



T. D. Autry
Division Production Manager

Amoco Production Company

Southern Division
1670 Broadway
P.O. Box 800
Denver, Colorado 80201
303-830-4040

January 9, 1991

New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, NM 87504

File: KJK - 54 - WF

E. E. Elliott SWD No. 1
Formation Water Analysis
NW/4, Section

RECEIVED

JAN 14 1991

OIL CON. DIV.
DIST. 3

Per Administrative Order SWD No. 376, stating that prior to commencing injection operations into said well, the operator shall obtain a formation water sample from the Morrison, Bluff and Entrada formations and shall have said samples analyzed, with the results sent to the Santa Fe office of the Division, find attached water analyses for the subject formations.

The samples were taken while swabbing immediately following perforating and prior to fracture stimulation. The water analyses from the Morrison and Bluff formations showed a total dissolved solids (TDS) level of 24,600 and 35,000 parts per million (ppm). These analyses compare favorably with a water analysis for the Morrison formation from Northeast Blanco Unit NEBU No. 501 which shows a TDS level of 35,100 ppm.

The sample from the Entrada formation showed a TDS level of only 8,800 ppm. We believe the Entrada sample is not representative of the formation water. An Entrada water analysis from the NEBU No. 501 shows 19,000 ppm TDS. Amoco's Entrada formation sample was heavily discolored and required dilution prior to analysis to obtain cation and anion levels. As a result the analysis is showing a total dissolved solids level much lower than expected. We believe the water discoloration was due to the significant lost circulation problems encountered in the Entrada and the mud materials pumped and circulated during drilling to alleviate lost circulation. After perforating and prior to fracture stimulation the Entrada formation was swabbed 5 days and 172 barrels of water recovered. Unfortunately all the recovered water was highly discolored. After the 5 days of swabbing Amoco proceeded with the fracture stimulation.

Should you have any questions please contact Brooke Bell at (303) 830-5341 in Denver.

Sincerely,

T. O. Astry /kjk

Attachments

cc: New Mexico Oil Conservation Division w/ attachments
1000 Rio Brazos Road
Aztec, NM 87410
Attention: Ernie Bush

Buddy Shaw - San Juan Operation Center w/ attachments
J. W. Hawkins - Building w/ attachments

API WATER ANALYSIS REPORT FORM

Laboratory No. 25-901231-2A

Company AMOCO		Sample No.		Date Sampled 11/1	
Field		Legal Description		County or Parish	
Lease or Unit ELLISIT		Well SWD #1	Depth	Formation Morrison	Water, B/D
Type of Water (Produced, Supply, etc.)		Sampling Point After Perforating Swab		Sampled By	

DISSOLVED SOLIDS

CATIONS	mg/l	me/l	pH
Sodium, Na (calc.)	9149	397.8	6.37
Calcium, Ca	3260	16.3	1000
Magnesium, Mg	32	3.1	0.35
Barium, Ba			

ANIONS

Chloride, Cl	1370	374
Sulfate, So ₄	1052	21.9
Carbonate, CO ₃	81	1.3
Bicarbonate, HCO ₃		

Total Dissolved Solids (calc.)

24614

Iron, Fe (total)
Sulfide, as H₂S

REMARKS & RECOMMENDATIONS:

ATTN: Jim Browne
326-9220

Brown Bear

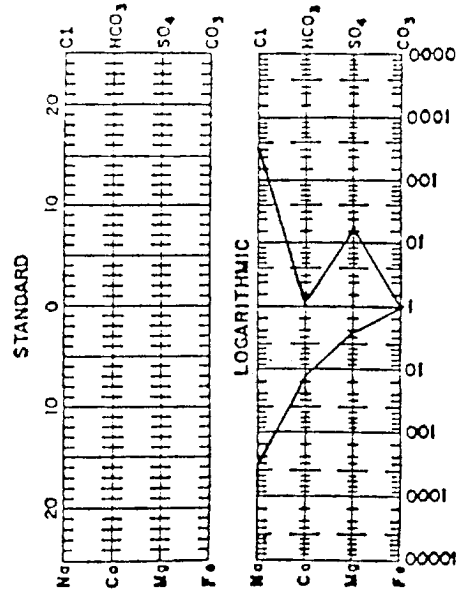
Date Received 12-31-90	Preserved	Date Analyzed 12-31-90	Analyzed By
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TECH, Inc.
333 East Main
Farmington
New Mexico
87401
505/327-3311

Post-It™ brand fax transmittal memo 7671		* of pages * 1	
To J. Browne	From ML	Co. Amoco	Dept. 1000

WATER PATTERNS — me/l



API WATER ANALYSIS REPORT FORM

Laboratory No. 25-901127-1A

Company AMOCO PRODUCTION CO.		Sample No.		Date Sampled	
Field		Legal Description		County or Parish	
Lease or Unit E.E. ELIST		Well SWD #1	Depth	Formation Bluff	Water, B/D
Type of Water (Produce, J. Supply, etc.) PRODUCED		Sampling Point Swab after perforating		Sampled By	

TECH, Inc.
333 East Main
Farmingington
New Mexico
87401
505/327-3311

DISSOLVED SOLIDS

CATIONS	mg/l	me/l
Sodium, Na (calc.)	<u>12827</u>	<u>557.7</u>
Calcium, Ca	<u>581</u>	<u>29.0</u>
Magnesium, Mg	<u>109</u>	<u>9.0</u>
Barium, Ba		

OTHER PROPERTIES

pH	<u>6.77</u>
Specific Gravity, 60/60 F.	<u>1.025</u>
Resistivity (ohm-meters) <u>62.6F.</u>	<u>0.48</u>

WATER PATTERNS — me/l

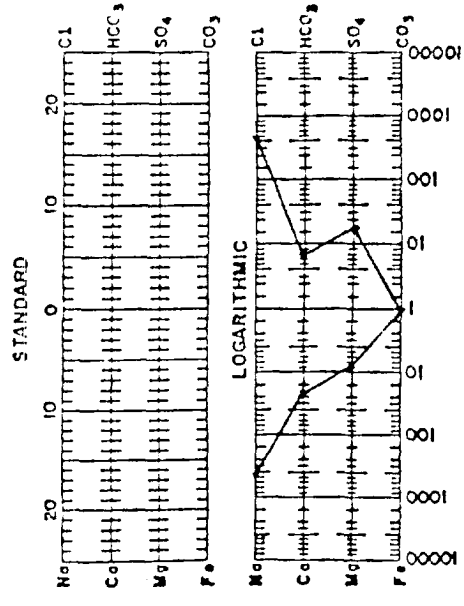
ANIONS

Chloride, Cl	<u>20167</u>	<u>567.2</u>
Sulfate, SO ₄	<u>1010</u>	<u>21.0</u>
Carbonate, CO ₃		
Bicarbonate, HCO ₃	<u>459</u>	<u>7.5</u>

Total Dissolved Solids (calc.)

35093

Iron, Fe (total)
Sulfide, as H₂S



REMARKS & RECOMMENDATIONS:

Attn: Terry Crews

FAX: 303-247-6825

Date Received <u>11-27-90</u>	Preserved	Date Analyzed <u>11-27-90</u>	Analyzed By <u>AL</u>
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API WATER ANALYSIS REPORT FORM

Laboratory No. 25-901119-5A

Company Amoco		Sample No.		Date Sampled	
Field		Legal Description		County or Parish	
Lease or Unit		Well E.E. Elliot SWD #1	Depth	Formation Entrada	Water, B/D
Type of Water (Produced, Supply, etc.)		Sampling Point Swabbing after perforation		Sampled By	

DISSOLVED SOLIDS

CATIONS	mg/l	me/l	pH
Sodium, Na (calc.)	3022	131.41	
Calcium, Ca	110	5.5	
Magnesium, Mg	9	0.75	
Barium, Ba			

ANIONS

Chloride, Cl	3455	97.47	
Sulfate, So ₄	905	18.94	
Carbonate, CO ₃			
Bicarbonate, HCO ₃	1396	20.25	

Total Dissolved Solids (calc.)

2201
193

Iron, Fe (total)
Sulfide, as H₂S

REMARKS & RECOMMENDATIONS:

SAMPLED FOR ANALYSIS

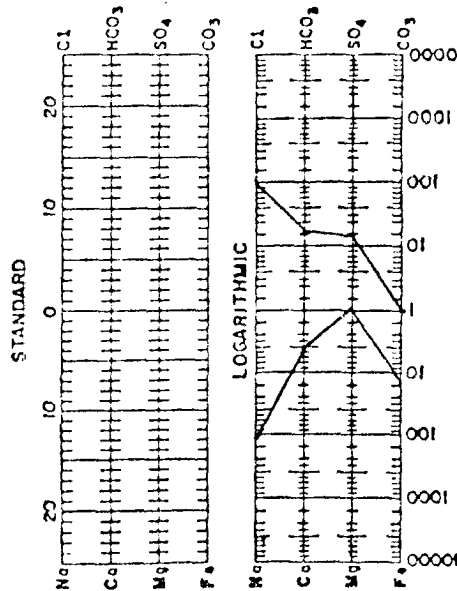
Date Received 19th Nov, 1990.	Preserved	Date Analyzed 20th Nov, 1990.	Analyzed By R. H.
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TECH, Inc.
333 East Main
Farmington
New Mexico
87401
505/327-3311

Post-It® brand fax transmittal memo 7671		To John Sullivan	Co. Amoco	Dept.	Fax # 503 247 6825
# of pages 2		From M. Kane	Phone #		

WATER PATTERNS — me/l



75 SUITE STREET
PO BOX 2605
DURANGO, CO 81302
(303) 247-4220

ATTEN: L CLARK
PO BOX 1237
DURANGO, CO 81302
(303) 247-0728

DATE SAMPLED: 8/2/88
WELL NAME: NEBU UNIT 501
LOCATION:
FORMATION: MORRISON PERFS.
SAMPLED FROM:
WELL ON/OFF:

CDS ID #: 1120

CONSTITUENT		ppm	epa	
Sodium	Na +	10600	461.1	Item 3A
Potassium	K +	1810	46.3	SWD-339
Calcium	Ca ++	685	34.2	
Magnesium	Mg ++	65.9	5.4	
Iron Total	Fe++ & Fe+++	230	12.4	

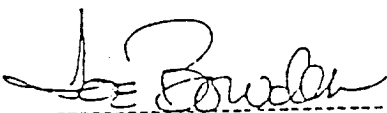
POSITIVE SUB-TOTAL 13390.9 557.3565

Chloride	Cl -	18200	513.2
Carbonate	CO3 =	0	0.0
Bicarbonate	HCO3-	537	8.8
Hydroxide	OH -	0	0.0
Sulfate	SO4 =	1750	36.4

NEGATIVE SUB-TOTAL 20487 558.47643

Total Dissolved Solids 35100 ppm
pH 6.71 units
Specific Gravity 1.023 @ 73 F.
Resistivity 24 ohm-cm

APPROVED BY:



DR. JOE BOWDEN, DIRECTOR

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Results are based on analysis made at the time samples are received at the laboratory.

75 SUTILE STREET

ATTEN: L. CLARK

DATE SAMPLED: 8/1/88

ATTACHMENT VII 5.

PO BOX 2605

PO BOX 1237

WELL NAME: NEBU UNIT 501

DURANGO, CO 81302

DURANGO, CO 81302

LOCATION:

(303) 247-4220

(303) 247-0728

FORMATION: ENTRADA WATER

SAMPLED FROM:

CDS ID #: 1119

WELL ON/OFF:

CONSTITUENT	ppm	epm
Sodium Na +	4760	207.1
Potassium K +	169	4.3
Calcium Ca ++	1310	65.4
Magnesium Mg ++	29.4	2.4
Iron Total Fe++ & Fe+++	164	8.8

Item 2A
SWD-339

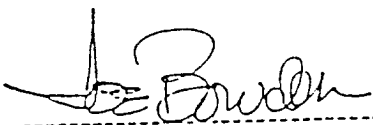
POSITIVE SUB-TOTAL 6432.4 287.9779

Chloride Cl -	8280	233.5
Carbonate CO3 =	0	0.0
Bicarbonate HCO3-	152	2.5
Hydroxide OH -	0	0.0
Sulfate SO4 =	2100	43.7

NEGATIVE SUB-TOTAL 10532 279.70928

Total Dissolved Solids 19000 ppm.
pH 5.07 units
Specific Gravity 1.01 @ 73 F.
Resistivity 45 ohm-cm

APPROVED BY:



DR. JOE BOWDEN, DIRECTOR

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