the Valles Caldera that is scientifically attractive to the Valles Caldera Scientific Drilling Team, such tract being called Patented Mining Claims M.S. No. 553 (Sulphur Bank Places Mining Claim) and M.S. No 1019 (Sulphur Bank No. 2 Placer Mining Claim) and being more specifically described in Attachment 1 hereto, and

WHEREAS said OWNERS desire to aid the objectives of the Drilling Team and to share in the knowledge and experience acquired in the program.

### NOW THEREFORE:

IN CONSIDERATION OF the premises and mutual covenants contained herein, the parties hereto agree as follows:

1. The OWNERS hereby give permission, for those members of the Drilling Team and their agents necessary to perform the scientific operations contemplated hereunder, to enter upon and pass over the applicable lands and/or leasehold estates and to conduct such scientific operations at any site mutually agreed upon by the OWNERS and Los Alamos.

2. All equipment and hardware necessary to conduct the operations will be provided by the Drilling Team, Los Alamos, and/or their subcontractors.

3. Under no circumstances whatsoever shall the OWNERS either individually or collectively be liable for, or otherwise be obligated to pay or bear any costs or expenses of whatever nature pertaining to the operations and activities performed hereunder. Los Alamos shall indemnify, defend and hold harmless the OWNERS and any of their respective officers, directors, agents, and employees from and against any and all claims, demands, liabilities, costs and expenses of whatever nature, including attorneys' fees and court costs, arising out of, or alleged to arise out of, any injury to or death of any person or persons or loss of or damage to any property caused by, or allegedly caused by, the willful acts or negligence of Los Alamos, or its officers, agents, employees, invitees or guests, including members of the Drilling Team.

4. In the event the operations or related scientific activities cause physical damage to the real or personal property of the OWNERS, Los Alamos shall replace or repair such property or pay the OWNERS fair compensation.

5. All data, core and fluid samples shall become the property of the Department of Energy. However, copies of the data shall be given to the OWNERS in the form of both raw and analytical data no later than six months after the completion of operations and not less than 60 days in advance of publication of the data.

6. Los Alamos and the Drilling Team shall exercise reasonable care in performance of the operations to prevent fire, in accordance with the Fire Prevention Plan. This plan will be provided to the owners 30 days before coring operations commence.

7. Los Alamos and the Drilling Team shall conduct all operations in accordance with the Ecological Damage Mitigation & Restoration Plan. This Plan will be provided to the owners 30 days before coring operations commence.

8. Los Alamos and the Valles Caldera Scientific Drilling Team hereby extend to the OWNERS an invitation to select a representative to join the Team as an ex-officio member; The OWNERS hereby accept such invitation, and nominate John W. Corbin.

9. This agreement shall be in effect for 5 years, beginning June 1, 1986 and ending May 31, 1991.

10. Both Los Alamos and the OWNERS reserve the right to terminate this agreement on September 30 of each year, with 60 days advance notice in writing provided to the other party (i.e. by August 1 of the year of termination).

11. Los Alamos will give to the OWNERS the completed corehole with casing, well head, and other hardware at the end of May, 1991 or earlier if scientific investigations are completed.

11a. The term "other hardware" referred to in paragraph 11 consists of, but not limited to, pipes, valves, pressure gauges. The University's best estimate for "other hardware" is not to exceed \$500.00.

*A. S. King  
5/17/86  
JW WC*

12. Los Alamos or their designated agents will assume full responsibility for plugging and abandoning the corehole if the coring operations result in blowout or if the corehole is mechanically unstable or unsafe. In such an event, Los Alamos or their agents are not obligated to core another hole for the use of the OWNERS.

13. Los Alamos will have the right to enter the corehole periodically during the 5 years of this agreement to make repairs, perform geophysical logs, take fluid samples, etc. as necessary. It is understood that should re-entry be done during periods of heavy snow, Los Alamos will pay the cost of snow removal necessary for such access.

14. Los Alamos requests the right to use the utilities and telephone services of the Sulphur Springs property, and will reimburse the owners the costs of using such services. It is understood that the OWNERS shall be paid one time a use fee of \$250. It is further understood that the use fee and reimbursement costs will be paid to the OWNERS by the Drilling Subcontractor as a third-party item.

*Amendment to #3 addition - to paragraph 3.  
Owners will not be liable for any injuries sustained by Los Alamos or its affiliates, agents, employees, invitees or guests, including members of the Drilling Team while occupying the premises ~~whether~~ or the right-of-way for business or any other purpose.  
#15 Los Alamos shall cause to be erected signs at the borders of the property stating it is private property and dangerous to the public.*

*Caryl M Harney, Owner*

*H H M G H*

*R W C*

THEREFORE WITNESSETH THE PARTIES:

UNIVERSITY OF CALIFORNIA  
LOS ALAMOS NATIONAL LABORATORY  
P.O. Box 1663  
Los Alamos, NM 87545

OWNERS

*N. Ellington* 5/5/86

NEWBY G. ELLINGTON  
MAT-DO, MS P274

Date

Date

*Gordon Z. Berger* 4/03/86

Approved, Los Alamos National Laboratory Legal Counsel

Date

Date

3-27-86

*James E. Hilde*

NOTARY

EXP. AUG 27<sup>th</sup> 1988

BERN. CO. NM

*John W. Corbin* 3/27/86

Date

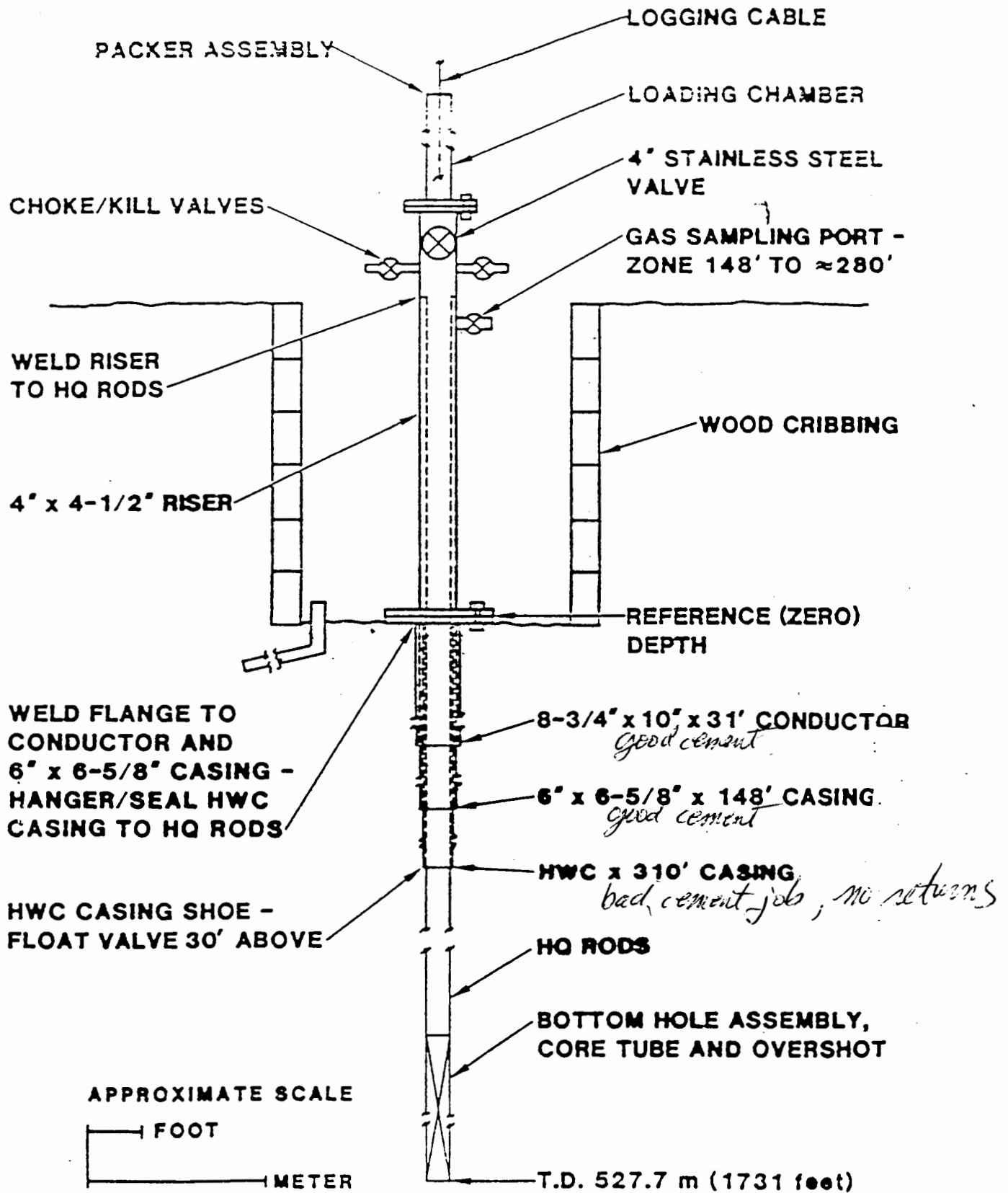
*Caryl McHarney* 3-27-86

*Henry McFar* 3/27/86

Date

# WELL VC-2A COMPLETION DIAGRAM

Sept. 1986



DRAFT

Wellhead Assembly  
VC-2A  
(Sept. 1988)

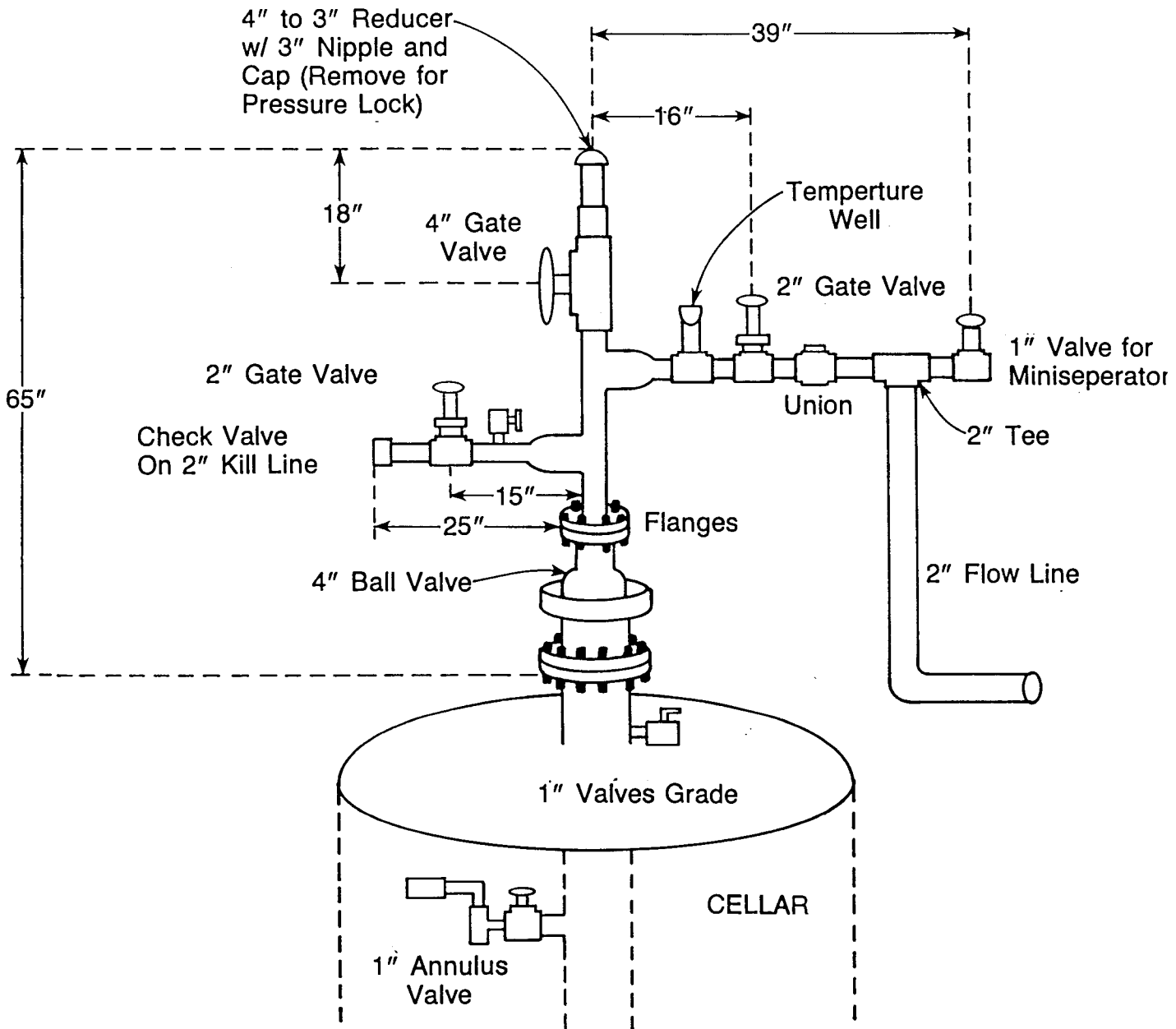


Table 1: Chemical composition of hot spring, celler water, vapor zone and deep formation water, Sulphur Springs, New Mexico (values in ppm except where noted).

	Footbath Spring		VC-2A, Celler	VC-2A, vapor zone	<sup>a/</sup> VC-2A, Formation	<sup>b/</sup> VC-2A, Formation
Date	9/80	6/88	8/88	5/87	8/87	12/87
Depth, m	—	—	—	91 <sup>c/</sup>	490	490
Temp., °C	33	31		112	210	207
pH	1.1	2.0		6.4	6.2	5.9
SiO <sub>2</sub>	214	176		3.7	322	310
Na	10.8	29		11.2	1888	1432
K	94	24		0.5	309	288
Ca	56	54		0.7	5.5	32
Mg	26.5	8.2		40.1	0.4	0.8
Li	0.1	0.1		40.1	18.8	24.3
HCO <sub>3</sub>	0.0	0.0		1127	57	417
SO <sub>4</sub>	7900	1600		4.4	56	27
Cl	41.0	8.5		40.5	2945	2460
B	0.2	0.1		40.1	18.2	21.4
As	40.2	40.1		40.1	1.8	0.3

<sup>a/</sup> Average of three analyses; compositions are recalculated downhole for steam flash; concentration and pH are higher at surface after flashing.

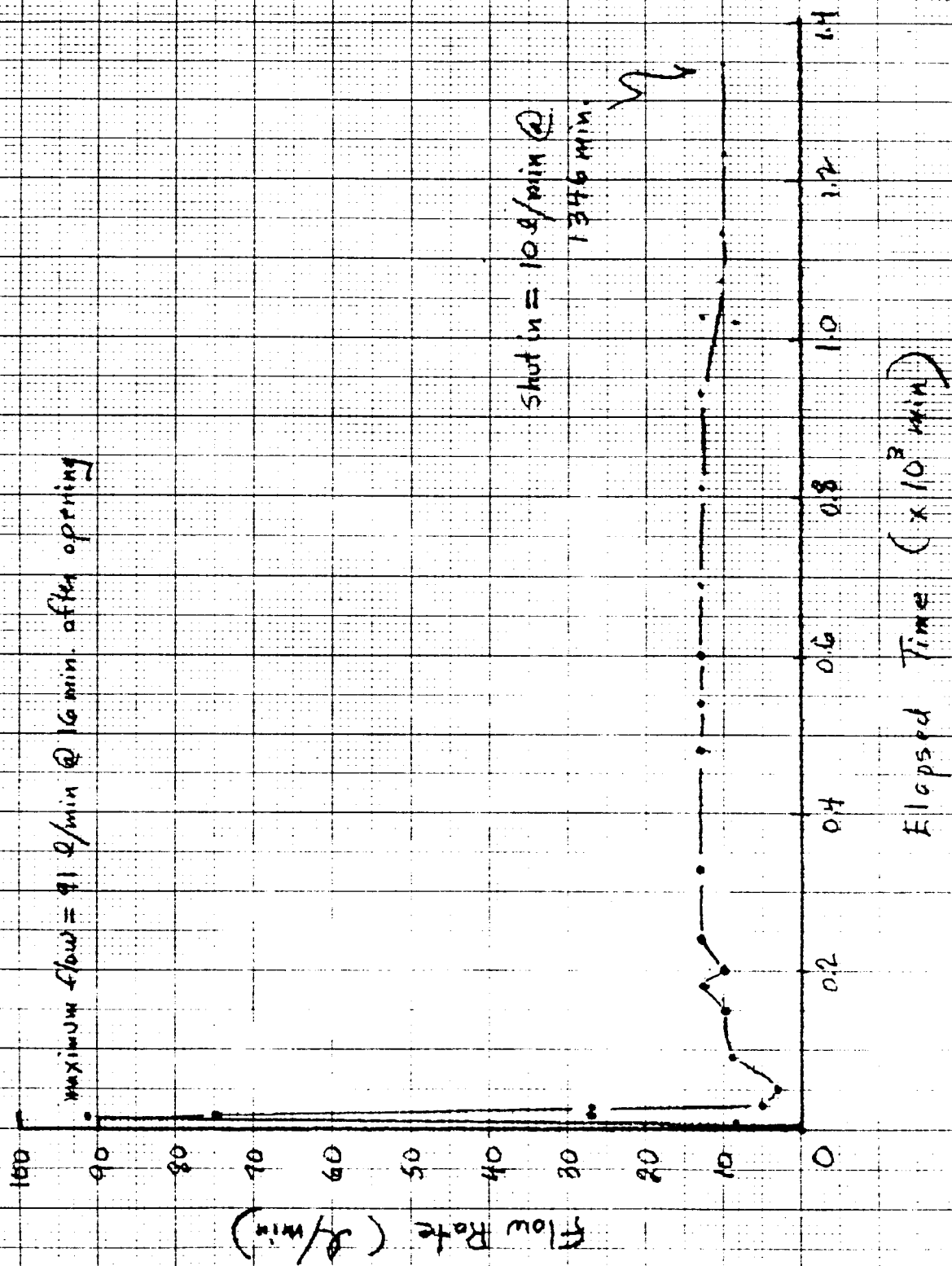
<sup>b/</sup> Downhole sample; no corrections necessary

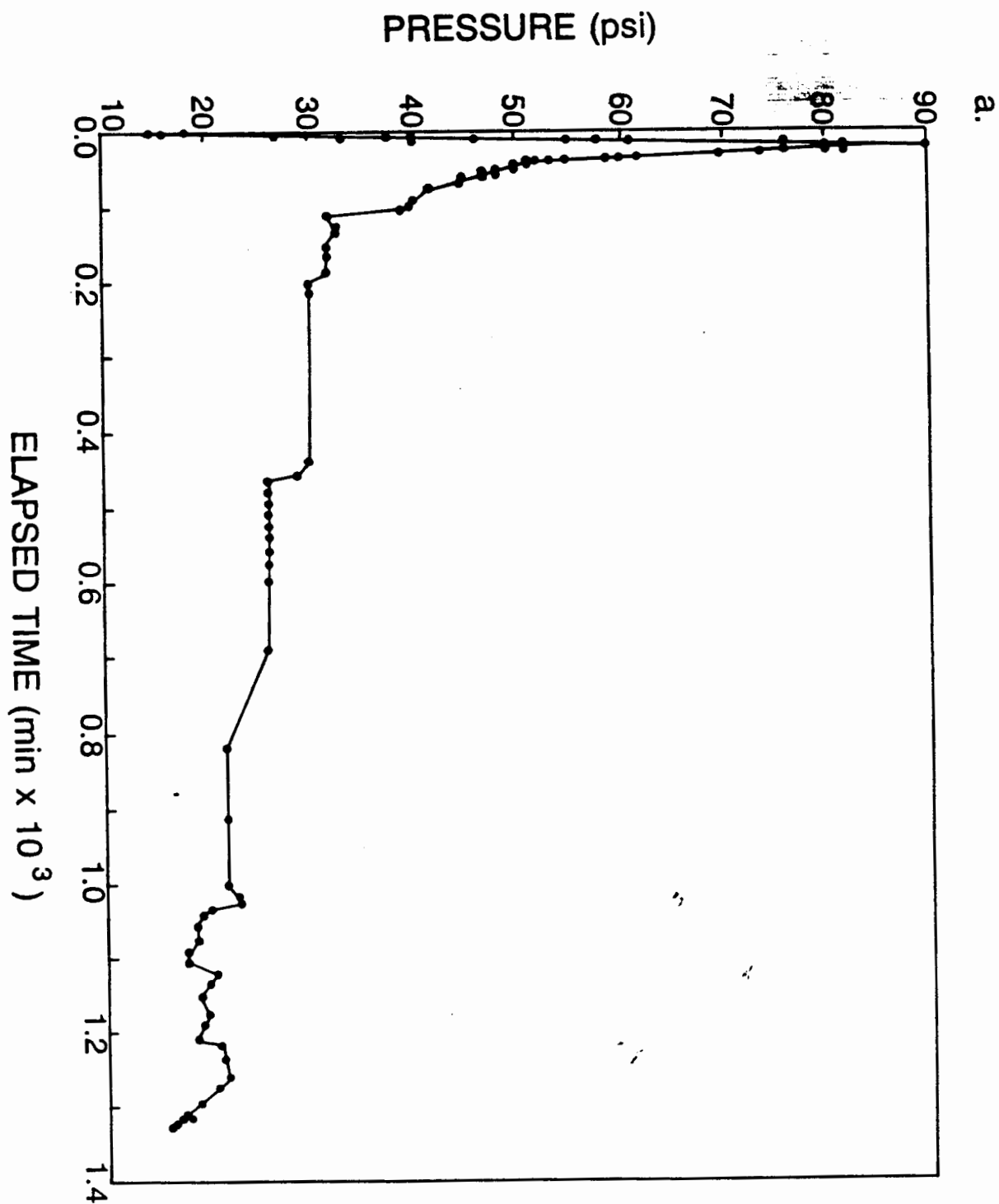
<sup>c/</sup> Sample collected from annulus valve on wellhead; Sample contains 3.7% non-condensable gas whose composition is: 95.1% CO<sub>2</sub>, 0.7% H<sub>2</sub>S, 1.6% NH<sub>3</sub>, 0.7% H<sub>2</sub>, 1.4% <sup>15</sup>N<sub>2</sub>, 0.04% CH<sub>4</sub>, 0.00% O<sub>2</sub>.

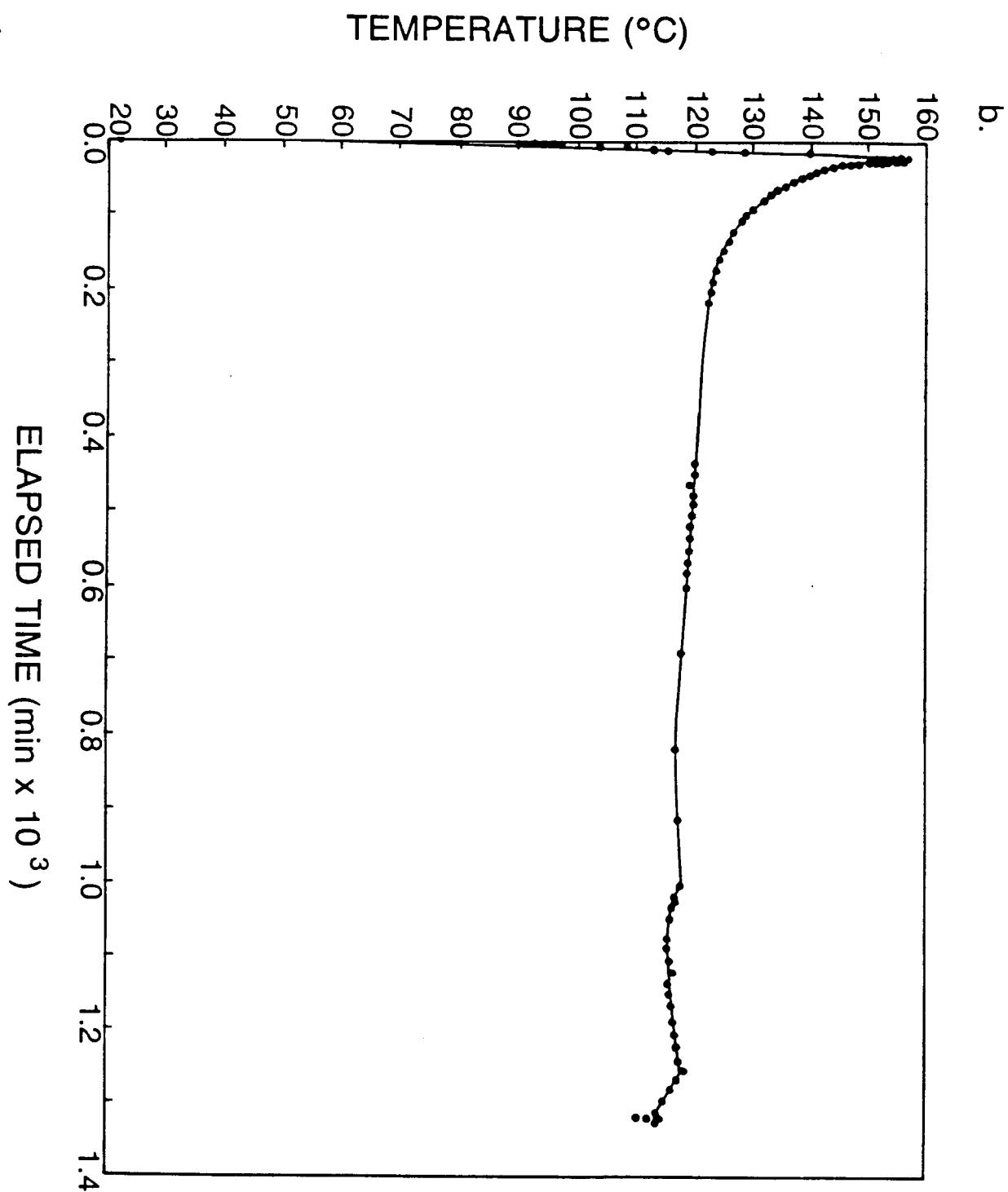
**DRAFT**

# VC-2A Flow Experiment

Aug. 27-28, 1987

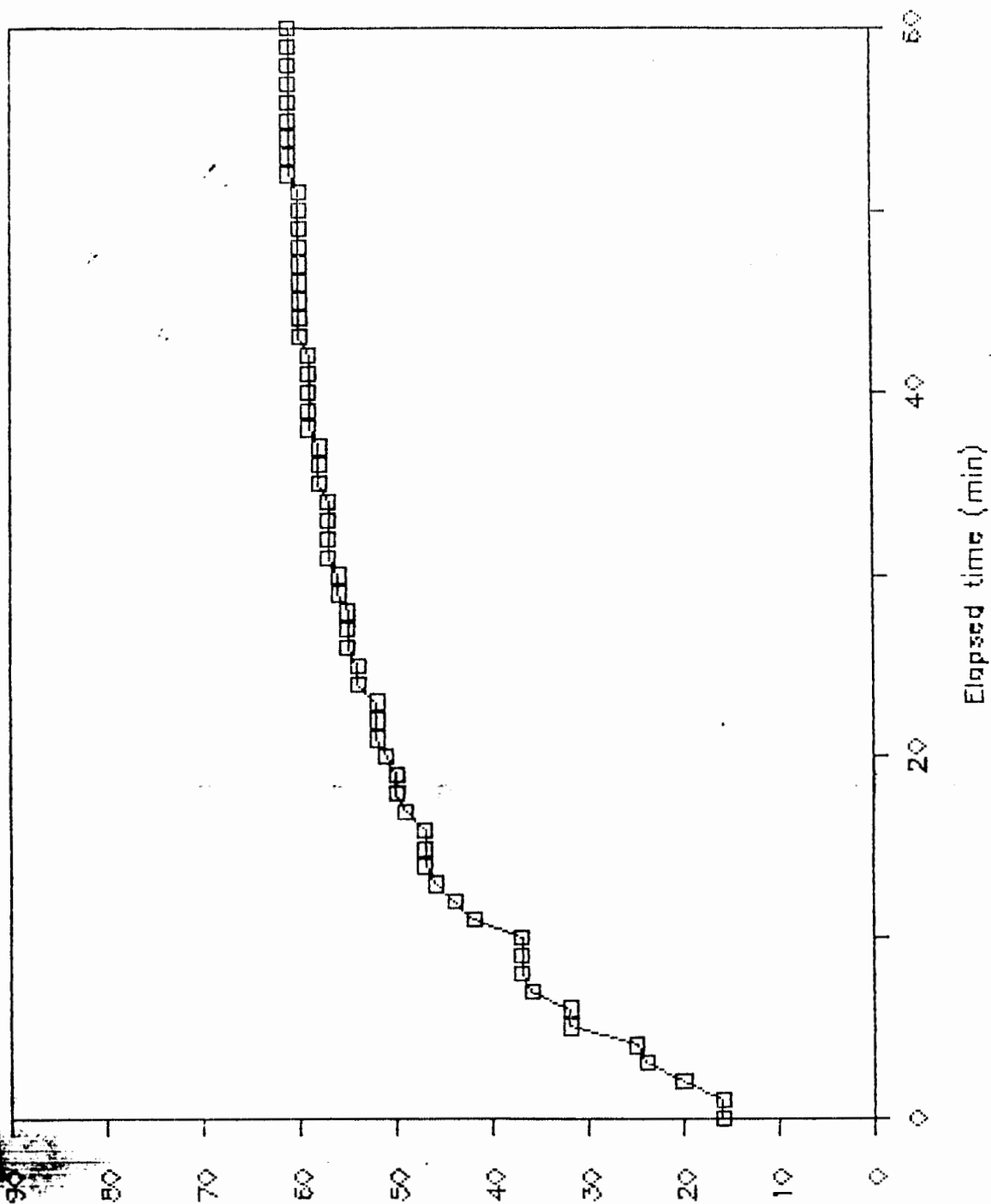






# VC-2A pressure buildup

on 8/28/87 begin at 12:21



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N. M. B. M.	
U. S. G. S.	
Operator	
Land Office	

**SUNDRY NOTICES AND REPORTS  
ON  
GEOTHERMAL RESOURCES WELLS**

5. Indicate Type of Lease  
State ☐ Mining ☒ Fee ☐  
5.a State Lease No.  
\*See below

Do Not Use This Form for Proposals to Drill or to Deepen or Plug Back to a Different Reservoir. Use "Application For Permit -" (Form G-101) for Such Proposals.)

1. Type of well  
Geothermal Producer ☐ Temp. Observation ☐ Stratigraphic Test ☐  
Low-Temp Thermal ☐ Injection/Disposal ☐ Borehole ☒

2. Name of Operator  
Los Alamos National Laboratory

3. Address of Operator  
P.O. Box 1663, ESS-1, Mail Stop D462, Los Alamos, NM 87545

4. Location of Well  
Unit Letter 2000 Feet ~~XXXXXX~~ South ~~XXX~~ and 1625 Feet ~~XXXX~~

~~XXX~~ East of / the NE corner 4 Township 19 N. Range 3E. NMPM.

7. Unit Agreement Name  
N/A

8. Farm or Lease Name  
Corbin/Sulphur Springs

9. Well No.  
VC-2A

10. Field and Pool, or Wildcat  
Stratigraphic Test

15. Elevation (Show whether ~~GP~~, ~~RT~~, GR etc.)  
8344 feet above sea-level

12. County  
Sandoval

6. Check Appropriate Box To Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:

PERFORM REMEDIAL WORK ☒ PLUG AND ABANDON ☐  
EMPORARILY ABANDON ☐  
ULL OR ALTER CASING ☐ CHANGE PLANS ☐  
OTHER ☐

SUBSEQUENT REPORT OF:

REMEDIAL WORK ☐ ALTERING CASING ☐  
COMMENCE DRILLING OPNS. ☐ PLUG & ABANDONMENT ☐  
CASING TEST AND CEMENT JOB ☐  
OTHER ☐

7. Describe Proposed or completed Operations (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work) SEE RULE 203.

\*Patented mining claims MS-553, Sulphur Bank Mining Claim, and M.S. 1019, Sulphur Bank No. 2 Placer Mining Claim No. 2

(All depths refer to ground level).

Present Condition of Well:

10 in. conductor pipe cemented at 36 ft in 12-1/4 in. hole.  
6-5/8 in. casing cemented from 153 ft to surface in 8-5/8 in. hole; shoe at 153 ft.  
4-1/2 in., BH drill rods, cemented at 316 ft in 5-7/8 in. hole. Fair cement from approximately 193 ft to the casing shoe at 316 ft. Poor or no cement from 193 ft to the surface.  
3-1/2 in., HQ drill rods landed at T.D. at 1741 ft open ended and hung in donut in the wellhead flange.

Proposal

In order to repair the primary cement job in the 4-1/2 in. x 5-7/8 in. and the 4-1/2 in. x 6-5/8 in. casing annulus, it is proposed to down or "Bradenhead" squeeze the open annulus with cement from the surface to the top of the presently existing cement and lost circulation zone at 193 ft. The annulus will be injection rate tested prior to cementing and lost circulation will be mitigated by injecting LCM and sodium silicate gel prior to pumping

(see Attachment "A" for Proposal continuation)

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNED Donald Duran TITLE Drilling Consultant DATE 11-3-88

PROVED BY RyE John TITLE DISTRICT SUPERVISOR DATE 11-3-88

CONDITIONS OF APPROVAL, IF ANY:

## ATTACHEMENT "A"

### Proposal (continued)

low density, high temperature, salt and sulphate resistant cement. The final integrity of the remedial cement job will be tested by demonstrating that the annulus will hold a column of water and by testing the annulus for shutin pressure buildup. (Present annulus gas pressure is approximately 45 psig.)

AFFIDAVIT OF RESPONSIBILITY  
CONVERSION TO CORE HOLE

STATE OF NEW MEXICO ) ss.  
County of Los Alamos )

Wayne Morris, being first duly sworn according to law, upon his oath deposes and says:

1. That he is Group Leader, ESS-1 of Los Alamos National Laboratory  
(Title) (Operator)

whose address is P.O. Box 1663, ESS-1, Mail Stop D462, Los Alamos, NM 87545

2. That Los Alamos National Laboratory is the operator of a hole cored on  
(Operator)

land belonging to John Corbin, whose address is P.O. Box 78, Mountain Route,  
(Landowner)

Jemez Springs, NM 87025, said well being drilled to test for geothermal scientific information and described as the VC-2A, being located 2000 feet from the South line and 1625 feet from the East of the NE corner line of Section 4, Township 19 N., Range 3E., NMPM, Sandoval County, New Mexico.

3. That said well was drilled to a total depth of 1741 feet from the ground level, and that casing has been set and cemented as follows:

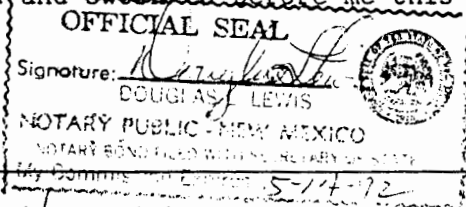
See attached letter to John Corbin, 11-18-88, from Wayne Morris, ESS-1.

4. That operator has back filled the cellar with gravel and cleared the site of all junk. Operator has left all casing in the core hole and has relinquished the core hole to landowner for his use as a heat source via a downhole heat exchanger. (See Attached.)

Los Alamos National Laboratory  
(Operator)

By Wayne Morris

Subscribed and sworn to before me this 18<sup>th</sup> day of November, A. D. 19 88



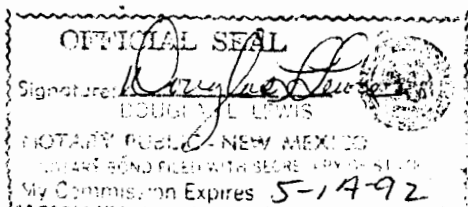
Sandoval  
Notary Public in and for the County of

STATE OF New Mexico ) ss.  
County of Sandoval )

John W. Corbin, being first duly sworn according to law upon his oath deposes and says that the provisions of Paragraphs 3 and 4 above have been complied with, he accepts the above-described core hole for his personal use as noted on the Attachments, and that he assumes all responsibility for the core hole, the location, and the conversion of the core hole to such personal use.

John W. Corbin  
(Landowner)

Subscribed and sworn to before me this 18<sup>th</sup> day of November, A. D. 19 88



Sandoval  
Notary Public in and for the County of