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REPORTS

DATE:
1990 - 1989

GROUNDWATER CONTAMINATION STUDY

Texaco CVU WSW #3

Vacuum Field, Buckeye

Lea County, New Mexico

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Hobbs, New Mexico
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TEXACO CVU #3 WATER STUDY

On Tuesday, October 17, 1989, Texaco Production Supervisor for the Buckeye, New Mexico area were alerted to possible groundwater contamination. This problem was discovered as a result of elevated chlorides on their Central Vacuum Unit Water Supply Well #3.

The finding of the well occurred as a result of regularly scheduled testing of all fresh water wells in the Vacuum Field. The New Mexico Oil Conservation Division was notified immediately of these findings, as were other waterflood operators in the Vacuum Field.

The OCD initiated the groundwork for solving this problem. A thorough Bradenhead Survey was conducted on all producing and injection wells within a half mile radius of the contaminated water well CVU #3. The results of the survey provided no clues as to the source of contamination.

Secondly, a map was constructed of the area showing all flowline and gathering system lines in the area and a physical inspection was made to check for leaks; none were found.

Thirdly, a trench and ditch line were constructed along the CVU #3 water line and around the well site area to check for intrusion from surface area; nothing was found.

With all the basic groundwork completed to no avail, a meeting was held on Friday, October 20, with Eddie Seay, Field Representative Supervisor for NMOCD and Jerry Sexton, District Supervisor-OCD, Texaco Superintendent Wayne Minchew, Texaco Engineer Russell Pool and Texaco's Environmental Affairs person Robert Browning in attendance, to discuss where to go from there. It was decided and agreed upon that Texaco would begin drilling monitor wells around the contaminated site in hopes of pinpointing the direction and source of the contamination. The drilling and study of the area will be a cooperative effort between OCD and Texaco personnel, with decisions agreed upon by both. It also was decided to shut in surrounding water supply wells to prevent the drawing or movement of the contaminant. The volume of CVU #3 was increased to 10,000 BPD to help keep the contaminant confined to one area. Daily testing of the water well will continue throughout this project.

SITE EVALUATION AND DESCRIPTION

The contamination site is located in Buckeye, New Mexico, approximately 25 miles west of Hobbs, New Mexico. The area in question is in the Vacuum Field, heavily covered with producing oil, gas and water injection wells. The Vacuum Field has been of special interest for several years because of waterflows encountered while drilling, attributed to the pressured-up salt formation in the area.

A committee was formed in 1977, comprised of OCD representatives and industry people to study the area for possible source. A waterflow committee was formed from producing operators in the field. Technical staff were put on the committee to keep up with and monitor waterflows, pressures on injection wells, drilling activity and quarterly sampling of fresh water wells. The Texaco CVU #3 water well was found as a result of this study.

CVU #3 water supply well location: NE 1/4 Section 6 - Township 17 South - Range 35 East, Lea County. The well is completed in the Ogallala formation, a predominant fresh water aquifer in SE New Mexico. This well produces in excess of 5,000 barrels per day from a depth of 190 feet; the primary use of this water is makeup water for Texaco's waterflood system. Our study was concentrated within a half mile radius of this well.

Site Geology

Geographically, the site is situated near the western boundary of the southern extension of the High Plains in Southeastern New Mexico. Topographically, the Southern High Plains, a plateau, rises approximately 100 to 300 ft. above the surrounding region and slopes to the Southwest at 10 to 20 ft. per mile.

The formation of interest in this area was the DacCum group, or "Redbed" and the Ogallala. The relatively impermeable shale facies of the upper portion of the Triassic Redbed represent the lower limit of the overlying Ogallala aquifer. Texaco's WSW #3 is completed in and producing from the saturated thickness of the Ogallala aquifer.

The Triassic Redbeds are composed of red to reddish brown mudstone with minor interbedded sandstone. This clay formation which underlies the fresh water aquifer is very irregular, varying in depth as much as fifty feet. Where the redbeds are exposed to the surface, it appears the changes and irregularities are due to stream erosion. These ridges and channels along with the southeastward dip of the redbed surface control the direction and movement of ground water in the lower portion of the "Ogallala" formation.

The Ogallala formation overlying the redbeds was found to consist of an upper unit of very dense light gray, beige to light pink caliche that contained occasional thin layers of light to medium brown very fine-grained silty sand. This upper caliche unit ranged in thickness from 28 to 80 ft. Underlying the upper caliche unit, the Ogallala formation consisted of unconsolidated, loose to very loose very fine-grained clean to silty sand with some medium to coarse-grained, clean to silty sand containing occasional small diameter gravel with occasional thin layers of very fine to medium grained sandstone and sandy clay. Immediately below the middle unit and just above the base of the Ogallala formation a 2 to 12 ft. section of clean 1/8 to 1/2 in. diameter gravel was encountered.

The Ogallala aquifer commonly yields 250 to 800 gallons per minute (gpm). and locally yields as much as 1000 gpm in some wells. The Texaco WSW #3 produced at a rate of 140 gpm and as much as 290 gpm during our water study .

The quality of the ground water in the Ogallala formation is reported to be generally suitable for domestic, municipal and irrigation use. Water in this area is also used for makeup waterflood projects. The study concentrated on the quality of water in the Ogallala formation.

Summary of Study

With the completion of the preliminary ground work, test well drilling began. The first series of wells drilled were selected to eliminate the obvious sources of contamination.

Test well #1 was drilled to the NW, the direction of natural waterflow in Southeastern New Mexico.

Test well #2 drilled to the SE to eliminate the closest producing oil well.

Test well #3 drilled to the NW, offsetting Texaco's #138 injection well.

Test well #4 drilled to the South, offsetting Texaco's #98 & 162. These wells, in early 1980, had large salt waterflows, which were contained in large reserve pits and hauled to a proper disposal site.

Test well #5 drilled North to eliminate any possible source from production or injection in this area.

Test well #6 drilled Northeast to eliminate any possible source from production in this area.

Test well #7 drilled S/SW toward Texaco CVU #137. This injection well had pressure show up on the intermediate casing while it was being monitored.

The water analyses in test wells 1-6 all tested good, but the analysis run on test well #7 showed elevated chlorides. This indicated we were headed in the right direction to find the source. We continued to drill in the direction toward CVU #137 to either eliminate the injection well as a source or verify it as the origin of contamination. Test well #8 tested good, so our drilling was concentrated more to the west of test well #7.

The next series of test wells were selected based upon redbed depth and chloride analysis.

Test wells #9, 10 & 11, all drilled to the S/SW of test well #7 and WSW #3, contained high chlorides ranging from 13000 ppm in #9 to 25000 ppm in #11. We continued to drill to the west until we run out of contaminated water or found source of contaminant.

Test well #12 located even further west of this high chloride area, showed chlorides of only 200 ppm. Also, redbed depth came up some 4 ft. in elevation. With this data we felt the west boundary of the plume had been reached.

The next few wells were drilled in and around the high chloride area to eliminate obvious sources in the area or to establish plume perimeter . Test well #13, located North of site and South of Texaco CVU #139 water injection well, redbeds came in high and chloride were lower. This eliminated any source from this area.

Test well #14 located halfway between test well #10 & #11. This was drilled to tie the area into a pattern to work on. Redbeds came in shallow and chlorides lower. There appeared to be a redbed ridge on dome between the two high chloride wells.

Test wells # 15, 16, and 17 were drilled to the south and southwest of the high chloride area. Analyses from all three wells showed fresh water. These wells will be used for monitor wells and also to define one plume to the south.

Test well #8 was drilled to the NW of wells #20 & 11 and just south of the Texaco Buckeye Plant. This eliminated any source from the plant area.

Test well #19 was drilled south of test wells #10 & 11, and east of Texaco's GBSA #58 and State L #7. After drilling, well was developed and chloride analyses were run, we pump tested the well for 4 hours, analyzing samples every 15 min. The longer we pumped the well, the higher the chlorides became. It was obvious we were drawing the contaminant into the test well. We knew our source had to be within a close proximity of this area.

A meeting was held between Texaco and OCD to decide location of the next well. It was agreed that two more wells were needed to fully define our contaminated area and eliminate possible sources. Test well #20 drilled NW of test well #10, and halfway between test wells #13 & 7. The second well, #21, was drilled east of CVU WSW #3 and halfway between test wells #2 and #6. Both wells tested good, but will be used to tie in the gap in the plume.

With all boundaries defined and taking into consideration the previous drilling , chloride analysis and the highs and lows on the redbed formation, it was decided that either Texaco's State L #7 or Texaco's GBSA #58 was was the source of contamination. Two more wells would be drilled, one offsetting State L #7 and one offsetting GBSA #58.

Test well #22 was drilled 12 ft.east of Texaco State L #7. With the water analysis from this test well being less than 4000 ppm Cl. and the produced water from State L #7 being 50,000 ppm Cl, we did not feel this well was our source.

Test well #23 was drilled 12 ft. N/NW of GBSA #58. Water analysis showed extremely high chlorides coming from the area - 116,000 ppm Cl. Will discontinue drilling and concentrate on GBSA #58, which seems to be the likely source of our contaminant.

Rigged up on GBSA #58 immediately to begin checking for problem. Also continued to monitor perimeter wells around contaminated area. CVU WSW #3 was shut-in to prevent the drawing or movement of contaminant.

Began testing on GBSA #58, tested casing to 500# and it tested okay. Dresser Atlas ran a new type of test on the well called Hydrolog. This detects movement on waterflow behind casing. The log showed movement of water from 1800' (salt section), up the back side of the production casing, between surface and production annulus, and exiting into the fresh water aquifer at 59' at a rate of 50 to 100 barrels per day.

Repairs began immediately, perforating and squeezing the annulus several times before a successful repair job was completed. A new Hydrolog was run to confirm repairs. No waterflow was detected and salt contamination stopped.

With all repairs made and our source of contamination stopped, cleanup of the fresh water aquifer began. It was decided and agreed upon by both Texaco and OCD that two recovery wells would be installed, one near our source of contamination, North of GBSA #58 and one in a redbed low area, which was just south of monitor well #10. The two wells were drilled to the redbed and completed in the lower-most portion of the aquifer. Pumps were installed and recovery began, pumping at a rate of 1500 bbls per day per well.

Since the wells were installed and extraction began, a total of 152,995 barrels of water have been pumped, with chlorides changing from the original 100,000 ppm at the start of recovery to 35,000 ppm some three months later. At the present pump rate, and the rate of decline in chloride content in the two recovery wells over the last 3 months, it is estimated it will take 12 to 18 months to cleanup the contaminated area.

Conclusion

We know by having the time and patience in working on a contamination problem you can clean up salt water contaminants in the aquifer. This water study, which was time consuming but a valuable learning experience for both Texaco and the OCD, took a better part of three months at a cost of some $86,000. Texaco provided both the financial and moral support to complete the study.

The drilling of the test well and the finding of the source of contamination was difficult due to the changes in chloride content of the water in each test well and the depth of the redbed. Daily conversation and meetings were held by both OCD and Texaco staff, so that all were kept informed of results of each test well so decisions could be made on the placement of the next test well.

The area of contamination was defined by the test wells that were drilled. We now have a row of monitor wells showing fresh water that will be tested on a regular schedule, so if the salt water moves from our contaminated area, it will be detected in these monitor wells, further study will be conducted and additional recovery wells installed.

CVU #3 will continue to be shut-in until water aquifer is cleaned up. Also, water analyses will be run monthly on the monitor wells and weekly on the two recovery wells, with results and changes recorded and reported to OCD.

MONITOR WELL

All monitor wells were drilled and witnessed by Eddie W. Seay, OCD, and Wayne Minchew and Robert Browning with Texaco. All water analyses were done on location by Eddie W. Seay, using the titration method. All locations and decisions were made daily on a well by well basis with both OCD Supervisor Mr. Jerry Sexton and Texaco Superintendent James Head kept fully informed. All monitor wells were drilled with rotary rigs by either Larry's Water Well Service or Glenn's Water Well Service. Both companies supplied well logs.

The construction of the monitor wells were all the same. A 4 3/4" hole was drilled into the redbed formation with 3" PVC pipe which was perforated through water formation was installed. 1" pipe was run into PVC casing and by using air compressor jetted water to the surface for sampling. A concrete pad was poured around each well and each well was capped.

TEST WELL DRILLING

The locations for the test wells were selected based on the following information: redbed depth, direction of natural waterflow, chloride analysis and topographical structure.

Water analyses were run on Texaco CVU #3 daily while drilling to keep up with changes in chloride content, the severity of the problem, and to establish location for new wells.

ABBREVIATIONS TO CONSIDER IN THIS REPORT:

CVU = Central Vacuum Unit

WSW = Water Supply Well

TD = Total Depth

WS = Water Sand

DW = Drilling Water

Cl = Chlorides

PPM = Measurement - Parts Per Million

Test well drilling began on 10/24/89, the first series of wells being drilled were selected to eliminate the obvious cause and source of contamination.

*** MONITOR WELL #1 ***

LOCATED: 610' NW of CVU WSW #3
This selection was drilled because the natural waterflow in Southeastern NM, is to the southeast; in addition, Texaco had a 50,000 barrel salt water spill on their New Mexico State O #28 well, which was located approximately 1/2 mile to the northwest.

TD = 200' (not to redbed)
WS = 115
CSNG = 3" PVC
PERFS = 60
DW = 70 PPM Cl
Run 1" PVC inside and jet samples.
Well analysis (1) 100 ppm Cl
(2) 100 ppm Cl
(3) 100 ppm Cl
(4) 100 ppm Cl

Water appears to be good.

*** MONITOR WELL #2 ***

Located: 210' SE of CVU WSW #3
This location was selected to eliminate the closest producing oil well, Marathon Oil Co. - State AC-2 #12, which is approximately 400' SE of CVU #3.

TD = 238' RedBed
WS = 115'
CSNG = 3" PVC
PERFS = 60'
DW = 70 ppm Cl
Run 1" pipe and jet samples; could not develop well.
Well analysis - 100 ppm Cl from bail sample.

Water test good.

*** MONITOR WELL #3 ***

Located 269' west by NW of CVU WSW #3 offsetting Texaco CVU #138 injection well.

TD = 237' Redbed
WS = 118'
CSNG = 3" PVC
PERFS = 80'
DW = 57 ppm Cl
Hit cavity and lost circulation from 125 - 135'.
Ran 1" pipe and jet pump samples.
Sample #1) 71 ppm Cl
" #2) 71 ppm Cl
" #3) 71 ppm Cl

Water test good.

*** MONITOR WELL #4 ***

Located: 437' S of CVU WSW #3
This site was chosen because in the early 1980's two wells were drilled in this area - CVU #98 and #162; both had large salt water flows from the salt section. This salt water was contained in reserve pits and hauled to a disposal site. Our location just offsets these large reserve pits.

TD = 232' RedBed
WS = 118'
CSNG = 3" PVC
PERFS = 80'
DW = 57 ppm Cl
Run 1" pipe and jet samples.
Sample #1) 70 ppm Cl
" #2) 56 ppm Cl
" #3) 50 ppm Cl
" #4) 40 ppm Cl

Water tested good.

*** MONITOR WELL #5 ***

Located: 334' N of CVU WSW #3
This location was drilled to eliminate any possible source from production in this area.

TD = 234' RedBed
WS = 115'
CSNG = 3" PVC
PERFS = 80'
DW = 57 ppm Cl
Run 1" pipe and jet samples.

Sample	#1)	71 ppm Cl
"	#2	56 ppm Cl
"	#3	56 ppm Cl
"	#4	56 ppm Cl
"	#5	56 ppm Cl

Water tested good.

*** MONITOR WELL #6 ***

Located: 389' NE of CVU WSW #3
This location was drilled to eliminate any possible sources from production in this area.

TD = 236' RedBed
WS = 115'
CSNG = 3" PVC
PERFS = 80'
DW = 57 ppm Cl
Run 1" pipe and jet samples.

Sample	#1)	56 ppm Cl
"	#2)	56 ppm Cl
"	#3)	56 ppm Cl
"	#4)	56 ppm Cl

Water tested good.

* MONITOR WELL #7 *

Located: 253' S/SW of CVU WSW #3
Toward Texaco CVU #137 - Water Injection Well. CVU #137 had pressure show up on the intermediate casing while it was being monitored.

Started drilling, lost circulation on well at 85', had only partial returns to T.D.

TD = 238' RedBed
CSNG = 3" PVC
Perfs = 120' - perforations cover entire water zone.
DW = 57 ppm Cl
Run 1" pipe and jet samples.

Sample	#1)	5325 ppm Cl
"	#2)	4260 ppm Cl
"	#3)	3195 ppm Cl
"	#4)	3337 ppm Cl
"	#5)	3479 ppm Cl
"	#6)	4047 ppm Cl
"	#7)	4189 ppm Cl

Water quality poor, elevated chlorides; this indicated we were headed in the right direction to find the source.

*** MONITOR WELL #8 ***

Located: 628' S/SW of CVU WSW #3 halfway between MW #7 and CVU WIW #137. We were hoping to either eliminate 137 or confirm it as the problem.

Start drilling, lost circulation at 40 feet, had only partial returns to T.D.

TD = 236' RedBed
CSNG = 3" PVC
WS = Unknown
Perfs = 120'
DW = 4600 ppm Cl

NOTE: After losing circulation, a service company truck was called to deliver a load of fresh water; they did - after unloading tank of salt water. This was the reason chlorides were elevated at the beginning of sampling. Well cleaned up, after pumping.

Run 1" pipe and jet samples.

Sample #1) 1065 ppm Cl
" #2) 710 ppm Cl
" #3) 355 ppm Cl
" #4) 213 ppm Cl
" #5) 213 ppm Cl
" #6) 142 ppm Cl

We felt the well had cleaned up and monitor well is out of the contaminated area.

*** MONITOR WELL #9 ***

Located: 613' W/SW of CVU WSW #3 and SW of monitor well #7, trying to pick up the higher chlorides found in #7.

TD = 236' RedBed
CSNG = 3" PVC
WS = 115'
DW = 42 PPM Cl
Perfs = 120'
Run 1" pipe and jet samples.

Sample	#1)	13,845 ppm Cl
"	#2)	12,750 ppm Cl
"	#3)	13,490 ppm Cl
"	#4)	13,064 ppm Cl
"	#5)	13,774 ppm Cl

The elevated chlorides in this well indicated we were drilling in the right direction.

*** MONITOR WELL #10 ***

Located: 774' W/SW of CVU WSW #3
Continue drilling in this direction until we either pinpoint the source or establish the boundary of the plume.

TD = 234' RedBed - 232'
WS = 115'
DW = 57 ppm Cl
Perfs = 120'
Run 1" pipe to jet water samples and develop well.

Sample	#1)	26,625 ppm Cl
"	#2)	28,986 ppm Cl
"	#3)	26,980 ppm Cl
"	#4)	20,495 ppm Cl

Chloride analyses indicated we were getting closer to the source.

* MONITOR WELL #11 *

Located: 1230' West/SW of CVU WSW #3
We planned to continue drilling in this direction until we ran out of contaminated water or found the source of contamination.

TD = 241' RedBed - 237'?
WS = Unknown
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 120'
Run 1" pipe to jet samples and develop well.
Sample #1) 18,460 ppm Cl
" #2) 24,495 ppm Cl
" #3) 23,288 ppm Cl
" #4) 24,495 ppm Cl
" #5) 25,489 ppm Cl
" #6) 25,418 ppm Cl

Lost circulation while drilling from 50-55 feet and again from 90-95'; from 95' to TD - only partial circulation.

*** MONITOR WELL #12 ***

Located: 1700' W/SW of CVU WSW #3
Continue to drill to the west until we find source or boundary of contaminated plume.

TD = 230' RedBed - 228'
WS = 115'
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 110'
Run 1" pipe to jet samples and develop well.
Sample #1) 284 ppm Cl
" #2) 284 ppm Cl
" #3) 284 ppm Cl
" #4) 284 ppm Cl

We felt the west boundary of the plume had been reached.

*** MONITOR WELL #13 ***

Located: 995' West of CVU WSW #3
This location was drilled to determine any contaminants coming from the North. Well drilled halfway between Texaco's CVU #139 (water injection well) and Monitor wells #10 and 11 which showed higher chlorides.

TD = 232' RedBed - 230'
WS = 115'
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 110'
Run 1" pipe to jet water samples and develop well.

Sample #1) 2457 ppm Cl
" #2) 3053 ppm Cl
" #3) 2982 ppm Cl
" #4) 2982 ppm Cl
" #5) 2982 ppm Cl

From the lower chloride analysis and from the higher redbed, we felt this eliminated any source from this direction.

*** MONITOR WELL #14 ***

Located: 987' W/SW of CVU WSW #3 and halfway between Monitor Wells #10 and 11; this was to tie the area into a pattern to work on.

TD = 231' RedBed - 229'
WS = 115'
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 110'
Run 1' pipe to jet samples and develop well.

Sample	#1	199 ppm Cl
"	#2	710 ppm Cl
"	#3	710 ppm Cl
"	#4	1633 ppm Cl
"	#5	1563 ppm Cl
"	#6	1633 ppm Cl
"	#7	1633 ppm Cl

Chlorides are lower than in wells #10 & 11 due to redbed depth.

*** MONITOR WELL #15 ***

Located: 1204' SW of CVU WSW #3
Start drilling south of MW #11 and 14 which was also south of the only producing wells in the area - State L #7 and GBSA #58; this will help eliminate any movement of contaminants from the south.

TD = 231' RedBed - 229'
WS = 115'
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 110'
Run 1" pipe to jet samples.
Sample #1) 56 ppm Cl
" #2) 43 ppm Cl
" #3) 43 ppm Cl
" #4) 43 ppm Cl

Good water; helped define the south perimeter of plume.

*** MONITOR WELL #16 ***

Located: 1100' S/SW of CVU WSW #3 and approximately 250' East of MW #15; this well was also on south side of plume area.

TD = 233' RedBed - 232'
WS = 115'
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 110'

Run 1" pipe to jet water samples and develop well.

Sample #1) 57 ppm Cl
" #2) 71 ppm Cl
" #3) 57 ppm Cl
" #4) 57 ppm Cl

Water good; the south end of area has been defined.

*** MONITOR WELL #17 ***

Located: 1400' SW of CVU WSW #3 and 300' south of MW #11 and 200' west of State L #7 and GBSA #58.

TD = 225' RedBed - 223'
WS = 115'
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 110'
Run 1" pipe to jet water samples and develop well.

Sample #1) 667 ppm Cl
" #2) 809 ppm Cl
" #3) 994 ppm Cl
" #4) 994 ppm Cl
" #5) 994 ppm Cl

Chlorides are lower than in MW #11; this indicated we were getting further away from the problem.

*** MONITOR WELL #18 ***

Located: 1300' W of CVU WSW #3, 200' W of MW well #13, and 200' N of MW #11 just to the south of Texaco Buckeye Gasoline Plant. This eliminates any possible source from the plant area.

TD = 237' RedBed - 235'
CSNG = 3" PVC
DW = 57 ppm Cl
WS = 118'
Perfs = 110'
Run 1" pipe to jet samples and develop well.

Sample	#1)	326 ppm Cl
"	#2)	326 ppm Cl
"	#3)	340 ppm Cl
"	#4)	340 ppm Cl
"	#5)	326 ppm Cl

This location tied in our NW boundary of the plume.

*** MONITOR WELL #19 ***

Located: 75' E of GBSA #58 and 75' N of State L #7, south of MW #10 and #11, which show higher chlorides.

TD = 226' RedBed - 225'
CSNG = 3" PVC
WS = 115'
DW = 57 ppm Cl
Perfs = 110'
Run 1" pipe to jet samples and develop well.

Sample # 1)	411 ppm Cl	
" # 2)	1164 ppm Cl	
" # 3)	1732 ppm Cl	
" # 4)	2414 ppm Cl	
" # 5)	2698 ppm Cl	
" # 6)	3978 ppm Cl	
" # 7)	4828 ppm Cl	
" # 8)	5254 ppm Cl	
" # 9)	5254 ppm Cl	
" #10)	5394 ppm Cl	
" #11)	5751 ppm Cl	
" #12)	5964 ppm Cl	Slight smell of oil & sheen on sample.
" #13)	6319 ppm Cl	" "
" #14)	6390 ppm Cl	" "
" #15)	6461 ppm Cl	" "
" #16)	6532 ppm Cl	" "

The longer we pumped the well, the higher the chlorides became; it seems as though we were drawing the contaminant into the well.

Meetings were held between Texaco and OCD; two locations will be drilled to define perimeters of contaminated area.

*** MONITOR WELL #20 ***

Located: N of MW #10 and halfway between MW #13 & #7.

TD = 233' Redbed - 231'
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 110'
Run 1" pipe to jet samples and develop well.

Sample	# 1)	113 ppm Cl
"	# 2)	255 ppm Cl
"	# 3)	454 ppm Cl
"	# 4)	837 ppm Cl
"	# 5)	994 ppm Cl
"	# 6)	1050 ppm Cl
"	# 7)	1093 ppm Cl
"	# 8)	1164 ppm Cl
"	# 9)	1278 ppm Cl
"	#10)	1278 ppm Cl

This well seems to be on the northern edge of plume.

*** MONITOR WELL #21 ***

Located: 200' E of CVU WSW #3 and halfway between MW #2 and MW #6; this would or should have tied in the gap in this area for possible contamination.

TD = 233' RedBed - 231'
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 110'
Run 1" pipe to jet samples and develop well.
Sample #1) 56.8 ppm Cl
" #2) 42.6 ppm Cl
" #3) 42.6 ppm Cl
" #4) 42.6 ppm Cl
" #5) 42.6 ppm cl

This well ties in the east boundary.

*** MONITOR WELL #22 ***

Located: 12' East of Texaco - N M State L #7.
This location should eliminate any leak in the well.

TD = 227' RedBed - 225'
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 110'
Run 1" pipe to jet samples and develop well.
Sample #1) 2513 ppm Cl
" #2) 3195 ppm Cl
" #3) 3905 ppm Cl
" #4) 3905 ppm Cl
" #5) 3905 ppm Cl
" #6) 3905 ppm Cl

Produced water from the State L #7 should be in excess of 50,000 ppm Cl; do not feel this is our source.

*** MONITOR WELL #23 ***

Located: 12' N/NW of GBSA #58
This location helped confirm the problem.

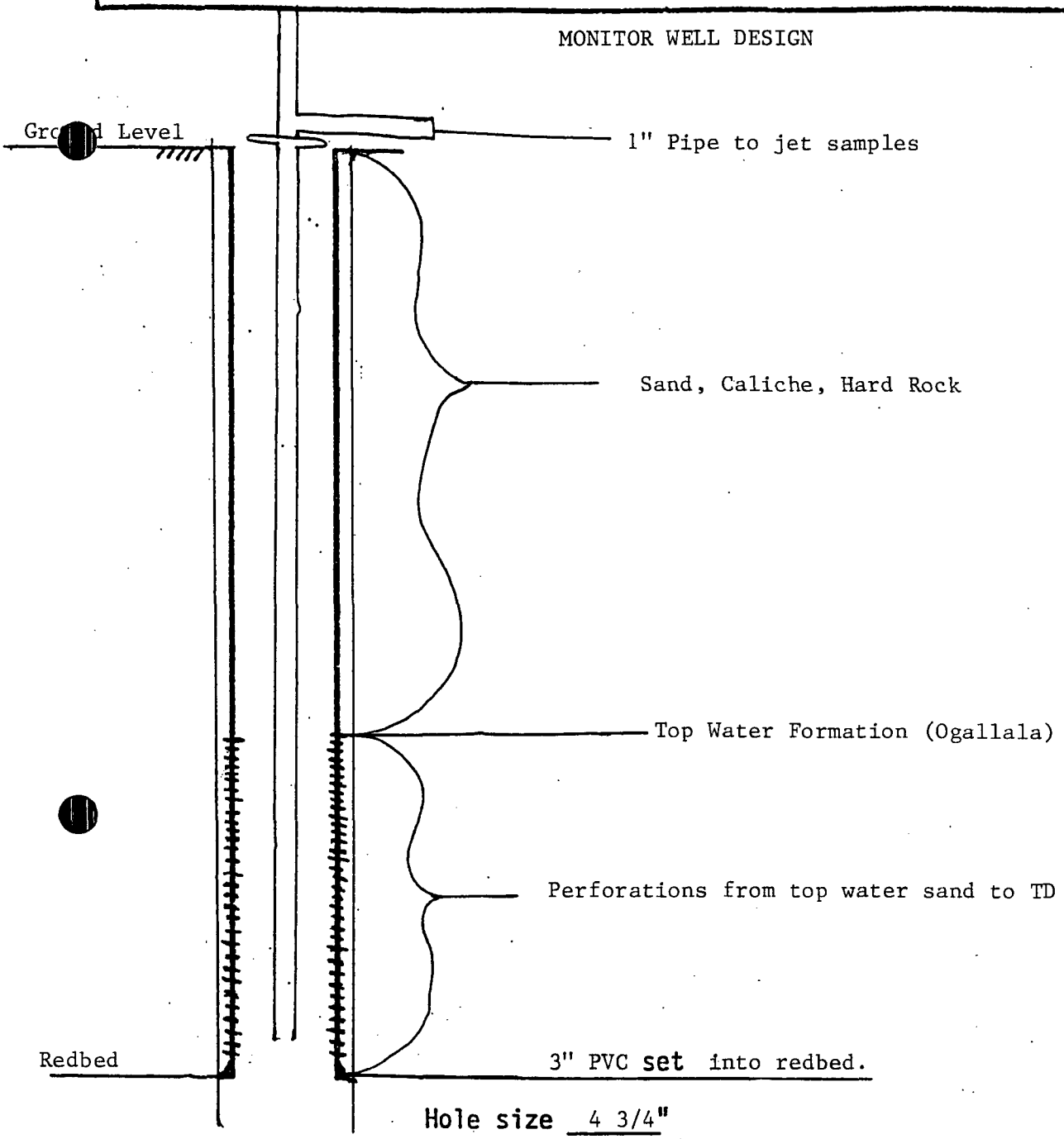
TD = 226' RedBed - 224'
CSNG = 3" PVC
DW = 57 ppm Cl
Perfs = 110'
Run 1" pipe to jet samples and develop well.
Sample #1) 99,000 ppm Cl
" #2) 112,000 ppm Cl
" #3) 116,000 ppm Cl

Extremely high chlorides coming from GBSA #58. Will discontinue drilling and rig up on GBSA #58, which seems to be the likely source.

We had perimeter wells around the area of contamination and continued to monitor these wells. We also shut in CVU WSW #3 well to prevent the drawing or movement of contaminant while repairs are being made to #58.

LEASE Vacuum Field LOCATION Texaco CVU #3 Water Study

MONITOR WELL DESIGN



REPAIRS ON GBSA #58

Rig up on GBSA #58 on 1/8/90, pull tubing and pump out of hole; run in hole with retrievable bridge plug (RBP) and packer. Set RBP at 3980'. Test casing to 500# for 10 minutes - test o.k. Well bore in this well is not leaking.

1/9/90 Rig up Dresser Atlas to run Hydrolog. " The Hydrolog test utilizes oxygen activation for accurate detection of waterflow behind casing. Waterflow behind pipe, whether annular or channel flow can often be identified through the use of combined temperature, noise and radioactive tracer surveys for both production and injection wells. The U.S. Environmental Protection Agency (EPA) has granted approval for this new oxygen activation method for detecting waterflow behind casing."

The wells were logged from 2800' to surface checking for waterflow. Log data shows well to be flowing from approximately 1800' - "salt section", up between 5 1/2" and 7 5/8" annulus to a hole in the 7 5/8" casing at 59'; salt water was exiting into the fresh water zone at a rate of 50 to 100 barrels per day. This confirms and pinpoints our source of contamination. Repairs to GBSA #58 were as follows.

Repairs began immediately; the 5 1/2" casing was perforated at 1517', with cement retainer at 1453', establish circulation to surface and squeeze with 50 sx Class C and 200 sx Thixset, circulate to surface, wait on cement, drill out cement retainer and cement and test casing. "Would not test."

Rig up Atlas Wireline Service to run Hydrolog, to check results of squeeze. Log data shows waterflow and channeling from 1515' to 59'. Repair job unsuccessful.

Repairs continue, set CIBP at 1400', perforate at 395', establish rate, pressure and squeeze. Pump 100 gal. 10% CaCl2, 100 gal. Flo-Chek, amd 50 sx 50/50 Cal-seal, displace with squeeze pressure of 1200 psi, wait on cement.

Drill out cement retainer and cement 200-395', test casing to 500 psi - held o.k. Ran in hole to squeeze hole in 5 1/2" casing at 1517', set cement retainer at 1430' and squeeze with 200 gal. Flo-Chek, 50 sx Cl C with 10# Cal-Seal and 50 sx Cl C 10# Cal-Seal with 2% CaCl2; job complete. Wait on cement; drill out retainer and cement - "would not test."

Run new cement retainer and set at 1430', squeeze with 1000 gal. Flo-Chek and 124 sx Thixatropic cement. Wait on cement, drill out cement retainer and cement and test - "Squeeze did not hold."

Resqueeze casing, set CIBP at 1525', spot 35' Cal-Seal plug from 1495' to 1525'. Ran packer to 508' and pressure casing to 1000 psi; shut in and wait on cement. Pull out of hole with packer, drill cement from 1495-1525', test casing - "would not test."

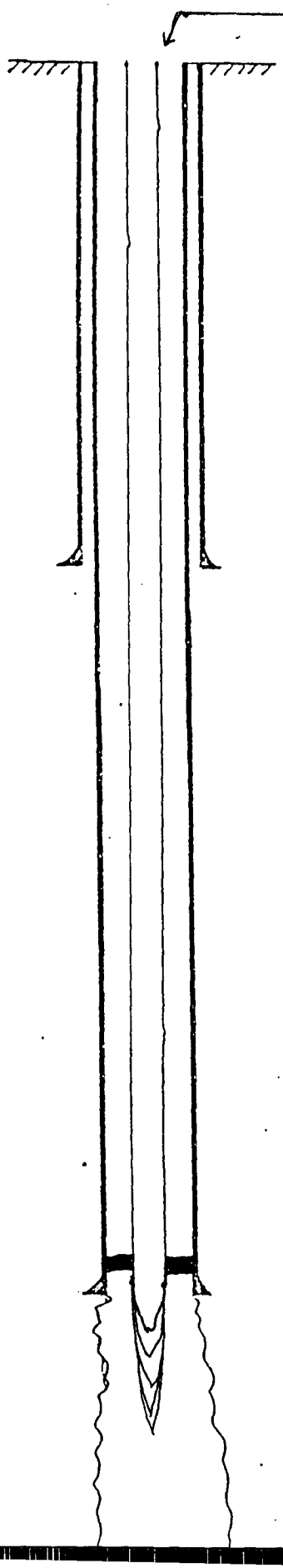
Pull out of hole with all equipment, run pipe analysis from 3980' to surface to check condition of casing - all o.k. Will resqueeze. Set CIBP at 1525', pump 35 feet Cal-Seal, run in with packer and set at 508; pressure up to 2500 psi; shut in and wait on cement.

Drill out cement from 1490' to 1525'; test squeeze - test o.k. Clean out casing to 3980' and test, all o.k.

Rig up Atlas Wireline Service to run Hydrolog; ran logging tools to 4087' and test back to surface. No waterflow or casing leak; well repaired and salt contamination stopped.

All work and repairs done on this well were approved and witnessed by Oil Conservation Personnel. The repair and work done on this well took thirty-five days at a cost of $145,000. Texaco and the OCD were very pleased with the job that was done and that our source of contamination was ended.

OPERATOR		DATE
Texaco Producing Inc.		1938
LEASE	WELL No.	LOCATION
Vacuum GB/SA	58	(A) Section 1-T18S-R34E



Top Salt 1540'

Base Salt 2680'

No record of waterflow or casing repair.

7 5/8 " casing set at 1507 ' with 300 sx of Trinity ceme

Hole size 9 5/8"

5 1/2" casing set at 4075 ' with 200 sx of _____ ce

Total Depth 4710 ' Hole size 6 5/8 "

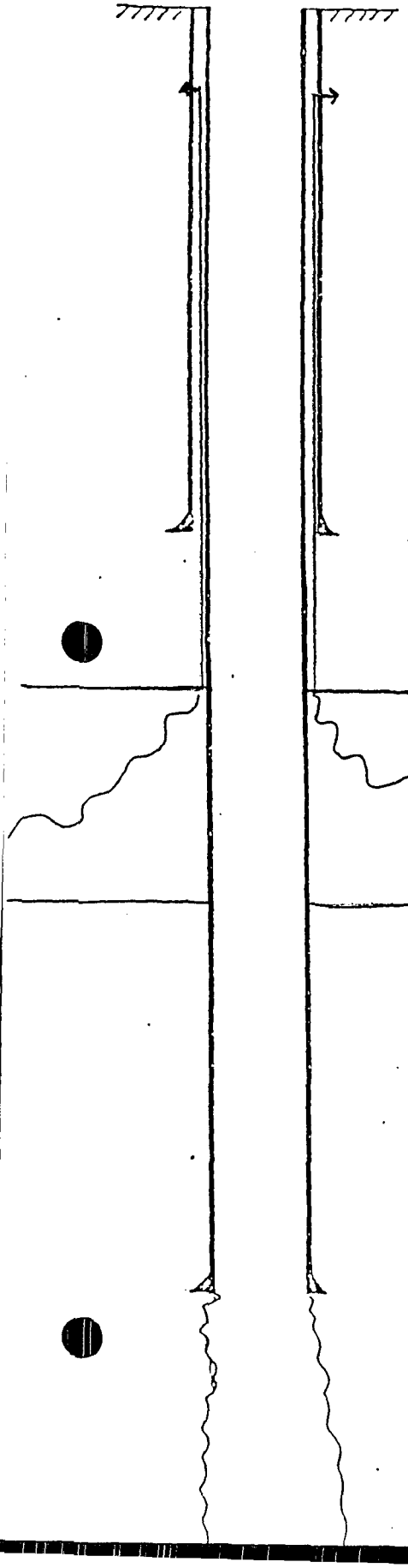
Well producing from open hole formation from 4075' to 4710'.

OPERATOR			DATE
Texaco Producing Inc.			1938
LEASE	WELL No.	LOCATION	
Vacuum GB/SA	58	(A) Section 1-T18S-R34E	

Top Salt 1540'

Base Salt 2680'

No record of waterflow or casing repair.



Hole in pipe at 59'. Salt water leaking in fresh Water Aquifer.

7 5/8" casing set at 1507' with 300 sx of Trinity ce

Hole size 9 5/8"

Salt Section pressured up.

5 1/2" casing set at 4075' with 200 sx of _____

Total Depth 4710' Hole size 6 5/8"

HYDROLOG

CONFIRMS WATERFLOW

HYDROLOG ANALYSIS
ATLAS WIRELINE SERVICE

COMPANY NAME: _TEXACO INC._____ RECORDED BY: _KOENN_____
WELL NAME: _VAC. GRAYBURG S.A. UNIT58 WITNESSED BY: _DEMEL_____
FIELD : _VAC. GRAYBURG S.A._____ TOOL #: _TP-1_____
STATE & CO.: _LEA, NEW MEXICO_____
DATE: _9-JAN-90_____
COMMENTS: 5 1/2" CSG. FROM SURF. TO 4087': 7 5/8" CSG. FROM SURF. TO 1507' PBTD AT 3890'
LOG DATA SHOWS WELL TO BE FLOWING FROM APX. 1800' TO HOLE IN 7 5/8" CSG. AT APX. 59'

DEPTH FEET	FILE:	OXYGEN SS.	OXYGEN LS	COMMENTS:	ISS	ILS	CALCULATED SS	CALCULATED LS
2800	ST1A	2.045	.149	BK NO	3395	253	.00060	.00059
2800	ST1B	2.212	.130	FLOW	3295	251	.00067	.00052
2800	ST1C	1.952	.112	SALT	3215	245	.00061	.00046
CALCULATED BACKGROUND CORRECTION FACTOR AVERAGE =							.00063	.00052

DEPTH	FILE #	FLOW IND. SS	FLOW IND. LS	COMMENTS:	VELOCITY FT/MIN
200	ST9A	17.070	4.215	ABOVE 7 5/8" CSG.	5.5
200	ST9B	16.464	5.087		6.5
150	ST10A	11.60	3.510	ABOVE 7 5/8" CSG.	6.4
150	ST10B	15.11	5.554		7.7
100	ST11A	10.94	4.058	ABOVE 7 5/8 CSG.	7.7
100	ST11B	10.26	3.477		7.1
50	ST12A	-.260	-.093	ABOVE 7 5/8" CSG.	0.0
50	ST12B	-1.41	-.019		0.0
40	ST13A	.000	.000	ABOVE 7 5/8" CSG.	0.0
40	ST13B	-.724	.019		0.0
75	ST14A	19.45	11.21	ABOVE 7 5/8" CSG.	13.9
62	ST15A	29.42	20.57	ABOVE 7 5/8" CSG.	21.4
56	ST16A	-.093	-.204	ABOVE 7 5/8" CSG.	0.0
59	ST17A	-.130	.093	ABOVE 7 5/8" CSG.	0.0

HYDROLOG ANALYSIS
ATLAS WIRELINE SERVICE

COMPANY NAME: _TEXACO INC._____ RECORDED BY: _KOENN_____
WELL NAME: _VAC. GRAYBURG S.A. UNIT58 WITNESSED BY: _DEMEL_____
FIELD : _VAC. GRAYBURG S.A._____ TOOL #: _TP-1_____
STATE & CO.: _LEA, NEW MEXICO_____
DATE: _9-JAN-90_____
COMMENTS: 5 1/2" CSG. FROM SURF. TO 4087': 7 5/8" CSG. FROM SURF. TO 1507' PBTD AT 3890'
LOG DATA SHOWS WELL TO BE FLOWING FROM APX. 1800' TO HOLE IN 7 5/8" CSG. AT APX. 59'

DEPTH FEET	FILE:	OXYGEN SS.	OXYGEN LS	COMMENTS:	ISS	ILS	CALCULATED SS	CALCULATED LS
2800	ST1A	2.045	.149	BK NO	3395	253	.00060	.00059
2800	ST1B	2.212	.130	FLOW	3295	251	.00067	.00052
2800	ST1C	1.952	.112	SALT	3215	245	.00061	.00046
CALCULATED BACKGROUND CORRECTION FACTOR AVERAGE =							.00063	.00052

DEPTH	FILE #	FLOW IND. SS	FLOW IND. LS	COMMENTS:	VELOCITY FT/MIN
2800	ST1A	-.094	.017	BACKGROUND NO FLOW IN SALT	0.0
2800	ST1B	.137	.000		0.0
2800	ST1C	-.074	-.016		0.0
1800	ST2A	2.434	.085	IN SALT	0.0
1800	ST2B	5.354	.902		4.3
1800	ST2C	1.946	.309		4.2
1600	ST3A	.212	-.044	IN SALT	0.0
1600	ST3B	.259	-.008		0.0
1500	ST4A	3.699	.933	ABOVE 7 5/8" CSG.	5.6
1500	ST4B	4.434	1.286		6.2
1500	ST4C	2.842	.992		6.3
1200	ST5A	6.669	1.236	ABOVE 7 5/8" CSG.	4.5
1200	ST5B	5.358	.992		4.5
900	ST6A	6.582	1.194	ABOVE 7 5/8" CSG.	4.5
900	ST6B	6.268	1.160		4.5
600	ST7A	9.426	3.492	ABOVE 7 5/8" CSG.	7.7
600	ST7B	9.653	3.141		6.8
300	ST8A	14.108	3.370	ABOVE 7 5/8" CSG.	5.3
300	ST8B	14.413	3.963		5.9

OXYGEN ACTIVATION ANALYSIS
ATLAS WIRELINE SERVICES

Date	: 09-JAN-90	Time	12:08:39
Company Name	: TEXACO INC.		
Well Name	: VAC. GRAYBURG SAN AND. UNIT NO 58		
Field Name	: VACUUM GRAYBURG S.A.		
County Name	: LEA		
State Name	: NEW MEXICO		
Service Name	: HYDROLOG		
Bkg. File Name	: INELASTIC CORRELATION		
Disk File Name	: ST1A.DAT		
Tool Position	: UP		
Real Time	: 300.0		
Depth	: 2800.0		
Station Number	: 3		
Spectrum Number	: 1		
Comment	: BK. NO FLOW		

OXYGEN SS (cts)	BKG SS (cts)	FLOW IND. SS (cts)
2.045 +/- .195	2.139 +/- .199	-.094

OXYGEN LS (cts)	BKG LS (cts)	FLOW IND. LS (cts)
.149 +/- .053	.132 +/- .049	.017

VELOCITY (ft/min)	LODR	ISS (cts)	ILS (cts)	GR (cts)	BGR (cts)
.000 +/- .000	41.51	3395.	253.	62.6	166.0

# CYCLES	SYNCS/CYCLE	# BKG GATES	BKG WIDTH us	SPACING ft	SS LLD	LS LLD
8405	28	16	400.0	1.31	240	240

HYDROLOG

INDICATES REPAIRS FAILED

HYDROLOG ANALYSIS
ATLAS WIRELINE SERVICE

COMPANY NAME: _TEXACO INC._____ RECORDED BY: _KOENN_____
WELL NAME: _VAC. GRAYBURG S.A. UNIT58 WITNESSED BY: _DEMEL_____
FIELD : _VAC. GRAYBURG S.A._____ TOOL #: _TP-1_____
STATE & CO.: _LEA, NEW MEXICO_____
DATE: 15-JAN-90_____
COMMENTS: 5 1/2" CSG. FROM SURF. TO 4087': 7 5/8" CSG. FROM SURF. TO 1507' PBTD AT 3890'
LOG DATA SHOWS WELL TO BE FLOWING FROM APX. 1550' TO HOLE IN 7 5/8" CSG. AT APX. 59': WELL WAS SQ. WITH 100 SACKS AT 1515'

DEPTH FEET	FILE:	OXYGEN SS.	OXYGEN LS	COMMENTS:	ISS	ILS	CALCULATED SS	CALCULATED LS
2800	ST1A	3.439	.223	BK NO	2957	204	.00116	.00109
2800	ST1B	3.179	.372	FLOW	2901	204	.00110	.00182
2800	ST1C	2.565	.242	SALT	2864	203	.00090	.00119
CALCULATED BACKGROUND CORRECTION FACTOR AVERAGE =							.00105	.00137

DEPTH	FILE #	FLOW IND. SS	FLOW IND. LS	COMMENTS:	VELOCITY FT/MIN
1200	ST9A	1.873	1.102	ABOVE 7 5/8" CSG.	14.4
1200	ST9B	1.899	.804		8.9
758	ST10A	2.779	2.412	ABOVE 7 5/8" CSG.	54.1
758	ST10B	3.144	2.558		37.1
305	ST11A	7.506	2.122	ABOVE 7 5/8" CSG.	6.1
305	ST11B	6.453	2.520		8.1
200	ST12A	6.086	1.659	ABOVE 7 5/8" CSG.	5.9
200	ST12B	6.174	1.727		6.0
100	ST13A	4.160	2.797	ABOVE 7 5/8" CSG.	19.3
100	ST13B	4.357	3.076		22.0
62	ST14A	6.481	.906	ABOVE 7 5/8" CSG.	3.9
62	ST14B	5.761	.955		4.3
58	ST15A	.208	-.093	ABOVE 7 5/8" CSG.	0.0
58	ST15B	-.247	.086		0.0

HYDROLOG ANALYSIS
ATLAS WIRELINE SERVICE

COMPANY NAME: _TEXACO INC._____ RECORDED BY: _KOENN_____
WELL NAME: _VAC. GRAYBURG S.A. UNIT58 WITNESSED BY: _DEMEL_____
FIELD : _VAC. GRAYBURG S.A._____ TOOL #: _TP-1_____
STATE & CO.: _LEA, NEW MEXICO_____
DATE: 15-JAN-90_____
COMMENTS: 5 1/2" CSG. FROM SURF. TO 4087': 7 5/8" CSG. FROM SURF. TO 1507' PBTD AT 3890'
LOG DATA SHOWS WELL TO BE FLOWING FROM APX. 1550' TO HOLE IN 7 5/8" CSG. AT APX. 59': WELL WAS SQ. WITH 100 SACKS AT 1515'

DEPTH FEET	FILE:	OXYGEN SS.	OXYGEN LS	COMMENTS:	ISS	ILS	CALCULATED SS	CALCULATED LS
2800	ST1A	3.439	.223	BK NO	2957	204	.00116	.00109
2800	ST1B	3.179	.372	FLOW	2901	204	.00110	.00182
2800	ST1C	2.565	.242	SALT	2864	203	.00090	.00119
CALCULATED BACKGROUND CORRECTION FACTOR AVERAGE =							.00105	.00137

DEPTH	FILE #	FLOW IND. SS	FLOW IND. LS	COMMENTS:	VELOCITY FT/MIN
2800	ST1A	.334	-.057	BACKGROUND NO FLOW IN SALT	0.0
2800	ST1B	.133	.093		0.0
2800	ST1C	-.442	-.036		0.0
2600	ST2A	-1.263	-.301	IN SALT	0.0
2600	ST2B	-1.086	-.184		0.0
2453	ST3A	-.314	-.162	IN SALT	0.0
2453	ST3B	-.756	.022		0.0
2182	ST4A	-1.300	-.286	IN SALT	0.0
2182	ST4B	-1.404	-.214		0.0
1880	ST5A	-2.166	-.179	IN SALT	0.0
1880	ST5B	-1.996	-.214		0.0
1724	ST6A	-2.128	-.342	IN SALT	0.0
1724	ST6B	-2.028	-.317		0.0
1550	ST7A	11.487	1.359	IN SALT SURF. VALVE SHUT	3.6
1550	ST7B	20.414	3.002	" " "	4.0
1550	ST7C	17.426	5.235	" " OPEN	6.4
1550	ST7D	7.428	1.751	" " "	5.3
1550	ST7E	12.348	1.699	" " "	3.9
1550	ST7F	3.454	.545	" " SHUT	4.1
				(FLOW WAS NOT STEADY DURING TIME ABOVE READINGS WERE TAKEN)	
1500	ST8A	1.792	.325	ABOVE 7 5/8" CSG.	4.5
1500	ST8B	2.055	.364		4.4

OXYGEN ACTIVATION ANALYSIS
ATLAS WIRELINE SERVICES

Date	: 15-JAN-90	Time 14:39:08
Company Name	: TEXACO INC.	
Well Name	: VAC. GRAYBURG SAN AND. UNIT NO 58	
Field Name	: VACUUM GRAYBURG S.A.	
County Name	: LEA	
State Name	: NEW MEXICO	
Service Name	: HYDROLOG	
Bkg. File Name	: INELASTIC CORRELATION	
Disk File Name	: ST1A.DAT	
Tool Position	: UP	
Real Time	: 300.0	
Depth	: 2800.0	
Station Number	: 18	
Spectrum Number	: 1	
Comment	: BK NO FLOW IN SALT	

OXYGEN SS (cts)	BKG SS (cts)	FLOW IND. SS (cts)
3.439 +/- .253	3.105 +/- .240	.334

OXYGEN LS (cts)	BKG LS (cts)	FLOW IND. LS (cts)
.223 +/- .064	.280 +/- .072	-.057

VELOCITY (ft/min)	LODR	ISS (cts)	ILS (cts)	GR (cts)	BGR (cts)
.000 +/- .000	52.06	2957.	204.	75.6	198.0

# CYCLES	SYNCS/CYCLE	# BKG GATES	BKG WIDTH us	SPACING ft	SS LLD	LS LLD
8405	28	16	400.0	1.31	240	240

HYDROLOG

AFTER CASING REPAIRED

HYDROLOG ANALYSIS
ATLAS WIRELINE SERVICE

COMPANY NAME: _TEXACO INC._____ RECORDED BY: _KOENN_____
WELL NAME: _VAC. GRAYBURG S.A. UNIT58 WITNESSED BY: _DEMEL_____
FIELD : _VAC. GRAYBURG S.A._____ TOOL #: _TP-1_____
STATE & CO.: _LEA, NEW MEXICO_____
DATE: _2-FEB-90_____
COMMENTS: 5 1/2" CSG. FROM SURF. TO 4087': 7 5/8" CSG. FROM SURF. TO 1507'; PBTD AT 3980'

DEPTH FEET	FILE:	OXYGEN SS.	OXYGEN LS	COMMENTS:	ISS	ILS	CALCULATED SS	CALCULATED LS
1800	ST1A	1.580	.037	BK NO	2923	277	.00054	.00013
1800	ST1B	1.431	.093	FLOW	2902	274	.00049	.00034
1800	ST1C	1.450	.130	SALT	2875	275	.00050	.00047
CALCULATED BACKGROUND CORRECTION FACTOR AVERAGE =							.00051	.00031
DEPTH	FILE #	FLOW IND. SS	FLOW IND. LS	COMMENTS:				VELOCITY FT/MIN
[illegible]00	ST1A	.089	-.049	BACKGROUND NO FLOW IN SALT				0.0
[illegible]00	ST1B	-.049	-.008					0.0
1800	ST1C	-.016	.045					0.0
1550	ST3A	.073	.024	ABOVE SALT				0.0
1550	ST3B	.010	-.033					0.0
1550	ST3C	-.072	.059					0.0
1500	ST4A	-1.023	-.035	ABOVE 7 5/8" CSG.				0.0
1500	ST4B	-.734	-.049					0.0
1500	ST4C	-.353	-.088					0.0
1200	ST5A	1.981	-.001	ABOVE 7 5/8" CSG.				0.0
1200	ST5B	1.317	.134					0.0
1200	ST5C	1.694	.035					0.0
758	ST2A	.321	-.055	ABOVE 7 5/8" CSG.				0.0
758	ST2B	.373	.070					0.0
758	ST2C	.240	-.096					0.0
305	ST6A	1.514	.033	ABOVE 7 5/8" CSG.				0.0
305	ST6B	1.675	.129					0.0
305	ST6C	1.812	.223	(NO FLOW)				3.7

OXYGEN ACTIVATION ANALYSIS
ATLAS WIRELINE SERVICES

Date	: 02-FEB-90	Time 08:51:33
Company Name	: TEXACO PRODUCING INC.	
Well Name	: VACUUM GRAYBURG S. A. UNIT NO. 58	
Field Name	: VACUUM GRAYBURG S.A.	
County Name	: LEA	
State Name	: NEW MEXICO	
Service Name	: HYDROLOG	
Bkg. File Name	: INELASTIC CORRELATION	
Disk File Name	: ST1A.DAT	
Tool Position	: UP	
Real Time	: 300.0	
Depth	: 1800.0	
Station Number	: 2	
Spectrum Number	: 1	
Comment	: BACKGROUND NO FLOW	

OXYGEN SS (cts)	BKG SS (cts)	FLOW IND. SS (cts)
1.580 +/- .171	1.491 +/- .166	.089

OXYGEN LS (cts)	BKG LS (cts)	FLOW IND. LS (cts)
.037 +/- .026	.086 +/- .040	-.049

VELOCITY (ft/min)	LODR	ISS (cts)	ILS (cts)	GR (cts)	BGR (cts)
.000 +/- .000	.00	2923.	277.	21.6	99.8

# CYCLES	SYNCS/CYCLE	# BKG GATES	BKG WIDTH us	SPACING ft	SS LLD	LS LLD
8406	28	16	400.0	1.31	240	240

RECOVERY WELLS

It was decided that a minimum of two recovery wells would be installed, one near our source of contamination and one in a redbed low area.

It was found during our drilling of the monitor wells and from past water contamination studies, that salt water, being heavy in weight, lays in the lowermost portion of the water formation, moving along the top of the redbed formation, settling in low areas.

Our second well will be located in the vicinity of Monitor Well #10, because of the higher Chlorides and the lower redbeds. Also, resistivity logs were run on Monitor Wells #10, 11, 23, 14 to determine where to perforate recovery wells, for the most effective way of pumping contaminant out of the formation.

Recovery well #1 is located approximately 100 feet east of monitor well #10.

Drilling began 2/27/90 with 8 1/2" bit; drilled to redbed. Redbed came in at 230', pulled out of hole with bit and prepare to plug well; redbed too shallow.

The redbed area came in 4 feet higher than in MW #10, which indicated a ridge or barrier between our source of contamination GBSA #58 and CVU #3 water well. Our intent was to install a recovery well within the lower portion of this redbed cavity. Well was plugged and abandoned.

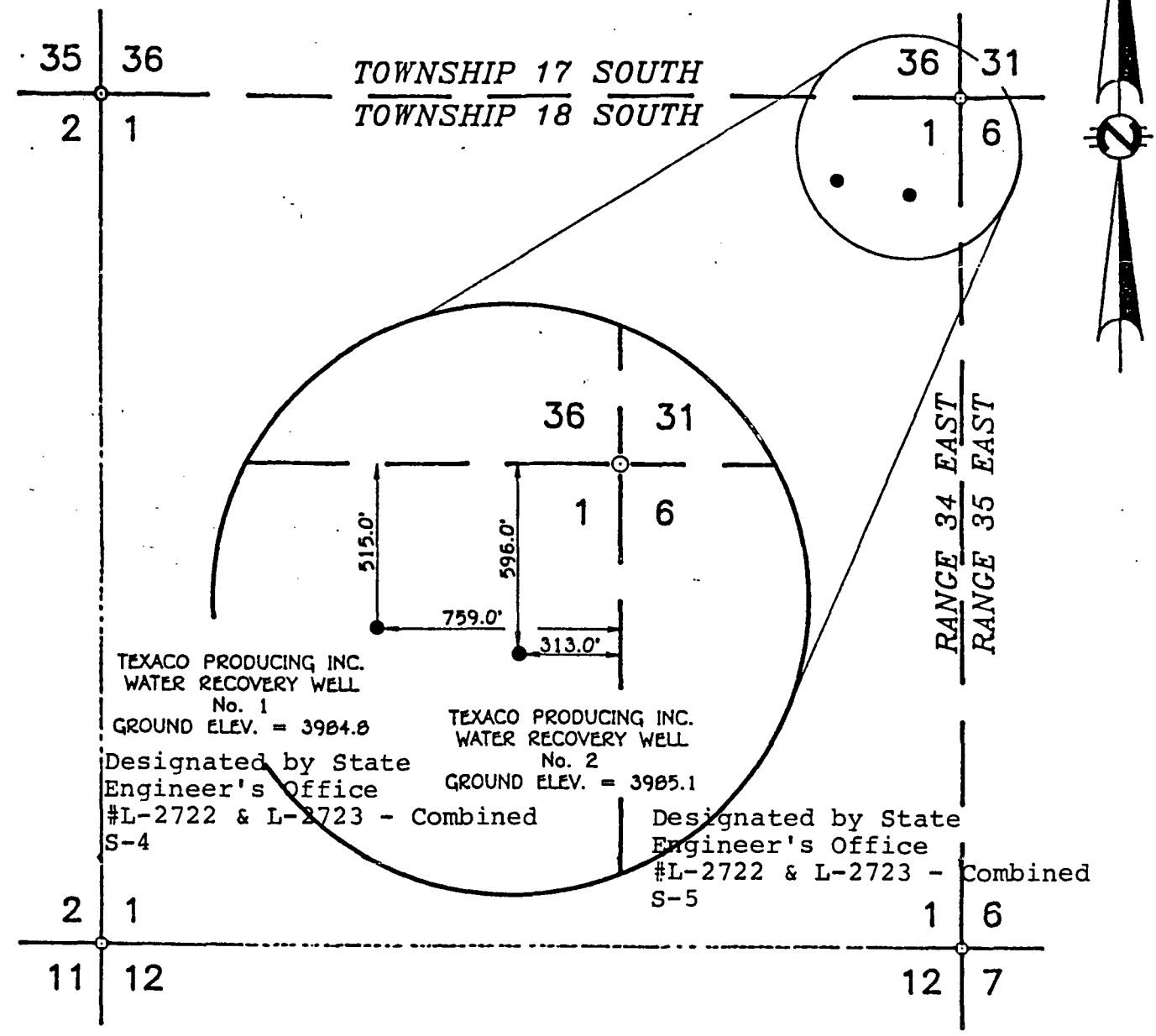
Start drilling recovery well #2. Location of well: NE 1/4 of NE 1/4, Section 1-T18S-R34E, approximately 100 feet to the north of Texaco GBSA #58 and to the SE of MW #11, which show higher chlorides and deeper redbed. The well was drilled in the vicinity of our source to extract as much contaminant as possible, to hold the contaminant in place, and not move through the formation.

Started drilling with 9 7/8" bit to TD of 232 feet; also redbed. Ran 6" PVC casing with perforations from 232-212'; this 20' section contained our best gravel section with the most porosity. Well was gravel-packed from 232' back to 200' and a bentonite cap was placed above the gravel. Well was then backfilled and cemented. Well was bailed and developed for testing; after several hours of bailing, water analyses were run. Chloride content was 111,825 ppm Cl. The location of this well was excellent to extract the most contaminant from the area. Pump will be installed and calibrated to pump approximately 1500 barrels per day, with analyses run on a regular basis.

Recovery well #1, located NE 1/4 of NE 1/4, Sec.1-T18S-R34E, approximately 75 feet south of Monitor Well #10, was a replacement location for the previously abandoned well.

Started drilling 9 7/8" hole to TD 234' and redbed. Ran 6" PVC casing with perforations from 234-214', the lowest portion of the formation with the most porosity and water bearing area. Well was gravel packed from TD back to 200 feet and capped with bentonite mud. Well was then backfilled and cemented to the surface. Well was bailed and developed for testing; water analysis was 98,335 ppm Cl. This was higher than expected; it seems the location was drilled in the main stream of our contaminant; this should give us a better chance of cleaning up the contaminated area and prevent the movement of the salt water. Pump was installed and pumped at 1500 barrels per day, with analyses run on a regular schedule.

LEA COUNTY, NEW MEXICO



REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR NO. 676 JOHN W. WEST

I HEREBY CERTIFY THAT THIS PLAT WAS MADE FROM NOTES TAKEN IN THE FIELD IN A BONA FIDE SURVEY MADE UNDER MY SUPERVISION, AND THAT THE SAME IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

JOHN W. WEST, N.M. P.E. & L.S. No. 676
TEXAS R.P.S. No. 1138

TEXACO PRODUCING, INC.

WATER RECOVERY WELL # 1 LOCATED 515.0' F.N.L. & 759.0' F.E.L. AND WATER RECOVERY WELL # 2 LOCATED 596.0' F.N.L. & 313.0' F.E.L., SECTION 1, TOWNSHIP 18 SOUTH, RANGE 34 EAST, N.M.P.M., LEA COUNTY, NEW MEXICO.

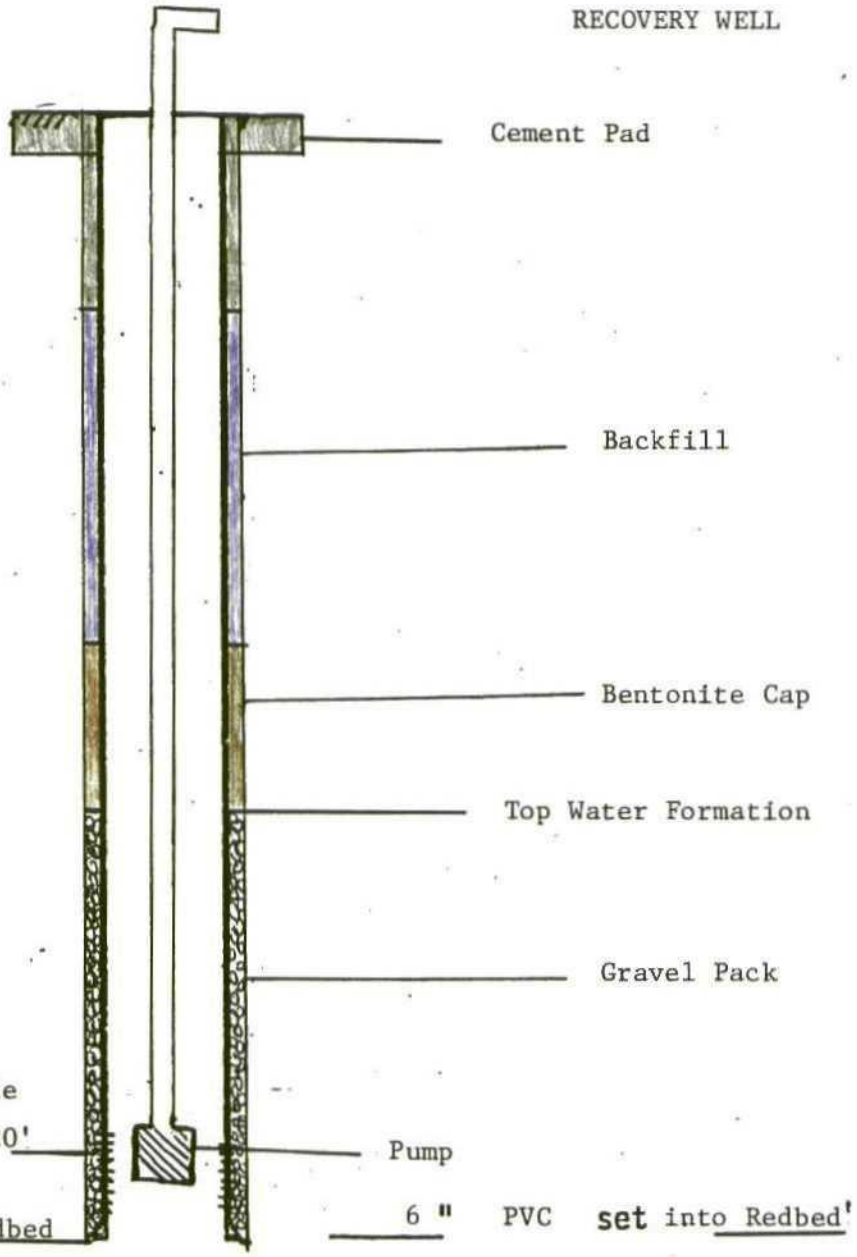
JOHN W. WEST ENGINEERING COMPANY

CONSULTING ENGINEERS — HOBBS, NEW MEXICO

Scale 1" = 1000'		Drawn By: S. STANFIELD	
Date: 2-28-1990	CK.	Sheet 1 of 1 Sheets	

LEASE		LOCATION	
Vacuum Field		Texaco CVU #3	Water Study

RECOVERY WELL



6 " PVC set into Redbed'

Hole size 9 5/8 "

Revised June 1972

water well #2

STATE ENGINEER OFFICE

WELL RECORD

Recovery Well #1

Section 1. GENERAL INFORMATION

(A) Owner of well Texaco USA Owner's Well No. _____

Street or Post Office Address P.O. Box 728

City and State Hobbs, New Mexico 88240

Well was drilled under Permit No. L-2722 L2723-S-5 and is located in the:

a. _____ ¼ _____ ¼ NE ¼ NE ¼ of Section 1 Township 18-S. Range 34-E. N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____ Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor Glenn's Water Well Service License No. WD 421

Address P.O. Box 692 Tatum, N.M. 88267

Drilling Began 2/27/90 Completed 2/27/90 Type tools rotary Size of hole 9 7/8 in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well 232 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Water Well #2

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	3	3	soil
3	18	15	caleche
18	34	16	sand
34	39	5	hard rock
39	221	198	sand
221	222	1	sandy clay
222	228	6	gravel
228	232	4	red clay

Revised June 1972

Water well #3

STATE ENGINEER OFFICE
WELL RECORD

Recovery Well #2

Section 1. GENERAL INFORMATION

(A) Owner of well Texaco USA Owner's Well No. _____
Street or Post Office Address P.O. Box 728
City and State Hobbs, New Mexico 88240

Well was drilled under Permit No. L-2722-L2723-S-4 and is located in the:

a. _____ ¼ _____ ¼ NE ¼ NE ¼ of Section 1 Township 18-S. Range 34-E. N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor Glenn's Water Well Service, Inc. License No. WD 421

Address P.O. Box 692 Tatum, New Mexico 88267

Drilling Began 2/28/90 Completed 2/28/90 Type tools rotary Size of hole 9 7/8 in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well 234 ft.

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	1	1	soil
1	13	12	caleche
13	15	2	hard rock
15	25	10	caleche
25	112	87	hard rock
112	118	6	sticky clay
118	208	90	sand
208	233	25	gravel
233	234	1	red clay

Well Abandon - 3-29-90

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION Water well #1

(A) Owner of well Texaco USA Owner's Well No. _____

Street or Post Office Address Box 728

City and State Hobbs, New Mexico 88240

Well was drilled under Permit No. L-2722 S- L-2723 5 and is located in the:

a. _____ ¼ _____ ¼ NE ¼ NE ¼ of Section 1 Township 18-S. Range 34-E. N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____ Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor Glenn's Water Well Service, Inc. License No. WD 421

Address P.O. Box 692 Tatum, New Mexico 88267

Drilling Began 2/27/90 Completed 2/27/90 Type tools rotary Size of hole 9 7/8 in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well 232 ft.

Section 6. LOG OF HOLE water well #1

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	1	1	soil
1	26	25	caleche
26	33	7	sand
33	41	8	hard rock
41	115	74	sand
115	208	93	sand
208	218	10	sandy clay
218	230	12	gravel
230	232	2	red clay

STATIC WATER LEVELS FOR MONITOR WELLS

1 - 122'6"

2 - 122'3"

3 - 123'1"

4 - 119'11"

5 - 123'3"

6 - 123'4"

7 - 122'1"

8 - 119'6"

9 - 121'6"

10 - 124'2"

11 - 123'10"

12 - 118'10"

13 - 120'6"

14 - 118'5"

15 - 118'2"

16 - 118'5"

17 - 118'11"

18 - 120'8"

19 - 119'

20 - 121'10"

21 - 123'1"

RECOVERY WELLS

WATER ANALYSIS

MONTH	RECOVERY #1	RECOVERY #2
2/90	111,825 ppm Cl	98,335 ppm Cl
3/90	69,000 ppm Cl	79,000 ppm Cl
4/90	55,000 ppm Cl	43,000 ppm Cl
5/90	39,300 ppm Cl	29,000 ppm Cl
6/90	35,000 ppm Cl	25,000 ppm Cl

DAILY CHLORIDE ANALYSIS

TEXACO CVU WATER SUPPLY WELL #3

10/20/89	1980 ppm Cl
10/21/89	1880 ppm Cl
10/22/89	3700 ppm Cl
10/23/89	3080 ppm Cl
10/24/89	2272 ppm Cl
10/26/89	2059 ppm Cl
10/27/89	1988 ppm Cl
10/30/89	2414 ppm Cl
11/01/89	2350 ppm Cl
11/02/89	1880 ppm Cl
11/07/89	1700 ppm Cl
11/10/89	1686 ppm Cl
11/13/89	6940 ppm Cl
11/16/89	1675 ppm Cl
11/17/89	1775 ppm Cl
11/21/89	2485 ppm Cl
11/29/89	6532 ppm Cl
12/01/89	2201 ppm Cl
12/04/89	2769 ppm Cl
12/05/89	1988 ppm Cl
12/06/89	4828 ppm Cl
12/07/89	4828 ppm Cl
12/12/89	3337 ppm Cl

Daily Chloride Analysis

Texaco CVU Water Supply Well #3 (continued)

12/13/89	3337 ppm Cl
12/14/89	2130 ppm Cl
12/19/89	3905 ppm Cl
12/27/89	6106 ppm Cl
12/28/89	4402 ppm Cl
01/04/90	2556 ppm Cl
01/05/90	3550 ppm Cl

VACUUM FIELD FRESH WATER WELLS

LEA COUNTY, NEW MEXICO

CHLORIDE CONTENT (PPM)

I.D.	WELL DESCRIPTION	1987 FOURTH QUARTER	1988 FIRST QUARTER	1988 SECOND QUARTER	1988 THIRD QUARTER	1988 FOURTH QUARTER	1989 FIRST QUARTER	1989 SECOND QUARTER	1989 THIRD QUARTER	1989 FOURTH QUARTER
1	TEXACO VGSAU SUPPLY WELL NO.1	173	156	156	142	165		196	213	
2	TEXACO VGSAU SUPPLY WELL NO.2				131			*	*	
3	TEXACO VGSAU SUPPLY WELL NO.3	145	153	170	190	213		*	*	
4	TEXACO VGSAU SUPPLY WELL NO.4	42	44	45	34	46	320	44	35	
5	TEXACO CVU SUPPLY WELL NO.1		554	280	582	660	840	544	*	
6	TEXACO CVU SUPPLY WELL NO.2	99	94	99	92	108	200	192	99	
7	TEXACO CVU SUPPLY WELL NO.3		87	79	91	109	360	114	1590	
8	TEXACO BUCKEYE OFFICE WELL	183	186	139	108	131	166	122	124	
9	TEXACO GAS PLANT WATER WELL						400	116	102	
10	BUCKEYE STORE WATER WELL	71	70	57	53	55	72	52	38	
11	FORKLIFT ENT. BUCKEYE STATION							*	*	
12	RANCH WINDMILL	40	42	38	36	36	84	*	34	
13	RANCH WINDMILL	36	37	33	35	37	66	36	37	
14	N. M. POTASH CORP. WELL NO.1						136	*	101	
15	N. M. POTASH CORP. WELL NO.5	103					92	88	78	
16	N. M. POTASH CORP. WELL NO.6	47						*	*	
17	N. M. POTASH CORP. WELL NO.7	45					58	48	55	
18	N. M. POTASH CORP. WELL NO.8	277	277	291		384	312	286	277	
19	AMAX WATER WELL	83					120	100	72	
20	WESTERN AG MINERALS WELL NO.1	93					82	78	62	
21	WESTERN AG MINERALS WELL NO.4	48					58	42	37	
22	WESTERN AG MINERALS WELL NO.5						90	*	27	
23	WESTERN AG MINERALS WELL NO.6	51						48	*	
24	WESTERN AG MINERALS WELL NO.7	46					70	*	*	
25	NATL. POTASH WATERWELL NO.7	244						*		
26	NATL. POTASH WATERWELL NO.2							*		
27	RANCH WINDMILLA	59	60	40	36	38	40	40	60	
28	WESTERN AG MINERALS WELL NO.9	62	62	65	62	64	66	68	70	
29	NVAU NO.100	152	146	160	146	146	164	166	180	
30	NVAU NO.101	100	152	150	142	142	144	140	140	
31	BRIDGES STATE NO. 179	64	56	60	48	55	54	44	60	
32	BRIDGES STATE NO. 94	88	80	85	84	80	84	88	85	
33	RANCH WINDMILL	39	38	45	36	44	40	38	40	
34	AMAX NO. 7	57	64	62	60	60	60	58	70	
35	AMAX NO. 6	53	62	55	52	56	60	62	60	
36	MOBIL OFFICE WATER WELL	45	46	46	48	44	50	50	60	
37	N.M. POTASH WATER WELL NO. 9	47	42	42	48	48	40	44	49	
38	NO NAME NO PUMP							*		

VACUUM FIELD FRESH WATER WELLS

LEA COUNTY, NEW MEXICO

CHLORIDE CONTENT (PPM)

I.D.	WELL DESCRIPTION	1987 FOURTH QUARTER	1988 FIRST QUARTER	1988 SECOND QUARTER	1988 THIRD QUARTER	1988 FOURTH QUARTER	1989 FIRST QUARTER	1989 SECOND QUARTER	1989 THIRD QUARTER	1989 FOURTH QUARTER
39	RANCH WINDMILL	38	38	40	34	38	40	36	40	
40	NO NAME NO PUMP							*		
41	RANCH WINDMILL							*		
42	RANCH WELL							*		
43	RANCH WELL							*		
44	RANCH WELL							*		
45	LEE PLANT SUPPLY WELL NO. 1	79	48		52		62	30	60	
46	LEE PLANT SUPPLY WELL NO. 2							*	168	
47	LEE PLANT SUPPLY WELL NO. 3	250			164	192	200	206		
48	LEE PLANT SUPPLY WELL NO. 4	190	156	170	176	168		117		
49	LEE PLANT MONITOR WELL NO. 1	113						*		
50	LEE PLANT MONITOR WELL NO. 2	248						*		
51	LEE PLANT MONITOR WELL NO. 3	85						*		
52	LEE PLANT MONITOR WELL NO. 4	99						*		
53	HALE MABLE SUPPLY WELL NO. SO-1	43	36	80	40	35	44	22	34	
54	HALE MABLE SUPPLY WELL NO. SO-2	71	76	90	62	52	80	47	66	
55	RANCH WINDMILL	47						*		
56	RANCH WINDMILL	38						*		
57	EVGSAU SUPPLY WELL NO. 2721-S04	115	40	50	52	60	64	32	60	
58	EVGSAU SUPPLY WELL NO. 2941-S05							*		
59	EVGSAU SUPPLY WELL NO. 3366-S06	59	42	37	52	62	76	58	64	
60	EVGSAU SUPPLY WELL NO. 3202-S07	59	28	32	50		60	30	64	
61	EVGSAU SUPPLY WELL NO. 2060-S01	78	40	46	48	56	60	46	44	
62	EVGSAU SUPPLY WELL NO. 2865-S02	61	36	80	50	60	64	56	60	
63	MOBIL SUPPLY WELL NO. S08							*		
64	MOBIL SUPPLY WELL NO. S09							*		
65	RANCH WINDMILL	54	36	90			44	38	48	
66	RANCH WINDMILL							*		
67	RANCH WINDMILL	42	20	50	32		42	24		
68	WATER WELL							*		
69	CHEVRON DOGHOUSE			70	50	24	28	8	20	
70	EXXON DOGHOUSE							*		
71	RANCH WINDMILL	27	18	20	16	30	18	20	11	
72	STATE OBSERVATION WELL NO. 1					57	57	57		
73	STATE OBSERVATION WELL NO. 4					57		*		
74	STATE OBSERVATION WELL NO. 5					71	71	28		
75	SW PUBLIC SERVICE WELL NO. 26			31	360	43		*		
76	SW PUBLIC SERVICE WELL NO. 27			36	109	57		*		
77	SW PUBLIC SERVICE WELL NO. 28			48	>2000	700	269	184	199	

UNICHEM
INTERNATIONAL

Home Office 707 N. Leech, P.O. Box 1499 / Hobbs, NM 88240 / Ph. 505/393-7751, TWX 910/986-0010

February 23, 1990

Mr. Wayne Minchew
Texaco, Inc.
West Star Route, Box 423
Lovington, NM 88260

Dear Mr. Minchew:

On February 19, 1990 samples from **Water Monitor Wells** were submitted for the following analysis:

LOCATION	CHLORIDES (mg/l)
#1	90
#2	166
#3	166
#4	100
#5	32
#6	122
#7	60
#8	78
#9	36
#10	36
#11	110
#12	44
#13	44
#14	66
#15	42
#16	48
#17	46
#18	44
#19	192
#20	108
#21	32
#22	76
#23	53,600

If you have any questions or require further information, please contact us.

Sincerely,

Bob Wallace

Bob Wallace
Production
Laboratory Manager

UNICHEM INTERNATIONAL INC.

cc: Jay Brown
David Demel
Maxey Brown
Joe Hay

UNICHEM
INTERNATIONAL

Home Office 707 N. Leech, P.O. Box 1499 / Hobbs, NM 88240 / Ph. 505/393-7751, TWX 910/986-0010

March 28, 1990

Mr. Wayne Minchew
Texaco, Inc.
West Star Route, Box 423
Lovington, NM 88260

Dear Mr. Minchew:

On March 26, 1990 samples were submitted to our laboratory from your Monitor Wells for the following analysis:

LOCATION	CHLORIDES (mg/l)
1	76
2	64
3	100
4	32
5	44
6	78
7	60
8	50
9	32
10	44
11	68
12	44
13	32
14	26
15	64
16	54
17	98
18	30
19	210
20	116
21	30
22	78
23	28,000

If you have any questions or require further information, please contact us.

Sincerely,

Sharon Wright
Laboratory Technician

SW/sr

UNICHEM INTERNATIONAL INC.

cc: Jay Brown David Demel Maxey Brown Joe Hay

UNICHEM
INTERNATIONAL

Home Office 707 N. Leech, P.O. Box 1499 / Hobbs, NM 88240 / Ph. 505/393-7751, TWX 910/986-0010

May 8, 1990

Mr. Wayne Minchew
Texaco, Inc.
West Star Route, Box 423
Lovington, NM 88260

Dear Mr. Minchew:

On May 1, 1990 samples were submitted to our laboratory for testing. Results are as follow:

LOCATION	CHLORIDES (mg/l)
VGSAU (Monitor Wells):	
#1	68
#2	60
#3	94
#4	30
#5	40
#6	44
#7	47
#8	36
#9	22
#10	26
#11	60
#12	42
#13	26
#14	18
#15	44
#16	44
#17	40
#18	32
#19	58
#20	100
#21	34
#22	50
#23	20,000

If you have any questions or require further information, please contact us.

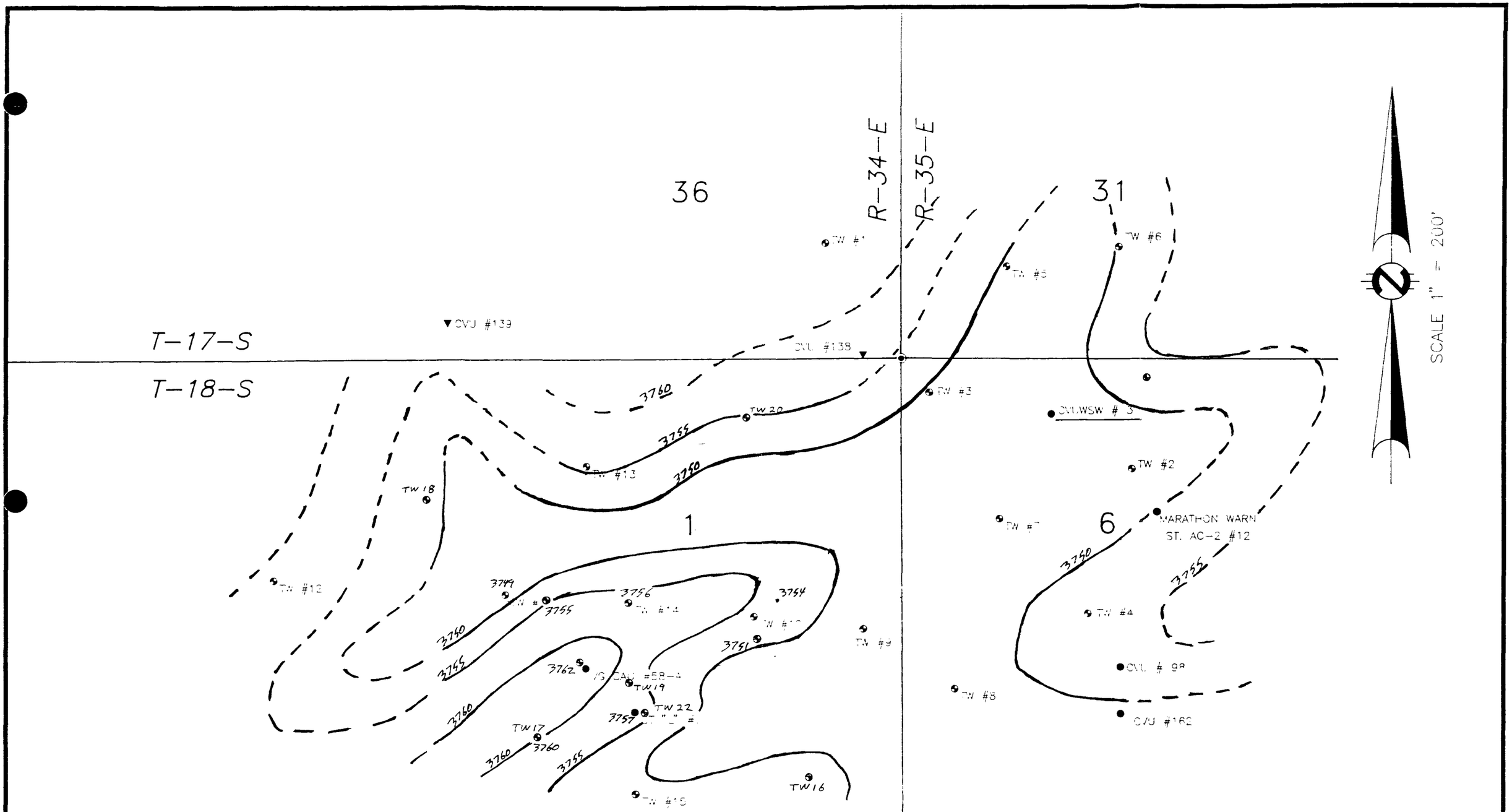
Sincerely,

Sharon Wright
Laboratory Technician

UNICHEM INTERNATIONAL INC.

SW/sr

cc: Jay Brown
Wayne Minchew
David Demel
Maxey Brown
Joe Hay



NOTE: TW = TEST WELL

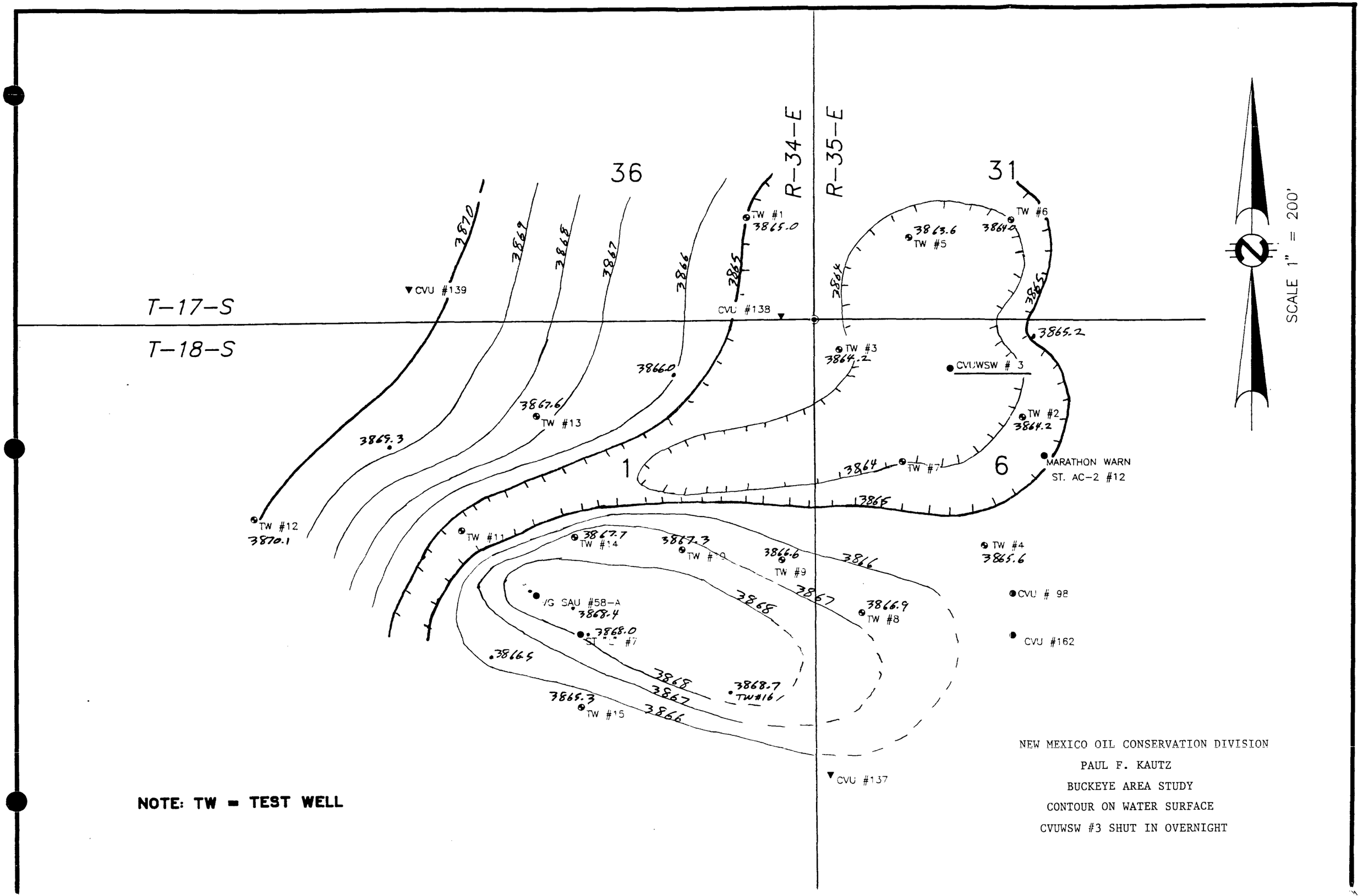
NEW MEXICO OIL CONSERVATION DIVISION

PAUL F. KAUTZ

BUCKEYE AREA STUDY

CONTOUR ON TOP OF REDBEDS

C1 = 5 FEET



NOTE: TW = TEST WELL

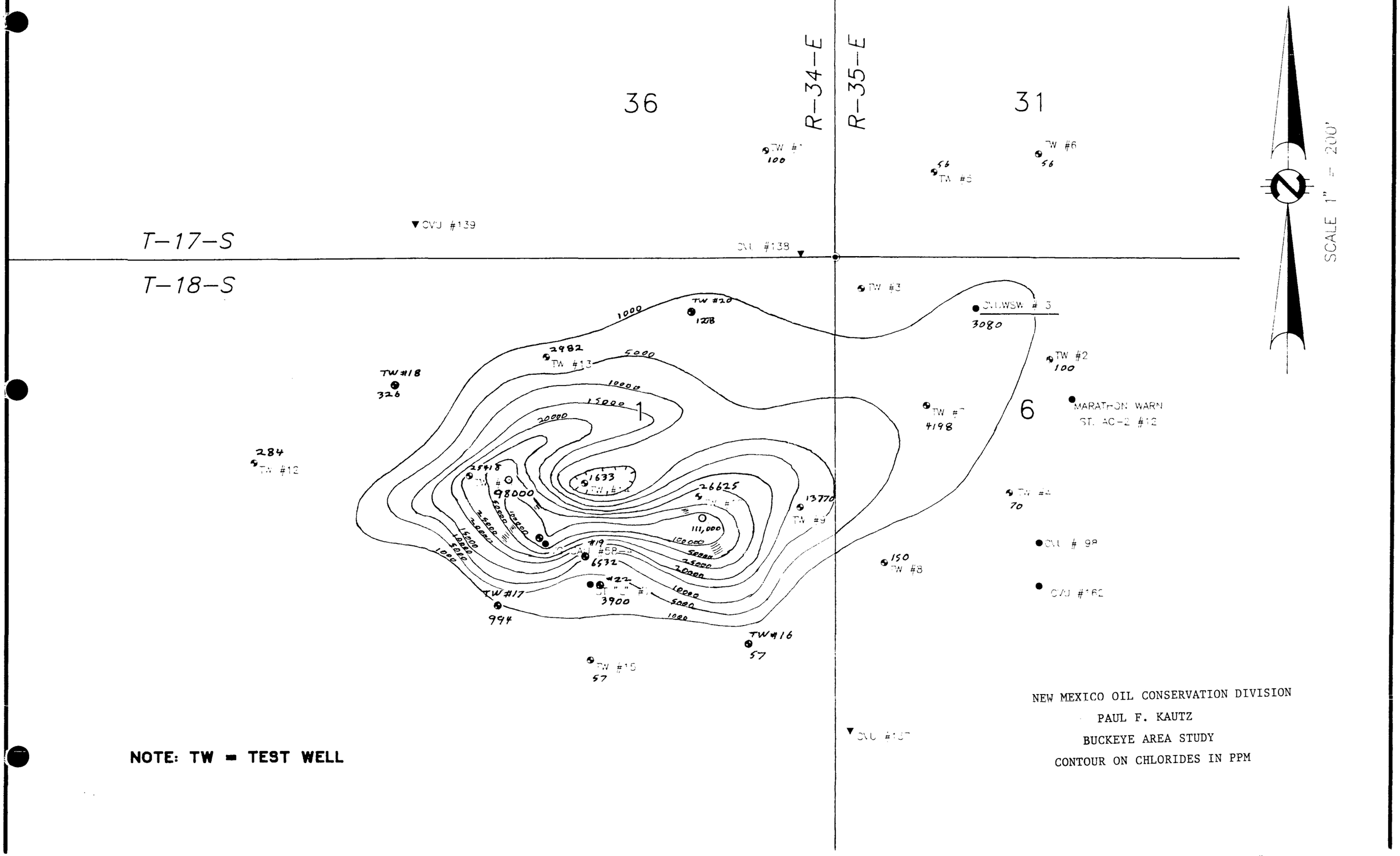
NEW MEXICO OIL CONSERVATION DIVISION

PAUL F. KAUTZ

BUCKEYE AREA STUDY

CONTOUR ON WATER SURFACE

CVUWSW #3 SHUT IN OVERNIGHT



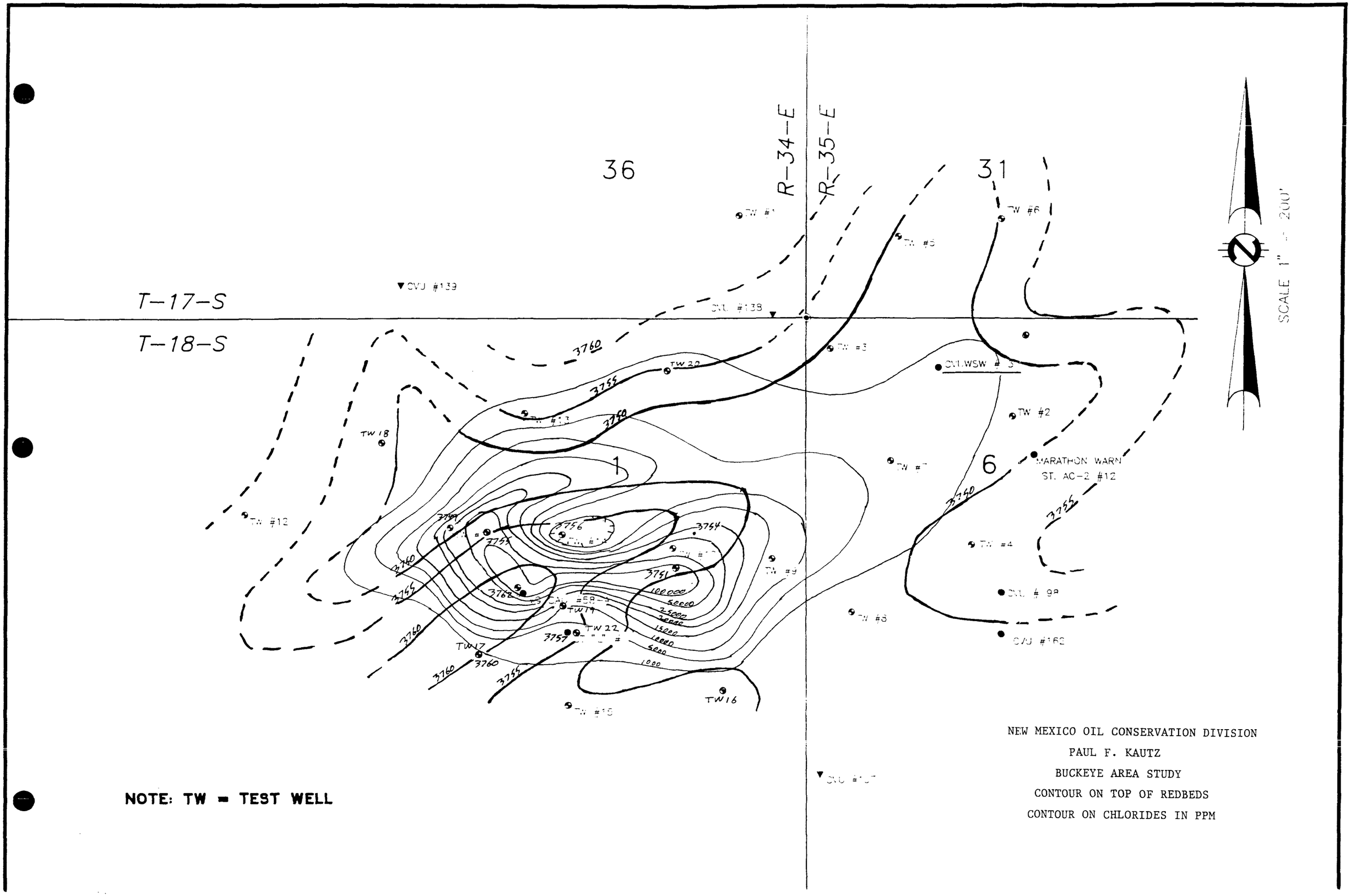
NOTE: TW = TEST WELL

NEW MEXICO OIL CONSERVATION DIVISION

PAUL F. KAUTZ

BUCKEYE AREA STUDY

CONTOUR ON CHLORIDES IN PPM



NOTE: TW = TEST WELL

NEW MEXICO OIL CONSERVATION DIVISION

PAUL F. KAUTZ

BUCKEYE AREA STUDY

CONTOUR ON TOP OF REDBEDS

CONTOUR ON CHLORIDES IN PPM

WELL RECORD

Monitor well #1

Section 1. GENERAL INFORMATION

(A) Owner of well Texaco U.S.A. Owner's Well No. _____

Street or Post Office Address _____

City and State _____

Well was drilled under Permit No. _____ and is located in the:

a. _____ ¼ _____ ¼ _____ ¼ _____ ¼ of Section _____ Township _____ Range _____ N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____ Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor _____ License No. _____

Address _____

Drilling Began _____ Completed _____ Type tools _____ Size of hole _____ in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
3"	PVC						120	200

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 5. PLUGGI ORD

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	34	34	caleche
34	42	8	hard rock
42	58	16	sand
58	64	8	rock
64	115	51	sand and rock
115	200	85	Sand

Section 7. REMARKS AND ADDITIONAL INFORMATION

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Monitor well #2

Section 1. GENERAL INFORMATION

(A) Owner of well Texaco U.A.S. Owner's Well No. _____

Street or Post Office Address _____

City and State _____

Well was drilled under Permit No. _____ and is located in the:

a. _____ ¼ _____ ¼ _____ ¼ _____ ¼ of Section _____ Township _____ Range _____ N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____ Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor _____ License No. _____

Address _____

Drilling Began _____ Completed _____ Type tools _____ Size of hole _____ in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
3"	PVC						158	238

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 6. LOG OF HOLE #2

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	36	36	caleche
	40	4	hard rock
40	52	12	Sand
52	55	3	rock
55	117	62	sand and rock
117	126	9	sand
126	138	12	sand and rock
138	146	8	sand
146	154	8	rock
154	215	61	sand and rock ledges
215	219	4	sandy clay
219	232	12	sand and gravel
232	238	6	red clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Monitor well #3

Section 1. GENERAL INFORMATION

(A) Owner of well Texaco U.S.A. Owner's Well No. _____

Street or Post Office Address _____

City and State _____

Well was drilled under Permit No. _____ and is located in the:

a. _____ ¼ _____ ¼ _____ ¼ _____ ¼ of Section _____ Township _____ Range _____ N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____ Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor _____ License No. _____

Address _____

Drilling Began _____ Completed _____ Type tools _____ Size of hole _____ in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
3"	PVC						156	238

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	36	36	caleche
36	41	5	hard rock
41	58	17	sand and caleche
58	125	67	sand
125	135	10	sand
135	224	89	sand and rock ledges
224	233	9	gravel stringers of
233	236	3	red clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

Revised June 1

STATE ENGINEER OFFICE

WELL RECORD

Moniter Well #4

Section 1. GENERAL INFORMATION

(A) Owner of well Texaco U.S.A. Owner's Well No. _____

Street or Post Office Address _____

City and State _____

Well was drilled under Permit No. _____ and is located in the:

a. _____ ¼ _____ ¼ _____ ¼ _____ ¼ of Section _____ Township _____ Range _____ N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____ Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor _____ License No. _____

Address _____

Drilling Began _____ Completed _____ Type tools _____ Size of hole _____ in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
3"	PVC						154	234

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

#4

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	3	3	oil
3	36	33	caleche
36	42	6	hard rock
42	54	12	sand and caleche
54	56	2	rock
56	105	49	sand
105	112	7	sandy clay
112	117	5	rock
117	222	105	sand and rock ledgers
222	232	10	gravel
232	234	2	red clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

#5 Monitor well

Section 1. GENERAL INFORMATION

(A) Owner of well Texaco U.S.A. Owner's Well No. _____

Street or Post Office Address _____

City and State _____

Well was drilled under Permit No. _____ and is l[illegible] l in the:

a. _____ ¼ _____ ¼ _____ ¼ _____ ¼ of Section _____ Town[illegible] _____ Range _____ N.M.P.M.

b. Tract No. _____ [illegible]f Map No. _____ of the _____

c. Lot No. _____ Block No. _____ of the _____
Subdivision, reco[illegible] _____ _____ County.

d. X= _____ [illegible]et, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ _____ Grant.

(B) Drilling Contractor _____ License No. _____

Address _____

Drilling Began _____ Completed _____ Type tools _____ Size of hole _____ in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
3"	PVC						154	234

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

well #5

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	35	35	caleche
35	41	6	hard rock
41	110	69	sand
110	113	3	rock
113	168	55	sand and rock ledgers
168	188	20	hard sand some clay
188	228	40	sand
228	231	3	gravel
231	234	3	red clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

well #6 Monitor well

Section 1. GENERAL INFORMATION

(A) Owner of well Texaco U.S.A. Owner's Well No. _____

Street or Post Office Address _____

City and State _____

Well was drilled under Permit No. _____ and is located in the:

a. _____ ¼ _____ ¼ _____ ¼ of Section _____ Township _____ Range _____ N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor _____ License No. _____

Address _____

Drilling Began _____ Completed _____ Type tools _____ Size of hole _____ in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
3"	PVC						156	236

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	37	37	caleche
37	42	5	hard rock
42	115	73	sand
115	179	64	sand and rock ledgers
179	185	6	sand some clay
185	226	41	sand
226	233	7	gravel
233	236	3	red clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

monotor well #7

(A) Owner of well Texaco U. S. A. Owner's Well No. _____

Street or Post Office Address _____

City and State _____

Well was drilled under Permit No. _____ and is located in the:

a. _____ ¼ _____ ¼ _____ ¼ _____ ¼ of Section _____ Township _____ Range _____ N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor Glenn's Water Well Service License No. _____

Address _____

Drilling Began 11/16/89 Completed 11/16/89 Type tools rotary Size of hole 6 ½ in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To				

Section 6. LOG OF HOLE Monotor well #7 Texaco U...

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	34	34	caleche
34	40	6	hard rock
40	75	35	sand with rock ledgers
75	222	47	sand
222	236	14	gravel
236	238	2	red clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

Revised June 197-

STA'' EER OFFICE

L RECORD

Sectio NERAL INFORMATION Monotor well #8

(A) Owner of well Texaco U.S.A. Owner's Well No. _____

Street or Post Office Address _____

City and State _____

Well was drilled under Permit No. _____ and is located in the:

a. _____ ¼ _____ ¼ _____ ¼ _____ ¼ of Section _____ Township _____ Range _____ N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____ Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor Glenn's Water Well Service License No. _____

Address _____

Drilling Began 11/17/89 Completed 11/17/89 Type tools rotary Size of hole 6 ½ in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

Section 6. LOG OF HOLE monotor well #8

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	36	36	caleche
36	39	3	hard rock
39	120	81	sand
120	225	105	sand and rock ledges
225	234	9	gravel
234	236	2	red clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION monotor well #9

(A) Owner of well Texaco U.S.A. Owner's Well No. _____

Street or Post Office Address _____

City and State _____

Well was drilled under Permit No. _____ and is located in the:

a. _____ ¼ _____ ¼ _____ ¼ _____ ¼ of Section _____ Township _____ Range _____ N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor Glenn's Water Well Service License No. _____

Address _____

Drilling Began 11/17/89 Completed 11/17/89 Type tools rotary Size of hole 6 ½ in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well _____ ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well _____ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

Section 6. LOG OF HOLE monotor well #2

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	32	32	Caleche
32	36	4	hard rock
36	41	5	Caleche clay
41	120	79	Sand
120	221	101	sand and rock ledgers
221	236	15	gravel
236	238	2	red clay

Section 7. REMARKS AND ADDITIONAL INFORMATION

LARRY'S DRILLING & PUMP CO.
2116 W. BENDER HOBBS, N.M.

DRILLING LOGES ON TEST WELLS FOR TEXACO AT BUCKEYE N.M.

WELL #10 TD 234 FT.

0	- 2	TOP SOIL LOOSE ROCK
2	- 20	CALICHE
20	- 27	HARD CALICHE RED ROCK
27	- 30	CALICHE
30	- 34	SAND GRAVEL
34	- 37	HARD RED ROCK
37	- 56	SAND
56	- 84	FINE SAND
84	- 208	SAND REAL SOFT
208	- 214	CORSE SAND GRAVEL
214	- 232	GRAVEL
232	- 234	RED BED

WELL #11 TD 240 FT.

0	- 6	TOP SOIL LOOSE ROCK
6	- 35	CALICHE
35	- 50	RED & WHITE ROCK SAND
50	- 53	VOID LOST CIRCULATION
53	- 142	SAND WHITE ROCK CLAY
142	- 180	SAND SOME GRAVEL
180	- 219	SAND WHITE ROCK
219	- 238	GRAVEL
238	- 240	RED BED

WELL #12 TD 230 FT.

0	- 2	TOP SOIL
2	- 31	CALICHE
31	- 33	HARD RED ROCK
33	- 50	CALICHE SAND
50	- 60	SAND
60	- 90	FINE SAND WHITE ROCK
90	- 100	ROCK SAND CLAY
100	- 190	SAND WHITE ROCK
190	- 218	SAND SOME CLAY & GRAVEL
218	- 228	GRAVEL
228	- 230	RED BED

WELL #13

0	- 1	TOP SOIL
1	- 10	CALICHE
10	- 16	HARD RED ROCK
16	- 23	CALICHE THIN LAYERS RED ROCK
23	- 26	HARD WHITE & RED ROCK
26	- 34	CALICHE
34	- 39	HARD RED ROCK
39	- 58	SAND CLAY
58	- 68	FINE SAND
68	- 118	SAND CLAY WHITE ROCK
118	- 140	CORSE SAND WHITE ROCK CLAY
140	- 190	SAND THIN WHITE ROCK CLAY
190	- 218	SAND WHITE ROCK LITTLE GRAVEL
218	- 228	GRAVEL
228	- 230	RED BED

WELL #14 230 FT.

0	- 2	TOP SOIL
2	- 22	CALICHE
22	- 36	BARD RED ROCK
36	- 50	SAND
50	- 54	CALICHE
54	- 90	SAND
90	- 116	THIN LAYERS WHITE ROCK SAND & CLAY
116	- 134	SAND CLAY
134	- 178	SAND SOME GRAVEL
178	- 203	SAND
203	- 218	SAND GRAVEL SOME CLAY
218	- 228	GRAVEL
228	- 230	RED BED

WELL # 15 TD 230 FT.

0	4	BLACK DIRT
4	12	HARD ROCK
12	20	SOFT CALICHE
20	25	SAND CLAY
25	30	HARD CALICHE
30	50	SAND CLAY CALICHE
50	80	SAND
80	100	SAND WHITE ROCK
100	138	SAND SOME GRAVEL & CLAY
138	205	SAND GRAVEL
205	220	HARDER SAND GRAVEL WHITE ROCK
220	228	GRAVEL
228	230	RED BED

WELL # 16 TD 233 FT.

0	33	CALICHE
33	38	HARD RED ROCK
38	63	SAND CLAY WHITE ROCK
63	120	SAND WHITE ROCK
120	130	SOFT SAND
130	180	SAND CLAY
180	216	SAND SOME WHITE ROCK
216	231	GRAVEL
231	233	RED BED

WELL # 17 TD 225 FT.

0	5	TOP SOIL CLAY
5	33	CALICHE
33	42	SAND
42	50	RED &WHITE ROCK
50	88	SAND & CLAY
88	110	SAND WHITE ROCK CLAY
110	144	SAND & CLAY
144	180	SAND GRAVEL
180	212	SAND CLAY GRAVEL
212	223	GRAVEL
223	225	RED BED

WELL # 18 TD 237 FT.

0	10	CALICHE
10	20	CALICHE HARD RED ROCK
20	26	HARD RED ROCK
26	34	SAND
34	38	HARD RED &WHITE ROCK
38	52	SAND THIN LAYERS ROCK
52	58	CALICHE
58	62	SAND WHITE ROCK
62	116	SAND REAL FINE
116	120	SAND WHITE ROCK
120	140	RED & WHITE ROCK
140	152	FINE BROWN SAND
152	190	CORSE SAND & GRAVEL
190	205	SAND
205	220	SAND WHITE ROCK
220	235	GRAVEL
235	237	RED BED

WELL # 19 226 FT.

0	8	BLACK DIRT
8	14	CLAY
14	22	CALICHE
22	31	SAND
31	32	WHITE ROCK
32	48	SAND WHITE ROCK
48	65	FINE SAND
65	110	SAND WHITE ROCK
110	139	HARD BROWN CLAY SAND WHITE ROCK
139	163	SAND SOME GRAVEL SOFT
163	207	SAND
207	215	SAND CLAY SOME GRAVEL
215	225	GRAVEL
225	226	RED BED

LARRY'S DRILLING & PUMP CO.
2116 W. BENDER HOBBS, N.M.

WELL # 20 TD 233

0-	20	CALICHE
20-	33	CALICHE RED & WHITE ROCK
33-	39	BARD RED &WHITE ROCK
39-	110	SAND SOME WHITE ROCK
110-	142	SAND, CLAY & WHITE ROCK
142-	180	SAND, CLAY & GRAVEL
180-	216	WAND, CLAY & WHITE ROCK
216-	230	GRAVEL
230-	232	GRAVEL & RED BED
232-	233	RED BED

WELL # 22 TD 227

0 -	13	DIRT BROWN CLAY
13 -	14	RED ROCK
14 -	28	GRAY & WHITE CLAY
28 -	34	CALICHE
34 -	42	SAND
42 -	50	CALICHE
59 -	80	SAND
80 -	115	SAND BROWN CLAY
115 -	142	SAND & CLAY
142 -	203	GRAVEL & SAND
203 -	218	SAND RED CLAY GRAVEL
218 -	225	GRAVEL
225 -	227	RED BED

WELL # 21 TD 233

0 -	28	CALICHE
28 -	31	SAND
31 -	38	SAND & CALICHE
38 -	40	HARD CALICHE
40 -	50	SAND WHITE ROCK
50 -	54	CALICHE
54 -	56	SAND
56 -	78	SAND & WHITE ROCK
78 -	140	CLAY & SAND
140 -	152	WHITE & RED CLAY
152 -	180	RED CLAY & GRAVEL
180 -	201	SAND & CLAY
201 -	220	SAND SOME GRAVEL
220 -	231	GRAVEL
231 -	233	RED BED

WELL # 23 TD 226

0 -	6	BLACK DIRT
6 -	14	GRAY & WHITE CLAY
14 -	68	CALICHE
68 -	90	SAND ROCK & CLAY
99 -	110	SAND SOME WHITE ROCK
110 -	134	SAND CLAY ROCK
134 -	176	SAND GRAVEL CLAY
176 -	204	SAND
204 -	218	SAND & GRAVEL
218 -	224	GRAVEL
224 -	226	RED BED

NEW MEXICO OIL CONSERVATION DIVISION

CASING--BRADENHEAD TEST

OPERATOR: TEXACO PRODUCING CO.

LEASE: VACUUM GRAYBURG SAN ANDRES UNIT WELL # 58

POOL: VACUUM GB,SA UNIT LTR A

FOOTAGE 665-N SECTION 1 TWN 18 S RANGE 34 E

FOOTAGE 660-E PRESS LMT . TYPE LEASE S TYPE WELL P

ORDER NO.. DATE INJ. BEGAN .

TEST DATE 17-Jun-87 TEST TYPE BHT PASS/FAIL PASS

OPERATOR REP: WAYNE OCD REP: CASTLEBERRY

CASING	SIZE	SET AT	TOP CMT	CEMENTED	PRESSURE	REMARKS
SURFACE	7 5/8	1509	NDB	300SX	0	.
INTERM-1	.	.	.	.	.	.
INTERM-2	.	.	.	.	.	.
PROD	5 1/2	4075	NDB	200SX	25	.
LINER	.	.	.	.		
TUBING	2 7/8	.	.	PUMP	.	

REMARKS: . SNC NO

REPAIR LETTER DATE . DATE REPAIR .

TEST DATE 03-Jun-88 TEST TYPE BHT PASS/FAIL BP02

OPERATOR REP: BILL OCD REP: TURNACLIFF

CASING	SIZE	SET AT	TOP CMT	CEMENTED	PRESSURE	REMARKS
SURFACE	7 5/8	1509	NDB	300SX	0	.
INTERM-1	.	.	.	.	.	.
INTERM-2	.	.	.	.	.	.
PROD	5 1/2	4075	NDB	700SX	30	.
LINER	.	.	.	.		
TUBING	2 7/8	.	.		30	SUB PUMP

REMARKS: . SNC NO

REPAIR LETTER DATE . DATE REPAIR .

TEST DATE 5-16-89 TEST TYPE PASS/FAIL BP02

OPERATOR REP: WAYNE OCD REP: LYLE

CASING	SIZE	SET AT	TOP CMT	CEMENTED	PRESSURE	REMARKS
SURFACE	7 5/8	1509	NDB	300SX	0	BLOW
INTERM-1	.	.	.	.		
INTERM-2	.	.	.	.		
PROD	5 1/2	4075	NDB	200SX	18	
LINER	.	.	.	.		
TUBING	2 7/8	.	.		18	SUB. PUMP

REMARKS: SNC No

REPAIR LETTER DATE DATE REPAIRED

CENTRAL VACUUM UNIT WATER SOURCE WELL #3

On Tuesday, October 17, 1989, Wayne Minchew and the production engineering staff of Texaco, Inc. for the Buckeye, New Mexico, Sub-Area were alerted to groundwater contamination by high chloride content on Central Vacuum Unit Water Source Well #3. This occurred as a result of regularly scheduled testing of all fresh water wells in the Vacuum Field. Further tests confirmed well contamination with chloride content readings of 1,834 ppm. Mr. Jerry Sexton of the New Mexico Oil Conservation Division was immediately notified of these findings as were all other operators in the Vacuum Field.

A thorough Bradenhead survey was conducted on all injection and producing wells within a one-half mile radius. This survey provided no clues as to the source of contamination. All other fresh water source wells belonging to Texaco in the area were shut in and production from CVU WSW #3 was increased to a maximum rate of 10,000 to 11,000 bbls per day. These steps were taken to isolate and pump as much contaminated water out of the Ogallala formation as possible.

A meeting was held on Friday, October 20, with Mr. Eddie Seay, Field Supervisor for the NMOCD. It was decided that Texaco would begin drilling monitor wells around the contaminated site in hope of pinpointing the direction and source of the contamination.

Texaco CVU #3 Water Study

Test well drilling began on 10/24/89. The locations for the test wells were selected based on the following information: redbed

1989
WORK

depth, direction of natural water flow, chloride analysis and Topographical structure. All selections were made and agreed upon by OCD and Texaco representatives.

To date, twenty-one (21) monitor wells have been drilled. Nine (9) of these wells have shown chloride contamination with readings ranging from 1,000 to 28,986 ppm. Each of these wells is located to the west and southwest of CVU WSW #3, indicating that the source of contamination is coming from a direction that is against the natural water flow of the Ogallala formation. By pumping CVU #3, it was drawing the higher chloride to it, creating its own water flow pattern or plume. As evidenced by the extremely high chloride counts on these wells, we are confident that we have found the heart of the contamination and moved closer to its source.

CENTRAL VACUUM UNIT WATER SOURCE WELL #3 - NOTES

10/17/89

Notification is made of groundwater contamination by high chloride content (1843 ppm) to Wayne Minchew by Ron Matthews, Unichem Int. The facts are given to David Demel and they are presented to James Head and Russell Pool. Jerry Sexton of the NMOCD is notified. All parties in the field are alerted. (Shell, Marathon, Phillips, Mobil). CVU WSW #2 is shut in. Samples are taken of the following wells :

1) CVU WSW #2 - 144 ppm
2) Buckeye Gas Plant WSW - 128 ppm
3) Potash Mine WSW #8 - 312 ppm

Gang ran Bradenhead survey on all injection wells in the area. CVU #137 showed 425# on csng and 700# on sur. A diagram is made of all lines that cross the water line for CVU WSW #3.

10/19/89

Ditch line is dug out to check for contamination. Bradenhead survey is run on all wells in a 1/2 mile radius. Nothing is found.

10/20/89

Wayne Minchew, Russell Pool and Robert Browning meet with Eddy Seay Field Supervisor for NMOCD. Possible contamination from spill on NM State "O" #28 (2/21/88) is discussed. It is decided to drill

a series of monitor wells in the area to pinpoint the source of contamination. Daily tests are to be run on CVU WSW #3.

10/20/89

CVU WSW #3 - 1980 ppm

10/21/89

CVU WSW #3 - 1880 ppm

10/22/89

CVU WSW #3 - 3700 ppm

10/23/89

CVU WSW #3 - 3080 ppm

10/24/89

CVU WSW #3 - 2272 ppm

Monitor Well #1

Location - 610' NW of CVU WSW #3

TD - 200' (Not to Red Bed)

WS - 115'

Csng - 3" PVC

Perfs - 60'

DW - 70 ppm (Tatum)

Well Samples - 1) 100 ppm

2) 100 ppm

3) 100 ppm

4) 100 ppm

Witnesses - E Seay, W Minchew & R Browning

Driller - C Glenn, Glenn's Water Well Service

Monitor Well #2

Location - 210' SE of CVU WSW #3

TD - 238'

WS - 115'

Csng - 3" PVC

Perfs - 60'

DW - 70 ppm (Tatum)

Well Samples - None taken. Quit due to dark.

10/25/89

Gathered samples and took fluid levels.

CVU WSW #3 - 1) 1600 ppm (Unichem)

2) 2343 ppm (E Seay)

3) 2343 ppm (E Seay)

Monitor Well #1- 1) 195 ppm (Unichem) @ 130'

2) 110 ppm (E Seay) @ 140'

3) 113 ppm (E Seay) @ 140'

Monitor Well #2- 1) 195 ppm (Unichem)

2) 100 ppm (E Seay)

Fluid level - 126' CVU WSW #3 shut in for 2 hrs. Fluid level rose to 123' indicating a 3' draw down when running.

10/26/89

CVU WSW #3 - 2059 ppm

Monitor Well #3

Location - 269' NW of CVU WSW #3

TD - 237'

WS - 118'

Csng - 3" PVC

Perfs - 80'

DW - 57 ppm (VGSAU)

Well Samples - 1) 71 ppm

2) 71 ppm

3) 71 ppm

Witnesses - E Seay, W Minchew, R Browning

Driller - C Glenn, Glenn's Water Well Service

Comments - Hit cavity and lost circulation @ 125' - 130'

Monitor Well #4

Location - 437' S of CVU WSW #3 (Edge of drilling pit for

CVU #98)

TD - 232'

WS - 118'

Csng - 3" PVC

Perfs - 80'

DW - 57 ppm (VGSAU)

Well Samples - 1) 70 ppm

2) 56 ppm

3) 50 ppm

4) 40 ppm

Witnesses - E Seay,W Minchew,R Browning

Driller - C Glenn, Glenn's Water Well Service

Comments - Sampled and tested Lee Ranch windmill - 57 ppm

10/27/89

Sampled and tested wells.

CVY WSW #3 - 1988 ppm

Monitor Wells -#1) 114 ppm (@ 170') fluid level - 122' 2"

#2) 57 ppm (@ 170') fluid level - 124' 2'

#3) 57 ppm (@ 180') fluid level - 124' 5"

#4) 43 ppm (@ 190') fluid level - 120' 5"

10/30/89

CVU WSW #3 - 2414 ppm

Monitor Well #5

Location - 334' N of CVU WSW #3

TD - 234'

WS - 115'

Csng - 3" PVC

Perfs - 80'

DW - 57 ppm (VGSAU)

Well Samples - 1) 71 ppm
2) 56 ppm
3) 56 ppm
4) 56 ppm
5) 56 ppm

Witnesses - E Seay,R Browning

Driller - C Glenn, Glenn's Water Well Service

Monitor Well #6

Location - 389' NE of CVU WSW #3

WS - 115'

Csng - 3" PVC

Perfs - 80'

DW - 57 ppm (VGSAU)

Well Samples - 1) 56 ppm
2) 56 ppm
3) 56 ppm
4) 56 ppm

Witnesses - E Seay, R Browning

Driller - C Glenn, Glenn's Water Well Service

10/30/89

Gathered samples and checked fluid levels & draw downs

CVU WSW #3 - 2400 ppm

CVU WSW #2 - 50 ppm

Monitor Wells- #1) 90 ppm (@ 180') fluid level 122' 2" (122' 0")

#2) 50 ppm " " 125' 8" (122' 9")

#3) 64 ppm " " 123' 3" (122' 7")

#4) 40 ppm " " 120' 3" (119'10")

#5) 90 ppm " " 123' 5" (122'10")

#6) 50 ppm " " 123'11" (123" 1")

11/1/89

CVU WSW #3 - 2350 ppm

11/2/89

CVU WSW #3 - 1880 ppm

Letter is sent to R Lane in Midland notifying him and the regulatory compliance group of the situation and what has been done to date.

11/7/89

CVU WSW #3 - 1700 ppm

Potash Mine WSW #8 - 294 ppm

11/10/89

CVU WSW #3 - 1686 ppm

Potash Mine WSW #8 - 304 ppm

11/13/89

CVU WSW #3 - 6940 ppm

Potash Mine WSW #8 - 306 ppm

11/16/89

CVU WSW #3 - 1675 ppm

Monitor Well #7

Location - aprox 253' W of CVU WSW #3

TD - 238'

WS - Unknown

Csng - 3" PVC

Perfs - 120'

DW - 57 ppm (VGSAU)

Well Samples - 1) 5325 ppm

2) 4260 ppm

3) 3195 ppm

4) 3337 ppm

5) 3497 ppm

6) 4047 ppm

7) 4198 ppm

Witneses - E Seay, R Browning

Driller - C Glenn, Glenn's Water Well Service

Comments - Lost circulation at 85' - 140' due to cavity. Very poor circulation all the way.

11/17/89

CVU WSW #3 - 1775 ppm

Monitor Well #8

Location - 628' SW of CVU WSW #3

TD - 236'

WS - Unknown

Csng - 3" PVC

Perfs - 120'

DW - 4600 ppm (Source unknown. Came from town.)

Well Samples - 1) 1065 ppm

2) 710 ppm

3) 300 ppm

4) 200 ppm

5) 150 ppm

Witnesses - E Seay, W Minchew, R Browning

Driller - C Glenn, Glenn's Water Well Servive

Comments - Lost circulation at 40' - 85' due to large cavity. Very

poor circulation all the way.

Monitor Well #9

Location - 613' W of CVU WSW #3

TD - 236'

WS - 115'

Csng - 3" PVC

DW - 42 ppm (VGSAU)

Perfs - 120'

Well Samples - 1) 13,845 ppm
2) 12,750 ppm
3) 13,490 ppm
4) 13,064 ppm
5) 13,774 ppm

Witnesses - E Seay, R Browning

Driller - C Glenn, Glenn's Water Well Service

11/20/89

Followup letter is sent to R Lane in Midland updating him and the regulatory compliance group of all progress in the situation.

11/21/89

Fluid levels and samples on monitor wells.

CVU WSW #3 - 2485 ppm

Monitor Well - #1) 85 ppm. Fluid level - 122' 1" (121' 11")

#2) 57 ppm	"	"	125' 5"	(122' 4")
#3) 43 ppm	"	"	124' 4"	(122' 10")
#4) 43 ppm	"	"	120' 2"	(119" 10")
#5) 99 ppm	"	"	123' 2"	(122' 10")
#6) 43 ppm	"	"	123' 6"	(123' 0")
#7) 199 ppm	"	"	123' 2"	(122' 2")
#8) 540 ppm	"	"	119' 4"	(119' 3")
#9) 710 ppm	"	"	121' 3"	(121' 2")

11/29/89

CVU WSW #3 - 6532 ppm

Monitor Well #10

Location - 774' WSW of WSW #3

TD - 234 '

WS - 115'

Csng - 3" PVC

DW - 57 ppm

Perfs - 120'

** Quit for dark **

11/30/89

Completed drilling Monitor Well #10.

Well Samples - 1) 26,625 ppm

2) 28,986 ppm

3) 26,980 ppm

4) 20,495 ppm

Witnesses - E Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Monitor Well #11

Location - 1230' WSW of CVU WSW #3

TD - 241'

WS - Unknown

Csng - 3" PVC

DW - 57 ppm (VGSAU - 3 loads)

Perfs - 120'

** Quit for dark and weather **

12/1/89

CVU WSW #3 - 2201 ppm

Buckeye Yard WSW - 114 ppm

Completed drilling Monitor Well #11

Well Samples - 1) 18,460 ppm

2) 24,495 ppm

3) 23,288 ppm

4) 24,495 ppm

5) 25,489 ppm

6) 25,418 ppm

Witnesses - E Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Comments - Lost circulation at 50' - 55' and then again at 90' - 95' due to cavities. Poor circulation all the way. Used 4 bags of Aqua-Gel, 1 bag of Lime, and 1 bag of Hy-Seal that belonged to C Glenn. Took them from barn in yard when we learned that Larry did not have any. Told Corky the next afternoon. Fine with him.

Monitor Well #12

Location - 1700' WSW of CVU WSW #3

TD - 230' (Red Bed @ 228')

WS - 115'

Csng - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

** Quit for dark **

12/4/89

CVU WSW #3 - 2769 ppm

Completed drilling Monitor Well #12.

Well Samples - 1) 284 ppm
2) 284 ppm
3) 284 ppm
4) 284 ppm

Witnesses - E Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Monitor Well #13

Location - 995' W of CVU WSW #3 (Buckeye Gas Plant Yard)

TD - 232' (RB @ 230')

WS - 115'

Csng - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

** Quit for dark **

12/5/89

CVU WSW #3 - 1988 ppm

Completed drilling Monitor Well #13.

Sampled contaminated wells (#7, #8, #9, #10, #11, #12).

Well Samples - 1) 2457 ppm
2) 3053 ppm
3) 2982 ppm
4) 2982 ppm
5) 2982 ppm

Witnesses - E Seay, W Minchew, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Monitor Well - #7) 57 ppm @ 130' (57 ppm @ 225')
#8) 57 ppm @ 130' (170 ppm @ 225')
#9) 43 ppm @ 130' (994 ppm @ 225')
#10) 1051 ppm @ 130' (1420 ppm @ 225')
#11) 1207 ppm @ 130' (1349 ppm @ 225")
#12) 128 ppm @ 200'

Monitor Well #14

Location - 987' WSW of WSW #3 (Between Monitor Wells #10 and #11.)

TD - 231' (RB @ 229')

WS - 115'

Csng - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

** Quit for dark **

12/6/89

CVU WSW #3 - 4828 ppm

Completed drilling Monitor Well #14

Well Samples - 1) 199 ppm
2) 710 ppm
3) 710 ppm
4) 1633 ppm
5) 1563 ppm
6) 1633 ppm
7) 1633 ppm

Witnesses - E Seay, W Minchew, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Comments - The contamination has appeared to be running along the lower parts of the Red Bed. It has been found where the Red Bed is at the lower depths. We felt like we would

find extremely high chlorides on this well, but it appears that we hit a high spot in the Red Bed, causing us to get lower readings than expected.

Monitor Well #15

Location - 1204' SW of CVU WSW #3 (aprox 100' SE of NM State "L" #6)

TD - 231' (RB @ 229')

WS - 115'

Csng - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

** Quit for dark **

12/7/89

CVU WSW #3 - 4828 ppm

Completed drilling Monitor Well #15

Well Samples - 1) 56 ppm
2) 43 ppm
3) 43 ppm
4) 43 ppm

Witness - E Seay (W Minchew and R Browning were in Roswell, NM that day.)

Driller - L Felkins, Larry's Drilling & Pump Co.

** Quit for the Week to allow Larry to make repairs to his mud pump. Staked location for Monitor Well #16.

12/11/89

Air lines, and water truck froze due to weather. Shut down due to weather.

12/12/89

CVU WSW #3 - 3337 ppm

Monitor Well #16

Location - aprox 1100' SSW of CVU WSW #3

TD - 233' (RB @ 232')

WS - 115'

Csng - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

** Quit for dark **

12/13/89

CVU WSW #3 - 3337 ppm

CVU WSW #1 Relief Well - 700 ppm

Completed Monitor Well #16

Well Samples - 1) 57 ppm

2) 71 ppm

3) 57 ppm

4) 57 ppm

Witnesses - E Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Monitor Well #17

Location - aprox 1400' SW of CVU WSW #3 (aprox 300' S of Monitor Well #11.)

TD - 225' (RB @ 223')

WS - 115'

CSNG - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

** Quit for dark **

12/14/89

CVU WSW #3 - 2130 ppm

Completed drilling Monitor Well #17

Well Samples - 1) 667 ppm
2) 809 ppm
3) 994 ppm
4) 994 ppm
5) 923 ppm
6) 994 ppm

Witnesses - E Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

** Began drilling Monitor Well #18, but burned up one of Larry's

motors on his rig at aprox 215'. Shut down until he can repair it. A new one will have to be ordered. Will complete Monitor Well # 18 when it comes in. **

12/19/89

Monitor Well #18

Location - Apx. 200' W of Monitor Well #13 and 200' N of Monitor Well #11.

TD - 237' (RB @ 235')

CSNG - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

CVU #3 - 3905 ppm

Completed drilling Monitor Well #18

Well Samples - 1) 326.6 ppm
2) 326.6 ppm
3) 340.0 ppm
4) 340.0 ppm
5) 326.6 ppm

Witnesses - E. Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Move to drill #19.

12/20/89

Monitor Well #19

Location - 75' E of #58 and 75' N of #7 Pumping well.

TD- 226' (RB @ 225')

CSNG - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

Completed drilling Monitor Well #19.

Well Samples - 1) 411.8 ppm

2) 1164.4 ppm

3) 1732.4 ppm

4) 2414.0 ppm

5) 2698.0 ppm

6) 3976.0 ppm

7) 4828.0 ppm

8) 5254.0 ppm

9) 5254.0 ppm

10) 5396.0 ppm

11) 5751.0 ppm

12) 5964.0 ppm Smell of oil and Sheen on water.

13) 6319.0 ppm " "

14) 6390.0 ppm " "

15) 6461.0 ppm " "

16) 6532.0 ppm " "

Witnesses - E Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Move to Monitor Well #20.

12/27/89

Monitor Well #20

Location - 1/4 way between #13 & #7.

TD - 233' (RB @ 231')

CSNG - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

CVU #3 - 6106 ppm

Well Samples - 1) 113.6 ppm

2) 255.6 ppm

3) 454.4 ppm

4) 837.8 ppm

5) 994.0 ppm

6) 1050.8 ppm

7) 1093.4 ppm

8) 1164.4 ppm

9) 1278.0 ppm

10) 1278.0 ppm

Witnesses - E Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Move to test well #21.

12/28/89

Monitor Well #21

Location: 200' E of CVU #3 and between TW2 and TW6

TD - 233' (RB @ 231')

CSNG - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

Bail sample from test well #19; no show of oil on bailer or sample.

Test Well #19 - 85.2 ppm Top at 119

CVU #3 - 4402 ppm

Monitor Well #21
Well Samples - 1) 56.8 ppm

2) 42.6 ppm

3) 42.6 ppm

4) 42.6 ppm

5) 42.6 ppm

Witnesses - E Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Shut down.

1/4/90

Monitor Well #22

Location: 12' east of well #7 N.M. "L"

TD - 227' (RB @225')

CSNG - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

CVU #3 - 2556 ppm

Well Samples - 1) 2513 ppm
2) 3195 ppm
3) 3905 ppm
4) 3905 ppm
5) 3905 ppm
6) 3905 ppm

Rig down and move.

Witnesses - E Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

Monitor Well #22 Cuttings - Fluoroscope Test TD - 227' RB - 225'

110' - Nothing

120' - "

130' - "

140' - "

150' - "

160' - "

170' - Grease ?

Cont. (Fluoroscope test)

180' - Grease ?

190' - "

205' - "

215' - "

225' - (RedBed) - Trace of Hydrocarbon

227' - (TD) - Oil Sheen on Water

WATER LEVELS 1/4/90

1 - 122'6"

2 - 122'3"

3 - 123'1"

4 - 119'11"

5 - 123'3"

6 - 123'4"

7 - 122'1"

8 - 119'6"

9 - 121'6"

10 - 124'2"

11 - 123'10"

12 - 118'10"

13 - 120'6"

14 - 118'5"

15 - 118'2"

16 - 118'5"

17 - 118'11"

18 - 120'8"

19 - 119'

20 - 121'10"

21 - 123'1"

1/5/90

Monitor Well #23

Location: Apx. 12' N/NW of GBSA #58

TD - 226' (RB @ 224')

CSNG - 3" PVC

DW - 57 ppm (VGSAU)

Perfs - 110'

CVU #3 - 3550 ppm

Well Samples - 1) 99,000 ppm

2) 112,000 ppm

3) 116,000 ppm

Witnesses - E. Seay, R Browning

Driller - L Felkins, Larry's Drilling & Pump Co.

NEW MEXICO OIL CONSERVATION DIVISION
CASING--BRADENHEAD TEST

OPERATOR: TEXACO PRODUCING CO.
LEASE: VACUUM GRAYBURG SAN ANDRES UNIT WELL # 58 --
POOL: VACUUM GB,SA UNIT LTR A
FOOTAGE 665-N SECTION 1 TWN 18 S RANGE 34 E
FOOTAGE 660-E PRESS LMT . TYPE LEASE S TYPE WELL P
ORDER NO.. DATE INJ. BEGAN .

TEST DATE17-Jun-87 TEST TYPE BHT PASS/FAIL PASS
OPERATOR REP: WAYNE OCD REP: CASTLEBERRY

CASING	SIZE	SET AT	TOP CMT	CEMENTED	PRESSURE	REMARKS
SURFACE	7 5/8	1509	NDB	300SX	0	.
INTERM-1	.	.	.	.	.	.
INTERM-2	.	.	.	.	.	.
PROD	5 1/2	4075	NDB	200SX	25	.
LINER	.	.	.	.		
TUBING	2 7/8	.	.		PUMP	.

REMARKS: . SNC NO
REPAIR LETTER DATE . DATE REPAIR .

TEST DATE03-Jun-88 TEST TYPE BHT PASS/FAIL BP02
OPERATOR REP: BILL OCD REP: TURNACLIFF

CASING	SIZE	SET AT	TOP CMT	CEMENTED	PRESSURE	REMARKS
SURFACE	7 5/8	1509	NDB	300SX	0	.
INTERM-1	.	.	.	.	.	.
INTERM-2	.	.	.	.	.	.
PROD	5 1/2	4075	NDB	200SX	30	.
LINER	.	.	.	.		
TUBING	2 7/8	.	.		30	SUB PUMP

REMARKS: . SNC NO
REPAIR LETTER DATE . DATE REPAIR .

TEST DATE 5-16-89 TEST TYPE PASS/FAIL BP02
OPERATOR REP: WAYNE OCD REP: LYLE

CASING	SIZE	SET AT	TOP CMT	CEMENTED	PRESSURE	REMARKS
SURFACE	7 5/8	1509	NDB	300SX	0	BLOW
INTERM-1	.	.	.	.		
INTERM-2	.	.	.	.		
PROD	5 1/2	4075	NDB	200SX	18	
LINER	.	.	.	.		
TUBING	2 7/8	.	.		18	SUB PUMP

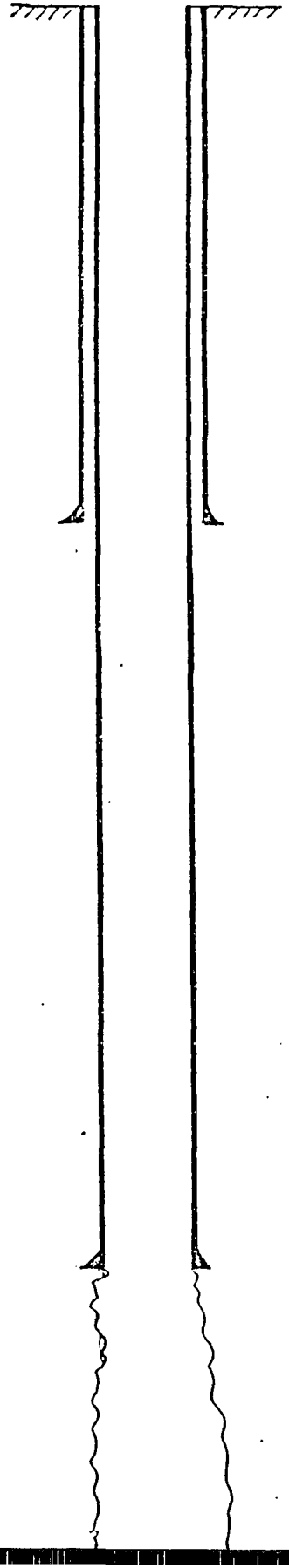
REMARKS: SNC KO
REPAIR LETTER DATE DATE REPAIRED

OPERATOR		DATE
Texaco Producing Inc.		1938
LEASE	WELL No.	LOCATION
Vacuum GB/SA	58	(A) Section 1-T18S-R34E

Top Salt 1540'

Base Salt 2680'

No record of waterflow or casing repair.



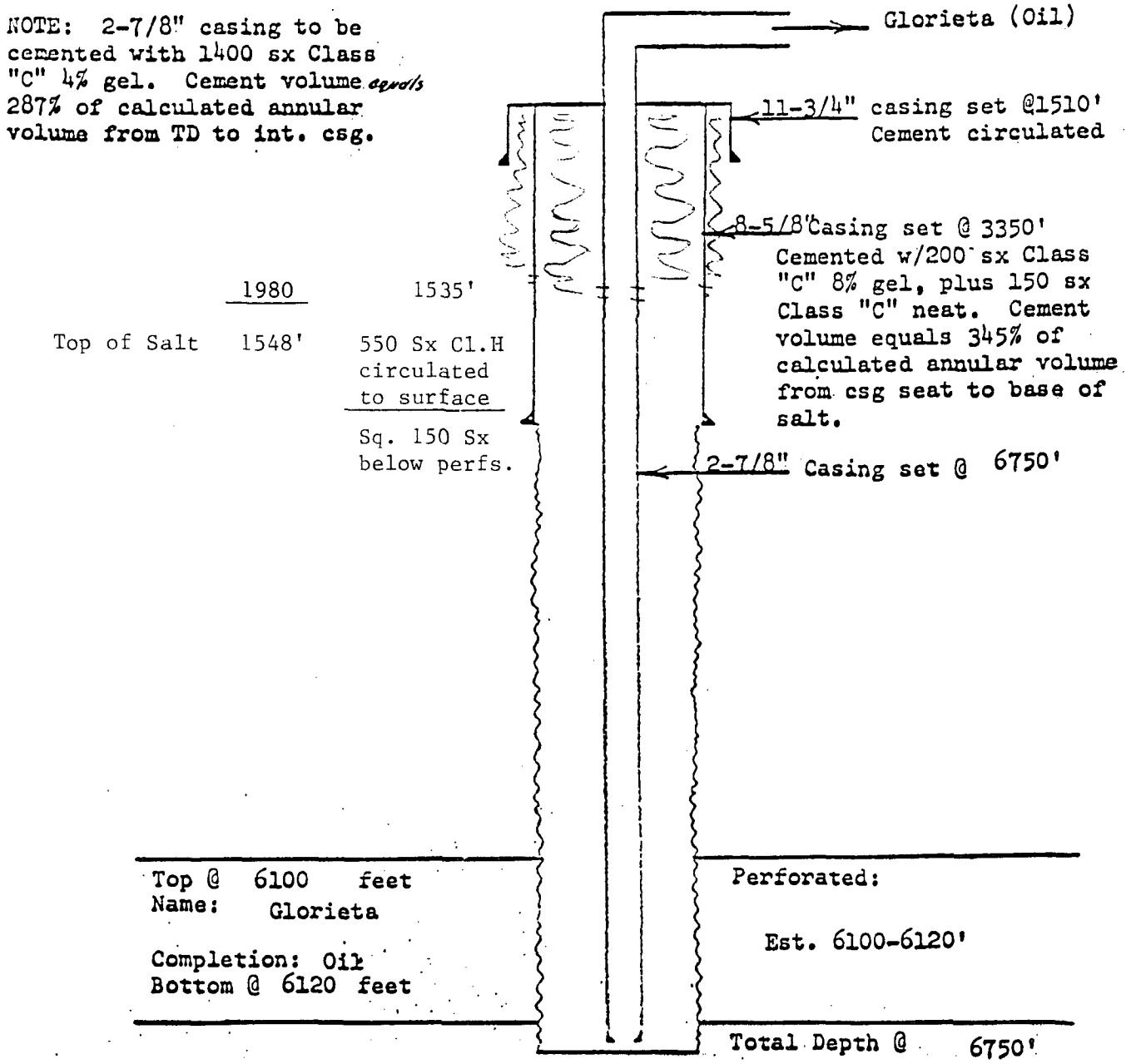
7 5/8" casing set at 1507' with 300 sx of Trinity cemen

Hole size 9 5/8"

5 1/2" casing set at 4075' with 200 sx of _____ ceme

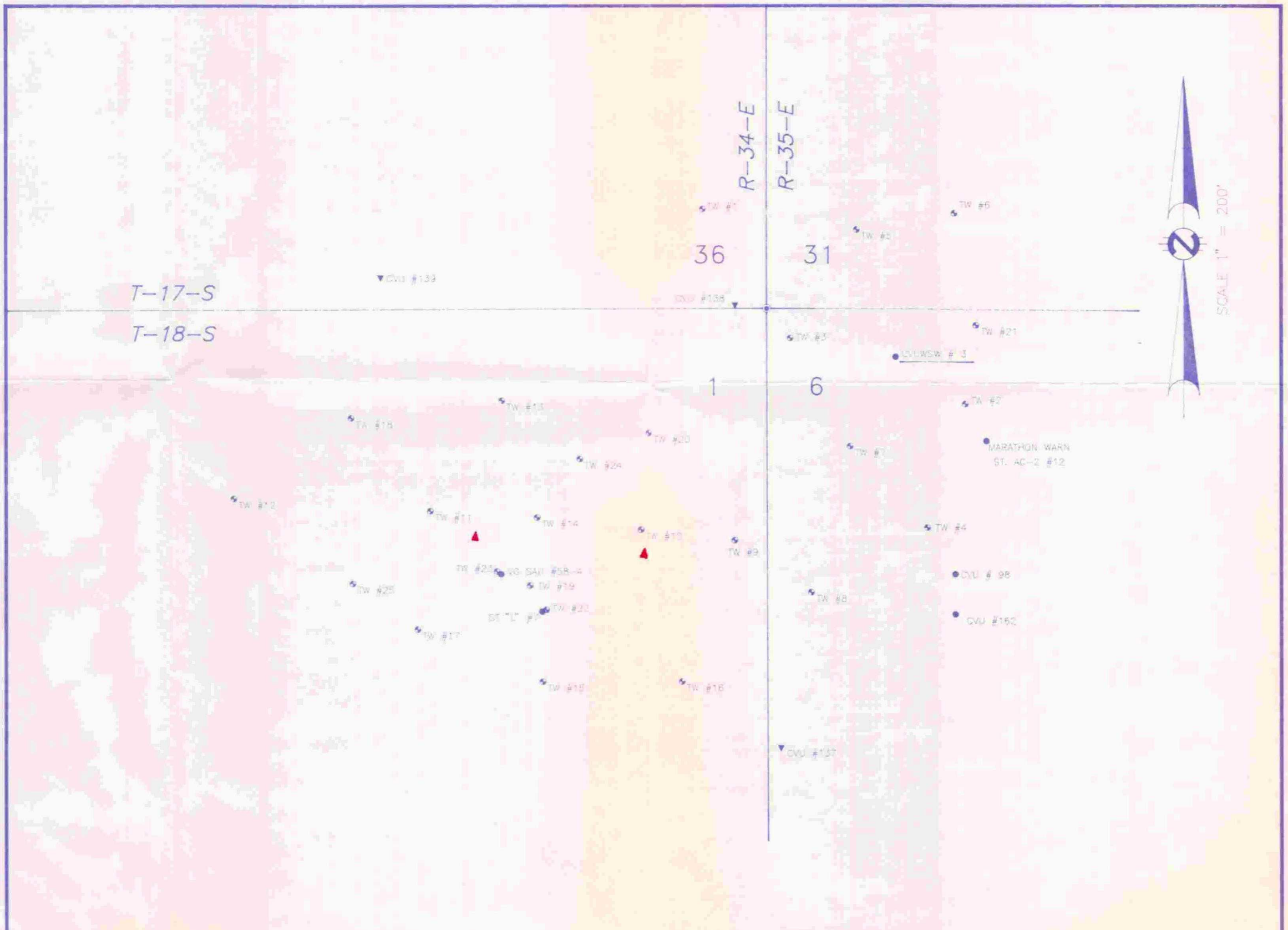
Total Depth 4710' Hole size 6 5/8"

Diagrammatic Sketch of Single Tubingless Completion



TEXACO Inc.

Lease: State of New Mexico "L" Well No. 7
Field: Vacuum (Glorieta)
Date: March 17, 1964



WELL No.	WELL ELEVATIONS		DISTANCE FROM CVUWSW No 3	LOCATION OF WELLS
TEST WELL No 1	TOP CONC. PAD	3985.7'	N52°37'W	181' FNL & 251' FEL SECTION 36, T-17-S, R-34-E
	TOP 3" PIPE UNDER CAP	3987.5'	616'	
TEST WELL No 2	TOP CONC. PAD	3984.8'	S56°38'E	210' FNL & 493' FWL SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3986.4'	210'	
TEST WELL No 3	TOP CONC. PAD	3985.8'	N79°21'W	44' FNL & 19' FWL SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3987.3'	289'	
TEST WELL No 4	TOP CONC. PAD	3984.0'	S12°31'E	551' FNL & 404' FWL SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3985.5'	437'	
TEST WELL No 5	TOP CONC. PAD	3985.4'	N17°08'W	198' FSL & 226' FWL SECTION 31, T-17-S, R-35-E
	TOP 3" PIPE UNDER CAP	3986.8'	354'	
TEST WELL No 6	TOP CONC. PAD	3985.5'	N21°58'E	240' FSL & 433' FWL SECTION 31, T-17-S, R-35-E
	TOP 3" PIPE UNDER CAP	3987.3'	389'	
TEST WELL No 7	TOP CONC. PAD	3984.8'	S26°55'W	346' FNL & 209' FWL SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3986.1'	232'	
TEST WELL No 8	TOP CONC. PAD	3983.8'	S19°48'W	312' FNL & 112' FWL SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3986.4'	628'	
TEST WELL No 9	TOP CONC. PAD	3985.0'	S41°17'W	581' FNL & 81' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3988.1'	613'	
TEST WELL No 10	TOP CONC. PAD	3985.1'	S23°54'W	562' FNL & 317' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3987.2'	774'	
TEST WELL No 11	GROUND	3985.9'	S71°40'W	508' FNL & 844' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3988.6'	1030'	
TEST WELL No 12	GROUND	3986.1'	S7°55'W	1339' FEL & 412' FNL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3988.9'	1700'	
TEST WELL No 13	GROUND	3985.2'	S83°38'W	231' FNL & 665' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3988.1'	995'	
TEST WELL No 14	GROUND	3983.6'	S85°53'W	524' FNL & 577' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3986.1'	984'	
TEST WELL No 15	GROUND	3981.0'	S47°26'W	935' FNL & 863' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3983.5'	1704'	
TEST WELL No 16	TOP CONC PAD	3985.0'	S37°26'W	994' FNL & 216' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3987.0'	975'	
TEST WELL No 17	GROUND	3982.0'	S60°20'W	802' FNL & 678' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3984.3'	1381'	
TEST WELL No 18	GROUND	3986.8'	S85°59'W	274' FNL &1044' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3989.4'	1376'	
TEST WELL No 19	GROUND	3981.2'	S58°01'W	692' FNL & 596' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3984.2'	1082'	
TEST WELL No 20	GROUND	3985.5'	S72°52'W	313' FNL & 298' FEL SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3987.8'	649'	
TEST WELL No 21	GROUND	3984.6'	N88°13'E	43' FNL & 523' FEL SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3986.5'	216'	
TEST WELL No 22	*GROUND	3981.3'	S54°08'W	753' FNL & 555' FEL SECTION 1, T-18-S, R-34-E
			1082'	
* TEST WELL No 23	*GROUND	3981.6'	S61°45'W	857' FNL & 679' FEL SECTION 1, T-18-S, R-34-E
			1137'	
* TEST WELL No 24	*GROUND	3985.3'	S72°04'W	376' FNL & 470' FEL SECTION 1, T-18-S, R-34-E
			934'	
TEST WELL No 25	*GROUND	3983.6'	S67°21'W	886' FNL &1041' FEL SECTION 1, T-18-S, R-34-E
			1477'	
CVUWSW No 3		3985.4'		121' FNL & 324' FWL SECTION 6, T-18-S, R-35-E
CVU No 98			S35°13'E	664' FNL & 473' FWL SECTION 6, T-18-S, R-35-E
			565'	
CVU No 137 (INJ.)		3984.1'	S16°23'W	1103' FNL & 35' FWL SECTION 6, T-18-S, R-35-E
			1023'	
CVU No 138 (INJ)			N72°21'W	13' FSL & 78' FEL SECTION 36, T-17-S, R-34-E
			473'	
CVU No 139 (INJ)		3987.4'	N81°19'W	76' FSL & 969' FEL SECTION 36, T-17-S, R-34-E
			1348'	
CVU No 162			S12°55'E	767' FNL & 472' FWL SECTION 6, T-18-S, R-35-E
			862'	
VG SAU No 58-A		3981.5'	S61°12'W	656' FNL & 662' FEL SECTION 1, T-18-S, R-34-E
			1131'	
ST "L" No 2		3981.9'	S24°16'W	760' FNL & 564' FEL SECTION 1, T-18-S, R-34-E
			1094'	
MARATHON WARN ST. AC-2 No 12			S46°53'E	333' FNL & 550' FWL SECTION 6, T-18-S, R-35-E
			309'	

▲ Recovery wells

* Not drilled

NOTE: The elevations shown for these four wells is natural ground plus 0.33 feet as directed by David Demel.

I HEREBY CERTIFY THAT THIS PLAT WAS MADE FROM NOTES TAKEN IN THE FIELD IN A BONA FIDE SURVEY MADE UNDER MY SUPERVISION, AND THAT THE SAME IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

JOHN W. WEST, N.M. P.E. & L.S. No. 676
TEXAS R.P.S. No. 1138

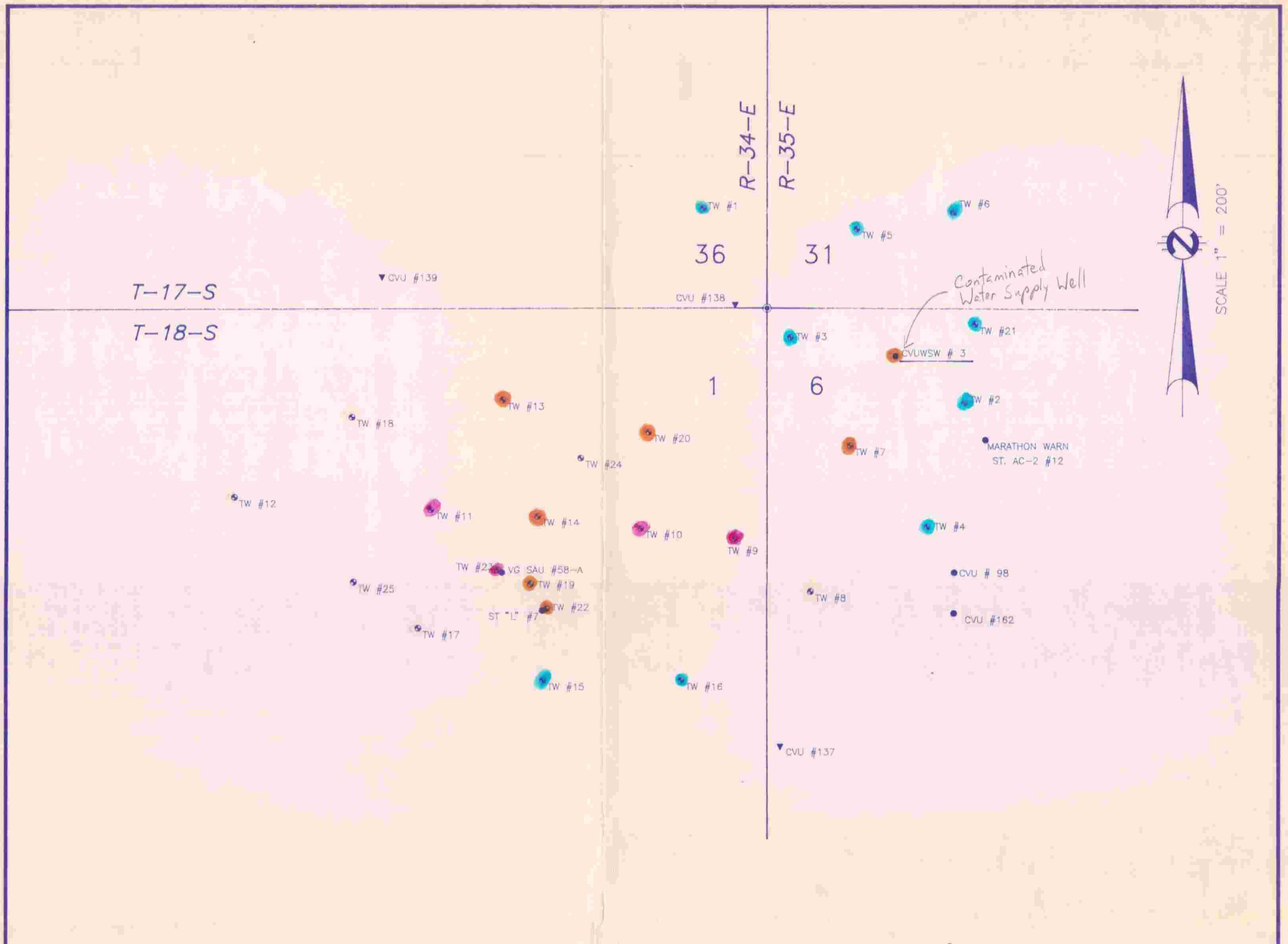
REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR NO. 676 NEW MEXICO JOHN W. WEST

TEXACO PRODUCING, INC

TEST WELLS LOCATED IN
SECTION 31, TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
SECTION 36, TOWNSHIP 17 SOUTH, RANGE 34 EAST, NMPM
SECTION 1, TOWNSHIP 18 SOUTH, RANGE 34 EAST, NMPM
SECTION 6, TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
LEA COUNTY, NEW MEXICO

HOBBS CONSULTANTS NEW MEXICO

Surveyed By DB & VC	Drawn By JH	LAST REV: 1-6-89	Drawing Number D-797-1
Date Begin 11/4/89	Date 12/14/89	Disk JPH #10	
Date End 12/8/89	Checked By GLJ	Sheet 1 of 1	
Project Number 89-11-018	File Name: C:\TEXACO\TSTWLS		



WELL No.	WELL ELEVATIONS		DISTANCE FROM CVUWSW No 3	LOCATION OF WELLS	
TEST WELL No 1	TOP CONC. PAD	3985.7'	N52°37'W	161' FWL & 250' FSL	SECTION 36, T-17-S, R-34-E
	TOP 3" PIPE UNDER CAP	3987.5'	610'		
TEST WELL No 2	TOP CONC. PAD	3984.8'	S55°38'E	240' FNL & 497' FWL	SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3986.4'	210'		
TEST WELL No 3	TOP CONC. PAD	3985.8'	N79°21'W	44' FNL & 19' FWL	SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3987.3'	269'		
TEST WELL No 4	TOP CONC. PAD	3984.0'	S10°31'E	551' FNL & 404' FWL	SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3985.5'	437'		
TEST WELL No 5	TOP CONC. PAD	3985.4'	N17°06'W	198' FSL & 226' FWL	SECTION 31, T-17-S, R-35-E
	TOP 3: PIPE UNDER CAP	3986.8'	334'		
TEST WELL No 6	TOP CONC. PAD	3985.5'	N21°58'E	240' FSL & 470' FWL	SECTION 31, T-17-S, R-35-E
	TOP 3" PIPE UNDER CAP	3987.3'	389'		
TEST WELL No 7	TOP CONC. PAD	3984.8'	S26°55'W	346' FNL & 209' FWL	SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3986.1'	253'		
TEST WELL No 8	TOP CONC. PAD	3983.8'	S19°46'W	712' FNL & 112' FWL	SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3986.4'	628'		
TEST WELL No 9	TOP CONC. PAD	3985.0'	S41°17'W	581' FNL & 81' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3988.1'	613'		
TEST WELL No 10	TOP CONC. PAD	3985.1'	S55°54'W	555' FNL & 317' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3987.2'	774'		
TEST WELL No 11	GROUND	3985.9'	S71°40'W	508' FNL & 844' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3988.6'	1230'		
TEST WELL No 12	GROUND	3986.1'	S77°55'W	1339' FEL & 477' FNL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3988.9'	1700'		
TEST WELL No 13	GROUND	3985.5'	S83°38'W	231' FNL & 665' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3988.1'	995'		
TEST WELL No 14	GROUND	3983.6'	S65°53'W	524' FNL & 577' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3986.1'	987'		
TEST WELL No 15	GROUND	3981.0'	S47°26'W	935' FNL & 563' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3983.5	1204'		
TEST WELL No 16	TOP CONC. PAD	3985.0'	S33°26'W	994' FNL & 216' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3987.0'	975'		
TEST WELL No 17	GROUND	3982.0'	S60°20'W	802' FNL & 878' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3984.3'	1381'		
TEST WELL No 18	GOUND	3986.8'	S83°55'W	272' FNL &1044' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3989.4'	1376'		
TEST WELL No 19	GROUND	3981.2'	S58°01'W	692' FNL & 596' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3984.2'	1082'		
TEST WELL No 20	GROUND	3985.5'	S72°52'W	311' FNL & 298' FEL	SECTION 1, T-18-S, R-34-E
	TOP 3" PIPE UNDER CAP	3987.8'	649'		
TEST WELL No 21	GROUND	3984.6'	N68°13'E	43' FNL & 523' FEL	SECTION 6, T-18-S, R-35-E
	TOP 3" PIPE UNDER CAP	3986.5'	215'		
TEST WELL No 22	*GROUND	3981.9'	S54°08'W	753' FNL & 555' FEL	SECTION 1, T-18-S, R-34-E
			1082'		
TEST WELL No 23	*GROUND	3981.6'	S61°45'W	657' FNL & 679' FEL	SECTION 1, T-18-S, R-34-E
			1137'		
* TEST WELL No 24	*GROUND	3985.3'	S72°04'W	376' FNL & 470' FEL	SECTION 1, T-18-S, R-34-E
			834'		
* TEST WELL No 25	*GROUND	3983.8'	S67°21'W	686' FNL &1041' FEL	SECTION 1, T-18-S, R-34-E
			1477'		
CVUWSW No 3		3985.4'		121' FNL & 324' FWL	SECTION 6, T-18-S, R-35-E
CVU No 98			S15°13'E	664' FNL & 473' FWL	SECTION 6, T-18-S, R-35-E
			565'		
CVU No 137 (INJ)		3984.1'	S16°23'W	1103' FNL & 35' FWL	SECTION 6, T-18-S, R-35-E
			1023'		
CVU No 138 (INJ)			N72°21'W	13' FSL & 79' FEL	SECTION 36, T-17-S, R-34-E
			423'		
CVU No 139 (INJ)		3987.4'	N81°19'W	76' FSL & 969' FEL	SECTION 36, T-17-S, R-34-E
			1348'		
CVU No 162			S12°55'E	767' FNL & 472' FWL	SECTION 6, T-18-S, R-35-E
			662'		
VG SAU No 58-A		3981.5'	S61°12'W	666' FNL & 667' FEL	SECTION 1, T-18-S, R-34-E
			1131'		
ST "L" No 7		3981.9'	S54°16'W	760' FNL & 564' FEL	SECTION 1, T-18-S, R-34-E
			1094'		
MARATHON WARN ST. AC-2 No 12			S46°53'E	333' FNL & 550' FWL	SECTION 6, T-18-S, R-35-E
			309'		

* Surveyed not drilled

NOTE: The elevations shown for these four wells is natural ground plus 0.33 feet as directed by David Demel.

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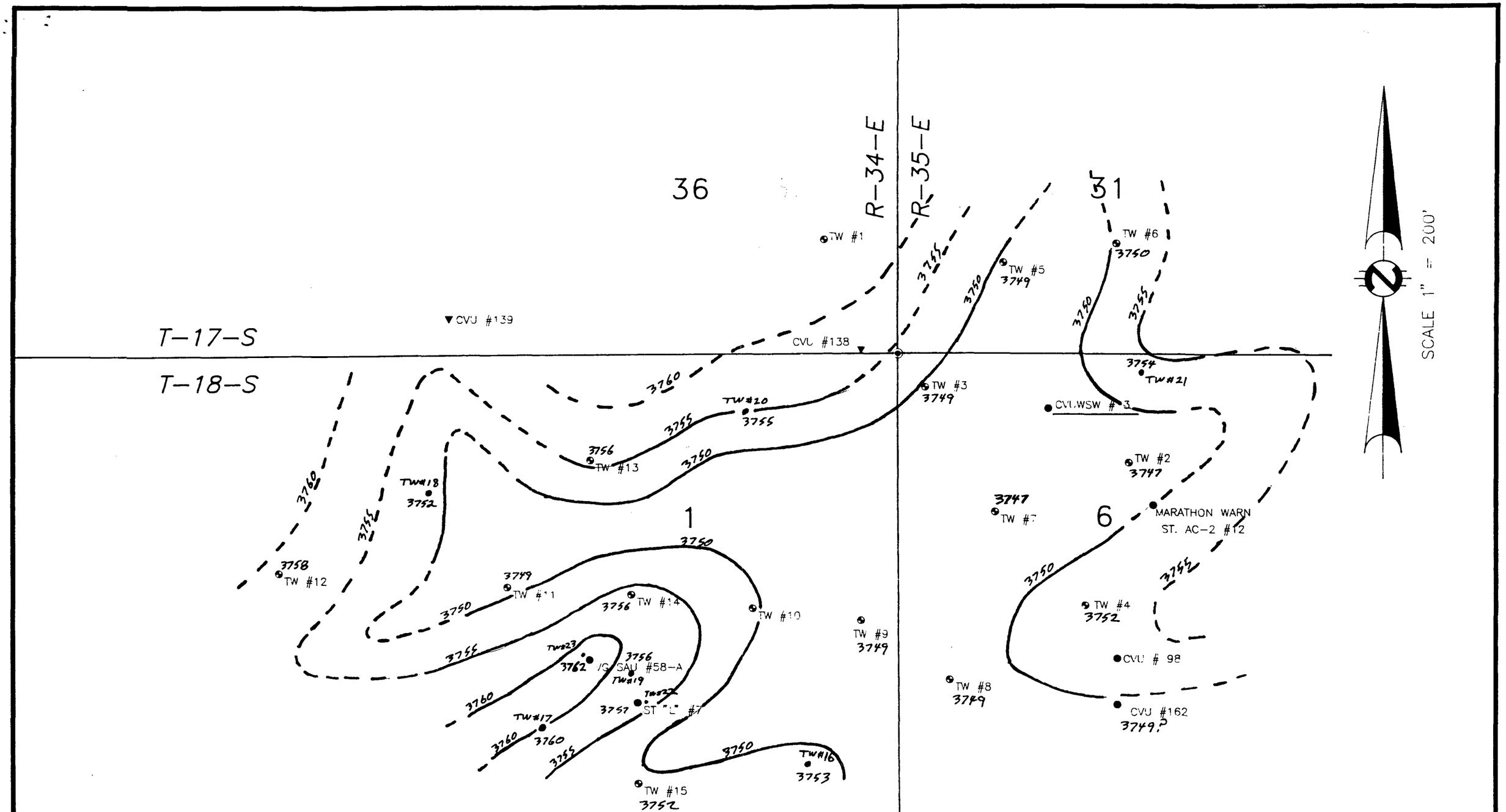
Surveyed By DB & VC	Drawn By JH	LAST REV: 1-6-89	Drawing Number
Date Begin 11/4/89	Date 12/14/89	Disk JPH #10	D-997-1
Date End 12/8/89	Checked By GLJ	Sheet 1 of 1	
Project Number: 89-11-018	File Name: C:\TEXACO\TITSTWLS		



NOTE: TW = TEST WELL

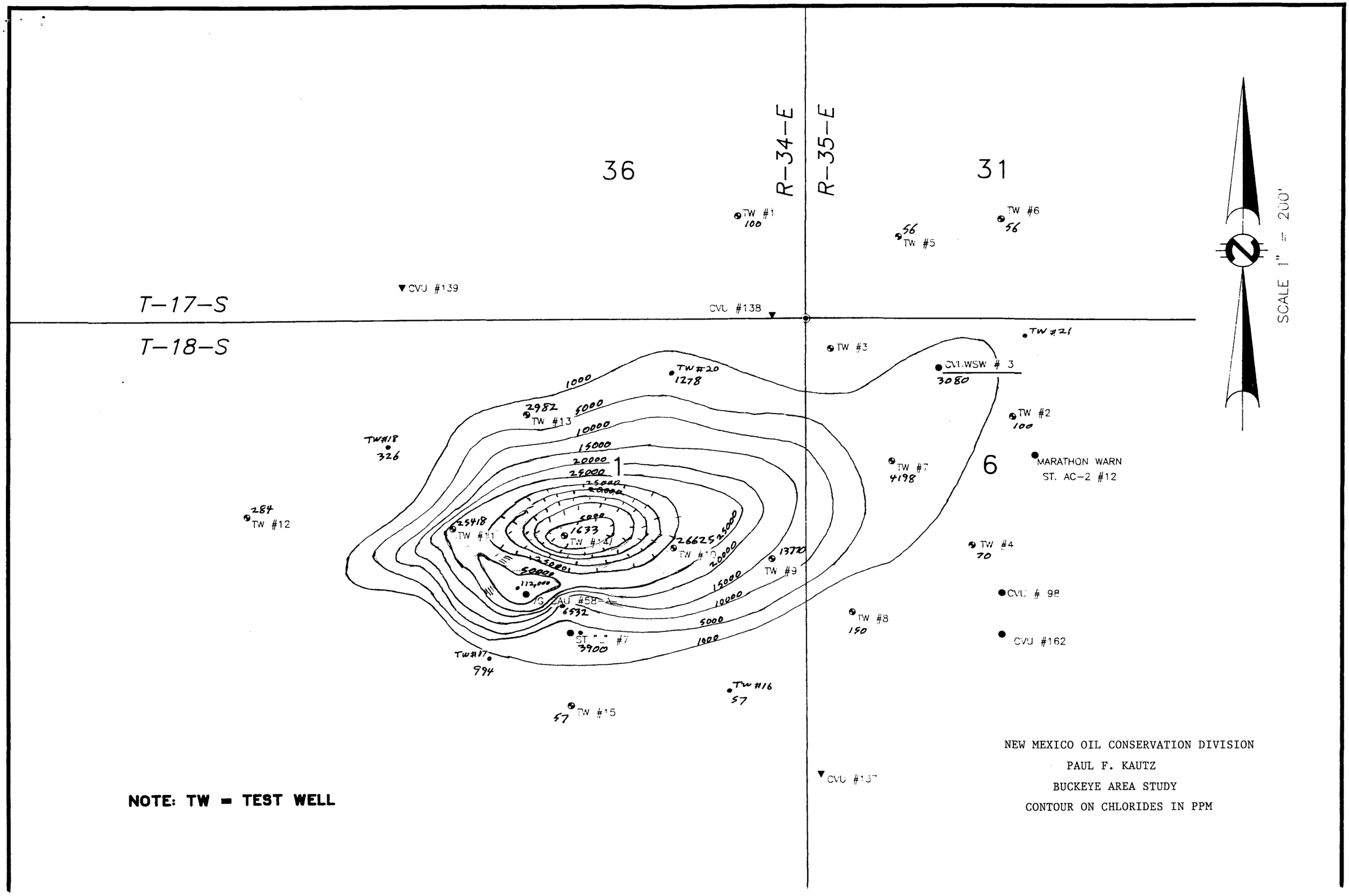
NEW MEXICO OIL CONSERVATION DIVISION

PAUL F. KAUTZ

BUCKEYE AREA STUDY

CONTOUR ON TOP OF REDBEDS

C1 = 5 FEET



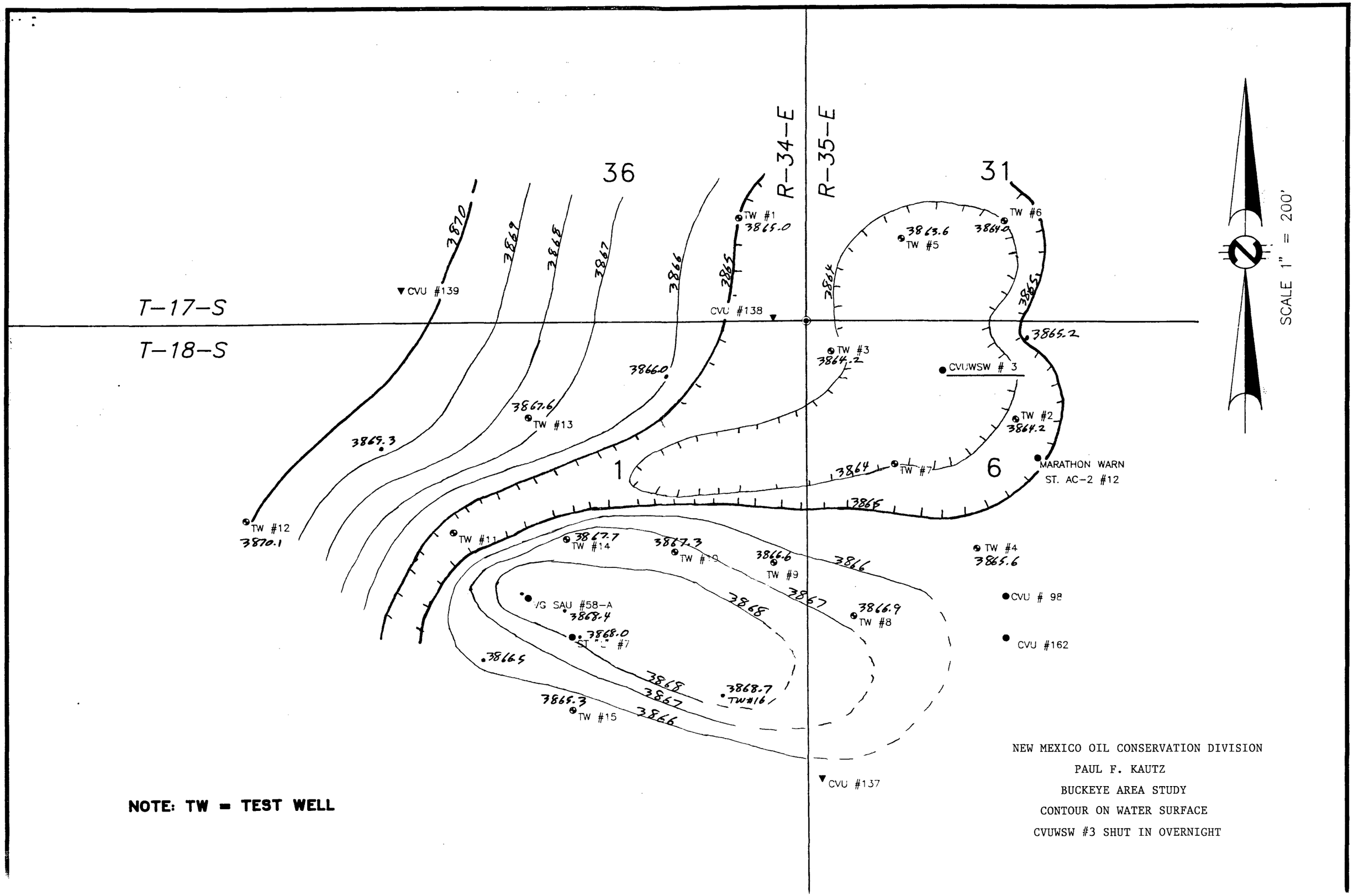
NOTE: TW = TEST WELL

NEW MEXICO OIL CONSERVATION DIVISION

PAUL F. KAUTZ

BUCKEYE AREA STUDY

CONTOUR ON CHLORIDES IN PPM



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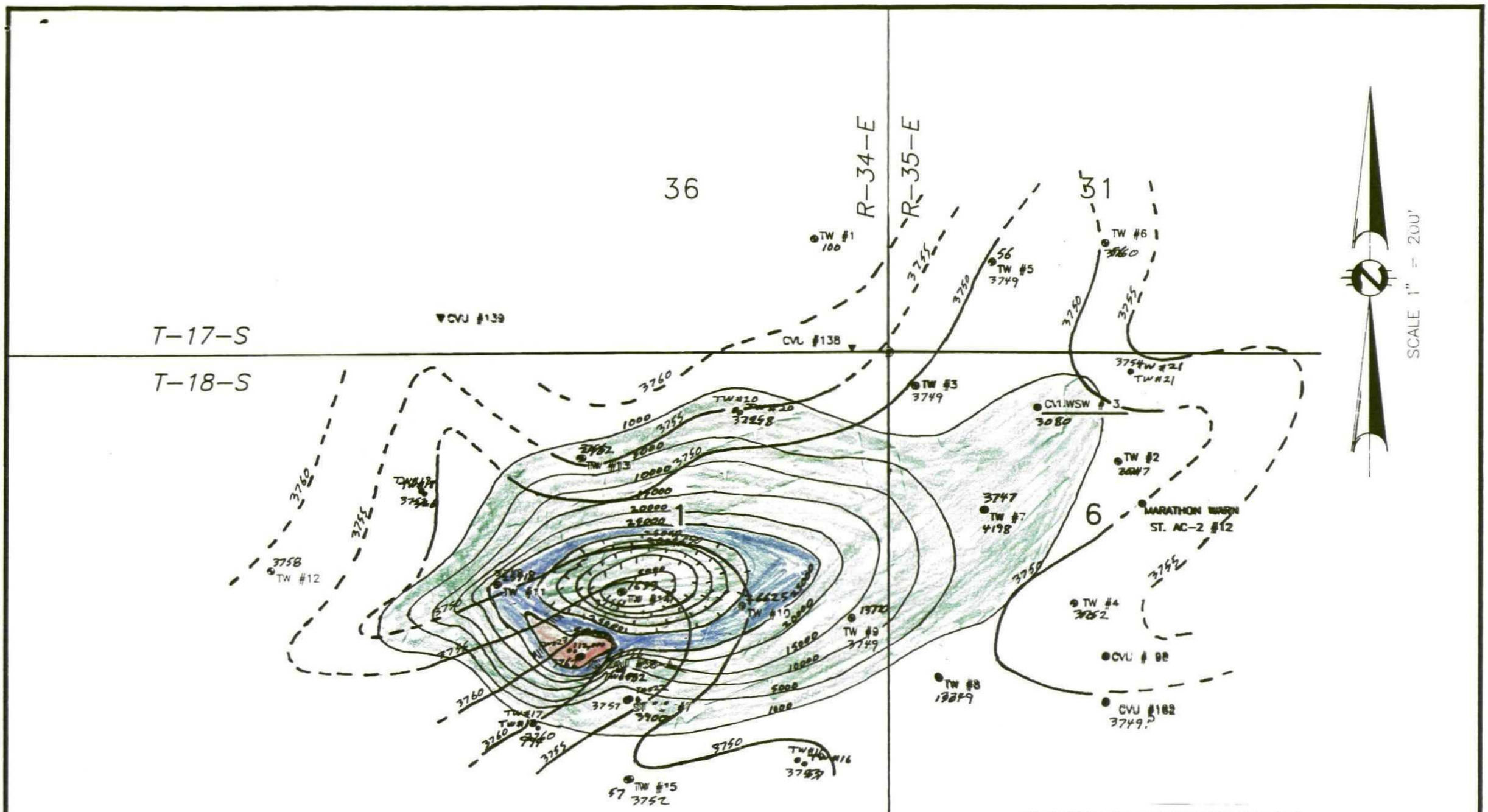
NEW MEXICO OIL CONSERVATION DIVISION

PAUL F. KAUTZ

BUCKEYE AREA STUDY

CONTOUR ON WATER SURFACE

CVUWSW #3 SHUT IN OVERNIGHT


36
R-34-E
R-35-E
1
T-17-S
T-18-S
TW #1
100
CVU #139
CVU #138
56
TW #5
3749
TW #6
3760
3754
TW #21
TW #3
3749
CVU WSW #3
3080
TW #2
3747
TW #7
4198
MARATHON WARN
ST. AC-2 #12
6
TW #4
3752
CVU #88
TW #8
CVU #182
3749
TW #12
3758
TW #13
3752
TW #11
TW #10
TW #9
3749
TW #15
3752
TW #16
CVU #137
SCALE 1" = 200'
NOTE: TW = TEST WELL
PPM CL
>50,000
25,000 - 50,000
1,000 - 25,000
NEW MEXICO OIL CONSERVATION DIVISION
PAUL F. KAUTZ
BUCKEYE AREA STUDY
CONTOUR ON TOP OF REDBEDS
CONTOUR ON CHLORIDES IN PPM