

14  
GLO 1855



May 4, 1990

U. S. Department of Energy  
Idaho Operations Office  
785 DOE Place  
Idaho Falls, Idaho 83402  
ATTN: Mr. Kenneth J. Taylor

RE: Contract #DE-FC07-86ID12654  
MZI-11A Cost Sharing Contract

Dear Mr. Taylor:

In accordance with ARTICLE IV - PAYMENTS of the above referenced contract, enclosed please find California Energy Company, Inc. (CECI) invoice in the amount of \$10,493.00 representing payment due for Milestone #5, submission of well data. Please wire this amount into CECI account #0043502474 at Bank of America in Santa Rosa.

Enclosed with this invoice you will find attached the following well completion report information described in CECI's Data Collection Plan:

- ✓ (1) Approved Sundry Notice from BLM modifying the status of MZI-11A to observation;
- ✓ (2) Well Summary describing daily drilling activities and method of completion;
- ✓ (3) Analysis of non-condensable gases dated August 30, 1988 prepared by Thermochem;
- ✓ (4) Results of laboratory analysis for water samples taken by Century Testing on 07/24/89 at stations 3804-1 through 4;
- ✓ (5) Results of sound level surveys taken by R & W Engineering; reports are dated October 29, 1986 and December 4, 1986;
- (6) Pruett sub-surface temperature survey dated September, 1989;
- ✓ (7) Lithology of Cuttings and Core for November, 1986 and November, 1989 drilling;

CE EXPLORATION COMPANY

Page Two  
Mr. Kenneth J. Taylor  
May 4, 1990

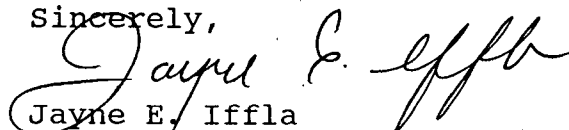
- ✓(8) Pictorial review of drillsite and drilling operations;
- ✓(9) Photographic log of core from 575' deep to 4,670' total depth (forwarded directly to Mike Wright - UURI);
- (10) Surface cuttings from 0' to 570' with continuous sampling bagged in 10' intervals (see below);
- (11) Core samples of the well are presently located at our Sunriver, Oregon office and are available for collection by Mike Wright at UURI.
- (12) mud flowline temperature information was provided on the daily drilling reports which were forwarded to Mike Wright at UURI during the drilling of this well.

During this month, all surface cuttings will be brought to our Sunriver, Oregon office and together with the core samples, will be made available to UURI at their convenience.

We anticipate formally plugging and abandoning TCH MZI-11A this summer and will contact you when the site has been restored. To complete invoicing under our contract, milestone #6 will be submitted at that time.

In closing, if you have any questions, please do not hesitate to contact me at (415) 399-5487 or Joe LaFleur for technical information in our Portland office at (503) 226-3636.

Sincerely,

  
Jayne E. Iffla  
Land & Permit Department

JEI/Enclosure

- cc: James P. McGowan - DOE
- Mike Wright - UURI ✓
- Sue Steiger - E G & G
- Phil Essner - CECI
- Bob Tibbs - CE Exp.
- Dave McClain - CE Exp.
- Pat Durgin - CECI



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

LAKEVIEW DISTRICT OFFICE  
P.O. BOX 151 (1000 Ninth Street S.)  
Lakeview, Oregon 97630

RECEIVED

NOV - 8 1989

Ans'd.....

TAKE PRIDE IN AMERICA  
IN REPLY REFER TO

3260

OR-920-85-WN-001

November 6, 1989

Mr. David W. McClain  
Project Manager  
California Energy Company, Inc.  
601 California Street, Suite 1000  
San Francisco, CA 94108

Dear Mr. McClain:

Enclosed is an approved sundry notice that modifies the status of well MZI-11A to "observation". This sundry notice will expire on September 15, 1990. Continuation of observation beyond that date will require the submittal of another sundry notice.

If California Energy Company decides to abandon this well, a sundry notice will also be required. Plugging and abandonment shall be done in accordance with Condition of Approval No. 18 of the approved sundry notice dated April 27, 1989.

If you have any questions, please contact our geologist, Dennis Simontacch

Sincerely,

Terry H. Sodorff  
Acting District Manager

Enclosures:  
Sundry Notice

cc w/attachments:  
Deputy State Director (920)  
Supervisor, Winema National Forest  
Joel Renner, Department of Energy

DS:sjb  
0412R/2

Form: GCS 9-1986

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY, CONSERVATION DIVISION

**PROPRIETARY**  
Supervisor Approved  
District Bureau No.

**GEOHERMAL SUNDRY NOTICE**

The U.S. Geological Survey requests this form or other Supervisor approved form to be prepared and filed in triplicate with requisite attachments with the Supervisor. The Supervisor must approve this permit prior to any lease operations.

1a. WELL TYPE: PRODUCTION ( ) INJECTION ( ) HEAT EXCHANGE ( ) OBSERVATION (X) OTHER ( )  
Temperature Gradient Core Hole

1b. WELL STATUS:  
Suspended for Observation

2. NAME OF LESSEE/OPERATOR  
CALIFORNIA ENERGY COMPANY, INC. (707) 526-1000

3. ADDRESS OF LESSEE/OPERATOR  
601 California St., 10th Floor, San Francisco, CA 94108

13. LOCATION OF WELL OR FACILITY  
Approx. 2225' E & 725' N of SW Corner, Sec. 10 T31S R7-1/2E

14. TYPE OF WORK:

CHANGE PLANE ( )	CONVERT TO INJECTION ( )	FULL OR ALTER CASING ( )
SITE AND ROAD CONSTRUCTION ( )	FRACTURE TEST ( )	MULTIPLE COMPLETS ( )
CONSTRUCT NEW PRODUCTION FACILITIES ( )	SHOOT OR ACIDIZE ( )	ABANDON (X)
ALTER EXISTING PRODUCTION FACILITIES ( )	REPAIR WELL ( )	OTHER ( )

4. LEASE SERIAL NO.  
OR34669

5. SURFACE MANAGER: SUR ( )  
Winema Nat. Forest

6. UNIT AGREEMENT NAME  
Mazama

7. WELL NO.  
MZI-11A

8. FIELD OR AREA  
Mazama

9. SEC. T., R., S. & M.  
Sec. 10 T31S R7-1

11. COUNTY  
Klamath

12. STATE  
OR

15. DESCRIBE PROPOSED OPERATIONS (Use this space for well activities only. See instructions for current well conditions on reverse)

SEE ATTACHED  
MZI-11A WELL SUMMARY

16. DESCRIBE PROPOSED OPERATIONS (Use this space for all activities other than well work)

17. I hereby certify that the foregoing is true and correct (Use reverse side if needed)

SIGNED James L. Moore TITLE VICE PRESIDENT/EXPLORATION DATE 9/8/89  
JAMES L. MOORE

(This space for Federal use)

APPROVED BY Terry J. Saffert TITLE District Manager DATE 11/06/89  
CONDITIONS OF APPROVAL: IF ANY:

expires 09/15/90. This sundry modifies status of this well to "observation". This sundry is required by law (30 U.S.C. 1073); regulations: 30 CFR 270.34, 30 CFR 270.35, 30 CFR 270.45, 30 CFR 270.71-3, 30 CFR 270.72; Federal Geothermal Lease Terms and Stipulations and other regulatory requirements. The United States Criminal Code (18 U.S.C. 1001) makes it a criminal offense to make a willfully false statement or representation to any Department or Agency of the United States as to any matter within its jurisdiction.

The well will remain open for one year as an observation well in accordance with the CECI Cost Share Contract with the DOE. Permanent plugging and abandonment in accordance with GRO Order #3 is anticipated for Fall, 1990.

RAP:sr:MZI-11A  
9/8/89

**PROPRIETARY**

MZI-11A Stabilized Temperature Survey on Trips

Depth 1980' 170 F after 5 hr. trip.  
Depth 2100' 130 F after 4 hr. trip  
Depth 2870' 165 F after 8 hr. trip  
Depth 3700' 228 F after 9 hr. trip repair  
Depth 4400' 240 F after 10-1/2 hr. trip  
Depth 4640' 220 F after 5 hr. trip

RAP:sr:MZI-11A  
9/8/89

PROPRIETARY

SEP 28 1988

# THERMOCHEM

1260 (1-7)

09-20-1988

## Quality Control Data

Samples Received: 09-06-88


For: Joe LaFleur  
California Energy Company  
2455 Bennett Valley Rd.  
Suite 214 B  
Santa Rosa, CA 95404

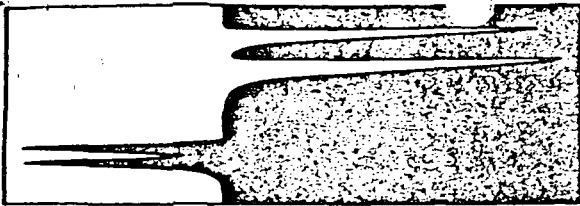
<u>Analyte</u>	<u>Percent Relative Standard Deviation<sup>1</sup></u>
Carbon Dioxide	1.2, 0.2
Hydrogen Sulfide	N/A
Ammonia	0.0, 0.0
Argon <sup>2</sup>	0.6
Nitrogen	1.4
Methane	2.8
Hydrogen	3.4

1. %RSD of replicate analysis results calculated as ppm by weight. Ar, N<sub>2</sub>, CH<sub>4</sub> and H<sub>2</sub> %RSD's are determined on actual samples and not standards. The %RSD of each set of replicate measurements performed on this batch of samples is listed.

2. Argon precision is affected by air correction procedure.

N/A Not enough sample for replicate analyses.

  
\_\_\_\_\_  
Paul N. Hirtz  
Director of Operations



THERMOCHEM

1260(2-4) 09-22-1988

DESCRIPTOR : MZ1-11A 08-30-1988 12:32  
59 DEG F

LAB NUMBER : 1260-02

PERCENT AIR IN SAMPLE :

3.57

STP MLs AIR IN SAMPLE :

37.94

TOTAL WEIGHT OF CONDENSATE (GRAMS):

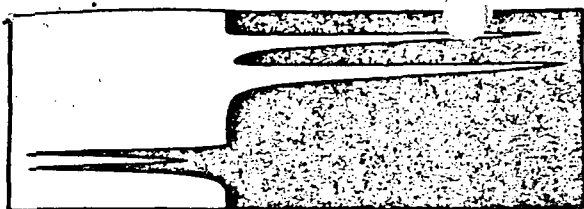
< 1.00

INITIAL HEAD SPACE PRESSURE (PSI):

14.51

<u>GAS</u>	<u>DRY GAS % BY VOL</u>
CARBON DIOXIDE	5.26E+01
HYDROGEN SULFIDE	3.23E-02
AMMONIA	<4.58E-02
ARGON	8.36E-01
NITROGEN	4.61E+01
METHANE	2.29E-01
HYDROGEN	1.56E-01





# THERMOCHEM

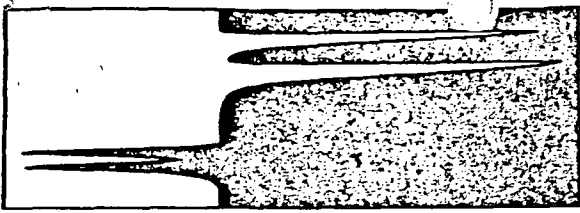
1260(2-4) 09-22-1988

DESCRIPTOR : MZ1-11A 08-30-1988 12:59  
198 DEG F

LAB NUMBER : 1260-03

SAMPLE GAS/STEAM RATIO (ft<sup>3</sup>/lb) : 1.9990  
SAMPLE GAS/STEAM RATIO (MOLES PER 10<sup>6</sup> MOLES H<sub>2</sub>O) : 100346.  
SAMPLE GAS/STEAM RATIO (PPM by WEIGHT) : 164423.  
PERCENT AIR IN SAMPLE : .22  
STP MLs AIR IN SAMPLE : 3.38  
TOTAL WEIGHT OF CONDENSATE (GRAMS): 12.35  
INITIAL HEAD SPACE PRESSURE (PSI): 14.95

GAS	DRY GAS % BY VOL	MOLES PER 10 <sup>6</sup> MOLES H <sub>2</sub> O	PPM BY WEIGHT
WATER VAPOR	N/A	N/A	8.36E+05
CARBON DIOXIDE	5.33E+01	5.34E+04	1.09E+05
HYDROGEN SULFIDE	2.13E-01	2.14E+02	3.38E+02
AMMONIA	1.14E+01	1.15E+04	9.05E+03
ARGON	7.16E-01	7.19E+02	1.33E+03
NITROGEN	3.42E+01	3.43E+04	4.46E+04
METHANE	1.10E-01	1.10E+02	8.21E+01
HYDROGEN	1.07E-01	1.08E+02	1.01E+01



# THERMOCHEM

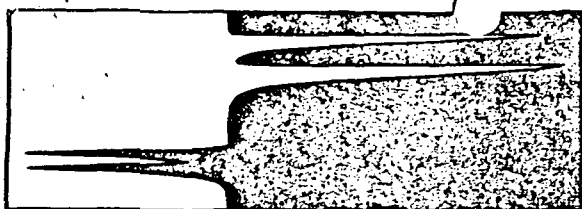
1260(2-4) 09-22-1988

DESCRIPTOR : MZ1-11A 08-30-1988 13:25  
204 DEG F

LAB NUMBER : 1260-04

SAMPLE GAS/STEAM RATIO (ft <sup>3</sup> /lb) :	1.5754
SAMPLE GAS/STEAM RATIO (MOLES PER 10 <sup>6</sup> MOLES H <sub>2</sub> O) :	79083.
SAMPLE GAS/STEAM RATIO (PPM by WEIGHT) :	143587.
PERCENT AIR IN SAMPLE :	2.11
STP MLs AIR IN SAMPLE :	3.85
TOTAL WEIGHT OF CONDENSATE (GRAMS):	1.81
INITIAL HEAD SPACE PRESSURE (PSI):	1.77

GAS	DRY GAS % BY VOL	MOLES PER 10 <sup>6</sup> MOLES H <sub>2</sub> O	PPM BY WEIGHT
WATER VAPOR	N/A	N/A	8.56E+05
CARBON DIOXIDE	64%	6.39E+01	1.06E+05
HYDROGEN SULFIDE		3.74E-01	4.79E+02
AMMONIA		7.72E-01	4.94E+02
ARGON		6.35E-01	9.53E+02
NITROGEN	34%	3.40E+01	3.58E+04
METHANE		1.65E-01	9.97E+01
HYDROGEN	<	1.29E-01	< 9.80E+00



THERMOCHEM

1260 (2-4) 09-23-1988

REPORT OF ANALYSIS

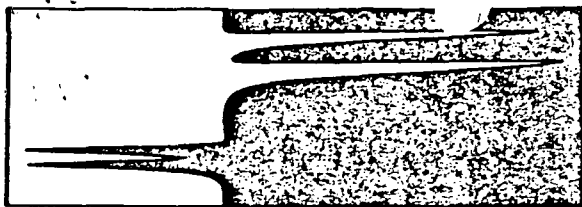
Descriptor: MZ1-11A 08-30-88 12:32  
59<sup>0</sup> F

Lab Number: 1260-2

Comprehensive Hydrocarbon Scan<sup>1</sup>

	<u>PPM by Volume<sup>2</sup></u>
Methane	2.33E+03
Ethane	9.73E+00
Propane	3.04E+00
Butane	2.53E+01
Pentane	2.03E+01
Hexane	3.03E+01
Benzene	3.26E+01
Other C2-C6	4.89E+02

1. All saturated, unsaturated and aromatic hydrocarbons with one through six carbons. Non-detected hydrocarbons in this weight range have a detection limit quantitated as methane.
2. Noncondensable gas at STP.



1260 (2-4)

09-23-1988

# THERMOCHEM

DESCRIPTOR: MZ1-11A 08-30-88 12:59  
198 DEG F  
LAB NUMBER: 1260-3

## Comprehensive Hydrocarbon Scan<sup>2</sup>

	<u>PPM By Volume</u> <sup>1</sup>	<u>mg/Kg Steam</u>
METHANE	1.09E+03	9.74E+01
ETHANE	7.13E+00	1.20E+00
PROPANE	2.25E+00	5.53E-01
BUTANE	1.82E+01	5.91E+00
PENTANE	1.18E+01	4.74E+00
HEXANE	2.12E+01	1.02E+01
BENZENE	5.42E+01	2.36E+01
OTHER C2-C6	3.61E+02	3.23E+01

1

Noncondensable at STP.

2

All saturated, unsaturated and aromatic hydrocarbons with one through six carbons. Non-identified hydrocarbons in this weight range are quantitated as methane.



1260 (2-4)

09-23-1988

# THERMOCHEM

---

DESCRIPTOR: MZ1-11A 08-30-88 13:25  
204 DEG F  
LAB NUMBER: 1260-4

## Comprehensive Hydrocarbon Scan<sup>2</sup>

	<u>PPM By Volume<sup>1</sup></u>	<u>mg/Kg Steam</u>
METHANE	1.64E+03	1.15E+02
ETHANE	8.07E+00	1.07E+00
PROPANE	2.81E+00	5.45E-01
BUTANE	2.80E+01	7.14E+00
PENTANE	2.49E+01	7.88E+00
HEXANE	7.34E+01	2.78E+01
BENZENE	1.18E+02	4.06E+01
OTHER C2-C6	1.87E+03	1.32E+02

1

Noncondensable at STP.

2

All saturated, unsaturated and aromatic hydrocarbons with one through six carbons. Non-identified hydrocarbons in this weight range are quantitated as methane.

**LABORATORY ANALYSIS**

**CHEMICAL OXYGEN DEMAND**

CALIFORNIA ENERGY CO.  
3333 MENDOCINO AVE.  
SANTA ROSA, CA 975401  
415-391-7700  
DAVID McCLAIN

ANALYSIS METHOD: EPA 410.1  
CONSTITUENT: COD  
DATE REPORTED: 7/24/89  
DATE SUBMITTED: 7/7/89  
DISCARD DATE: 9/7/89  
COLLECTED BY: CLIENT

LAB SAMPLE NUMBER	SAMPLE DESCRIPTION	SAMPLE CONC.	METHOD DETECTION LIMIT	UNITS	PERCENT RECOVERY**
-----	-----	-----	-----	-----	-----
3804-1	"A" SITE, SCOTT CREEK AT ROAD CROSSING	8.1	0.32	mg/l	94%
3804-2	"B" SITE, SCOTT CREEK SPRING AT M2I-11A	4.1	0.32	mg/l	94%
3804-3	"C" SITE, SCOTT CREEK AT CON/MAREE & MIDDLE	12.1	0.32	mg/l	94%
3804-4	"D" SITE, SCOTT CREEK AT CAMPGROUND	8.1	0.32	mg/l	94%

\*N.D. means "not detected."

\*\*All Percent Recovery values were within established control limits. *[Signature]*

**CENTURY TESTING LABORATORIES, INC.**

Reviewed and approved by:

*[Signature]*  
John H. Tillman, R.E.A.  
Manager Analytical Services

JHT/gs

**PROPRIETARY**

**LABORATORY ANALYSIS**

**TOTAL ORGANIC HALOGEN**

CALIFORNIA ENERGY CO.  
3333 MENDOCINO AVE.  
SANTA ROSA, CA 975401  
415-391-7700  
DAVID McCLAIN

ANALYSIS METHOD: EPA 9020  
CONSTITUENT: TOX  
DATE REPORTED: 7/24/89  
DATE SUBMITTED: 7/7/89  
DISCARD DATE: 9/7/89  
COLLECTED BY: CLIENT

LAB SAMPLE NUMBER	SAMPLE DESCRIPTION	SAMPLE CONC.*	METHOD DETECTION LIMIT	UNITS	PERCENT RECOVERY*
=====	=====	=====	=====	=====	=====
3804-1	"A" SITE. SCOTT CREEK AT ROAD CROSSING	0.065	0.003	ng/l	100%
3804-2	"B" SITE, SCOTT CREEK SPRING AT M2I-11A	0.008	0.003	ng/l	100%
3804-3	"C" SITE, SCOTT CREEK AT CON/MAREE & MIDDLE	0.011	0.003	ng/l	100%
3804-4	"D" SITE, SCOTT CREEK AT CAMPGROUND	0.005	0.003	ng/l	100%

\*N.D. means "not detected."

\*\*All Percent Recovery values were within established control limits.

CENTURY TESTING LABORATORIES, INC.

Reviewed and approved by:

*John H. Tillman*  
John H. Tillman, R.E.A.  
Manager Analytical Services

JHT/gs



Century Testing  
Laboratories, Inc.

**PROPRIETARY**

1444 N.W. College Way  
Bend, Oregon 97701  
503-382-6432

**LABORATORY ANALYSIS**

**EPA INORGANIC - DRINKING WATER**

CALIFORNIA ENERGY CO.  
3333 MENDOCINO AVE.  
SANTA ROSA, CA 975401  
415-391-7700  
DAVID McCLAIN

LAB SAMPLE NO.: 3804-1  
SAMPLE DESCIP.: "A" SITE, SCOTT CREEK  
AT ROAD CROSSING  
DATE REPORTED: 7/24/89  
DATE SUBMITTED: 7/7/89  
DISCARD DATE: 9/7/89  
COLLECTED BY: CLIENT

ANALYSIS METHOD NUMBER	CONSTITUENT	SAMPLE CONC.*	METHOD DETECTION LIMIT	MAXIMUM ALLOWABLE CONC.	UNITS	PERCENT RECOVERY**
=====	=====	=====	=====	=====	=====	=====
EPA 7060	Arsenic	N.D.	0.0015	0.05	mg/l	102%
EPA 7081	Barium	N.D.	0.060	1.0	mg/l	99%
EPA 7131	Cadmium	N.D.	0.0006	0.010	mg/l	103%
EPA 7191	Chromium	N.D.	0.0006	0.05	mg/l	100%
EPA 340.2	Fluoride	0.02	0.010	1.8	mg/l	100%
EPA 7421	Lead	N.D.	0.0009	0.05	mg/l	101%
EPA 7470	Mercury	0.0005	0.0001	0.002	mg/l	93%
EPA 353.3	Nitrate	0.03	0.01	10	mg/l	104%
EPA 7740	Selenium	N.D.	0.002	0.01	mg/l	104%
EPA 7761	Silver	N.D.	0.0006	0.05	mg/l	98%

\*N.D. means "not detected."

\*\*All Percent Recovery values are within established control limits. *JHT*

CENTURY TESTING LABORATORIES, INC.

Reviewed and approved by:

*John M. Tillman*  
John M. Tillman, R.E.A.  
Manager Analytical Services

JHT/gS



**PROPRIETARY**

**LABORATORY ANALYSIS**

CALIFORNIA ENERGY CO.  
3333 MENDOCINO AVE.  
SANTA ROSA, CA 975401  
415-391-7700  
DAVID McCLAIN

LAB SAMPLE NO.: 3804-1  
SAMPLE DESCIP.: "A" SITE, SCOTT CREEK  
AT ROAD CROSSING  
DATE REPORTED: 7/24/89  
DATE SUBMITTED: 7/7/89  
DISCARD DATE: 9/7/89  
COLLECTED BY: CLIENT

ANALYSIS METHOD NUMBER	CONSTITUENT	SAMPLE CONC.*	METHOD DETECTION LIMIT	MAXIMUM ALLOWABLE CONC.	UNITS	PERCENT RECOVERY**
=====	=====	=====	=====	=====	=====	=====
SM 404A	Boron	0.45			mg/l	91%
SM 407A	Chloride	2.9	0.5	250	mg/l	109%
EPA 120.1	Conductivity	28.8			umhos/cm	
EPA 7210	Copper	0.001	0.010	5	mg/l	101%
EPA 150.1	pH	6.17		6.0-9.0		
SM 273.1	Sodium	5.50			mg/l	103%
SM 426C	Sulfate	2.5	0.25	250	mg/l	103%
EPA 160.2	Total dissolved Solids	24		500	mg/l	

\*N.D. means "not detected."

\*\*All Percent Recovery values were within established control limits. *OK*

CENTURY TESTING LABORATORIES, INC.

Reviewed and approved by:

*John H. Tillman*  
John H. Tillman, R.E.A.  
Manager Analytical Services

JHT/gs



Century Testing  
Laboratories, Inc.

**PROPRIETARY**

1444 N.W. College Way  
Bend, Oregon 97701  
503-382-6432

**LABORATORY ANALYSIS**

**EPA INORGANIC - DRINKING WATER**

CALIFORNIA ENERGY CO.  
3333 MENDOCINO AVE...  
SANTA ROSA, CA 975401  
415-391-7700  
DAVID McCLAIN

LAB SAMPLE NO.: 3804-2  
SAMPLE DESCRIPT.: "B" SITE, SCOTT CREEK  
SPRING AT M2I-11A  
DATE REPORTED: 7/24/89  
DATE SUBMITTED: 7/7/89  
DISCARD DATE: 9/7/89  
COLLECTED BY: CLIENT

ANALYSIS METHOD NUMBER	CONSTITUENT	SAMPLE CONC.*	METHOD DETECTION LIMIT	MAXIMUM ALLOWABLE CONC.	UNITS	PERCENT RECOVERY**
EPA 7060	Arsenic	N.D.	0.0015	0.05	mg/l	102%
EPA 7081	Barium	0.07	0.060	1.0	mg/l	99%
EPA 7131	Cadmium	N.D.	0.0006	0.010	mg/l	103%
EPA 7191	Chromium	N.D.	0.0006	0.05	mg/l	100%
EPA 340.2	Fluoride	0.04	0.010	1.8	mg/l	100%
EPA 7421	Lead	N.D.	0.0009	0.05	mg/l	101%
EPA 7470	Mercury	0.0004	0.0001	0.002	mg/l	93%
EPA 353.3	Nitrate	0.05	0.01	10	mg/l	104%
EPA 7740	Selenium	N.D.	0.002	0.01	mg/l	104%
EPA 7761	Silver	N.D.	0.0006	0.05	mg/l	98%

\*N.D. means "not detected."

\*\*All Percent Recovery values are within established control limits.

CENTURY TESTING LABORATORIES, INC.

Reviewed and approved by:

John H. Tillman, R.E.A.  
Manager Analytical Services

JHT/gs

**PROPRIETARY**

**LABORATORY ANALYSIS**

CALIFORNIA ENERGY CO.  
3333 MENDOCINO AVE.  
SANTA ROSA, CA 975401  
415-391-7700  
DAVID MCCLAIN

LAB. SAMPLE NO.: 3804-2  
SAMPLE DESCIP.: "B" SITE, SCOTT CREEK  
SPRING AT M2I-11A  
DATE REPORTED: 7/24/89  
DATE SUBMITTED: 7/7/89  
DISCARD DATE: 9/7/89  
COLLECTED BY: CLIENT

ANALYSIS METHOD NUMBER	CONSTITUENT	SAMPLE CONC.*	METHOD DETECTION LIMIT	MAXIMUM ALLOWABLE CONC.	UNITS	PERCENT RECOVERY**
SM 404A	Boron	0.35			mg/l	91%
SM 407A	Chloride	2.9	0.5	250	mg/l	109%
EPA 120.1	Conductivity	32.2			umhos/cm	
EPA 7210	Copper	N.D.	0.010	5	mg/l	101%
EPA 150.1	pH	6.54		6.0-9.0		
SM 273.1	Sodium	6.6			mg/l	103%
SM 426C	Sulfate	2.5	0.25	250	mg/l	103%
EPA 160.2	Total dissolved Solids	56		500	mg/l	

\*N.D. means "not detected."

\*\*All Percent Recovery values were within established control limits. *[Signature]*

CENTURY TESTING LABORATORIES, INC.

Reviewed and approved by:

*[Signature]*  
John H. Tillman, R.E.A.  
Manager Analytical Services

JHT/gs

# PROPRIETARY

## LABORATORY ANALYSIS

### EPA INORGANIC - DRINKING WATER

CALIFORNIA ENERGY CO.  
3333 MENDOCINO AVE.  
SANTA ROSA, CA 975401  
415-391-7700  
DAVID McCLAIN

LAB SAMPLE NO.: 3804-3  
SAMPLE DESCIP.: "C" SITE, SCOTT CREEK  
AT CON/MAREE & MIDDLE  
DATE REPORTED: 7/24/89  
DATE SUBMITTED: 7/7/89  
DISCARD DATE: 9/7/89  
COLLECTED BY: CLIENT

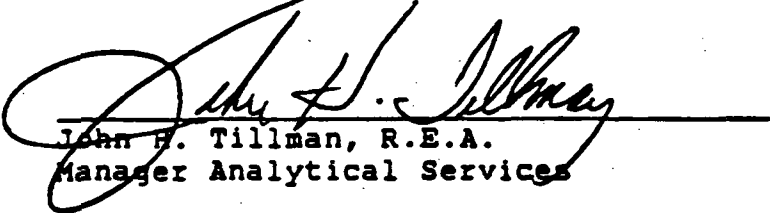
ANALYSIS METHOD NUMBER	CONSTITUENT	SAMPLE CONC.*	METHOD DETECTION LIMIT	MAXIMUM ALLOWABLE CONC.	UNITS	PERCENT RECOVERY**
EPA 7060	Arsenic	N.D.	0.0015	0.05	mg/l	102%
EPA 7081	Barium	N.D.	0.060	1.0	mg/l	99%
EPA 7131	Cadmium	N.D.	0.0006	0.010	mg/l	103%
EPA 7191	Chromium	N.D.	0.0006	0.05	mg/l	100%
EPA 340.2	Fluoride	0.03	0.010	1.8	mg/l	100%
EPA 7421	Lead	N.D.	0.0009	0.05	mg/l	101%
EPA 7470	Mercury	0.0004	0.0001	0.002	mg/l	93%
EPA 353.3	Nitrate	0.06	0.01	10	mg/l	104%
EPA 7740	Selenium	N.D.	0.002	0.01	mg/l	104%
EPA 7761	Silver	N.D.	0.0006	0.05	mg/l	98%

\*N.D. means "not detected."

\*\*All Percent Recovery values are within established control limits.

CENTURY TESTING LABORATORIES, INC.

Reviewed and approved by:

  
John H. Tillman, R.E.A.  
Manager Analytical Services

JHT/gs

**LABORATORY ANALYSIS**

CALIFORNIA ENERGY CO.  
3333 MENDOCINO AVE.  
SANTA ROSA, CA 975401  
415-391-7700  
DAVID McCLAIN

LAB SAMPLE NO.: 3804-3  
SAMPLE DESCIP.: "C" SITE, SCOTT CREEK  
AT CON/MAREE & MIDDLE  
DATE REPORTED: 7/24/89  
DATE SUBMITTED: 7/7/89  
DISCARD DATE: 9/7/89  
COLLECTED BY: CLIENT

ANALYSIS METHOD NUMBER	CONSTITUENT	SAMPLE CONC.*	METHOD DETECTION LIMIT	MAXIMUM ALLOWABLE CONC.	UNITS	PERCENT RECOVERY**
=====	=====	=====	=====	=====	=====	=====
SM 404A	Boron	0.63			mg/l	91%
SM 407A	Chloride	3.9	0.5	250	mg/l	109%
EPA 120.1	Conductivity	40.3			umhos/cm	
EPA 7210	Copper	0.007	0.010	5	mg/l	101%
EPA 150.1	pH	6.26		6.0-9.0		
SM 273.1	Sodium	1.6			mg/l	103%
SM 426C	Sulfate	3.0	0.25	250	mg/l	103%
EPA 160.2	Total dissolved Solids	23		500	mg/l	

\*N.D. means "not detected."

\*\*All Percent Recovery values were within established control limits. *[Signature]*

**CENTURY TESTING LABORATORIES, INC.**

Reviewed and approved by:

*[Signature]*  
John M. Tildman, R.E.A.  
Manager Analytical Services

JHT/gjs

**PROPRIETARY**

**LABORATORY ANALYSIS**

**EPA INORGANIC - DRINKING WATER**

CALIFORNIA ENERGY CO.  
3333 MENDOCINO AVE.  
SANTA ROSA, CA 975401  
415-391-7700  
DAVID McCLAIN

LAB SAMPLE NO.: 3804-4  
SAMPLE DESCIP.: "D" SITE, SCOTT CREEK  
AT CAMPGROUND  
DATE REPORTED: 7/24/89  
DATE SUBMITTED: 7/7/89  
DISCARD DATE: 9/7/89  
COLLECTED BY: CLIENT

ANALYSIS METHOD NUMBER	CONSTITUENT	SAMPLE CONC.*	METHOD DETECTION LIMIT	MAXIMUM ALLOWABLE CONC.	UNITS	PERCENT RECOVERY**
EPA 7060	Arsenic	N.D.	0.0015	0.05	mg/l	102%
EPA 7081	Barium	N.D.	0.060	1.0	mg/l	99%
EPA 7131	Cadmium	N.D.	0.0006	0.010	mg/l	103%
EPA 7191	Chromium	N.D.	0.0006	0.05	mg/l	100%
EPA 340.2	Fluoride	0.03	0.010	1.8	mg/l	100%
EPA 7421	Lead	N.D.	0.0009	0.05	mg/l	101%
EPA 7470	Mercury	0.005	0.0001	0.002	mg/l	93%
EPA 353.3	Nitrate	0.03	0.01	10	mg/l	104%
EPA 7740	Selenium	N.D.	0.002	0.01	mg/l	104%
EPA 7761	Silver	N.D.	0.0006	0.05	mg/l	98%

\*N.D. means "not detected."

\*\*All Percent Recovery values are within established control limits.

**CENTURY TESTING LABORATORIES, INC.**

Reviewed and approved by:

*John H. Tillman*  
John H. Tillman, R.E.A.  
Manager Analytical Services

JHT/gs

**PROPRIETARY**

**LABORATORY ANALYSIS**

CALIFORNIA ENERGY CO.  
3333 MENDOCINO AVE.  
SANTA ROSA, CA 975401  
415-391-7700  
DAVID McCLAIN

LAB SAMPLE NO.: 3804-4  
SAMPLE DESCIP.: "D" SITE, SCOTT CREEK  
AT CAMPGROUND  
DATE REPORTED: 7/24/89  
DATE SUBMITTED: 7/7/89  
DISCARD DATE: 9/7/89  
COLLECTED BY: CLIENT

ANALYSIS METHOD NUMBER	CONSTITUENT	SAMPLE CONC.*	METHOD DETECTION LIMIT	MAXIMUM ALLOWABLE CONC.	UNITS	PERCENT RECOVERY**
=====	=====	=====	=====	=====	=====	=====
SM 404A	Boron	0.35			mg/l	91%
SM 407A	Chloride	1.9	0.5	250	mg/l	109%
EPA 120.1	Conductivity	36.8			umhos/cm	
EPA 7210	Copper	0.001	0.010	5	mg/l	101%
EPA 150.1	pH	6.66		6.0-9.0		
SM 273.1	Sodium	4.2			mg/l	103%
SM 426C	Sulfate	2.5	0.25	250	mg/l	103%
EPA 160.2	Total dissolved Solids	119		500	mg/l	

\*N.D. means "not detected."

\*\*All Percent Recovery values were within established control limits.

CENTURY TESTING LABORATORIES, INC.

Reviewed and approved by:

*John H. Tillman*  
\_\_\_\_\_  
John H. Tillman, R.E.A.  
Manager Analytical Services

JHT/gjs

**ASW**  
engineering, inc.

**PROPRIETARY**

6415 S.W. Canyon Court • Suite 100 • Portland, Oregon 97221 • (503) 297-5676

October 29, 1986

California Energy Company  
Sun River Business Park  
P. O. Box 3399  
Sun River, Oregon 97702

Attention: Mr. David W. McClain

Subject: Sound level survey near Crater Lake

Gentlemen:

Enclosed is our report on the sound pressure level survey near Crater Lake prior to drilling operation and during drilling operation. We made ambient sound pressure level measurements in the field September 2nd through September 5th prior to commencement of drilling and October 15th and 16th during drilling operations.

Results of the study indicate that the levels at the park nearest the drilling site are not affected by the drilling operation. By listening carefully, you can detect the sound of the drilling operation, but it is of sufficiently low energy level that it does not add to the ambient level at the park boundary. We measured the park boundary levels at two sites which are approximately one half a mile away from the drilling operation site.

Since snow conditions did not allow us to make measurements at the Lost Creek and Mount Scott sites, we measured the octave band levels at the site and then calculated the sound pressure level as a function of distance from the drill site. Our calculations would indicate that for the maximum level that we observed during the drilling operation that California Energy could be within two hundred feet of the park boundary and not exceed the 65 dB-A maximum level that is required by the National Park Regulation.

We have also measured the sound pressure level approximately one thousand feet from the drill site, and found it to be less than 40 dB-A while drilling. A sound pressure level of 40 dB-A or less is judged to be a quiet environment. To obtain a sound pressure level of 40 dB-A or less the



California Energy Company  
Page 2  
October 29, 1986

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drilling would have to be at least one thousand feet from sensitive areas. Note that birds and insects create a sound pressure level of more than 40 dB-A when they are in the vicinity.

We have enclosed a draft copy of our report. Please send us your comments and then we will finalize it.

If you have any further questions, please contact us.

Very truly yours,



Harry C. Reeder, P.E.

HCR:mc  
Enclosure

PROPRIETARY

REPORT OF SOUND LEVEL SURVEY

NEAR CRATER LAKE

FOR CALIFORNIA ENERGY COMPANY

I. PURPOSE

The purpose of this study was to determine the sound pressure levels (SPL) before and during drilling operations near the Crater Lake National Park, to determine if the Park regulations were met during the drilling operations and to indicate the impact of drilling in this forest area near Crater Lake National Park.

II. LOCATIONS WHERE MEASUREMENTS WERE TAKEN

There were four locations identified to measure sound pressure levels prior to drilling and during drilling. These locations are as follows:

- A. The drilling Site (DS)
- B. Mount Scott Site (MS)
- C. Lost Creek campground Site (LC)
- D. Crater Lake National Park boundary Site (BS)

In addition to these sites, SPL were measured at the intersection of forest road 190 and 2308. Also measurements were made at two sites on the Crater Lake National Park Boundary, which was approximately one half mile from the drill site.

During the drilling operation, because of snow at the higher elevations, we were only able to take SPL readings at the drill site, at two locations at the Crater Lake National Park boundary and the intersection of Road 190 and 2308. The drill site measurements were made 50 feet from the engine driving the drill head and 81 feet from the engine-generator set. This location was between the drilling equipment and the park boundary and intersection of 190 and 2308 sites.

III. INSTRUMENTATION USED

Measuring equipment was as follows:

Handheld Equipment

Precision sound level meter	:	Quest model 155 (serial number D1 3070023) w/model OB145 Octave Band Filter (Serial number DM 3070017)
Calibrator	:	Quest model CA-22 (Serial number J 3060017)
Microphone	:	ACD model 7046 (serial number B219)

# PROPRIETARY

## Strip Chart Equipment

Precision sound  
level meter : B&K type 2203 (serial number 274951)  
Recorder : B&K type 2306 (serial number 569280)  
Calibrator : B&K type 4230 (serial number 282287)  
Microphone : B&K type 4165 (serial number 708607)

## IV. DATA ACQUISITION METHODOLOGY

Prior to the drilling commencing all data were obtained using handheld equipment and recording the sound pressure levels manually. Whenever the SPL was below 28 dB-A, octave band SPL was measured and then the dB-A calculated from the octave band data. During the drilling operations the strip chart equipment was placed at the drill site and run continuously for five hours. At the same time data was taken at the two Crater Lake National Park boundary locations and the intersection of 190 and 2308. Later, the strip chart at the drilling site was only run for a short period of time while we were taking data at the two boundary sites.

## V. RESULTS

The data indicates that prior to drilling the ambient SPL at all the sites was generally between 20 and 30 dB-A at all of the periods of times monitored. There were occasions when outside sources caused the levels to increase above 30 dB-A. Some of these sources were aircraft, insects and birds. Commercial aircraft flying at altitude over the locations would increase the level up to as high as 40 dB-A. Insects and birds in the vicinity of the microphone could cause the levels to go as high as 51 dB-A but in the absence of any identifiable outside sources, the SPL was between 20 and 30 dB-A, which is typical expected SPL for a rural area. During the drilling the SPL at the drill site was between 72 and 81 dB-A. Without any other sources at the drill site other than the drilling equipment operating, the SPL was measured to be between 70 and 81 dB-A. These limits were not exceeded. The drilling equipment SPL were near constant and repeatable. There was a vehicle used to bring water to the drill site and upon actuation of the air brakes, there were temporary spikes up to 86 dB-A. These were infrequent, and depended upon the amount of braking and the activity of the truck used to deliver water.

Prior to drilling, at the intersection of Road 190 and 2308, measured SPLs were generally between 20 and 30 dB-A, but one measurement during a commercial aircraft flyover was measured at 38 dB-A. A measurement at the same location during drilling produced SPL of 37 dB-A. At the Park boundary the SPL measured were the same as prior to drilling. R&W Engineering observed the BLM measurements at the Park boundary where, in the absence of other sources but during drilling, the SPL was 28 dB-A.

## VI. DISCUSSION

The ambient SPLs at all locations prior to drilling were between 20 and 30 dB-A without specific other sound sources, such as birds, insects, wind in the trees, high flying commercial aircraft and low flying general aviation aircraft. These sources would raise the level to as high as 51 dB-

# PROPRIETARY

A, but they were only short lived generally and infrequent. The most frequent outside source of SPL were the commercial aircraft overhead, and these could raise the level as much as 15 to 20 dB-A.

During the drilling operation the SPLs at the drill site were measured between 72 and 81 DB-A unless there was activity by a truck delivering water to the drill site. The maximum SPL from the drilling operation that was measured during a 22 hour period was 81 DB-A. Higher momentary spikes were observed whenever the water truck was operating near the sound measuring equipment. The variation at the drill site was caused by the engine driving the drill rig at different power settings during operations of changing core drilling rod or other operational periods when full power of that engine was not required it was throttled back to an idle position which resulted in the lower SPL of 72 dB-A. The engine generator set was operating at the same power level regardless of the operation of the drill. This established the minimum SPL of 72 dB-A. The engine generator set operated at the same power setting all the time during the time period we were there making measurements.

The noise levels measured at the two Crater Lake National Park boundaries at one site was 27 dB-A, which agreed closely with Bureau of Land Management's measurements of 28 dB-A. We observed their data, and without any external sources other than the drilling operation going on, that is insects, birds, motor vehicles operating on Road 2308, commercial aircraft or general aviation aircraft in the vicinity causing increased readings in the ambient, they measured 28 DB-A. Our measurements agree with their measurements closely, and also agree with the measurements made prior to any drilling operation.

At the other boundary site the measurements made during drilling operation were 2 to 3 DBa higher than those measured prior to the drilling operation. The measurements made prior to the drilling operation were made during the dry season, and there was no water flowing in the stream bed. During the drilling operation, water was flowing in the stream bed and was definitely measurable and did add to the SPL. It was very noticeable. At both boundary sites, if you listen very carefully, you could detect the SPL generated by the drilling operation, but it did not increase the ambient level readings.

Octave band data at the drilling site was obtained so that the levels that could be expected at various distances could be predicted. From this octave band data and knowing the terrain, and the distances to other locations, we predicted the SPL from the drilling operation. It was calculated that the SPL caused by the drilling operation would not propagate to the Lost Creek area and that it would be undetectable at the Mount Scott area. The Mount Scott location is a vertical elevation difference and therefore the sound propagates out of the forest area and is not attenuated by the vegetation and the trees. The forest does attenuate the sound as it propagates from the drill site to the Park boundary and Lost Creek locations. The forest attenuates the sound at a fairly rapid rate of approximately 3 dB-A per 100 feet. The measurement at the intersection of the Road 190 and 2308 was made during the drilling operation at a time when 81 was being recorded at the drill site, and this was measured at 37 dB-A. We estimated that the path of the SPL from the drill site was through

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approximately four to five hundred feet of trees then down the roadway of 2308. With 81 dB-A at the drill site, our calculations indicate that the noise level at the intersection site would be 39 dB-A with four hundred feet of forest and 34 dB-A with five hundred feet of forest. The measurement agrees with the calculation that we have done.

It was calculated that to meet the Park regulations of 65 dB-A the drilling could take place within two hundred feet of the boundary. If the sound path is forested the distance between the drilling operation and the location of a 30 dB-A SPL result would be 850 feet. If there are no trees between the drilling location and the receiving location, to obtain a SPL of 30 dB-A a distance of 4,200 feet is required. All of these predicted SPL are based upon an 81 dB-A level at the drill site location and the octave band distribution as measured.

## VII. CONCLUSIONS

Based upon a maximum SPL of 81 dB-A and an energy distribution that was measured, we conclude that:

1. The SPLs at the Crater Lake National Park boundary, at Lost Creek and at Mount Scott are not influenced by the current drilling operation.
2. The SPL at a distance of one thousand feet from the drill site will be less than 40 dB-A if the ambient is less than 35 at that location prior to drilling operation.
3. The National Park limit of 65 dB-A can be met at all times if the drilling site is no closer than two hundred feet regardless of the sound path.
4. The drilling operation should have no impact on any activity occurring more than one thousand feet from the site since the SPL would be below 40 dB-A. The SPL at all sites 1,000 feet or more from the drill are quiet and should not interfere with any activities occurring in that area.

**PROPRIETARY**  
**R&W**  
**engineering, inc.**

RECEIVED

DEC 8 1986

CECL

6415 S.W. Canyon Court • Suite 100 • Portland, Oregon 97221 • (503) 297-5676

December 4, 1986

Project #154.01

California Energy Company  
3333 Mendocino Avenue  
Santa Rosa, CA 95401

Attention: Mr. David W. McClain

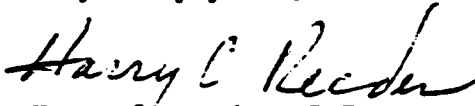
Subject: Crater Lake Sound Level Survey

Dear David:

Enclosed is the final report on the sound level survey for MZI-11A with revisions made as you suggested.

We had to sign an agreement with the Park Service that we would give them any measurements we took within the Park boundaries. We will not do this until they request this information, and we will inform you prior to sending the information to them.

Very truly yours,

  
Harry C. Reeder, P.E.

HCR:mc  
Enclosure

PROPRIETARY

CRATER LAKE SOUND LEVEL SURVEY

FOR

CALIFORNIA ENERGY COMPANY

PREPARED BY

R & W ENGINEERING, INC.

6415 S.W. CANYON COURT, SUITE 100

PORTLAND, OREGON 97221

(503) 297-5676



PROPRIETARY

REPORT OF SOUND LEVEL SURVEY

NEAR CRATER LAKE

FOR CALIFORNIA ENERGY COMPANY

I. PURPOSE

The purpose of this study was to determine the sound pressure levels (SPL) before and during drilling operations near the Crater Lake National Park, to determine if the Park regulations were met during the drilling operations and to indicate the impact of drilling in this forest area near Crater Lake National Park.

II. LOCATIONS WHERE MEASUREMENTS WERE TAKEN

There were four locations identified to measure sound pressure levels prior to drilling and during drilling. These locations are as follows:

- A. The drilling Site (DS)
- B. Mount Scott Site (MS)
- C. Lost Creek campground Site (LC)
- D. Crater Lake National Park boundary Site (BS)

In addition to these sites, SPL were measured at the intersection of forest road 190 and 2308. Also measurements were made at two sites on the Crater Lake National Park Boundary, which was approximately one half mile from the drill site.

During the drilling operation, because of snow at the higher elevations, we were only able to take SPL readings at the drill site, at two locations at the Crater Lake National Park boundary and the intersection of Road 190 and 2308. The drill site measurements were made 50 feet from the engine driving the drill head and 81 feet from the engine-generator set. This location was between the drilling equipment and the park boundary and intersection of 190 and 2308 sites.

III. INSTRUMENTATION USED

Measuring equipment was as follows:

Handheld Equipment

Precision sound level meter	:	Quest model 155 (serial number D1 3070023) w/model OB145 Octave Band Filter (Serial number DM 3070017)
Calibrator	:	Quest model CA-22 (Serial number J 3060017)
Microphone	:	ACO model 7046 (serial number 8219)



PROPRIETARY

#### Strip Chart Equipment

Precision sound  
level meter : B&K type 2203 (serial number 274951)  
Recorder : B&K type 2306 (serial number 569280)  
Calibrator : B&K type 4230 (serial number 282287)  
Microphone : B&K type 4165 (serial number 708607)

#### IV. DATA ACQUISITION METHODOLOGY

Prior to the drilling commencing all data were obtained using handheld equipment and recording the sound pressure levels manually. Whenever the SPL was below 28 dB-A, octave band SPL was measured and then the dB-A calculated from the octave band data. During the drilling operations the strip chart equipment was placed at the drill site and run continuously for five hours. At the same time data was taken at the two Crater Lake National Park boundary locations and the intersection of 190 and 2308. Later, the strip chart at the drilling site was only run for a short period of time while we were taking data at the two boundary sites.

#### V. RESULTS

The data indicates that prior to drilling and without discreet insect, bird or aircraft noise the ambient SPL at all the sites was generally between 20 and 30 dB-A at all of the periods of times monitored. There were occasions when other identifiable sources caused the levels to increase above 30 dB-A. Some of these sources were aircraft, insects and birds. Commercial aircraft flying at altitude over the locations would increase the level up to as high as 40 dB-A. Insects and birds in the vicinity of the microphone could cause the levels to go as high as 51 dB-A but in the absence of any identifiable outside sources, the SPL was between 20 and 30 dB-A, which is typical expected SPL for a rural area. During the drilling the SPL at the drill site was between 72 and 81 dB-A without any other sources at the drill site other than the drilling equipment operating. These limits were not exceeded. The drilling equipment SPL were near constant and repeatable. There was a vehicle used to bring water to the drill site and upon actuation of the air brakes, there were temporary spikes up to 86 dB-A. These were infrequent, and depended upon the amount of braking and the activity of the truck used to deliver water.

Prior to drilling, at the intersection of Road 190 and 2308, measured SPLs were generally between 20 and 30 dB-A, but one measurement during a commercial aircraft flyover was measured at 38 dB-A. A measurement at the same location during drilling produced SPL of 37 dB-A. At the Park boundary the SPL measured were the same as prior to drilling. R&W Engineering observed the BLM measurements at the Park boundary where, in the absence of other sources but during drilling, the SPL was 28 dB-A.

For the location of measurements refer to Figure 1 and for the SPL measured at these locations and the date of measurements refer to Table 1. No data was taken at Lost Creek and Mount Scott sites during drilling.

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## VI. DISCUSSION

The ambient SPLs at all locations prior to drilling were between 20 and 30 dB-A without specific other sound sources, such as birds, insects, wind in the trees, high flying commercial aircraft and low flying general aviation aircraft. These sources would raise the level to as high as 51 dB-A, but they were only short lived generally and infrequent. The most frequent outside source of SPL were the commercial aircraft overhead, and these could raise the level as much as 15 to 20 dB-A.

During the drilling operation the SPLs at the drill site were measured between 72 and 81 dB-A unless there was activity by a truck delivering water to the drill site. The maximum SPL from the drilling operation that was measured during a 22 hour period was 81 dB-A. Higher momentary spikes were observed whenever the water truck was operating near the sound measuring equipment. The variation at the drill site was caused by the engine driving the drill rig at different power settings during operations of changing core drilling rod or other operational periods when full power of that engine was not required it was throttled back to an idle position which resulted in the lower SPL of 72 dB-A. The engine generator set was operating at the same power level regardless of the operation of the drill. This established the minimum SPL of 72 dB-A. The engine generator set operated at the same power setting all the time during the time period we were there making measurements.

The noise levels measured at the two Crater Lake National Park boundaries at one site was 27 dB-A, which agreed closely with Bureau of Land Management's measurements of 28 dB-A. We observed their data, and without any external sources other than the drilling operation going on, that is insects, birds, motor vehicles operating on Road 2308, commercial aircraft or general aviation aircraft in the vicinity causing increased readings in the ambient, they measured 28 dB-A. Our measurements agree with their measurements closely, and also agree with the measurements made prior to any drilling operation.

At the other boundary site the measurements made during drilling operation were 2 to 3 dB-A higher than those measured prior to the drilling operation. The measurements made prior to the drilling operation were made during the dry season, and there was no water flowing in the stream bed. During the drilling operation, water was flowing in the stream bed and was definitely measurable and did add to the SPL. It was very noticeable. At both boundary sites, if you listen very carefully, you could detect the SPL generated by the drilling operation, but it did not increase the ambient level readings.

Octave band data at the drilling site was obtained so that the levels that could be expected at various distances could be predicted. From this octave band data and knowing the terrain, and the distances to other locations, we predicted the SPL from the drilling operation. It was calculated that the SPL caused by the drilling operation would not propagate to the Lost Creek area and that it would be undetectable at the Mount Scott area. The Mount Scott location is a vertical elevation difference and therefore the sound propagates out of the forest area and is not attenuated by the vegetation and the trees. The forest does attenuate the sound as it

# PROPRIETARY

propagates from the drill site to the Park boundary and Lost Creek locations. The forest attenuates the sound at a fairly rapid rate of approximately 3 dB-A per 100 feet. The measurement at the intersection of the Road 190 and 2308 was made during the drilling operation at a time when 81 was being recorded at the drill site, and this was measured at 37 dB-A. We estimated that the path of the SPL from the drill site was through approximately four to five hundred feet of trees then down the roadway of 2308. With 81 dB-A at the drill site, our calculations indicate that the noise level at the intersection site would be 39 dB-A with four hundred feet of forest and 34 dB-A with five hundred feet of forest. The measurement agrees with the calculation that we have done.

It was calculated that to meet the Park regulations of 65 dB-A the drilling could take place within two hundred feet of the boundary. If the sound path is forested the distance between the drilling operation and the location of a 30 dB-A SPL result would be 850 feet. If there are no trees between the drilling location and the receiving location, to obtain a SPL of 30 dB-A a distance of 4,200 feet is required. All of these predicted SPL are based upon an 81 dB-A level at the drill site location and the octave band distribution as measured.

## VII. CONCLUSIONS

Based upon a maximum SPL of 81 dB-A and an energy distribution that was measured, we conclude that:

1. The SPLs at the Crater Lake National Park boundary, at Lost Creek and at Mount Scott are not influenced by the current drilling operation.
2. The SPL at a distance of one thousand feet from the drill site will be less than 40 dB-A if the ambient is less than 35 at that location prior to drilling operation.
3. The National Park limit of 65 dB-A can be met at all times if the drilling site is no closer than two hundred feet regardless of the sound path.
4. The drilling operation should have no impact on any activity occurring more than one thousand feet from the site since the SPL would be below 40 dB-A. The SPL at all sites 1,000 feet or more from the drill are quiet and should not interfere with any activities occurring in that area.

CALIFORNIA ENERGY CO.

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JOB # 154.01

FIG. NO. 1

(A) - TEST LOCATION

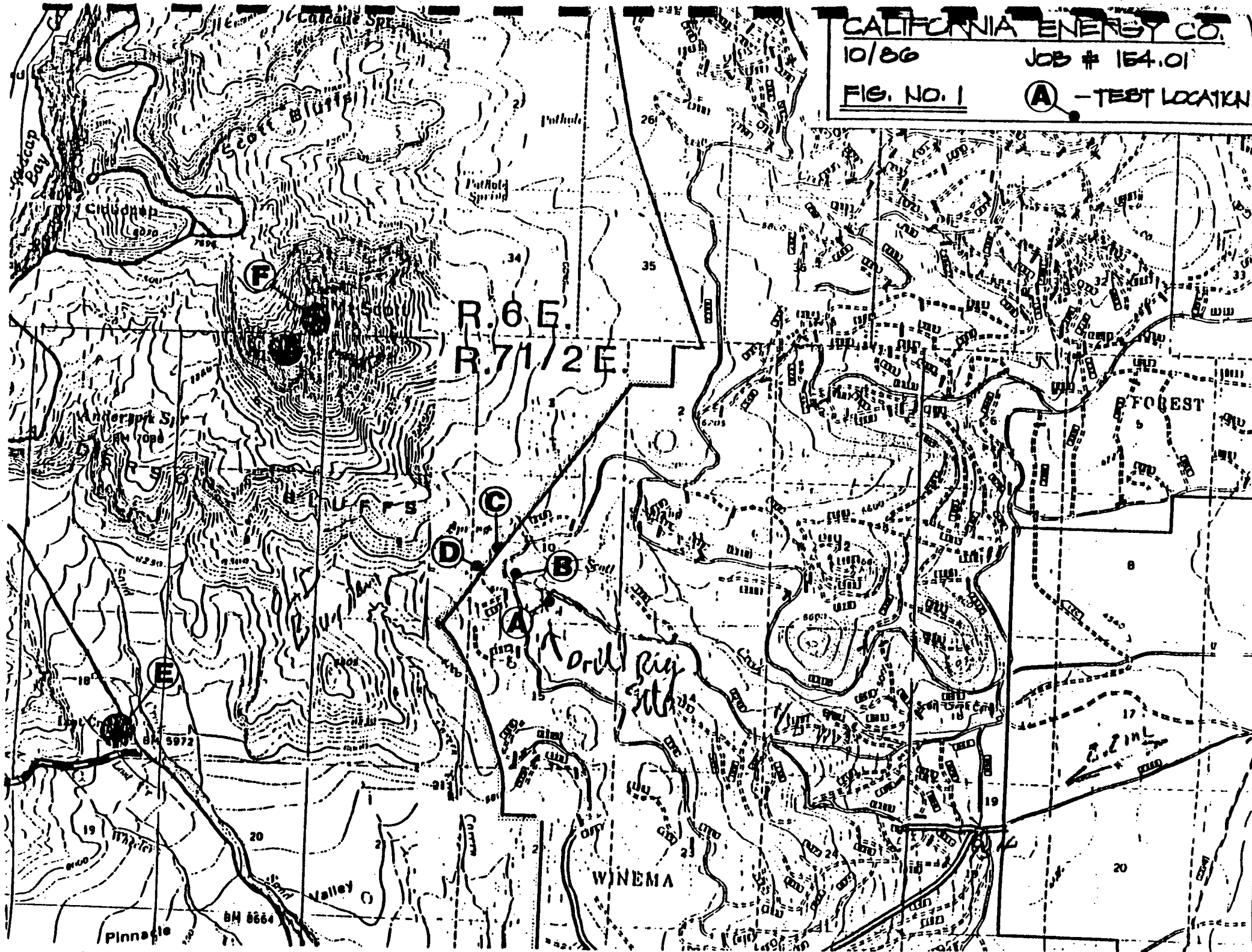


TABLE 1

SITE		DATA RECORDING Sound Pressure Level in dB-A				
*Designation	Description	Date	Range prior to drilling	Range during drilling	Median prior to drilling	Median during drilling
A	Drill Site	8/28 10/15, 10/16	27 to 46	72 to 86	38	77
B	Junction of 2308 & 190	8/28, 10/16	27 to 46	37	38	37
C	Near creek at Park Boundry (1/2 mile from drill site)	8/28 10/15, 10/16	29 to 39	30 to 51	31	33
D	Due west of drill site at Park boundry (1/2 mile from drill site)	8/28, 10/16	22 to 41	27 to 28	28	28
E	Lost Creek camp ground	8/27	30 to 63	None	33	None
F	Top of Mount Scott near lookout tower	8/26	25 to 52	None	28	None

\*See Figure 1 for location on map.

PROPRIETARY



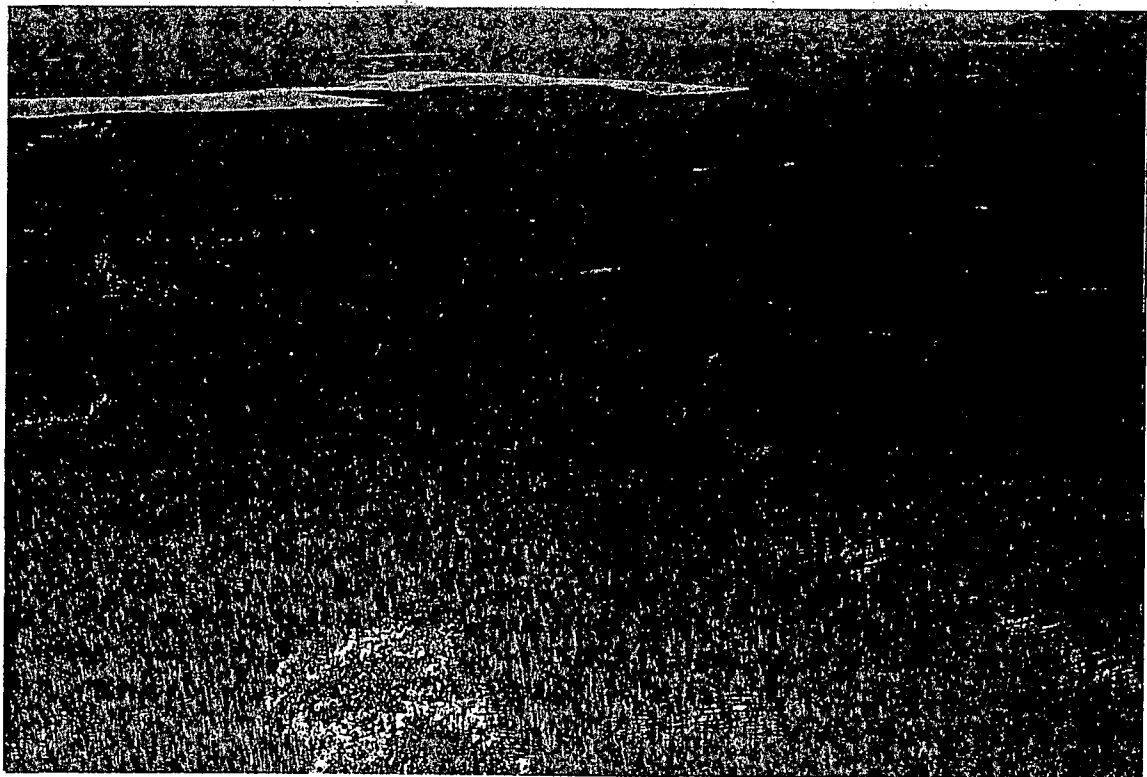
PREDRILL VISITATION OF SEVERAL SITES  
USFS, BLM, USGS, STATE LANDS, DOGAMI



MZI-11A SITE - PRE CONSTRUCTION  
GROUND DISTURBANCE BY EARLIER COMMERCIAL  
TIMBER HARVEST



MZI-11A DRILLING SURFACE HOLE, SEPT 1986



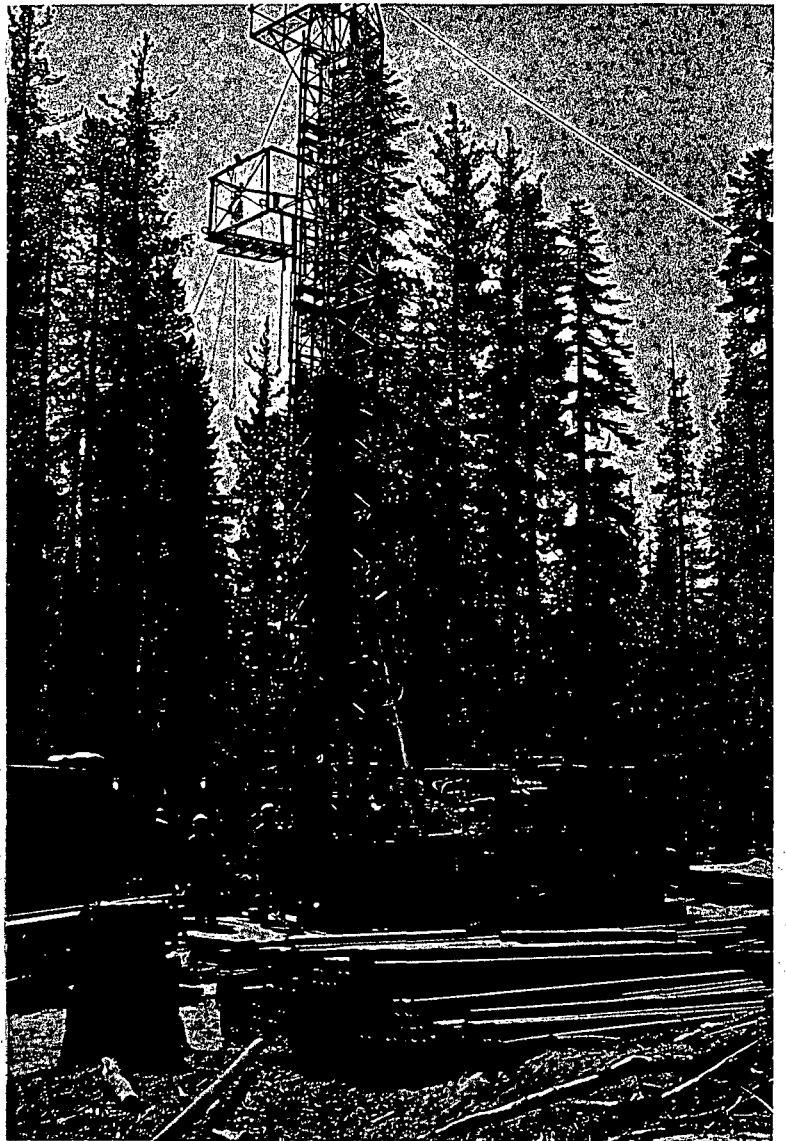
VIEW OF MZI-11A DRILLING IN PROGRESS  
TAKEN FROM TOP OF MOUNT SCOTT, CRATER LAKE  
NATIONAL PARK

MZI-11A DURING  
CORE DRILLING





MAI-11A DURING  
CORE DRILLING



BLM AND NPS INSPECTION  
OF SUMPS AND CORE DRILLING  
WATER





MZI-11A SITE MAY 1, 1990: DRILLING COMPLETED  
PRE PLUG AND ABANDON - PRE SITE RESTORATION



SITE INSPECTION BY BLM MAY 1, 1990