DOE/WIPP-95-2154

BASIC DATA REPORT

DOE/WIPP--95-2154

For

WQSP 1

WQSP 2

WQSP 3

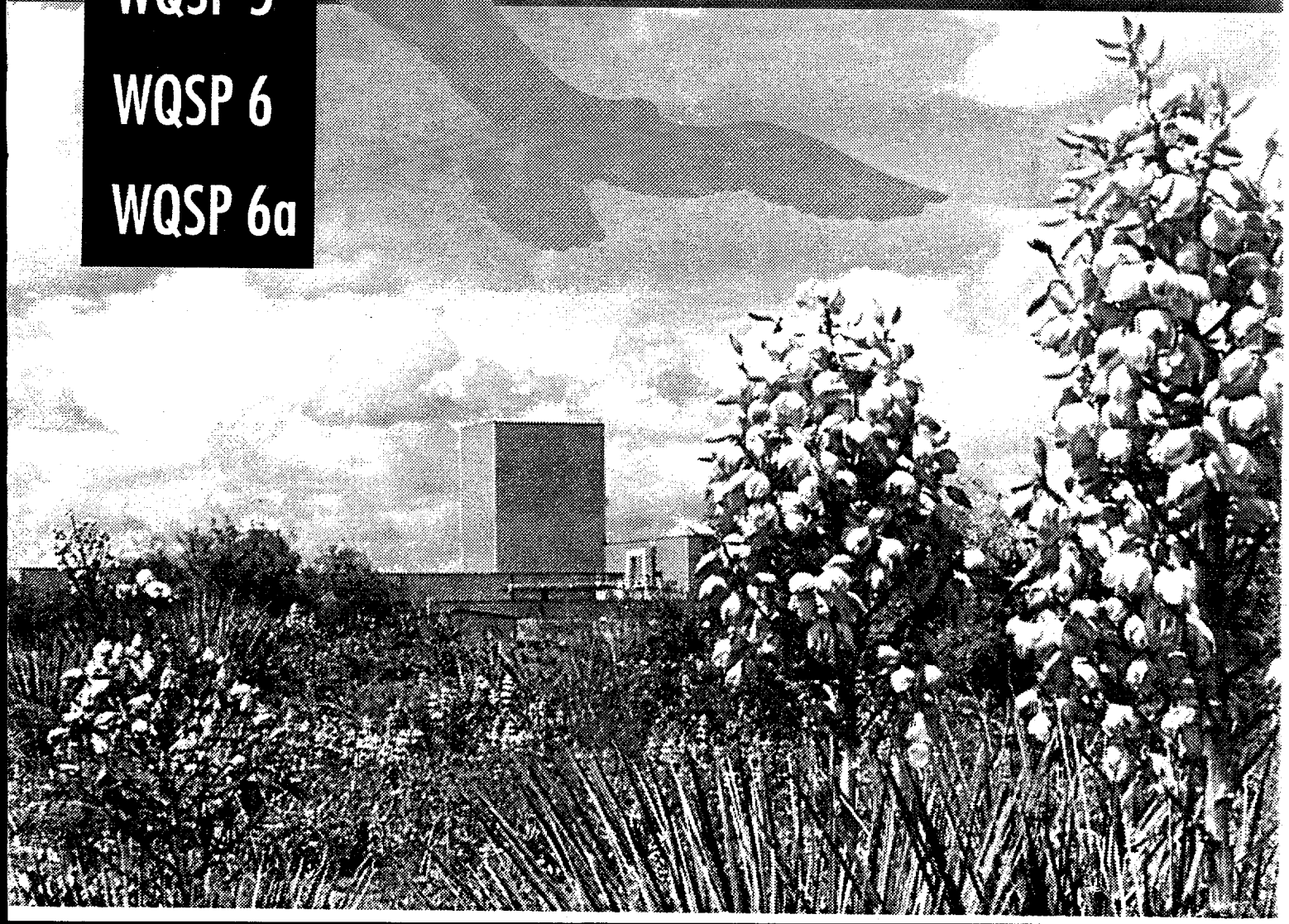
WQSP 4

WQSP 5

WQSP 6

WQSP 6a

MASTER



Processing and final preparation of this report was performed by the Waste Isolation Pilot Plant Management and Operating Contractor for the U.S. Department of Energy under Contract No. DE-AC04-86AL31950.

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List of Tables and Figures

Attachments

1.0 Introduction

The Waste Isolation Pilot Plant (WIPP) is located in southeastern New Mexico about 30 miles east of Carlsbad, New Mexico. The WIPP was authorized by Congress in 1979 (Public Law 96-194) and given the mission to provide "...a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission." The WIPP is intended to receive, handle, and permanently dispose of transuranic waste. To fulfill this mission, the U.S. Department of Energy is constructing a full scale facility to demonstrate both technical and operational principles of the permanent storage/disposal of transuranic waste. Technical aspects are those concerned with the design, construction, and performance of subsurface structures. Operational aspects refer to the receiving, handling, and emplacement of transuranic waste in salt. The facility is also designed for in situ studies and experiments in salt. The Water Quality Sampling Program (WQSP) evaluates the physical and chemical properties of the groundwater above the repository horizon that are part of the technical performance aspects.

2.0 Purpose of the Water Quality Sampling Program Wells

The objective of the WQSP is to collect representative groundwater samples from water-bearing zones in the area of the WIPP site. These data assist in meeting the requirements of site characterization. The WQSP wells drilled in 1994 are intended to provide representative, reproducible, and defendable quality data that are free of well construction bias. These seven wells were drilled along the boundary of the Off Limits Area under an U.S. Environmental Protection Agency (EPA) directive and enhance the current groundwater monitoring network.

3.0 Description of Drilling Program

Wells WQSP#1 through WQSP#6a are located (Figure 3-1) in east-central Eddy County, New Mexico in the T22S, R31E (Table 3-1). This drilling program was initiated by Westinghouse Electric Corporation and involved a number of subcontractors. Each of their contributions to the program are provided below.

An archeological survey was performed at the locations of the new monitoring wells by Pecos Archeological Consultants. This survey was conducted on May 26 and June 16, 1994 for the six drill pads and new access roads constructed for this program. One archeological site was recorded with significant cultural remains within the impact zone. This site was avoided by rerouting one of the access roads to a drill pad. The description is intentionally vague to protect

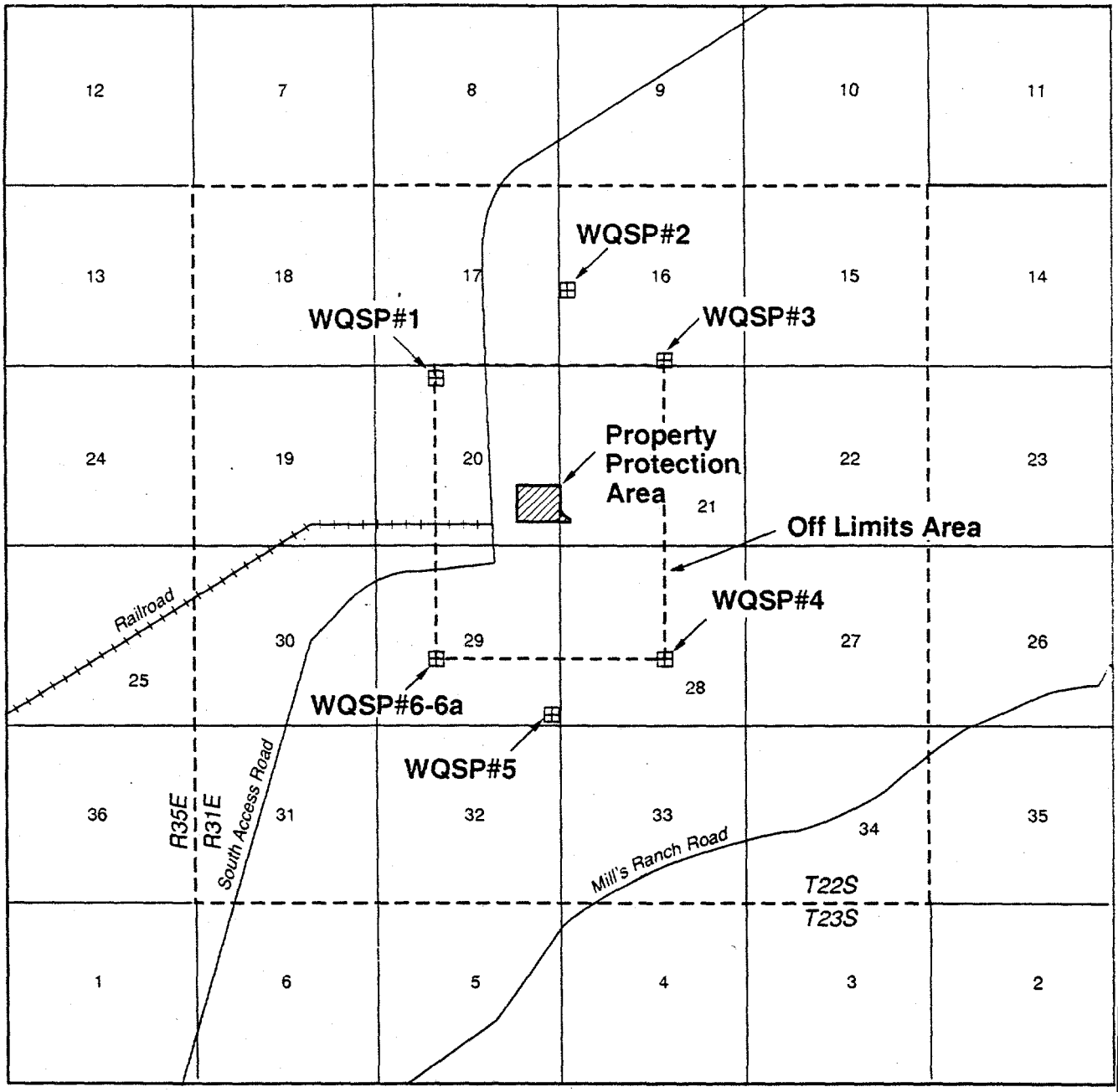


Figure 3-1
Location of WQSP Wells 1 to 6a

Table 3-1
Location Information for the
1994 Water Quality Sampling Program (WQSP) Boreholes

Borehole ID	State Plane Coordinate		Elevation amsl	Location T22S R31E	Coordinates (feet)	
	East	North				
WQSP#1	663600	503774	3416.6	Section 20	101 FNL	1422 FWL
WQSP#2	667598	505542	3461.4	Section 16	1646 FSL	142 FWL
WQSP#3	670576	504030	3477.5	Section 16	96 FSL	2162 FEL
WQSP#4	670658	495000	3430.5	Section 28	1632 FSL	2136 FEL
WQSP#5	667170	493666	3381.6	Section 29	330 FSL	340 FEL
WQSP#6	663691	494942	3361.8	Section 29	1626 FSL	1461 FWL
WQSP#6a	663625	494969	3361.2	Section 29	1653 FSL	1395 FWL

- FNL - feet from north line
- FSL - feet from south line
- FWL - feet from west line
- FEL - feet from east line
- amsl - above mean sea level

the location of this site. Unauthorized collection, vandalism, or excavation of cultural remains is prohibited under the Archeological Resources Protection Act (ARPA) (16 USC §470aa et seq).

The access roads to the drill locations, the drill pads, and the pits were constructed by MMP Construction. The drill pads are 100 ft by 100 ft, topped with construction grade caliche, and occupy approximately 2.29 acres. At each location, two pits were constructed approximately 30 ft by 15 ft and approximately 10 ft deep and lined with high density polyethylene plastic. One pit contained the discharged cuttings and fluids from the drilling; the other pit was divided into two sections, with one side containing the drilling mud, and the other side containing non-potable water. WQSP#6 and WQSP#6a occupy the same drill pad; however, four discharge pits were constructed at this location. After drilling and well development, these pits were filled with soil.

The wells were drilled by West Texas Water Well Service from September to November of 1994 (Table 3-2). Grab samples of the cuttings were taken by IT Corporation every 20 ft to track formations penetrated and to stop open-hole drilling in time to core the Culebra Member of the Rustler Formation. The core was described by INTERA. A condensed well summary, stratigraphic summary, cuttings description, Culebra core description (Dewey Lake core description for WQSP#6a), hole history, and geophysical logs (Century Geophysical Corporation) are presented as appendices in this report.

The drilling plan for the six new monitoring wells provided an option for additional wells to be drilled should water be encountered in the Dewey Lake Formation. Water in the Dewey Lake Formation was encountered in only one well, WQSP#6. WQSP#6a, located approximately 100 ft west of WQSP#6, was terminated within the upper portion of the Dewey Lake Formation for further investigation.

3.1 WQSP#1

WQSP #1 is located 101 ft from the north line and 1422 ft from the west line in Section 20, T22S, R31E in Eddy County, New Mexico. The well was drilled from September 13 through 16, 1994, and encountered 40 ft of Santa Rosa Formation, 482 ft of Dewey Lake Formation, and 174 ft of Rustler Formation. Cuttings were collected every 20 ft and the well was cored from 696 ft to 737 ft for detailed description of the Culebra Member of the Rustler Formation. Geophysical logs

Table 3-2
Drilling Information for the
1994 Water Quality Sampling Program (WQSP) Boreholes

Borehole ID	Drill Dates	Total depth (feet)	Cored Interval (feet)	Unit
WQSP#1	September 13-16, 1994	737	696-737	Culebra
WQSP#2	September 6-10, 1994	846	800-846	Culebra
WQSP#3	October 20-26, 1994	879	833-879	Culebra
WQSP#4	October 5-7, 1994	800	740-798	Culebra
WQSP#5	October 12-13, 1994	681	648-676	Culebra
WQSP#6	September 22-30, 1994	617	568-617	Culebra
WQSP#6a	October 28-31, 1994	225	160-220	Dewey Lake

- SPC_NAD27 - State plane coordinates _ North American Datum Model 27

were run in the hole and include: caliper, spontaneous potential, resistivity, natural gamma, and neutron porosity. The geophysical logs were run in this hole before it was reamed, therefore, approximately 40 ft of slough prevented the logging tool from reaching the bottom of the hole. The rest of the wells were reamed before they were logged.

3.2 WQSP#2

WQSP #2 is located 1646 ft from the south line and 142 ft from the west line in Section 16, T22S, R31E in Eddy County, New Mexico. The well was drilled from September 6 through 10, 1994, and encountered 147 ft of Santa Rosa Formation, 486 ft of Dewey Lake Formation, and 215 ft of Rustler Formation. Cuttings were collected every 20 ft and the well was cored from 800 ft to 846 ft for detailed description of the Culebra Member of the Rustler Formation. Geophysical logs were run the entire length of the hole and include: caliper, spontaneous potential, resistivity, natural gamma, and neutron porosity.

3.3 WQSP#3

WQSP #3 is located 96 ft from the south line and 2162 ft from the east line in Section 16, T22S, R31E in Eddy County, New Mexico. The well was drilled from October 20 through 26, 1994, and encountered 155 ft of Santa Rosa Formation, 513 ft of Dewey Lake Formation, and 212 ft of Rustler Formation. Cuttings were collected every 20 ft and the well was cored from 833 ft to 879 ft for detailed description of the Culebra Member of the Rustler Formation. Geophysical logs were run the entire length of the hole and include: caliper, spontaneous potential, resistivity, natural gamma, and neutron porosity.

3.4 WQSP#4

WQSP #4 is located 1632 ft from the south line and 2136 ft from the east line in Section 28, T22S, R31E in Eddy County, New Mexico. The well was drilled from October 5 through 7, 1994, and encountered 78 ft of Santa Rosa Formation, 510 ft of Dewey Lake Formation, and 212 ft of Rustler Formation. Cuttings were collected every 20 ft and the well was cored from 740 ft to 798 ft for detailed description of the Culebra Member of the Rustler Formation. Geophysical logs were run the entire length of the hole and include: caliper, spontaneous potential, resistivity, natural gamma, and neutron porosity.

3.5 WQSP#5

WQSP #5 is located 330 ft from the south line and 340 ft from the east line in Section 29, T22S, R31E in Eddy County, New Mexico. The well was drilled from October 12 through 13, 1994, and encountered 25 ft of Santa Rosa Formation, 450 ft of Dewey Lake Formation, and 206 ft of Rustler Formation. Cuttings were collected every 20 ft and the well was cored from 648 ft to 676 ft for detailed description of the Culebra Member of the Rustler Formation. Geophysical logs were run the entire length of the hole and include: spontaneous potential resistivity, natural gamma, density, and neutron porosity.

3.6 WQSP#6

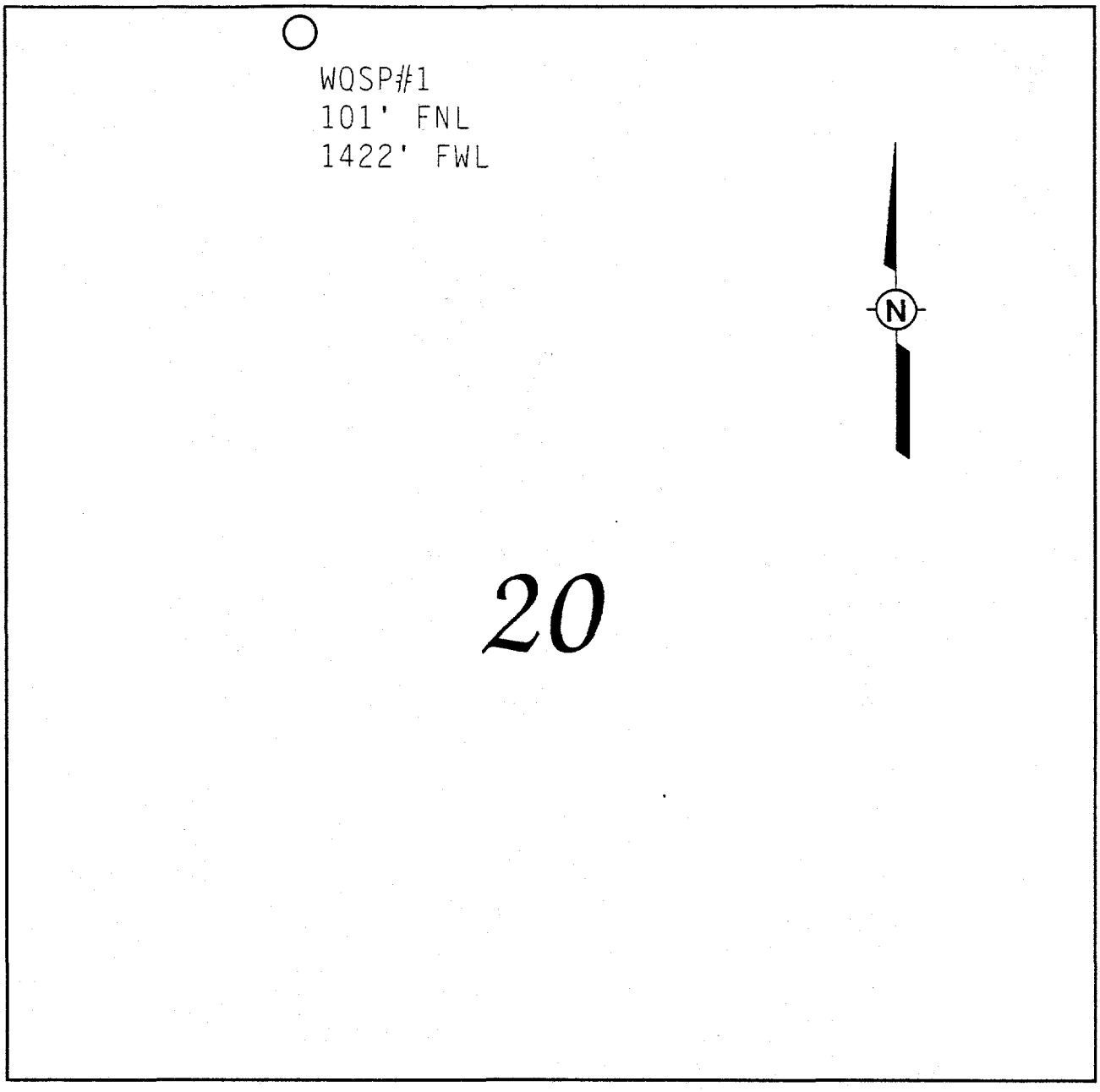
WQSP #6 is located 1626 ft from the south line and 1461 ft from the west line in Section 29, T22S, R31E in Eddy County, New Mexico. The well was drilled from September 22, through October 4, 1994, and encountered 68 ft of Santa Rosa Formation, 341 ft of Dewey Lake Formation, and 208 ft of Rustler Formation. Cuttings were collected every 20 ft and the well was cored from 568 ft to 617 ft for detailed description of the Culebra Member of the Rustler Formation. Geophysical logs were run the entire length of the hole and include: deviation, caliper, spontaneous potential, resistivity, natural gamma, and neutron porosity.

3.7 WQSP#6a

WQSP #6a is located 1653 ft from the south line and 1395 ft from the west line in Section 29, T22S, R31E in Eddy County, New Mexico. The well was drilled from October 28, through November 1, 1994, and encountered 35 ft of Santa Rosa Formation and 185 ft of Dewey Lake Formation. Cuttings were collected every 20 ft and the well was cored from 160 ft to 220 ft for detailed description of the Dewey Lake Formation. Geophysical logs were run the entire length of the hole and include: caliper, spontaneous potential, resistivity, natural gamma, and neutron porosity.

WQSP#1

Section 20,T22S,R31E



Location of WQSP #1

WQSP #1
Condensed Well Summary

Location:	Section 20, T22S, R31E 101 ft from the north line 1422 ft from the west line	
Elevation: (Top of Casing)	3419.2 ft above mean sea level	
Cuttings Description:	D.S. Belski	
Drilling Contractor:	West Texas Water Well Service 3432 W. University, Odessa, Texas 79764 (915) 381-2687 phone (915) 381-7853 fax	
Drilling Record	Date: Bottom of hole: Cored interval: Cuttings:	September 13 to 16, 1994 737 ft below land surface 696 to 737 ft every 20 ft

WQSP #1
Stratigraphic Summary

Stratigraphic Unit	***Depth Interval Natural Gamma Log (feet)**	**Core Description**
Surficial Deposits/Santa Rosa	0-40	
Dewey Lake Redbeds	40-522	
Rustler Formation	522-689 partial	
• Forty Niner Member	522-591	
• Magenta Member	591-612	
• Tamarisk Member	612-689?	695.6-699 partial
• Culebra Member	NA	699-722
• Partial lower unnamed member	NA	722-737 partial
Maximum Recorded Depth	689	

* Geophysical logs were run before the hole was reamed. Sloughing in the hole prevented the loggers from reaching bottom.

WQSP #1
CUTTINGS DESCRIPTION

WQSP #1
Cuttings Description *

Date	Time	Sample Number	Depth (feet)	Description
08/31/94	1120	1**	6	Surficial deposits
	1125	2**	25	Surficial deposits
09/13/94	1309	1	45	Mudstone, clay, siltstone and sandstone
	1324	2	65	Siltstone and sandstone
	1353	3	85	Sandstone, siltstone, and mudstone
	1423	4	105	Siltstone and mudstone
	1433	5	125	Sandstone, siltstone, and mudstone
	1520	6	145	Siltstone, mudstone, and clay
	1546	7	165	Sandstone, siltstone, and gypsum
	1610	8	185	Siltstone, mudstone, sandstone, and gypsum
	1638	9	205	Siltstone, mudstone, and gypsum
	1707	10	225	Mudstone, siltstone, and gypsum
	1718	11	245	Siltstone, mudstone, and gypsum
09/14/94	0746	12	265	Sandstone, siltstone, and gypsum
	0759	13	285	Sandstone, siltstone, and gypsum
	0825	14	305	Sandstone, mudstone, and gypsum
	0845	15	325	Sandstone, trace gypsum
	0904	16	345	Siltstone, gypsum, and sand
	0919	17	365	Siltstone and gypsum
	0945	18	385	Sandstone, siltstone, and mudstone
	1009	19	405	Siltstone, mudstone, and sandstone
	1021	20	425	Siltstone, mudstone, and gypsum
	1040	21	445	Siltstone and mudstone
	1102	22	465	Siltstone with selenite, claystone with green reduction spots
	1112	23	485	Siltstone with selenite, claystone with green reduction spots

* Cuttings description is for stratigraphic control not geologic description.

** Auger drilling

WQSP #1
Cuttings Description (Continued) *

Date	Time	Sample Number	Depth (feet)	Description
	1131	24	505	Siltstone with selenite and fibrous gypsum
	1154	25	525	Anhydrite and gypsum
09/14/94	1219	26	545	Anhydrite and gypsum
	1235	27	565	Mud
	1306	28	585	Anhydrite and siltstone
	1318	29	605	Anhydrite
	1351	30	625	Anhydrite, selenite, and siltstone
	1413	31	645	Anhydrite
	1502	32	665	Anhydrite
	1536	33	685	Anhydrite with mud

* Cuttings description is for stratigraphic control not geologic description.
** Auger drilling

WQSP #1
CULEBRA CORE DESCRIPTION

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WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#1 DIA.: 4"

LOCATION: NE1/4 NW1/4 Section 20 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 101' FSL 1422' FWL

ELEVATION: 3419.2 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/15/94

DRILL DATE: 09/15/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		695.0					
		695.6					
09/15 11:25	1	696.0	8 7			695.6 - 699.0 ft: upper 0.2 ft of unit: red-brown mudstone with numerous subrounded-subangular pebble-sized anhydrite clasts underlain by light to dark gray mottled anhydrite with 2-3 mm gypsum laminae. Lower 0.2 ft of unit: light-brown and black interbedded clays. Sharp contact between anhydrite, clay, and underlying Culebra Member.	Tamarisk Member of Rustler Formation
		697.0					
		698.0					
		699.0				699.0 - 700.6 ft: reddish gray-brown microcrystalline dolomite with numerous open vugs (1 mm - 0.25 cm). Fractures occurring along horizontal, thin (< 1 mm) clay seams.	Culebra Member of Rustler Formation
		700.0			CF		
		701.0					

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WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#1 DIA.: 4"

LOCATION: NE1/4 NW1/4 Section 20 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 101' FSL 1422' FWL

ELEVATION: 3419.2 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/15/94

DRILL DATE: 09/15/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
09/15	1	701.0 702.0 703.0 704.0 705.0 706.0 707.0	8 7	OV OV OV OV OV OV	GF CF	700.6 - 706.0 ft: light olive-gray microcrystalline dolomite. Upper 2 ft of unit contains infrequent open vugs up to 1.5 cm. Vugs decrease in size and increase in frequency toward base of unit (~1 mm). In lower 2.5 ft open vugs form in bands 0.1 to 0.3 ft in width. Horizontal fractures occur toward base of unit along thin (<1 mm) clay seams. In upper 2 ft of unit horizontal fractures occur along gypsum seams. Unit contains infrequent high-angle gypsum veins (2-3 mm).	Culebra Member of Rustler Formation

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WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#1 DIA.: 4"

LOCATION: NE1/4 NW1/4 Section 20 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 101' FSL 1422' FWL

ELEVATION: 3419.2 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/15/94

DRILL DATE: 09/15/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
09/15 11:30	1	707.0	8 7	OV OV		706.0 - 710.5 ft: same dolomite as previous unit. Upper 1.5 ft highly fractured and clayey. Small (1-2 mm) vugs, open, and of moderate intensity. Vugs decrease in frequency and increase in size (0.5 - 3 cm) toward base of unit. Lower 3 ft of unit highly fractured with thin (<1 mm) clay seams and small blebs of clay.	Culebra Member of Rustler Formation ~1.5 feet of core loss
		708.0		OV			
		709.0		OV			
		710.0			CF		
		711.0					
		712.0					
		713.0					

PAGE 1 OF 1

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#1 DIA.: 4"

LOCATION: NE1/4 NW1/4 Section 20 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 101' FSL 1422' FWL

ELEVATION: 3419.2 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/15/94

DRILL DATE: 09/15/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		710.0					
		710.5					
09/15 14:31	2		27	OV		710.5 - 722.0 ft: light olive-gray microcrystalline dolomite, highly fractured. Numerous moderately-sized (5-10 mm) open vugs toward top of unit decreasing in frequency and size with depth. Toward base of unit vugs are sparse and gypsum filled. Evidence of infrequent gypsum filled fractures throughout unit. Contact between the Culebra Member and underlying unnamed member not visible.	Culebra Member of Rustler Formation 8.5 feet of core loss
		712.0		OV	GF		
				OV			
		714.0					
				OV			
		716.0			GF		
		718.0					
		720.0					
		722.0					

PAGE 1 OF 3

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#1 DIA.: 4"

LOCATION: NE1/4 NW1/4 Section 20 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 101' FSL 1422' FWL

ELEVATION: 3419.2 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/16/94

DRILL DATE: 09/15/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
09/15 17:04	3	722.0 723.0 724.0 725.0 726.0 727.0 728.0	100			722.0 - 724.5 ft: black, plastic clay with infrequent 1-2 mm gypsum stringers. 724.5 - 726.5 ft: very dark red-brown clay with 0.1 - 0.2 ft white to pinkish white gypsum bands. Infrequent gypsum stringers up to 2 mm in width.	Unnamed Member of Rustler Formation

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#1 DIA.: 4"

LOCATION: NE1/4 NW1/4 Section 20 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 101' FSL 1422' FWL

ELEVATION: 3419.2 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/16/94

DRILL DATE: 09/15/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
09/15	3	728.0 729.0 730.0 731.0 732.0 733.0 734.0	100			726.5 - 732.0 ft: lighter red-brown clay with numerous gypsum veins up to 0.3 ft in width. White to pinkish-white crystalline (lath-like interlocking crystals) gypsum fill. Veins are horizontal to high angle and increase in frequency toward base of unit as clay grades into anhydrite. 732.0 - 737.0 ft: light to dark gray mottled anhydrite with abundant 1-2 mm gypsum laminae.	Unnamed Member of Rustler Formation

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OF 3

WIPP CORE-LOG INVENTORY

INTERA
FORM 1400

BOREHOLE: WQSP#1 DIA.: 4"
LOCATION: NE1/4 NW1/4 Section 20 T22S R31E
ORIENTATION: Vertical Down
COORDINATES: 101' FSL 1422' FWL
ELEVATION: 3419.2 feet amsl
DRILL METHOD(S): Air Rotary

LOG BY: JBD
DATE: 09/16/94
DRILL DATE: 09/15/94
DRILLER: Ronnie Keith
DRILL: Gardner Denver 1500
DRILL CO.: West Texas Water Well Service

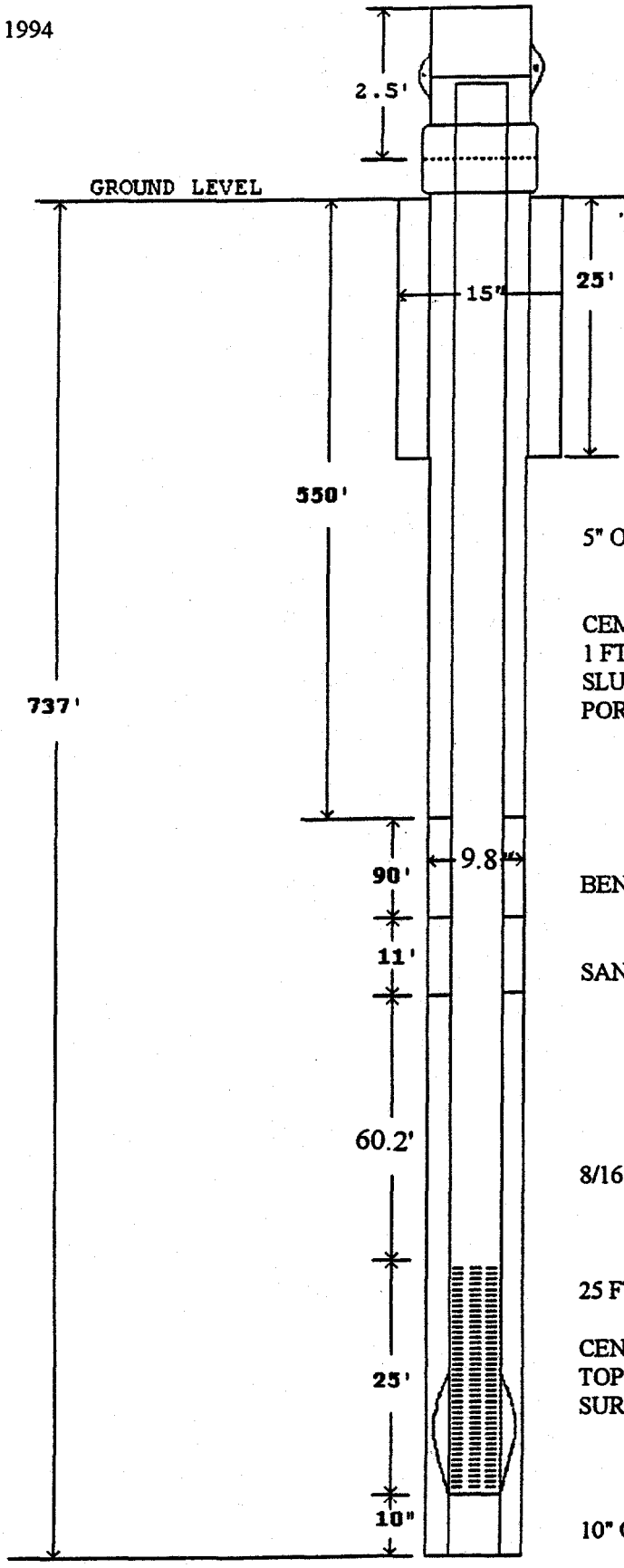
Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
09/15 17:40	3	734.0 735.0 736.0 737.0 738.0 739.0 740.0	100			732.0 - 737.0 ft: light to dark gray mottled anhydrite with abundant 1-2 mm gypsum laminae.	Unnamed Member of Rustler Formation

WQSP #1
HOLE HISTORY

WIPP Project
WQSP #1
Eddy County, New Mexico

September 13-16, 1994

WEST TEXAS WATER WELL SERVICE
RIG #15



2.5 FT EXTENSION WITH LOCKABLE CAP TO PROTECT WELL CASING

10.75 X 0.375 WALL SURFACE CASING CEMENTED IN A 15" HOLE

5" O.D. X 0.280 WALL BLANK FIBERGLASS CASING

CEMENT SLURRY MIX FROM 550 FT TO 1 FT
1 FT BELOW SURFACE
SLURRY IS 7 GALLONS WATER TO 1 CU FT
PORTLAND-ASTM C1510-92

BENTONITE SEAL FROM 640 TO 550 FT

SAND PACK FROM 651 TO 640 FT

8/16 BRADY GRAVEL FROM 651 TO 712 FT

25 FT OF 5" O.D. FIBERGLASS 0.020 SLOT SCREEN

CENTRALIZERS LOCATED AT BOTTOM OF SCREEN, TOP OF SCREEN, AND AT 60 FT INTERVALS TO SURFACE

10" OF BLANK 5" O.D. CASING

WEST TEXAS WATER WELL SERVICE

September 13, 1994

WQSP # 1

6:30 AM - 8:00 AM - Rig down on WQSP # 2 and move to WQSP # 1
8:00 AM - 11:30 AM - Rigging up on WQSP # 1
11:30 AM - 5:00 PM - Drilling 9 7/8" hole from 25' - 245'
5:00 PM - 5:20 PM - Come out of hole & secure rig for day

September 14, 1994

WQSP # 1

6:00 AM - 6:35 AM - Carlsbad to WQSP # 1
6:35 AM - 6:45 AM - Check fluid levels
6:45 AM - 7:25 AM - Fix rotating head & T.I.H.
7:25 AM - 4:00 PM - Drill 9 7/8" hole from 245' - 693'
4:00 PM - 4:15 PM - Trip pipe out of hole
4:15 PM - 4:30 PM - Shut down rig and secure for day
4:30 PM - 5:15 PM - WQSP # 1 to Carlsbad

September 15, 1995 is missing from the drillers log, see WQSP#1 core description.

WEST TEXAS WATER WELL SERVICE

September 16, 1994

WQSP # 1

6:30 AM	6:35 AM	Carlsbad to WQSP # 1
6:35 AM	6:50 AM	Check & service rig
6:50 AM	7:50 AM	Finish tripping out of hole with 3rd core run
7:50 AM	8:30 AM	Retrieve core
8:30 AM	9:00 AM	Breakdown core tools
9:00 AM	12:45 PM	Rig up logger & log well
12:45 PM	1:00 PM	Secured rig for weekend

September 20, 1994

WQSP # 1

6:00 AM	6:30 AM	Carlsbad to WQSP # 1
6:30 AM	6:40 AM	Check fluid levels in equipment
6:40 AM	7:00 AM	Run bailer in casing
7:00 AM	11:30 AM	Run 1" pipe inside 2" trimmie line to check gravel depth and remove bridge, added gravel to depth of 650' below ground surface, placed sand pack from 650'-640'
11:30 AM	12:40 PM	Pulled 1" pipe, mixed bentonite slurry to pump for bentonite seal from 640'-550' - approximately 275 gallons.
12:40 PM	1:30 PM	Rigged up to pump cement
1:30 PM	3:00 PM	Waited on cement trucks
3:00 PM	4:30 PM	Pump cement from 550' to surface, circulating out to reserve pit
4:30 PM	5:00 PM	Washout cement from lines, shut down operations for the day
5:00 PM	5:30 PM	WQSP # 1 to Carlsbad

WEST TEXAS WATER WELL SERVICE

September 21, 1994

WQSP # 1 & 2

6:10 AM - 6:40 AM - Carlsbad to WQSP # 1
6:40 AM - 6:55 AM - Service rig
6:55 AM - 8:00 AM - Clean up location & rig down

September 22, 1994

WOSP # 1

8:50 AM - 5:30 PM - Bailed well to develop and clean up

September 28, 1994

WOSP # 1

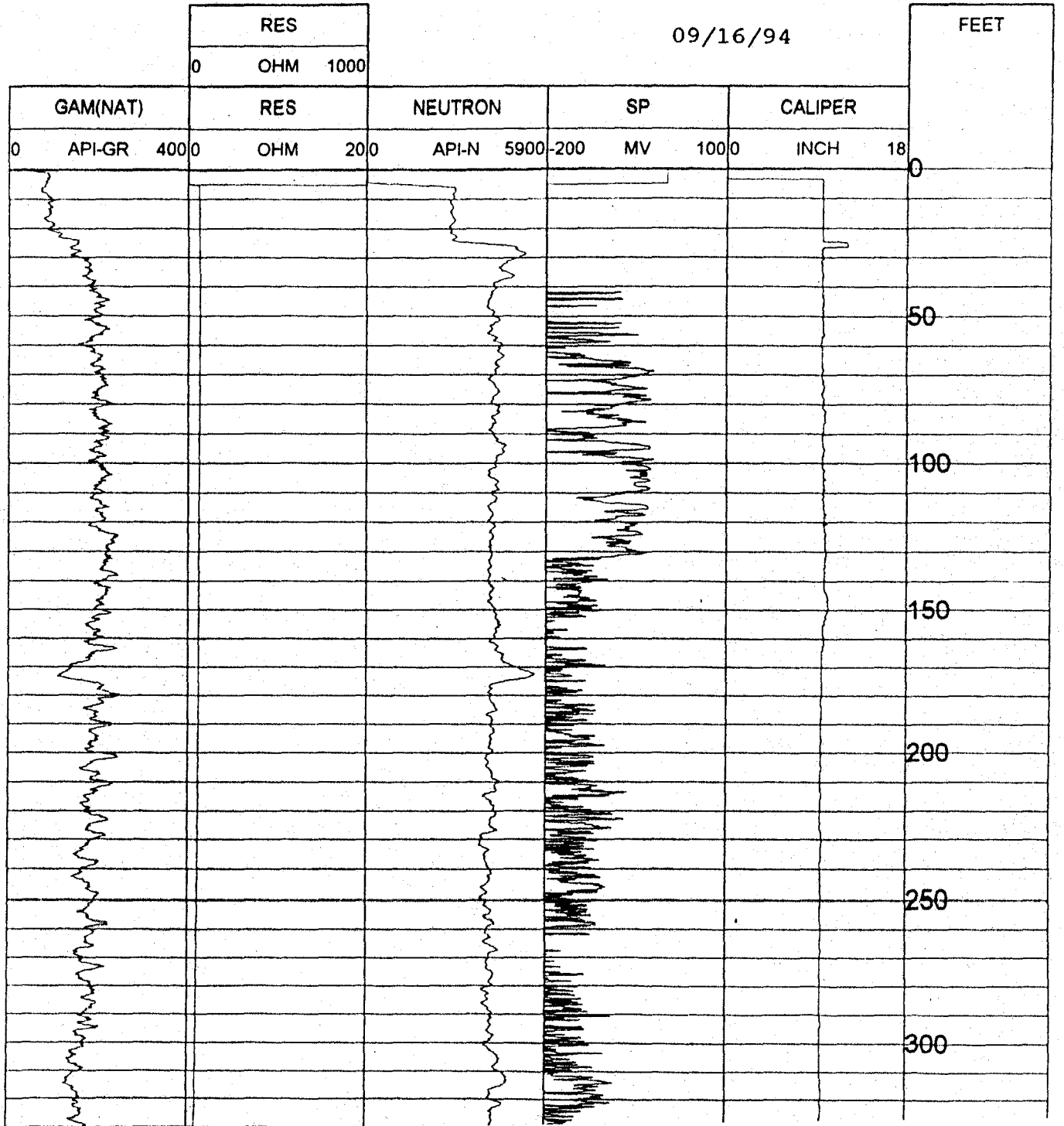
7:25 AM - 9:30 AM - Make 24 trips with bailer, rig down, & go to get pipe trailer & pump
9:30 AM - 10:00 AM - Getting pipe trailer & pump
10:00 AM - 10:45 AM - Rig up to run pump
10:45 AM - 11:15 AM - Lunch
11:15 AM - 12:30 PM - Run pump
12:30 PM - 12:40 PM - Hook up to generator & start pumping - pump rate 13 GPM
12:40 PM - 3:30 PM - Pump well - average 10.9 GPM
Pump was set on 714' 1" gal. pipe
3:30 PM - 4:00 PM - Rig down & go to WQSP # 6

September 29, 1994

WOSP # 1

6:30 AM - 6:45 AM - Rig up to pull pump
6:45 AM - 8:00 AM - Pulled pump & rigged down
8:00 AM - 9:45 AM - Load up, straighten sand line
9:45 AM - 10:00 AM - WQSP # 1 to WQSP # 6

WQSP #1
GEOPHYSICAL LOGS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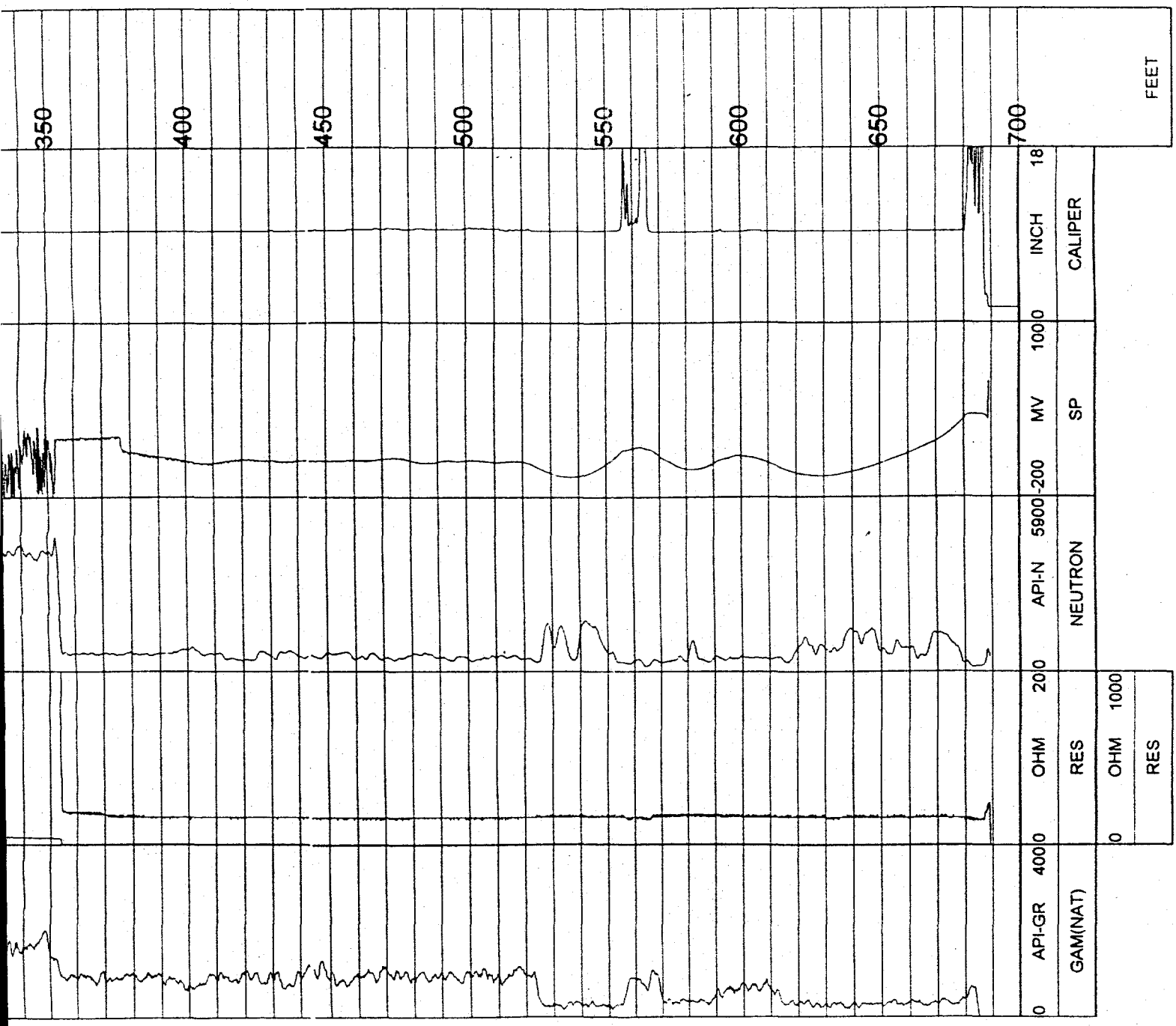
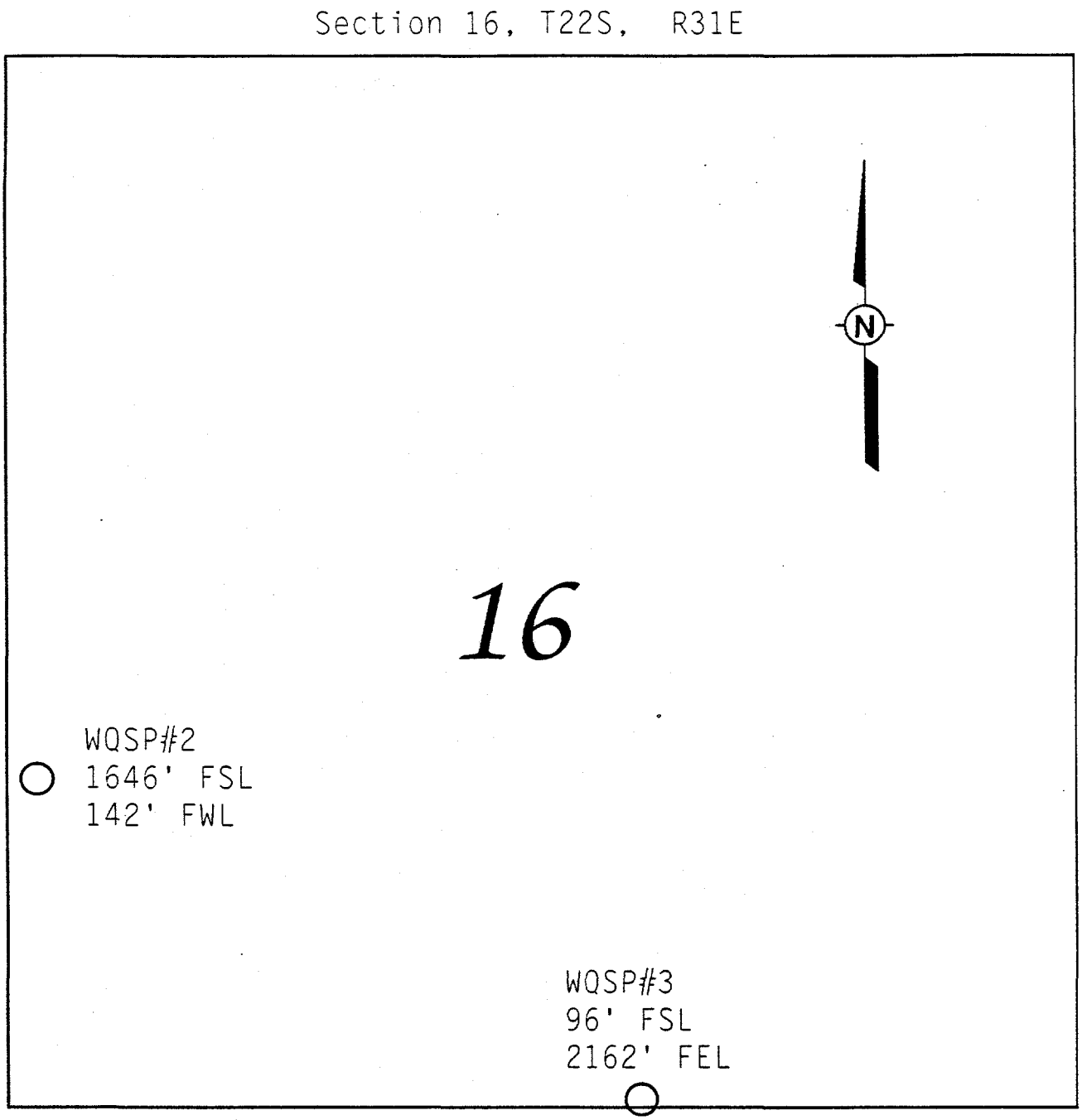


WQSP #1
Geophysical Logs

WQSP#2



Location of WQSP #2

WQSP #2
Condensed Well Summary

Location:	Section 16, T22S, R31E 1646 ft from the south line 142 ft from the west line	
Elevation: (Top of Casing)	3463.9 ft above mean sea level	
Cuttings Description:	D.S. Belski	
Drilling Contractor:	West Texas Water Well Service 3432 W. University, Odessa, Texas 79764 (915) 381-2687 phone (915) 381-7853 fax	
Drilling Record	Date: Bottom of hole: Cored interval: Cuttings:	September 6 to 10, 1994 848 ft below land surface 800 to 846 ft every 20 ft

WQSP #2
Stratigraphic Summary

Stratigraphic Unit	**Depth Interval Natural Gamma Log (feet)**	**Core Description**
Surficial Deposits/Santa Rosa	0-143	
Dewey Lake Redbeds	143-629	
Rustler Formation	629-844 partial	
• Forty Niner Member	629-692	
• Magenta Member	692-714	
• Tamarisk Member	714-811	800-810 partial
• Culebra Member	811-833	810-834
• Partial lower unnamed member	833-844	834-846
Maximum Recorded Depth	844	

WQSP #2
CUTTINGS DESCRIPTION

WQSP #2
Cuttings Description*

Date	Time	Sample Number	Depth (feet)	Description
08/31/94	0920	1**	6	Surficial deposits
	0928	2**	25	Surficial deposits
09/06/94	0845	1	45	Sandstone, clay, and sand
	0900	2	65	Clay, sandy siltstone, and mudstone
	0927	3	85	Clay
	1035	4	105	Sandy mudstone, clay, and sandstone
	1102	5	125	Sandstone, clay, and interbedded siltstone and sandstone
09/07/94	0824	6	145	Sandstone with minor gypsum
	1101	7	165	Mudstone
	1239	8	185	Mudstone, trace sandstone
	1259	9	205	Sandstone, clay, minor gypsum
	1323	10	215	Sandstone, clay, minor gypsum and sandstone
	1330	11	225	Sandstone
	1341	12	245	Claystone and gypsum
	1407	13	265	Sandstone and minor fibrous gypsum
	1423	14	285	Sandstone with green reduction spots
	1447	15	305	Sandstone
	1523	16	325	Sandstone
	1550	17	345	Siltstone and sandstone
	1610	18	365	Sandstone, minor fibrous gypsum
	1643	19	385	Siltstone with interbedded sandstone
	1715	20	405	Siltstone with green reduction spots, minor fibrous gypsum and clay
	1729	21	425	Siltstone with interbedded mudstone and sandstone
	1749	22	445	Sandstone, trace gypsum
09/08/94	0833	23	465	Siltstone, trace gypsum

* Cuttings description is for stratigraphic control not geologic description.
** Auger drilling

WQSP #2
Cuttings Description (Continued)*

Date	Time	Sample Number	Depth (feet)	Description
	0854	24	485	Siltstone, sandstone, trace gypsum
	0922	25	505	Siltstone, clay, trace gypsum
	0946	26	525	Mudstone, siltstone, sand, and clay
	1003	27	545	Mudstone, siltstone, sand, and clay
	1030	28	565	Sandy siltstone
	1048	29	585	Siltstone with minor gypsum
	1103	30	605	Sandy siltstone with mudstone
	1152	31	625	Siltstone, mudstone, and sand
	1154	32	630	Sandstone
09/08/94	1216	33	645	Anhydrite and clay
	1243	34	665	Siltstone, mudstone, and sand
	1313	35	685	Anhydrite with gypsum
	1326	36	705	Dolomite, damp
	1350	37	725	Anhydrite with gypsum
	1431	38	745	Gypsum and anhydrite
	1450	39	765	Gypsum and anhydrite
	1530	40	785	Gypsum
	1538	41	798	Mudstone, minor gypsum and anhydrite

* Cuttings description is for stratigraphic control not geologic description.
** Auger drilling

WQSP #2
CULEBRA CORE DESCRIPTION

PAGE 1 OF 3

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#2 DIA.: 4"

LOCATION: NW1/4 SW1/4 Section 16 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1646'FSL 142'FWL

ELEVATION: 3463.9 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/09/94

DRILL DATE: 09/09/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
09/09 11:29	1	800.0 801.0 802.0 803.0 804.0 805.0 806.0	9 1			800.0 - 810.1 ft: light to dark gray mottled anhydrite with gypsum laminae (1-2 mm). Upper 0.2 ft of unit is red-brown mudstone with subrounded to subangular pebble-sized anhydrite clasts. Lens of similar material from 804.3 - 804.5 ft with bladed selenite crystals.	Tamarisk Member of Rustler Formation

PAGE 2 OF 3

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#2 DIA.: 4"

LOCATION: NW1/4 SW1/4 Section 16 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1646' FSL 142' FWL

ELEVATION: 3463.9 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/09/94

DRILL DATE: 09/09/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
09/09	1	806.0	9 1			800.0 - 810.1 ft: light to dark gray mottled anhydrite with gypsum laminae (1-2 mm). Upper 0.2 ft of unit is red-brown mudstone with subrounded to subangular pebble-sized anhydrite clasts. Lens of similar material from 804.3 - 804.5 ft with bladed selenite crystals. Contact with underlying dolomite unclear.	Tamarisk Member of Rustler Formation
		807.0					
		808.0					
		809.0					
		810.0				810.1 - 816.0 ft: highly fractured light olive gray microcrystalline dolomite, appears clayey. Small open vugs increasing in size and decreasing in frequency with depth. Toward base gypsum-filled vugs (~ 4 cm).	Culebra Member of Rustler Formation
		811.0					
		812.0					

PAGE 3 OF 3

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#2 DIA.: 4"

LOCATION: NW1/4 SW1/4 Section 16 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1646' FSL 142' FWL

ELEVATION: 3463.9 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/09/94

DRILL DATE: 09/09/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		812.0					
09/09	1		9 1	OY		810.1 - 816.0 ft: highly fractured light olive gray microcrystalline dolomite. Small open vugs increasing in size and decreasing in frequency with depth. Toward base of unit vugs are sparse (5 mm - 4.5 cm) and gypsum filled. Fractures toward base appear to have been gypsum filled.	Culebra Member of Rustler Formation 1.5 feet of core loss
		813.0					
		814.0		Φy			
				Φy			
12:30		815.0			GF		
		816.0					

PAGE 1 OF 1

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#2 DIA.: 4"

LOCATION: NW1/4 SW1/4 Section 16 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1646'FSL 142'FWL

ELEVATION: 3463.9 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/10/94

DRILL DATE: 09/10/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		816.0					
09/10 16:42	2		7 5	ov ov	F	816.0 - 830.0 ft: light olive gray dolomite, highly fractured. Upper portion of unit contains numerous small, open vugs and infrequent gypsum filled fractures. Vugs increase in size and decrease in frequency with depth. Some vugs up to 3 cm in size, many are gypsum filled. Clay lined fractures are present toward base of unit.	Culebra Member of Rustler Formation 3.5 feet of core loss
		819.0			GF		
				ov	F		
		822.0		ov			
				ov			
		825.0					
				ϕv	F		
				ϕv			
		828.0			CF		
17:15				ϕv			
		830.0					
		831.0					

PAGE 1 OF 2

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#2 DIA.: 4"

LOCATION: NW1/4 SW1/4 Section 16 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1646'FSL 142'FWL

ELEVATION: 3463.9 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/10/94

DRILL DATE: 09/10/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
09/10 9:55	3	830.0				830.0 - 833.7 ft: light olive gray microcrystalline dolomite with numerous small vugs (open) with gypsum lined fractures. Vugs decrease in frequency toward base of unit.	Culebra Member of Rustler Formation
		832.0	75		GF GF		
		834.0				833.7 - 837.6 ft: transition between Culebra Member and underlying unnamed member . Upper 1.0 ft very rubbly clayey dolomite and claystone with numerous gypsum crystals. Lower portion dark black plastic clay.	Unnamed Member of Rustler Formation
		836.0					
		838.0				837.6 - 846.0 ft: dark black rubbly claystone in upper portion turning to red-brown clay with white, pinkish-white gypsum bands. Gypsum and anhydrite percent increases toward base of unit.	
		840.0					
		842.0					

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#2 DIA.: 4"

LOCATION: NW1/4 SW1/4 Section 16 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1646'FSL 142'FWL

ELEVATION: 3463.9 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/10/94

DRILL DATE: 09/10/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

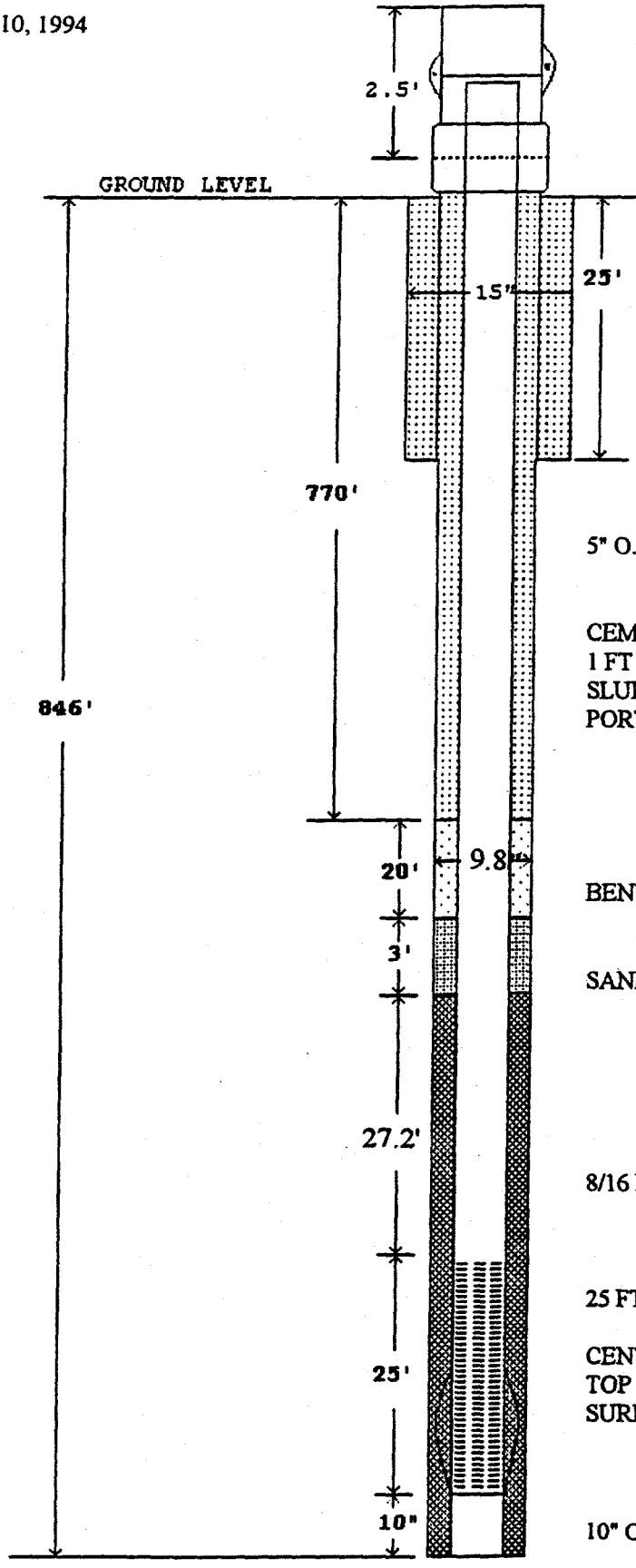
Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		842.0					
09/10 10:35	3		75			837.6 - 846.0 ft: dark black rubbly claystone in upper portion turning to red-brown clay with white-pink gypsum bands. Gypsum and anhydrite percentages increase toward base of unit.	Unnamed Member of Rustler Formation 4 ft of core lost
		844.0					
		846.0					

WQSP #2
HOLE HISTORY

WIPP Project
WQSP #2
Eddy County, New Mexico

September 6-10, 1994

WEST TEXAS WATER WELL SERVICE
RIG #15



2.5 FT EXTENSION WITH LOCKABLE CAP TO PROTECT WELL CASING

10.75 X 0.375 WALL SURFACE CASING CEMENTED IN A 15" HOLE

5" O.D. X 0.280 WALL BLANK FIBERGLASS CASING

CEMENT SLURRY MIX FROM 770 FT TO 1 FT
1 FT BELOW SURFACE
SLURRY IS 7 GALLONS WATER TO 1 CU FT
PORTLAND-ASTM C1510-92

BENTONITE SEAL FROM 770 TO 790 FT

SAND PACK FROM 790 TO 793 FT

8/16 BRADY GRAVEL FROM 846 TO 793 FT

25 FT OF 5" O.D. FIBERGLASS 0.020 SLOT SCREEN

CENTRALIZERS LOCATED AT BOTTOM OF SCREEN, TOP OF SCREEN, AND AT 60 FT INTERVALS TO SURFACE

10" OF BLANK 5" O.D. CASING

WEST TEXAS WATER WELL SERVICE

September 6, 1994

WQSP # 2

7:30 AM - 8:15 AM - Put rotating head back together and serviced rig
8:15 AM -11:15 AM - Drilled 9 7/8" hole from 25'-125', tripped out of hole
11:30 AM - 1:10 PM - Worked on rotating head
1:10 PM - 1:30 PM - Trip drill collars, remove rotating head, & take in to machine shop
1:30 PM - 2:00 PM - Service rig and secure for the day

September 7, 1994

WQSP # 2

7:20 AM - 8:00 AM Put on rotating head & trip in hole
8:00 AM - 8:40 AM Drill 9 7/8" hole from 125' - 147'
8:40 AM - 10:10 AM Work on rotating head
10:10 AM - 7:00 PM Drill 9 7/8" hole from 147' - 461'
7:00 PM - 7:15 PM T.O.O.H. 150' shut down, secure rig for the day

September 8, 1994

WQSP # 2

6:20 AM - 6:50 AM - Carlsbad to WQSP # 2
6:50 AM - 7:15 AM - Service rig & auxiliary air compressor
7:15 AM - 8:10 AM - Work on air compressor
8:10 AM - 8:15 AM - T.I.H.
8:30 AM - 11:15 AM - Drilling 9 7/8" hole from 461'-616'
11:15 AM - 11:35 AM - Change out batteries & alternator on air compressor
11:35 AM - 4:00 PM - Drilling 9 7/8" hole from 616'-800'. Stopped drilling at this point to come out of hole & prepare for coring 9-9-94
4:00 PM - 5:30 PM - Finished blowing on well to remove cuttings, had several tight spots due to anhydrite chunks falling in hole & catching bit on trip out
5:30 PM - 6:30 PM - Serviced rig and secured for the day. Talked with company man providing core tools for job

WEST TEXAS WATER WELL SERVICE

September 9, 1994

WQSP # 2

5:40 AM	6:15 AM	Carlsbad to WQSP # 2
6:15 AM	6:30 AM	Check fluid levels on equipment
6:30 AM	8:40 AM	Trip in the hole, had two feet of fill in overnight. Had t mist with foam to clean out hole
8:40 AM	10:30 AM	Rig up core barrel
10:30 AM	11:20 AM	Going in the hole
11:20 AM	11:35 AM	Coring 15′
11:35 AM	11:55 AM	Cleaning out hole
11:55 AM	12:15 PM	Waiting on orders to core deeper
12:15 PM	12:35 PM	Coring 1′
12:35 PM	3:15 PM	Coming out of hole with 1st core, recovered 15′, laid core barrel, broke it down, & pump into core troughs
3:15 PM	3:45 PM	Make up core barrel & start back in hole for second run
3:45 PM	4:40 PM	Tripping in the hole
4:40 PM	5:15 PM	Coring 2nd run 14′ - Depth 830′
5:15 PM	6:20 PM	Come out of the hole, lay down core barrel
6:20 PM	7:05 PM	Push out core
7:05 PM	7:30 PM	Secure rig for day, leave location
7:30 PM	8:10 PM	WSQP @ 2 to Carlsbad

September 10, 1994

WQSP # 2

7:00 AM	7:40 AM	Carlsbad to WQSP # 2
7:40 AM	7:55 AM	Service rig
7:55 AM	8:40 AM	Trip in the hole for 3rd core run, had 55′ of fill in, plug bit
8:40 AM	9:00 AM	Come out of hole 150′ & try to unload hole
9:00 AM	9:10 AM	Run 2 jts. back in well and unload hole. Possible bridge @ 55′ off bottom, back to bottom @ 10:00 AM
10:00 AM	10:35 AM	Coring 3rd run, cut 16′
10:35 AM	11:35 AM	Coming out of the hole w/3rd core
11:35 AM	12:35 PM	Lay down core barrel and pump out
12:35 PM	1:30 PM	Break down tool joints on core barrel & load on trailer
1:30 PM	2:00 PM	Shut down rig and secure rig for week end

WEST TEXAS WATER WELL SERVICE

September 12, 1994

WQSP # 2

5:45 AM	7:35 AM	Odessa to WIPP WQSP # 2
7:35 AM	9:00 AM	Line pits for brine water
9:00 AM	10:10 AM	Trip pipe in hole
10:10 AM	11:00 AM	Mix 30 sacks sw gel to sweep hole with and remove cuttings
11:00 AM	11:45 AM	Circulate and condition
11:45 AM	1:05 PM	Ream 8 1/2" core hole to 9 7/8"
1:05 PM	3:55 PM	TD 846' circulating
3:55 PM	4:40 PM	Trip out of hole
4:40 PM	4:55 PM	Rig up to log well
4:45 PM	6:45 PM	Log hole

September 21, 1994

WQSP # 1 & 2

6:10 AM	6:40 AM	Carlsbad to WQSP # 1
6:40 AM	6:55 AM	Service rig
6:55 AM	8:00 AM	Clean up location & rig down
8:00 AM	10:10 AM	Replace cable on blocks
10:10 AM	11:30 AM	Picked up well casing for WQSP # 2 and filled pits at WQSP # 2
11:30 AM	12:00 PM	Rigged up drilling rig on WQSP # 2
12:00 PM	1:30 PM	Trip in the hole and tag fill in
1:30 PM	2:10 PM	Mix mud to circulate down hole
2:10 PM	3:00 PM	Clean out bottom of hole
3:00 PM	3:30 PM	Circulate
3:30 PM	4:00 PM	Trip out of hole 200' and shut down rig
3:00 PM	4:30 PM	Spot surface hole on WQSP #'s 5 & 6
4:30 PM	5:00 PM	Back to Carlsbad

WEST TEXAS WATER WELL SERVICE

September 22, 1994

WQSP # 2

6:00 AM	6:35 AM	Carlsbad to WQSP # 2
6:35 AM	6:45 AM	Check fluid level in equipment
6:45 AM	7:05 AM	Trip pipe in hole to check TD
7:05 AM	7:30 AM	Circulate
7:30 AM	8:30 AM	Trip pipe out of hole
8:30 AM	9:10 AM	Water meter locked up - waiting on key
9:10 AM	10:20 AM	Run 2" trimmie line
10:20 AM	12:35 PM	Run 5" fiberglass casing, screen, & centralizers
12:35 PM	1:00 PM	Rig up gravel hopper to gravel pack well
1:00 PM	3:00 PM	Gravel pack well
3:00 PM	4:00 PM	Mix bentonite slurry and spot above gravel for seal
4:00 PM	5:30 PM	Pump cement grout to surface
5:30 PM	6:00 PM	Pull trimmie pipe, wash up and secure rig for the day

September 23, 1994

WQSP #'s 2 & 6

6:00 AM	6:40 AM	Carlsbad to WQSP # 2
6:40 AM	8:15 AM	Rigged down on WQSP # 2, cleaned up location & moved to WQSP # 6
8:15 AM	12:00 PM	Rigged up on WQSP # 6, lined pit, put rotating head on, and shut down for weekend
12:00 PM	2:00 PM	WQSP # 6 to Odessa

September 26, 1994

WQSP # 2

8:45 AM	12:15 PM	Bail & develop well - water level @ start of day - 351'
12:15 PM	12:45 PM	Water level recovered from bail down point of 500' back to 400'
12:45 PM	3:45 PM	Continued bailing to develop well - water level @ end of day - 400'
3:45 PM	4:00 PM	Shut down unit & secured for day

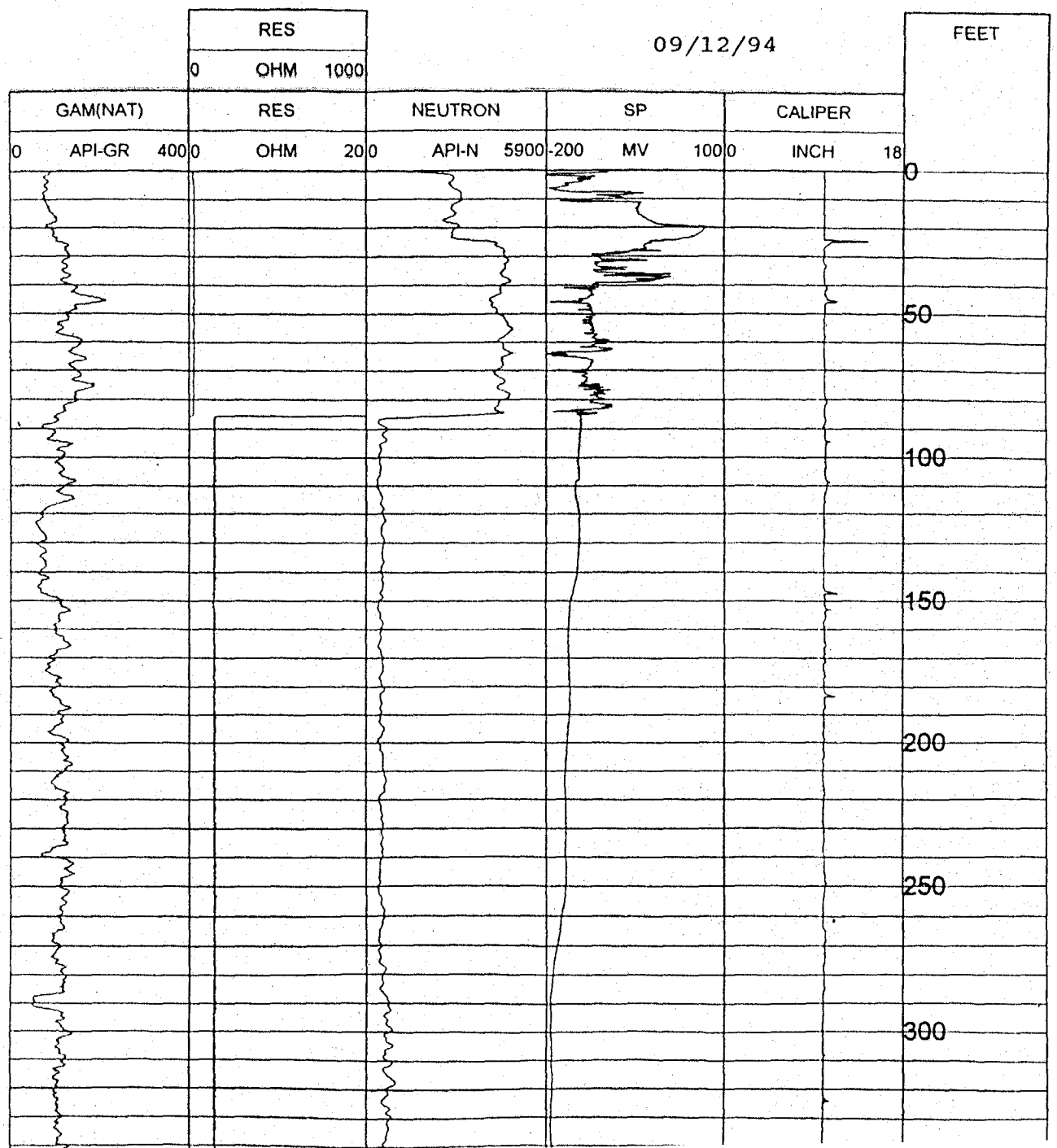
WEST TEXAS WATER WELL SERVICE

September 27, 1994

WQSP # 2

8:00 AM - 8:30 AM - Ran bailer - water level @ 400' TD 849' from top of casing
8:30 AM - 10:30 AM - Make splice on pump and ran 3 HP 230V 3 Ph 10 GPM pump in hole, start pumping @ 13 GPM
10:30 AM - 2:30 PM - Pump well to develop - avg. 10.33 gpm over 4 hours
2:30 PM - 4:00 PM - Pull pump from well
4:00 PM - 5:00 PM - WQSP # 6

WQSP #2
GEOPHYSICAL LOGS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FEET
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CALIPER
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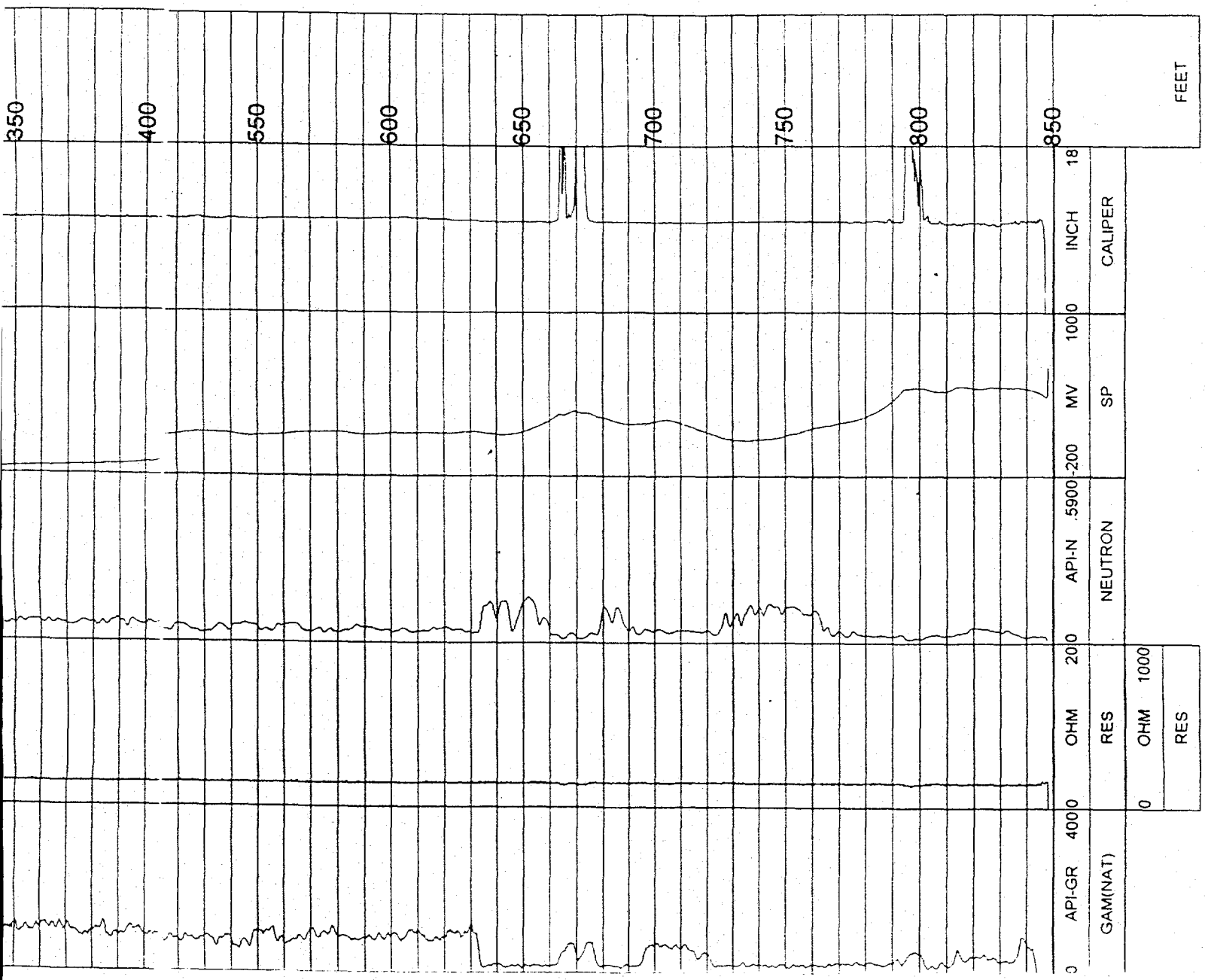
200
250
300

Century GEOPHYSICAL CORP.

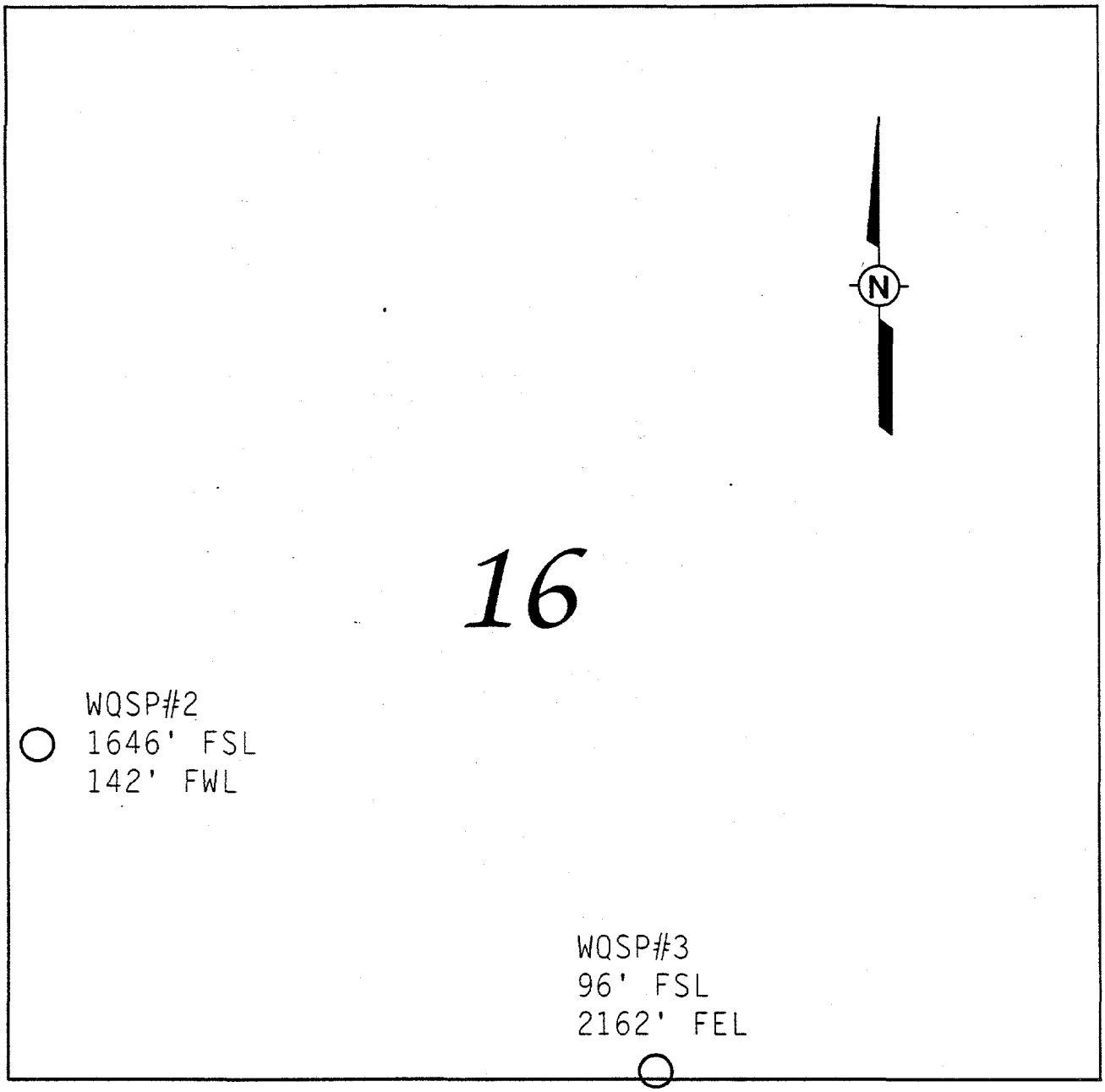


Best available data

WQSP #2
Geophysical Logs

WQSP#3

Section 16, T22S, R31E



Location of WQSP #3

WQSP #3
Condensed Well Summary

Location:	Section 16, T22S, R31E 96 ft from the south line 2162 ft from the east line	
Elevation: (Top of Casing)	3480.3 ft above mean sea level	
Cuttings Description:	M.L. Martin	
Drilling Contractor:	West Texas Water Well Service 3432 W. University, Odessa, Texas 79764 (915) 381-2687 phone (915) 381-7853 fax	
Drilling Record	Date: Bottom of hole: Cored interval: Cuttings:	October 20 to 26, 1994 880 ft below land surface 833 to 879 ft every 20 ft

WQSP #3
Stratigraphic Summary

Stratigraphic Unit	**Depth Interval Natural Gamma Log (feet)**	**Core Description**
Surficial Deposits/Santa Rosa	0-156	
Dewey Lake Redbeds	156-669	
Rustler Formation	669-881 partial	
• Forty Niner Member	669-727	
• Magenta Member	727-749	
• Tamarisk Member	749-848	833-844 partial
• Culebra Member	848-871	844-870
• Partial lower unnamed member	871-881 partial	870-879 partial
Maximum Recorded Depth	881	

WQSP #3
CUTTINGS DESCRIPTION

WQSP #3
Cuttings Description *

Date	Time	Sample Number	Depth (feet)	Description
10/03/94	1045	1**	5	Caliche
	1120	2**	25	Surficial deposits
10/20/94	0825	3	45	Sandstone
	0840	4	65	Sandstone
	0903	5	85	Sandstone
	0922	6	105	Sandstone
	0937	7	125	Mudstone
	0945	8	145	Siltstone
	1005	9	165	Siltstone and mudstone
	1020	10	185	Sandstone with minor carbonate
	1033	11	205	Mudstone interbedded with siltstone
	1055	12	225	Sandstone and siltstone
	1117	13	245	Sandstone
	1147	14	265	Mudstone, sandstone, and minor gypsum
	1242	15	285	Gypsiferous mudstone
	1255	16	305	Sandstone, carbonate, and fibrous gypsum
	1336	17	325	Mudstone interbedded with siltstone, green reduction spots, fibrous gypsum
	1414	18	345	Sandstone with carbonate
	1445	19	365	Sandstone, siltstone interbedded with mudstone, fibrous gypsum
	1515	20	385	Sandstone, mudstone, siltstone, and fibrous gypsum
10/21/94	0730	21	405	Mudstone and sandstone, limited sample, slightly damp
	0805	22	425	Sandstone, minor gypsum and mudstone, mud balls
	0839	23	445	Sandstone with minor gypsum
	0855	24	465	Siltstone and fibrous gypsum filled fractures in the sandstone

* Cuttings description is for stratigraphic control not geologic description.
** Auger drilling.

WQSP #3
Cuttings Description (Continued) *

Date	Time	Sample Number	Depth (feet)	Description
	0915	25	485	Sandstone, trace carbonate and gypsum
	0935	26	505	Mudstone, selenite gypsum and siltstone interbedded with mudstone
10/21/94	0952	27	525	Mudstone and selenite
	1007	28	545	Gypsiferous sand, sandstone, and selenite
	1021	29	565	Sandstone and mudstone with green reduction spots, trace gypsum,
	1034	30	585	Gypsiferous mudstone with green reduction spots, trace selenite
	1048	31	605	Mudstone, sandstone, and fibrous gypsum
	1110	32	625	Siltstone, sandstone, and selenite
	1120	33	645	Siltstone, sandstone, and gypsum
	1142	34	665	Siltstone and sandstone
10/24/94	1031	35	705	Anhydrite, mudstone, and selenite
	1113	36	725	Anhydrite with minor gypsum and mudstone
	1120	37	745	Anhydrite, minor selenite, trace mudstone
	1210	38	765	Anhydrite, minor selenite, trace claystone
	1255	39	785	Anhydrite, trace claystone
	1335	40	805	Anhydrite, limited sample
	1350	41	825	Anhydrite

* Cuttings description is for stratigraphic control not geologic description.
** Auger drilling.

WQSP #3
CULEBRA CORE DESCRIPTION

PAGE 1 OF 4

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#3 DIA.: 4"

LOCATION: NW1/4 NE1/4 Section 16 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 96' FSL 2162' FEL

ELEVATION: 3480.3 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/25/94

DRILL DATE: 10/25/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		832.0					
10/25 09:35	1	834.0	9 7		GF	833.0 - 844.0 ft: light to dark gray mottled anhydrite with wavy (1-3 mm) gypsum laminae. Gypsum filled fracture 0.5 cm wide from 841.2 - 844.0 ft with minor displacement.	Tamarisk Member of Rustler Formation
		836.0					
		838.0					
		840.0					
		842.0					
		844.0					

WIPP CORE-LOG INVENTORY

INTERA
FORM 1400

BOREHOLE: WQSP#3 DIA.: 4"
LOCATION: NW1/4 NE1/4 Section 16 T22S R31E
ORIENTATION: Vertical Down
COORDINATES: 96' FSL 2162' FEL
ELEVATION: 3480.3 feet amsl
DRILL METHOD(S): Air Rotary

LOG BY: JBD
DATE: 10/25/94
DRILL DATE: 10/25/94
DRILLER: Ronnie Keith
DRILL: Gardner Denver 1500
DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		844.0					
10/25	1	846.0	9 7	φv φv φv φv φv φv φv φv	GF GF	844.0 - 855.6 ft: light olive gray microcrystalline dolomite. Upper 0.2 ft red-gray dolomite with small (1-2 mm) elongate gypsum filled vugs grading to gray dolomite. Wavy discontinuous clay filled fractures (0.5 - 1 mm). Vugs increase in size, variety, and intensity with depth becoming large (up to 2 cm), gypsum filled, small (1 - 2 mm), and open. 853 - 855.6 ft: vugs decrease in intensity, are mainly large and some gypsum filled. Few thin, wavy discontinuous gypsum filled fractures. 853.9 - 854.5 ft: broken, rubbly, silty interval.	Culebra Member of Rustler Formation
		848.0					
		850.0					
		852.0					
		857.0					

WIPP CORE-LOG INVENTORY

INTERA
FORM 1400

BOREHOLE: WQSP#3 DIA.: 4"
LOCATION: NW1/4 NE1/4 Section 16 T22S R31E
ORIENTATION: Vertical Down
COORDINATES: 96' FSL 2162' FEL
ELEVATION: 3480.3 feet amsl
DRILL METHOD(S): Air Rotary

LOG BY: JBD
DATE: 10/25/94
DRILL DATE: 10/25/94
DRILLER: Ronnie Keith
DRILL: Gardner Denver 1500
DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		856.0					
10/25 10:40	1		9 7			855.6 - 861.3 ft: light olive gray microcrystalline dolomite interbedded with brown/tan silty dolomite (laminated) with moderate open vugs some gypsum filled. Moderate gypsum filled fractures with minor displacement. Base of unit is transition to extremely vuggy non-silty dolomite.	Culebra Member of Rustler Formation
		858.0			GF		
		860.0			GF		
		861.3				861.3 - 864.0 ft: extremely vuggy light olive gray microcrystalline dolomite. 2-3 mm open vugs, some ≥ 2 cm, minor gypsum filled vugs. Rare thin horizontal gypsum filled fractures.	1' core loss
		862.0					
					GF		
13:40		864.0				864.0 - 870.4 ft: same dolomite as above, majority of vugs gypsum filled. Vugs increase in size and decrease in frequency with depth becoming rare to nonexistent at base of unit. Large, opaque, gypsum-filled inclusions from 867-870.4 ft. (continued on next page)	1' core loss
		866.0					
		868.0					

PAGE 4 OF 4	WIPP CORE-LOG INVENTORY	INTERA FORM 1400

BOREHOLE: WQSP#3 DIA.: 4"
LOCATION: NW1/4 NE1/4 Section 16 T22S R31E
ORIENTATION: Vertical Down
COORDINATES: 96' FSL 2162' FEL
ELEVATION: 3480.3 feet amsl
DRILL METHOD(S): Air Rotary

LOG BY: JBD
DATE: 10/25/94
DRILL DATE: 10/25/94
DRILLER: Ronnie Keith
DRILL: Gardner Denver 1500
DRILL CO.: West Texas Water Well Service

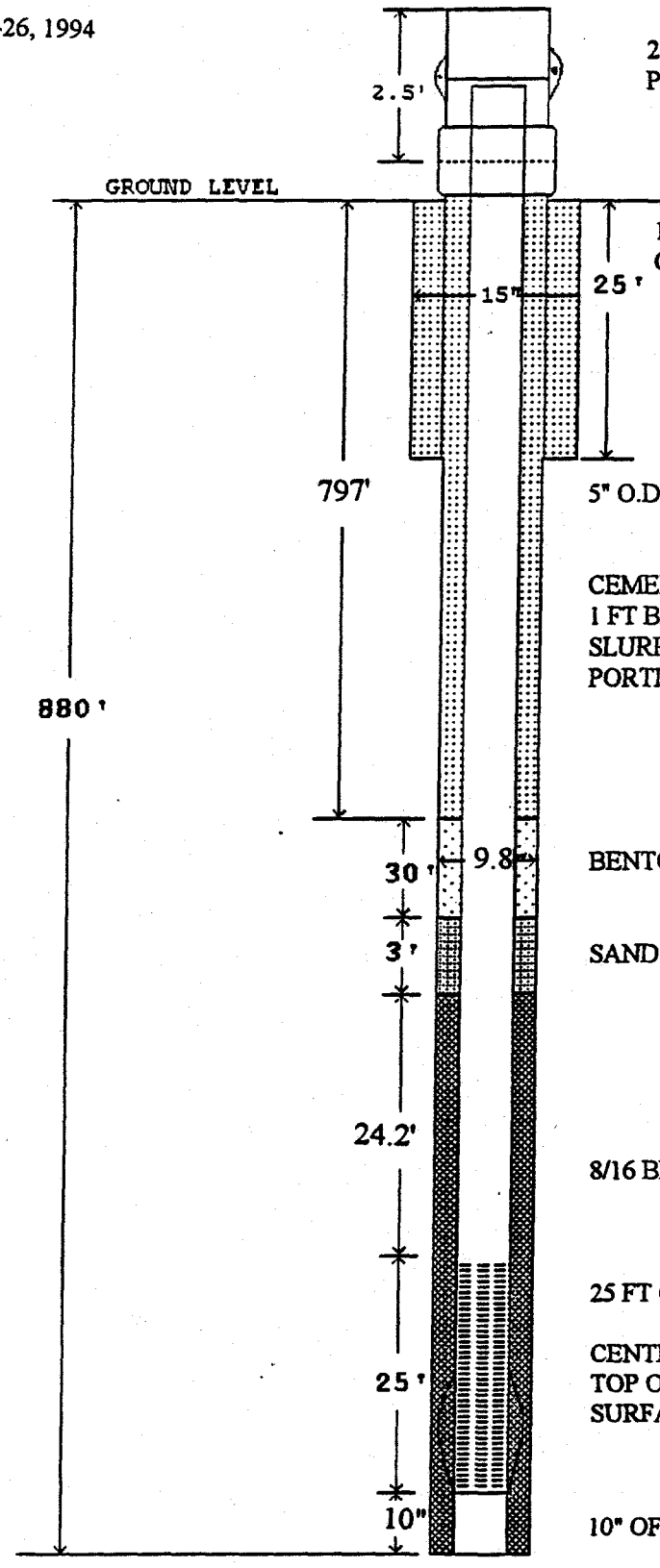
Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
10/25 14:40	2	868.0	9 7			Wavy, discontinuous, vertical gypsum-filled fractures (1-2 mm) contact between Culebra and underlying unnamed member is sharp. ~1 ft of core loss.	Culebra Member of Rustler Formation
		870.0				870.4 - 873.0 ft: upper 0.9 ft black plastic clay with minor gypsum stringers grading to dark red/brown clay with minor red-pink/gray anhydrite beds.	Unnamed member of Rustler Formation
		872.0					
		874.0				873.0 - 877.4 ft: red/light brown mud-clay with frequent light-gray/pink anhydrite beds and high angle veins and stringers. Anhydrite decreases in frequency with depth. Rare light gray clay inclusions. Base of unit contains subrounded anhydrite pebbles (0.25 - 1 cm) and thin (5 - 6 mm) anhydrite beds.	
		876.0					
		878.0				877.4 - 879.0 ft: dark-light gray microcrystalline anhydrite with thin (2-4 mm) wavy gypsum laminae.	
		880.0					

WQSP #3
HOLE HISTORY

WIPP Project
WQSP #3
Eddy County, New Mexico

October 20-26, 1994

WEST TEXAS WATER WELL SERVICE
RIG #15



2.5 FT EXTENSION WITH LOCKABLE CAP TO PROTECT WELL CASING

10.75 X 0.375 WALL SURFACE CASING CEMENTED IN A 15" HOLE

5" O.D. X 0.280 WALL BLANK FIBERGLASS CASING

CEMENT SLURRY MIX FROM 796 FT TO 1 FT
1 FT BELOW SURFACE
SLURRY IS 7 GALLONS WATER TO 1 CU FT
PORTLAND-ASTM C1510-92

BENTONITE SEAL FROM 827 TO 797 FT

SAND PACK FROM 830 TO 827 FT

8/16 BRADY GRAVEL FROM 880 TO 830 FT

25 FT OF 5" O.D. FIBERGLASS 0.020 SLOT SCREEN

CENTRALIZERS LOCATED AT BOTTOM OF SCREEN, TOP OF SCREEN, AND AT 60 FT INTERVALS TO SURFACE

10" OF BLANK 5" O.D. CASING

WEST TEXAS WATER WELL SERVICE

October 20, 1994

WQSP # 3

6:00 AM	6:35 AM	Carlsbad to WQSP # 3
6:35 AM	6:45 AM	Check fluid levels
6:45 AM	7:50 AM	Finish rigging up and line pits
7:50 AM	12:00 PM	Started drilling 9 7/8" hole from 25'. 10.75" .375W surface in place
12:00 PM	12:30 PM	Work on air compressor
12:30 PM	3:30 PM	Continued drilling
3:30 PM	4:15 PM	Pulled 60' of drill pipe, service air filters on rig
4:15 PM	5:15 PM	Secure rig & go to Carlsbad

October 21, 1994

WQSP # 3

5:50 AM	6:30 AM	Carlsbad to WQSP # 3
6:30 AM	6:45 AM	Check fluid levels
6:45 AM	7:10 AM	Work on air compressor
7:10 AM	12:30 PM	Drilling 9 7/8" from 400' on air
12:30 PM	12:45 PM	Trip out 200' of drill pipe
12:45 PM	3:00 PM	Replace cable on blocks
3:00 PM	5:00 PM	Carlsbad to Odessa

October 24, 1994

WQSP # 3

6:00 AM	8:40 AM	Odessa to WQSP # 3 (had flat in route)
8:40 AM	8:50 AM	Check fluid levels
8:50 AM	9:30 AM	Trip pipe in the hole
9:30 AM	2:00 PM	Drill 9 7/8" hole from 680' to 833' on mist pump
2:00 PM	2:30 PM	Clean out hole
2:30 PM	3:30 PM	Trip drill pipe and collars out of hole, prepare to core
3:30 PM	4:45 PM	Get load of water, secure rig
4:45 PM	5:30 PM	WQSP # 3 to Carlsbad

WEST TEXAS WATER WELL SERVICE

October 25, 1994

WQSP # 3

6:00 AM - 6:30 AM - Carlsbad to WQSP # 3
6:30 AM - 6:40 AM - Check fluid levels
6:40 AM - 7:10 AM - Wait on Weatherford
7:10 AM - 8:10 AM - Rig up core tools
8:10 AM - 9:20 AM - Trip in hole for 1st core run
9:20 AM - 10:40 AM - Coring from 833' - 864', top of Culebra @ 844'
10:40 AM - 10:50 AM - Clean out hole
10:50 AM - 11:50 AM - Trip out of the hole
11:50 AM - 12:30 PM - Breakout core barrel and lay down inner barrel
12:30 PM - 1:00 PM - Pick up inner barrel & go back in hole
1:00 PM - 2:00 PM - Tripping in hole
2:00 PM - 2:30 PM - Coring from 844' - 859'
2:30 PM - 2:40 PM - Clean out hole
2:40 PM - 3:45 PM - Tripping out of the hole, pull inner barrel & lay out on ground
3:45 PM - 4:30 PM - Pump out core, load core tools & secure rig
4:30 PM - 5:15 PM - WQSP # 3 to Carlsbad

October 26, 1994

WQSP # 3

6:00 AM - 6:40 AM - Carlsbad to WQSP # 3
6:40 AM - 6:55 AM - Check fluid levels
6:55 AM - 8:35 AM - Trip pipe in the hole
8:35 AM - 10:30 AM - Ream hole from 8 1/2" to 9 7/8" to receive logging tools - hole reamed from 833' - 880'
10:30 AM - 11:00 AM - Clean out hole with foaming agents
11:00 AM - 12:05 PM - Trip out of the hole
12:05 PM - 2:30 PM - Wait on logging unit
2:30 PM - 5:00 PM - Run logs
5:00 PM - 5:35 PM - WQSP # 3 to Carlsbad

WEST TEXAS WATER WELL SERVICE

October 27, 1994

WQSP # 3

6:00 AM	6:40 AM	Carlsbad to WQSP # 3
6:40 AM	6:50 AM	Check fluid levels
6:50 AM	7:35 AM	Run bailer to check if hole is open, had 40′ of fill
7:35 AM	8:40 AM	Trip pipe in the hole
8:40 AM	9:45 AM	Clean out hole, hit bridge at 840′. Hole was bridged over from 840′ - 860′, open from 860′ - 880′
9:45 AM	10:35 AM	Trip out of the hole
10:35 AM	11:15 AM	Prepare to run 2" trimmie line
11:15 AM	12:00 PM	Run 2" trimmie line
12:00 PM	12:15 PM	Prepare to run fiberglass screen & casing - 29 jts blank, 1 - 10′ blank bottom, 1 jt screen
12:15 PM	2:10 PM	Running casing
2:10 PM	2:45 PM	Rig up to gravel pack (work on mud pump)
2:45 PM	3:45 PM	Gravel packing well with 8/16 Brady gravel from 880′
3:45 PM	4:15 PM	Mix bentonite slurry for plug above gravel pack
4:15 PM	4:40 PM	Rig up to cement (wait on truck)
4:40 PM	5:20 PM	Cementing from 800′
5:20 PM	6:10 PM	Pull 2: trimmie line
6:10 PM	6:20 PM	Secure rig
6:20 PM	7:00 PM	WQSP # 3 to Carlsbad

October 31, 1994

WQSP # 3

Unit # 2

7:55 AM	9:10 AM	Arrive on location, pour 4 gallons of bleach into well, check & service unit, rig up & prepare to bail well, surge well with bailer to allow solution to work through screened interval
9:10 AM	12:25 PM	Start bailing, water level @ 448′, TD from top of casing 803′. Made 20 trips
12:25 PM	1:25 PM	Made 10 more trips with bailer
1:25 PM	3:10 PM	Run test pump in well, pump set on 1" pipe @ 866′
3:10 PM		Start pump - 7.5 GPM
3:30 PM		Pumping 6.2 gpm
3:55 PM		Well pumped off, shut down for the day
4:00 PM		Left location

WEST TEXAS WATER WELL SERVICE

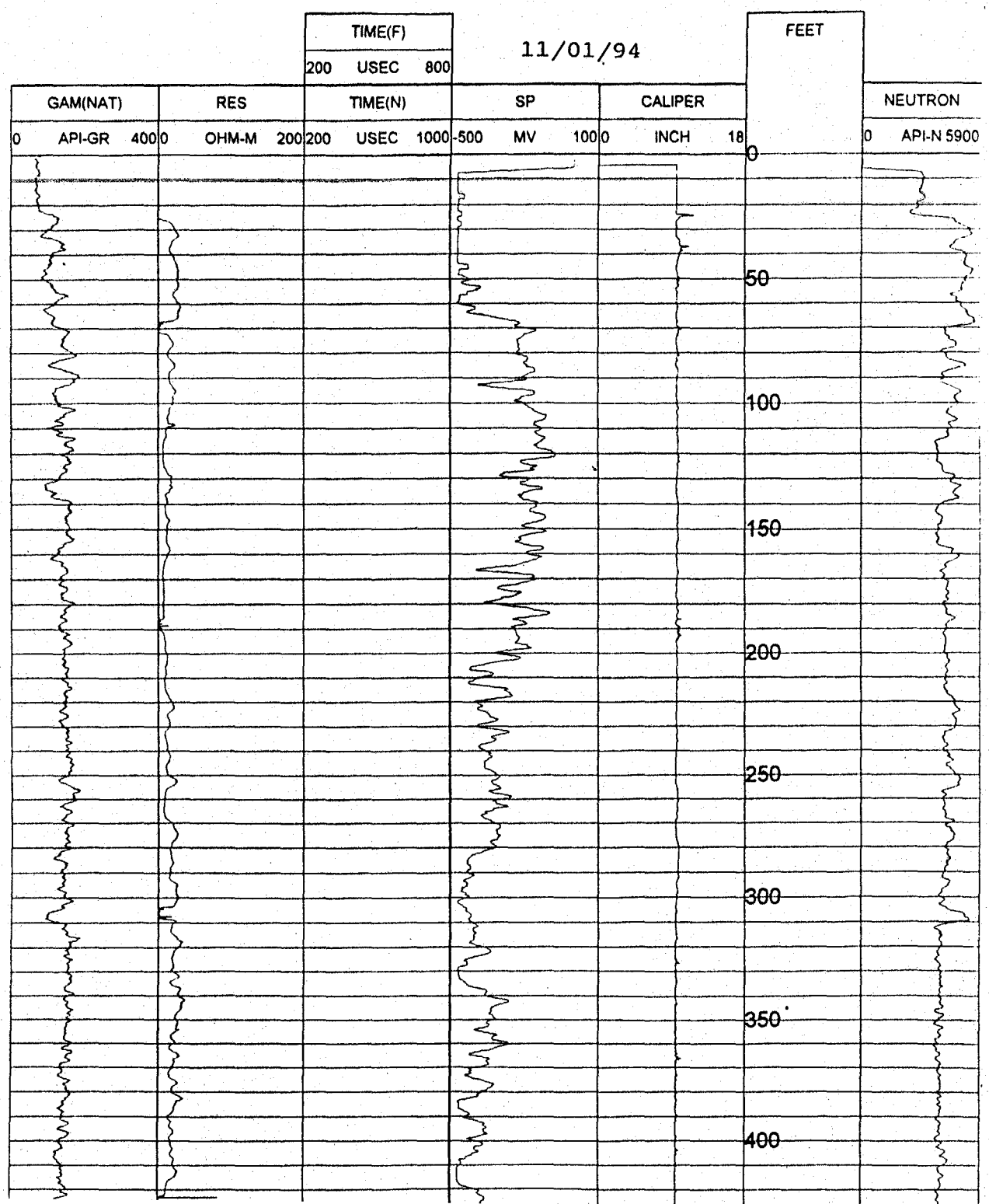
November 1, 1994

WOSP # 3

Unit # 2

6:40 AM -	7:00 AM -	Arrive on location, check unit
7:00 AM -	8:40 AM -	Start surging well, pumping 9 GPM
8:40 AM -	-	Start continuous test w/2 GPM choke in line, 65# backpressure
9:20 AM -	-	Change to 3 GPM choke, 40# backpressure
9:25 AM -	-	Pumped off well, change back to 2 GPM choke
9:35 AM -	-	1.2 GPM @ 60# backpressure
9:55 AM -	-	.75 GPM @ 60# backpressure
10:15 AM -	-	.8 GPM @ 60# backpressure
10:30 AM -	-	.8 GPM @ 60# backpressure
10:45 AM -	-	.8 GPM @ 60# backpressure
11:00 AM -	-	.8 GPM @ 60# backpressure
11:15 AM -	-	.8 GPM @ 60# backpressure
11:30 AM -	-	.8 GPM @ 60# backpressure
11:45 AM -	-	.8 GPM @ 60# backpressure
12:00 PM -	-	.8 GPM @ 60# backpressure - shut down test
12:05 PM -	1:30 PM -	Rig up, pull pump
1:30 PM -	2:55 PM -	Set up to log
2:55 PM -	4:10 PM -	Finish logging and wait on cement truck
4:10 PM -	4:35 PM -	Cement from 147' to surface
4:35 PM -	4:45 PM -	Clean up & leave location

WQSP #3
GEOPHYSICAL LOGS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11/01/94
FEET
GAM(NAT)
0 API-GR 400
RES
0 OHM-M 200
TIME(N)
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SP
-500 MV 100
CALIPER
0 INCH 18
NEUTRON
0 API-N 5900
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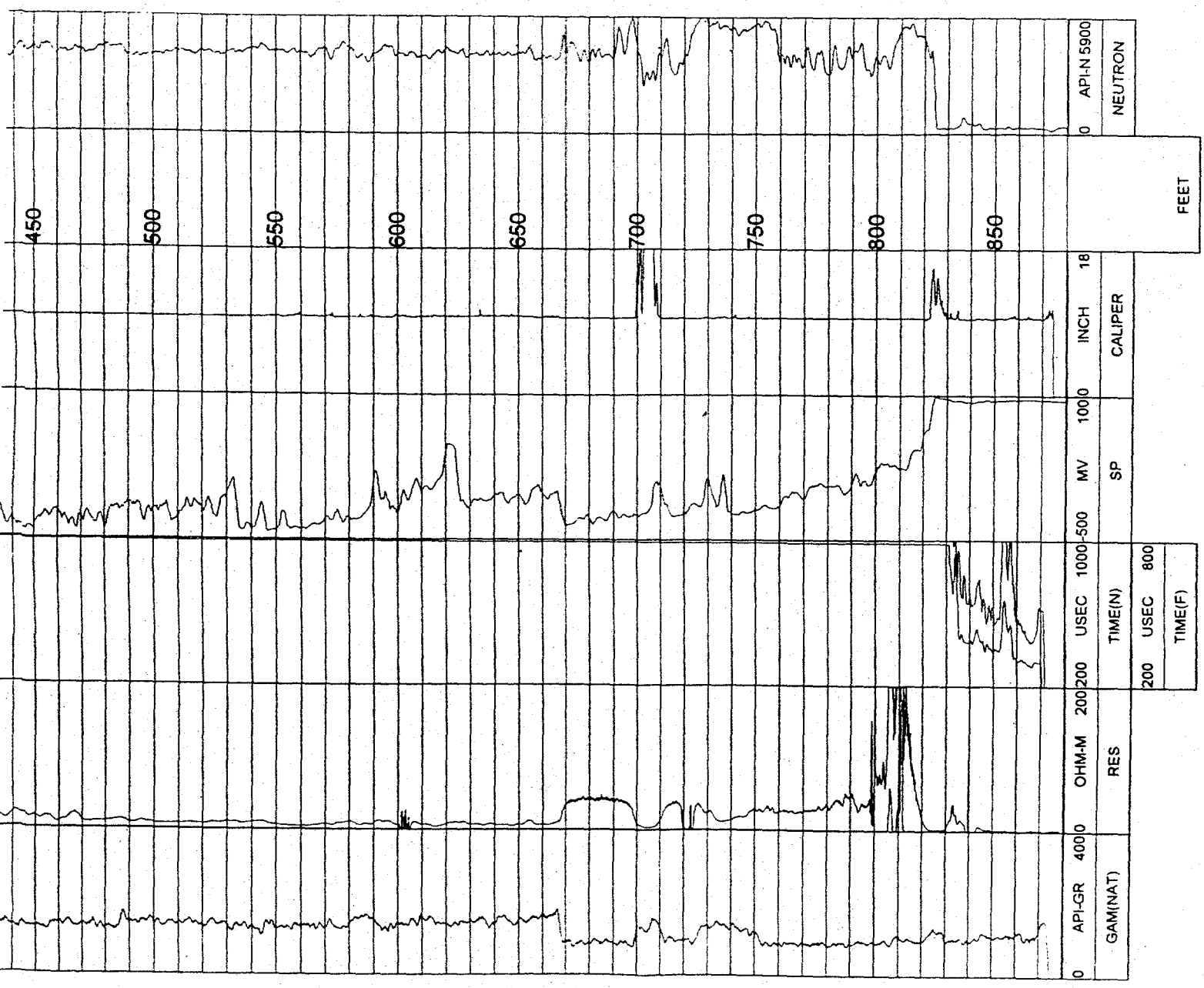
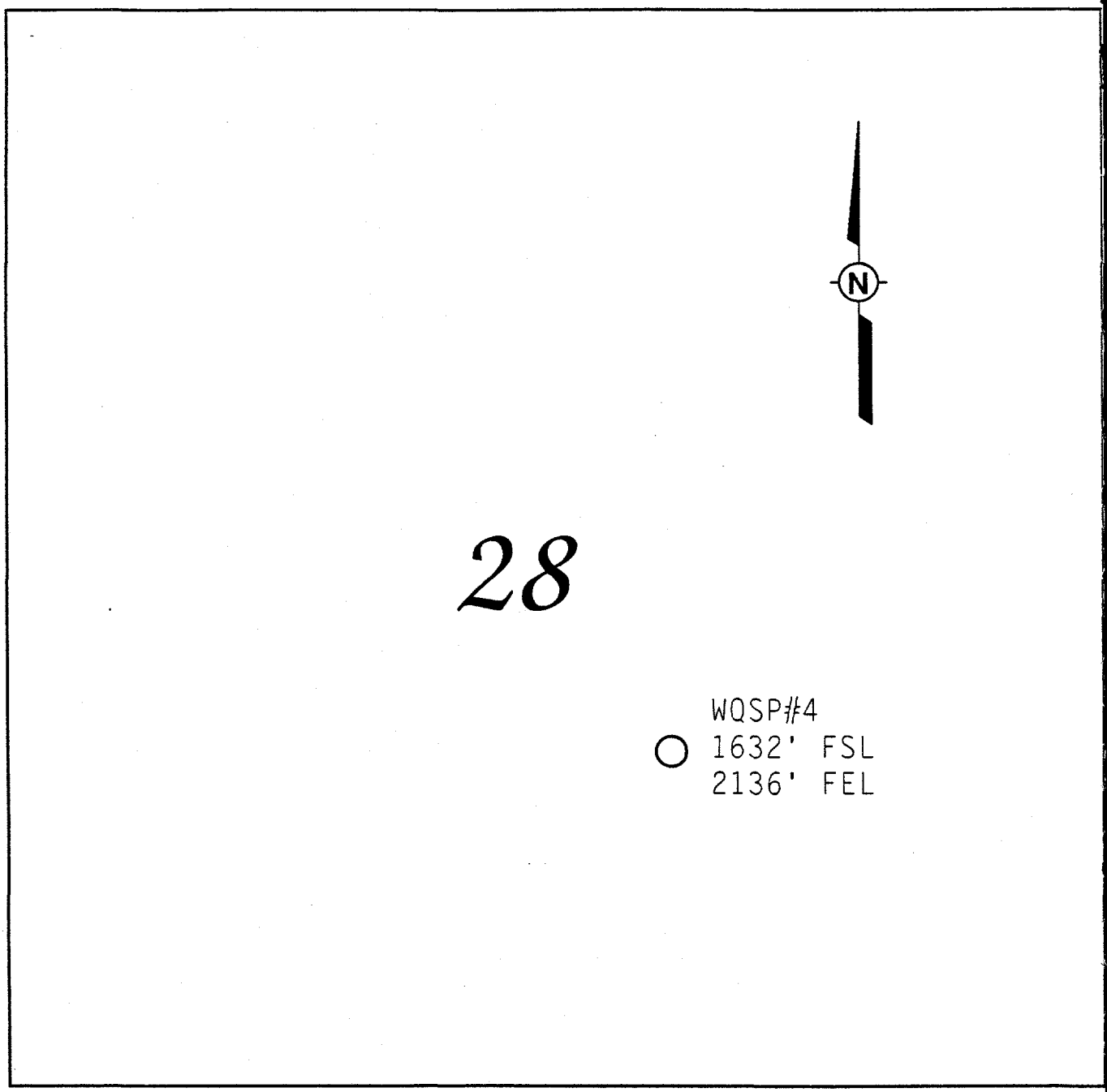
50
100
150
200
250
300
350
400



WQSP #3
Geophysical Logs

WQSP#4

Section 28, T22S, R31E



Location of WQSP #4

WQSP #4
Condensed Well Summary

Location:	Section 28, T22S, R31E 1632 ft from the south line 2136 ft from the east line	
Elevation: (Top of Casing)	3433.0 ft above mean sea level	
Cuttings Description:	M.L. Martin	
Drilling Contractor:	West Texas Water Well Service 3432 W. University, Odessa, Texas 79764 (915) 381-2687 phone (915) 381-7853 fax	
Drilling Record:	Date: Bottom of hole: Cored interval: Cuttings:	October 5 to 7, 1994 800 ft below land surface 740 to 798 ft every 20 ft

WQSP #4
Stratigraphic Summary

Stratigraphic Unit	**Depth Interval Natural Gamma Log (feet)**	**Core Description**
Surficial Deposits/Santa Rosa	0-78	
Dewey Lake Redbeds	78-588	
Rustler Formation	588-802 partial	
• Forty Niner Member	588-652	
• Magenta Member	652-672	
• Tamarisk Member	672-770	740-765.6 partial
• Culebra Member	770-790	765.6-790.8
• Partial lower unnamed member	790-802 partial	790.8-798 partial
Maximum Recorded Depth	802	

WQSP #4
CUTTINGS DESCRIPTION

WQSP #4
Cuttings Description*

Date	Time	Sample Number	Depth (feet)	Description
10/03/94	0930	1**	5	Caliche
	0955	2**	25	Surficial deposits
10/05/94	0820	1	45	Siltstone, mudstone, and clay
	0834	2	65	Sandstone, siltstone, mudstone, and mud
	0903	3	85	Siltstone and mudstone
	0923	4	105	Mudstone and siltstone
	0939	5	125	Mudstone and Siltstone
	1003	6	145	Sandstone and mudstone
	1025	7	165	Siltstone, mudstone, trace gypsum
	1043	8	185	Siltstone and sandstone
	1104	9	205	Mudstone, trace fibrous gypsum and sandstone
	1130	10	225	Sandstone and fibrous gypsum
	1157	11	245	Siltstone and sandstone with green reduction spots, fibrous gypsum
	1225	12	265	Sandstone with green reduction spots, minor carbonate
	1258	13	285	Siltstone, sandstone, trace gypsum
	1327	14	305	Siltstone, sandstone, trace gypsum
	1402	15	325	Siltstone and sandstone
	1432	16	345	Mudstone and sandstone with green reduction spots
	1451	17	365	Mudstone and sandstone with green reduction spots, minor carbonate, and trace gypsum
	1510	18	385	Silt and sandstone with green reduction spots, minor fibrous gypsum
	1538	19	405	Sandstone, mudstone, minor gypsum, and silt, damp
	1547	20	425	Silt with gypsum, mudstone, and sandstone
10/06/64	0735	21	445	Silt, sand, and gypsum
	0804	22	465	Silt and sandstone with gypsum filled fractures

* Cuttings description is for stratigraphic control not geologic description.

** Auger drilling.

WQSP #4
Cuttings Description (Continued) *

Date	Time	Sample Number	Depth (feet)	Description
	0821	23	485	Silt with gypsum, sandstone with green reduction spots, damp
	0850	24	505	Mudstone, silt, and gypsum
10/06/94	0910	25	525	Mudstone with selenite
	0922	26	545	Sandstone with green reduction spots, selenite and fibrous gypsum
	0945	27	565	Mudstone, trace selenite
	1001	28	585	Sandy mudstone with green reduction spots, selenite
	1045	29	605	Anhydrite
	1114	30	625	Sandy gypsiferous siltstone, damp
	1136	31	645	Anhydrite
	1225	32	665	Anhydrite, claystone, trace dolomite
	1310	33	685	Anhydrite, claystone, minor dolomite, trace gypsum
	1350	34	705	Anhydrite, gypsum, claystone, trace dolomite
	1445	35	725	Anhydrite, gypsum, and clay
	1515	36	740	Anhydrite, selenite, and clay

* Cuttings description is for stratigraphic control not geologic description.
** Auger drilling.

WQSP #4
CULEBRA CORE DESCRIPTION

PAGE 1 OF 5

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#4 DIA.: 4"

LOCATION: NE1/4 SE1/4 Section 28 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1632'FSL 2136'FEL

ELEVATION: 3433.0 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/07/94

DRILL DATE: 10/07/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
10/07 09:30	1	740.0	100			740.47 - 746.0 ft: red-brown muddy clay with angular anhydrite clasts (≤ 0.25 cm), isolated gypsum crystals (~ 4-5 mm), and light gray clay inclusions. Some rare fibrous gypsum fragments (~ 0.25 cm).	Tamarisk Member of Rustler Formation
		742.0					
		744.0					
		746.0				746.0 - 765.4 ft: light-dark gray mottled microcrystalline anhydrite with thin (~1 mm) wavy gypsum laminae grading to coarsely crystalline light-dark gray mottled anhydrite at 749.0 ft. Anhydrite is coarsely crystalline from 749.0 - 752.3 ft. (continued on next page)	
		748.0					
		750.0					
		752.0					

PAGE 2 OF 5

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#4 DIA.: 4"

LOCATION: NE1/4 SE1/4 Section 28 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1632'FSL 2136'FEL

ELEVATION: 3433.0 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/07/94

DRILL DATE: 10/07/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
10/07	1	752.0 754.0 756.0 758.0 760.0 762.0 764.0	100			Dark band of gray microcrystalline anhydrite with thin lenses of gypsum, some fibrous from 752.3 - 753.0 ft. Dark brown clay seam (~ 0.10 ft thick) interbedded at 752.5 ft. Remainder of unit light with dark gray mottled microcrystalline anhydrite.	Tamarisk Member of Rustler Formation

WIPP CORE-LOG INVENTORY

INTERA
FORM 1400

BOREHOLE: WQSP#4 DIA.: 4"
LOCATION: NE1/4 SE1/4 Section 28 T22S R31E
ORIENTATION: Vertical Down
COORDINATES: 1632'FSL 2136'FEL
ELEVATION: 3433.0 feet amsl
DRILL METHOD(S): Air Rotary

LOG BY: JBD
DATE: 10/07/94
DRILL DATE: 10/07/94
DRILLER: Ronnie Keith
DRILL: Gardner Denver 1500
DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		764.0					
10/7 11:00	1		100			765.4 - 765.6 ft: gray-brown clay.	Tamarisk Member of Rustler Formation
		766.0				765.6 - 771.5 ft: upper 0.5 ft red-gray microcrystalline dolomite, laminated with numerous open vugs (< 1 - 5 mm) grading to light olive gray dolomite. 766.1 - 767.1 ft: decrease in frequency of vugs, numerous thin (1-2 mm) vertical gypsum filled fractures, gypsum vein (1-3 cm) from 766.6 - 767.2 isolated large open vugs. Remainder of unit very vuggy (≤ 1 mm), highly fractured - some gypsum healed.	Culebra Member of Rustler Formation lower ~2 ft broken and bagged
		768.0			F GF		
		770.0					
10/7 13:55			73.6			771.47 - 775.47 ft: same dolomite as above. Upper foot is extremely vuggy (1-4 mm). Open vugs decrease in frequency with depth, increase in size and become gypsum filled. Gypsum vein (~4 cm), vertical, extends 4 ft.	
		772.0					
		774.0				See Next Page	
		776.0					

WIPP CORE-LOG INVENTORY

INTERA FORM 1400

BOREHOLE: WQSP#4 DIA.: 4"

LOCATION: NE1/4 SE1/4 Section 28 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1632' FSL 2136' FEL

ELEVATION: 3433.0 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/07/94

DRILL DATE: 10/07/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
10/07	2	776.0	73.6			775.47 - 784.8 ft: same dolomite as above, highly fractured, clayey, with large (4 cm) lenticular, open vugs. Some fractures gypsum healed.	Culebra Member of Rustler Formation broken and bagged (sample bags #1-5) top-bottom ~7' core loss
		778.0		OV	F		
		780.0		OV	F		
		782.0		OV	GF		
		784.0		OV	F		
		786.0			CF	784.8 - 790.8 ft: same dolomite as above, thinly laminated horizontal clay lined fractures decreasing in width toward base of unit, large gypsum filled irregular vugs (4-5 cm). (continued on next page)	
		788.0		ΦV			
				ΦV			

PAGE 5 OF 5

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#4 DIA.: 4"

LOCATION: NE1/4 SE1/4 Section 28 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1632'FSL 2136'FEL

ELEVATION: 3433.0 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/07/94

DRILL DATE: 10/07/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

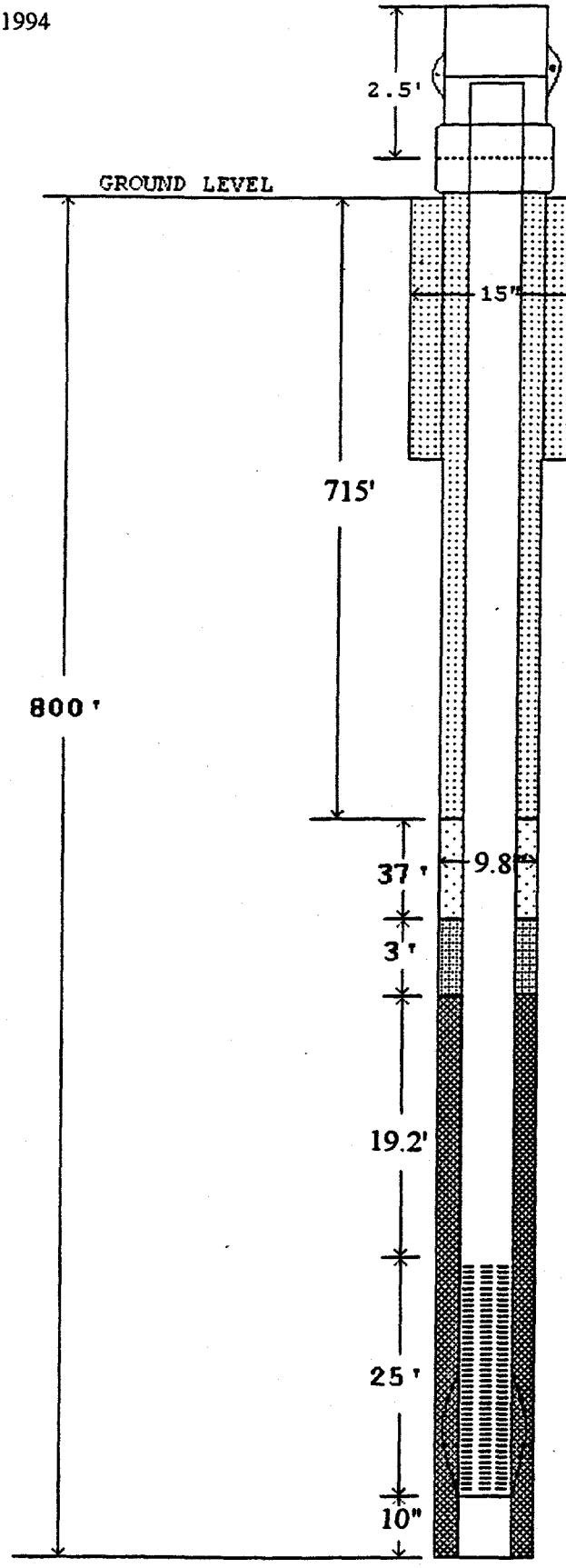
Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
10/7 15:30	2	788.0	73.6			~2 - 4 cm band of intraformational conglomerate at very base of unit. Sharp contact between Culebra Member and unnamed member.	Culebra Member of Rustler Formation
		790.0				790.8 - 795.6 ft: black, plastic clay with thin (1-2 mm) white gypsum stringers (vertical) and isolated lenticular gypsum inclusion. Black clay grades to red-brown muddy clay with minor anhydrite interbeds.	Unnamed Member of Rustler Formation
		792.0					
		794.0					
		796.0				795.6 - 798.0 ft: dark to light gray mottled microcrystalline anhydrite grading to white-pink at depth with red/brown mud-clay interbeds.	
		798.0					

WQSP #4
HOLE HISTORY

WIPP Project
WQSP #4
Eddy County, New Mexico

October 5-7, 1994

WEST TEXAS WATER WELL SERVICE
RIG #15



2.5 FT EXTENSION WITH LOCKABLE CAP TO PROTECT WELL CASING

10.75 X 0.375 WALL SURFACE CASING CEMENTED IN A 15" HOLE

5" O.D. X 0.280 WALL BLANK FIBERGLASS CASING

CEMENT SLURRY MIX FROM 715 FT TO 1 FT
1 FT BELOW SURFACE
SLURRY IS 7 GALLONS WATER TO 1 CU FT
PORTLAND-ASTM C1510-92

BENTONITE SEAL FROM 752 TO 715 FT

SAND PACK FROM 755 TO 752 FT

8/16 BRADY GRAVEL FROM 800 TO 755 FT

25 FT OF 5" O.D. FIBERGLASS 0.020 SLOT SCREEN

CENTRALIZERS LOCATED AT BOTTOM OF SCREE
TOP OF SCREEN, AND AT 60 FT INTERVALS TO
SURFACE

10" OF BLANK 5" O.D. CASING

WEST TEXAS WATER WELL SERVICE

October 5, 1994

WQSP # 4

5:55 AM -	6:30 AM -	Carlsbad to WQSP # 4
6:30 AM -	6:40 AM -	Check fluid levels
6:40 AM -	7:40 AM -	Work on rotating head
7:40 AM -		Start drilling operations running 9 7/8" mill tooth bit, 10.75" surface, set & cemented to 25'

October 6, 1994

WQSP # 4

5:55 AM -	6:30 AM -	Carlsbad to WQSP # 4
6:30 AM -	6:40 AM -	Check fluid levels
6:40 AM -	6:50 AM -	Trip pipe back to bottom
6:50 AM -	7:20 AM -	Wait on Ron
7:20 AM -	3:30 PM -	Drilling 9 7/8" hole from 428' to 745'
3:30 PM -	4:00 PM -	Circulate to clean up hole
4:00 PM -	4:50 PM -	Trip out of hole & prepare to core
4:50 PM -	5:30 PM -	WQSP # 4 to Carlsbad

Had to go on mist pump & adding foam @ 648'

WEST TEXAS WATER WELL SERVICE

October 7, 1994

WQSP # 4

5:55 AM	6:30 AM	Carlsbad to WQSP # 4
6:30 AM	6:40 AM	Check fluid levels
6:40 AM	7:30 AM	Rig up core barrel
7:30 AM	8:30 AM	Trip core barrel in for 1st run
8:30 AM	9:15 AM	Clean out hole of fill in
9:15 AM	10:40 AM	Core from 740.47 - 772
10:40 AM	10:50 AM	Clean out hole
10:50 AM	11:35 AM	Tripping out of hole
11:35 AM	12:00 PM	Breakout inner barrel and lay on ground
12:00 PM	12:30 PM	Pick up inner barrel
12:30 PM	12:45 PM	Pump out core
12:45 PM	1:30 PM	Start back hole for 2nd run
1:30 PM	1:40 PM	Clean out hole
1:40 PM	3:30 PM	Coring
3:30 PM	4:15 PM	Tripping out of hole
4:15 PM	4:50 PM	Break off jars and pull inner barrel to lay down
4:50 PM	5:15 PM	Pump out core
5:15 PM	6:00 PM	Load core tools and secure rig
6:00 PM	8:00 PM	WQSP # 4 to Odessa

October 10, 1994

WQSP # 4

5:30 AM	7:30 AM	Odessa to WQSP # 4
7:30 AM	8:00 AM	Service rig
8:00 AM	9:30 AM	Trip pipe in the hole
9:30 AM	12:00 PM	Ream hole from 8 1/2" to 9 7/8" from 740' - 800'
12:00 PM	12:10 PM	Clean out hole
12:10 PM	1:10 PM	Trip out of hole
1:10 PM	1:30 PM	Rig up logging unit
1:30 PM	3:15 PM	Log well
3:15 PM	4:20 PM	Work on rig & load casing
4:20 PM	5:00 PM	WQSP # 4 to Carlsbad

WEST TEXAS WATER WELL SERVICE

October 11, 1994

WQSP # 4

5:30 AM	6:30 AM	Carlsbad to WQSP # 4
6:30 AM	6:40 AM	Check fluid levels
6:40 AM	6:55 AM	Measure hole depth to check for fill in - TD 800′
6:55 AM	8:55 AM	Run 2" trimmie line in hole
8:55 AM	10:40 AM	Run 5" fiberglass casing 1 - 10" x 5" bottom 1 - 25′ x 5″ .020 screen 767′ x 5" blank casing Bottom cap, slip cap, centralizers
10:40 AM	12:00 PM	Gravel pack w/ 8-16 gravel from 800′ - 755′
12:00 PM	12:15 PM	Mix bentonite plug and spot above gravel pack
12:15 PM	1:35 PM	Wait on cement
1:35 PM	2:30 PM	Pump cement
2:30 PM	3:00 PM	Pull 2" trimmie line
3:00 PM	3:20 PM	Rig down
3:20 PM	4:40 PM	Move and rig up on WQSP # 5
4:40 PM	5:25 PM	WQSP # 5 to Carlsbad

October 12, 1994

WQSP # 4

Unit @ 2

8:30 AM		Arrived on WQSP # 6, rig up pulling unit to pull test pump
9:00 AM	11:00 AM	Pulled test pump and moved to WQSP # 4
11:00 AM	1:30 PM	Rigged up and waited on cement
1:30 PM	4:00 PM	Bailed on well to develop and clean up any fines left by gravel pack TD 800′

WEST TEXAS WATER WELL SERVICE

October 13, 1994

WQSP # 4

Unit # 2

6:45 AM	-	Arrive on location, check & service unit
7:35 AM - 7:50 AM	-	Make 5 runs with bailer
7:50 AM - 9:00 AM	-	Make splice on test pump, get ready to run
9:00 AM - 10:50 AM	-	Run 3 HP 20 GPM test pump
10:50 AM - 11:35 Am	-	Make electrical hook up and put on wellhead
11:35 AM	-	Start pump open ended - 12 GPM
11:40 AM	-	12 GPM
11:45 AM	-	11.75 GPM
11:50 AM	-	11.5 GPM
11:55 AM	-	11 GPM
12:00 PM	-	9.75 GPM
12:20 PM	-	9.25 GPM
12.35 PM	-	8.75 GPM
1:05 PM	-	8 GPM
1:35 PM	-	8 GPM
2:05 PM	-	8 GPM
2:35 PM	-	8 GPM
3:05 PM	-	7.75 GPM
3:35 PM	-	7.75 GPM Stopped pumping
3:35 PM - 4:15 PM	-	Surged well and shut down operations for the day
4:15 PM - 4:25 PM	-	Back to WQSP # 5
4:25 PM - 5:15 PM	-	Help Ronny come out of hole

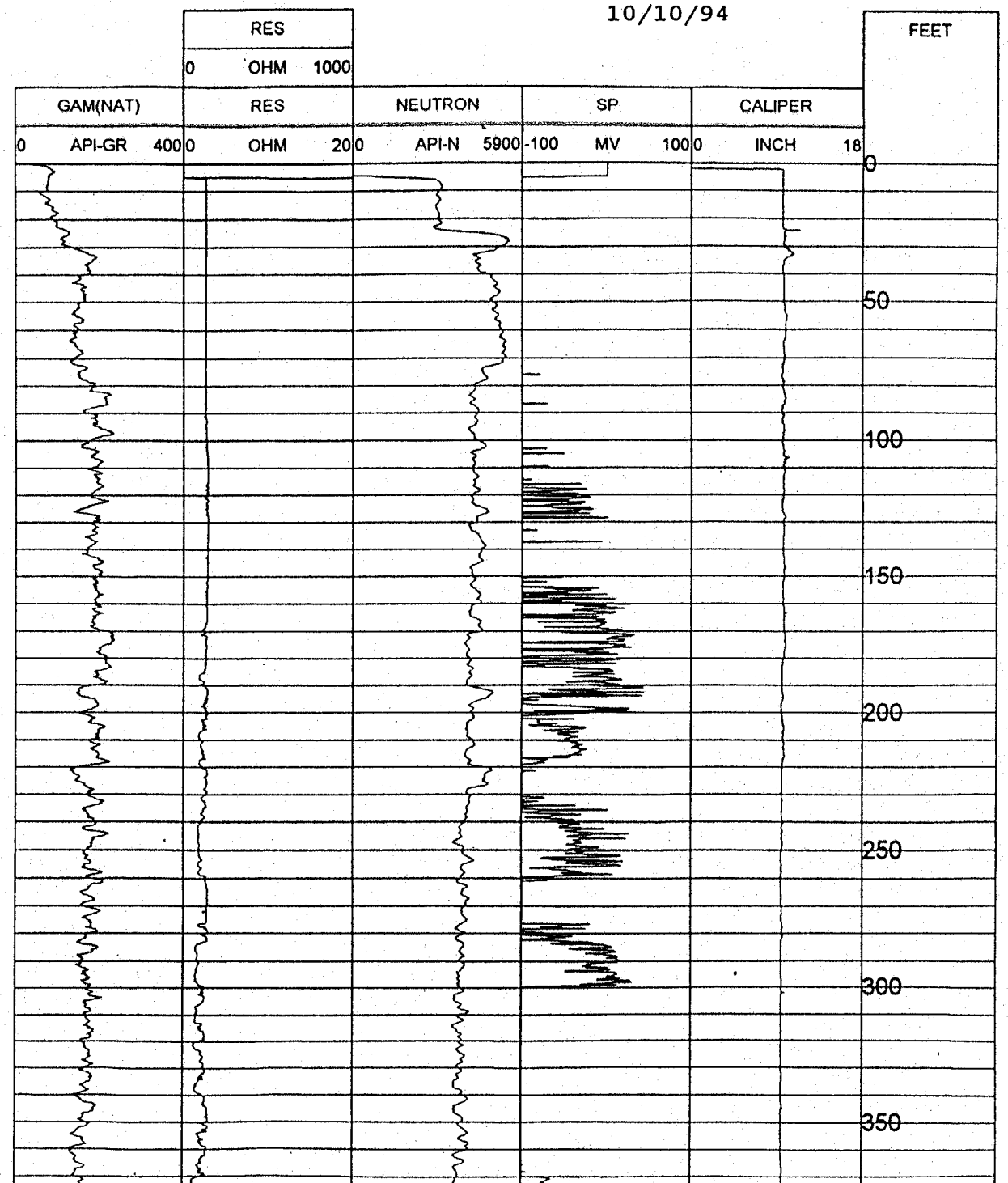
October 14, 1994

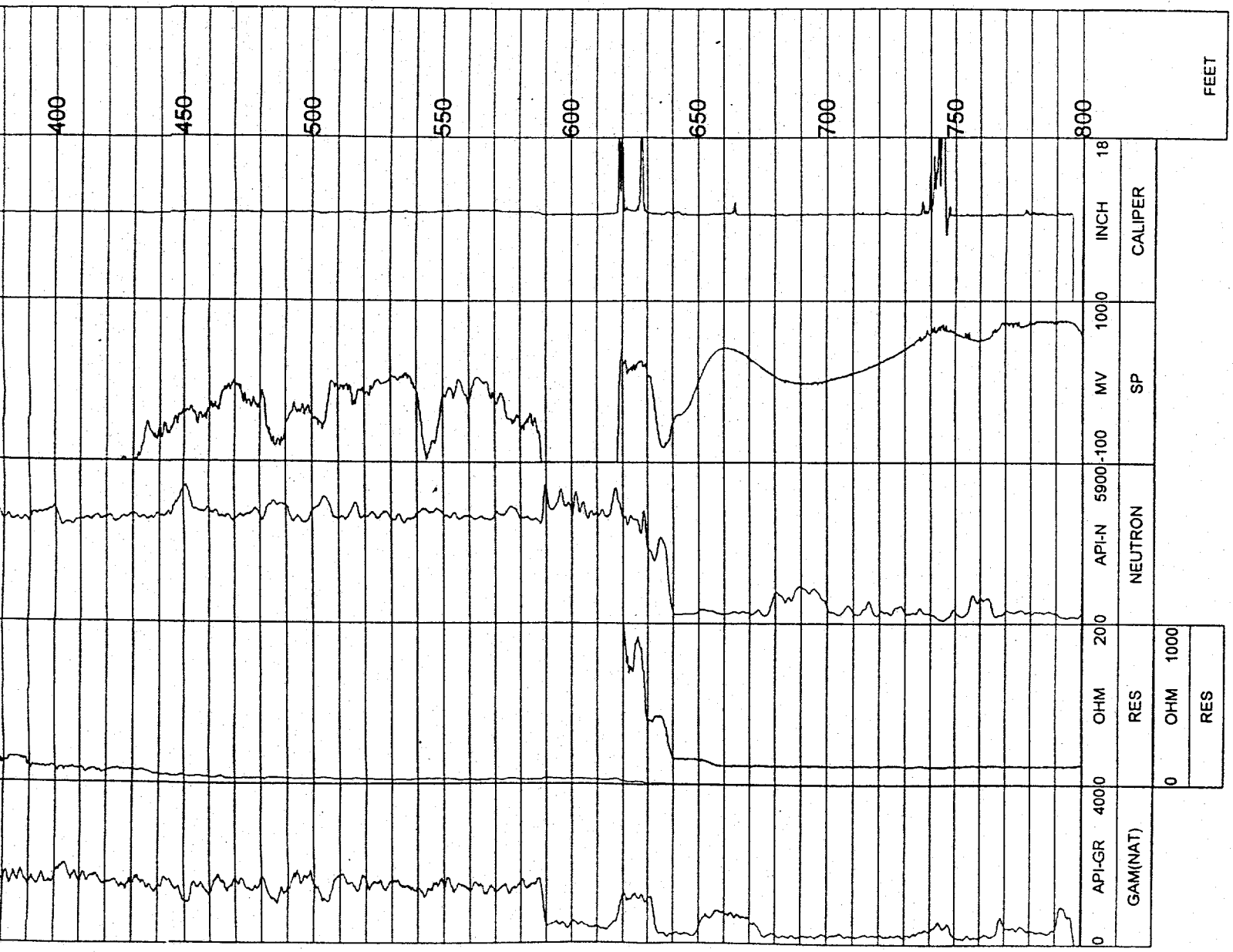
WQSP # 4

Unit # 2

7:15 AM	-	Surged well 20 times in effort to try and dirty up fluid being pumped
8:15 AM	-	Stopped surging well and began pumping constant, open ended discharge
8:20 AM	-	Pumping 12 GPM, clear discharge
8:25 AM	-	Pumping 11.5 GPM, clear discharge
8:30 AM	-	Pumping 10.5 GPM, clear discharge
8:35 AM	-	Pumping 10 GPM, clear discharge
8:40 AM	-	Pumping 9.75 GPM, clear discharge
8:45 AM	-	Pumping 9.5 GPM, clear discharge
8:50 AM	-	Pumping 9.25 GPM, clear discharge
8:55 AM	-	Pumping 9.25 GPM, clear discharge
9:00 AM	-	Pumping 9 GPM, clear discharge
1:00 PM	-	Shut down operations for weekend
1:00 PM - 3:00 PM	-	Returned to Odessa

WQSP 4#
GEOPHYSICAL LOGS

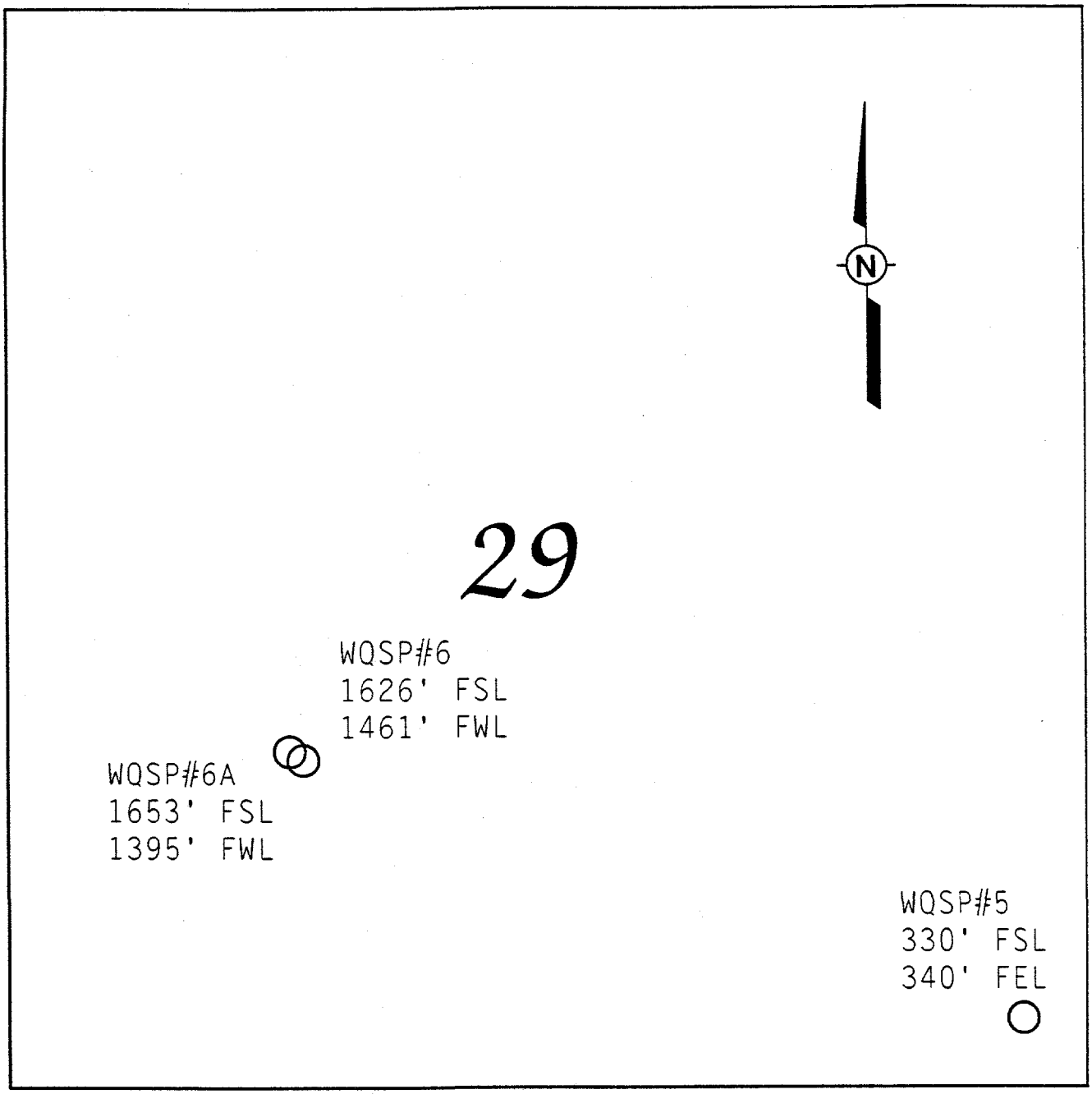

10/10/94
RES
0 OHM 1000
FEET
GAM(NAT)
0 API-GR 400
RES
0 OHM 200
NEUTRON
0 API-N 5900
SP
-100 MV 100
CALIPER
0 INCH 18
0
50
100
150
200
250
300
350



WQSP #4
Geophysical Logs

WQSP#5

Section 29, T22S, R31E



Location of WQSP #5

WQSP #5
Condensed Well Summary

Location:	Section 29, T22S, R31E 330 ft from the south line 340 ft from the east line	
Elevation: (Top of Casing)	3384.4 ft above mean sea level	
Cuttings Description:	M.L. Martin	
Drilling Contractor:	West Texas Water Well Service 3432 W. University, Odessa, Texas 79764 (915) 381-2687 phone (915) 381-7853 fax	
Drilling Record	Date: Bottom of hole: Cored interval: Cuttings:	October 12 to 13, 1994 683 ft below land surface 648 to 676 ft every 20 ft

WQSP #5
Stratigraphic Summary

Stratigraphic Unit	**Depth Interval Natural Gamma Log (feet)**	**Core Description**
Surficial Deposits/Santa Rosa	0-25	
Dewey Lake Redbeds	25-475	
Rustler Formation	475-683 partial	
• Forty Niner Member	475-530	
• Magenta Member	530-554	
• Tamarisk Member	554-648	
• Culebra Member	648-669	648-674
• Partial lower unnamed member	669-683	674-676 partial
Maximum Recorded Depth	683	

WQSP #5
CUTTINGS DESCRIPTION

WQSP #5
Cuttings Description *

Date	Time	Sample Number	Depth (feet)	Description
09/22/94	0935	1**	4	Caliche
	0940	2**	25	Mudstone
10/12/94	0825	3	45	Sandstone and mudstone
	0833	4	65	Mudstone and sandstone
	0855	5	85	Sandstone
	0910	6	105	Mudstone with green reduction spots, damp
	0925	7	125	Mudstone, damp
	0936	8	145	Sandy siltstone with gypsum
	0950	9	165	Mudstone, fibrous gypsum
	1014	10	185	Mudstone and sandstone with green reduction spots, minor gypsum
	1025	11	205	Sandstone
	1045	12	225	Sandstone and mudstone with green reduction spots, damp
	1110	13	245	Mudstone and sandstone
	1120	14	265	Mudstone laminated with fibrous gypsum, sandstone, minor gypsum
	1140	15	285	Sandy mudstone, sandstone with minor gypsum
	1153	16	305	Mudstone and sandstone with green reduction spots, fibrous gypsum
	1210	17	325	Mudstone with green reduction spots, minor gypsum
	1233	18	345	Sandstone interbedded with fibrous gypsum
	1245	19	365	Sandstone, trace gypsum
	1308	20	385	Sandy mudstone interbedded with gypsum, trace carbonate
	1335	21	405	Sandstone with green reduction spots and gypsiferous siltstone
10/12/94	1353	22	425	Sandstone with green reduction spots, laminated with fibrous gypsum
	1416	23	445	Gypsiferous mudstone laminated with fibrous gypsum, damp
	1440	24	465	Mudstone with green reduction spots, minor gypsum
	1504	25	485	Anhydrite, minor gypsum, sandstone and carbonate

* Cuttings description is for stratigraphic control not geologic description.
** Auger drilling.

WQSP #5
Cuttings Description (Continued) *

Date	Time	Sample Number	Depth (feet)	Description
	1535	26	505	Gypsiferous siltstone, carbonate
10/13/94	0810	27	545	Anhydrite, mudstone, trace carbonate
10/13/94	0847	28	565	Anhydrite
	0920	29	585	Anhydrite, mudstone, trace dolomite
	1005	30	605	Anhydrite, mudstone, trace dolomite
	1050	31	625	Anhydrite and claystone
	1115	32	645	Anhydrite

* Cuttings description is for stratigraphic control not geologic description.
** Auger drilling.

WQSP #5
CULEBRA CORE DESCRIPTION

PAGE 1 OF 3

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#5 DIA.: 4"

LOCATION: SE1/4 SE1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 330' FSL 340' FEL

ELEVATION: 3384.4 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/13/94

DRILL DATE: 10/13/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
10/13 2:20	1	648.0	68		GF	648.0 - 657.0 ft: light olive gray microcrystalline dolomite, thinly laminated, with 1-2 mm wide irregular gypsum healed fractures and rare, small (1-2 mm) open vugs. At 655.0 ft vugs become larger (up to 2 inches), irregular and increase in frequency, rock has a distinct "Swiss cheese" texture. Highly fractured, clayey intervals occur between 649.2-649.9 and 652.6-652.7 ft. Rubbly, clayey, but competent interval occurs between 653.4 - 655.0 ft with rare (≤ 0.25 cm) vugs. Contact between Culebra Member and overlying Tamarisk Member not observed.	Culebra Member of Rustler Formation
		650.0			F		
		652.0			GF		
		654.0			F		
		656.0					
		658.0				657.0 - 666.0 ft: core loss.	9 feet of core loss
		660.0					

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#5 DIA.: 4"

LOCATION: SE1/4 SE1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 330' FSL 340' FEL

ELEVATION: 3384.4 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/13/94

DRILL DATE: 10/13/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
10/13		660.0				657.0 - 666.0 ft: core loss.	Culebra Member of Rustler Formation
		662.0					
		664.0					9 feet of core loss
	1						
		666.0	68				
					GF	666.0 - 674.4 ft: same dolomite as above, extremely vuggy, most vugs are small and rock has a "sponge-like" texture. Some vugs are interconnected by dissolution and are highly irregular in shape. Vugs tend to form horizontal bands (~0.10 ft thick). Some dissolution pockets are gypsum filled. Vugs decrease in frequency with depth. Short, irregular gypsum-healed fractures and clay lens toward top of units. (continued on next page)	
		668.0					
		670.0					
		672.0					

PAGE 3
OF 3

WIPP CORE-LOG INVENTORY

INTERA
FORM 1400

BOREHOLE: WQSP#5 DIA.: 4"
LOCATION: SE1/4 SE1/4 Section 29 T22S R31E
ORIENTATION: Vertical Down
COORDINATES: 330' FSL 340' FEL
ELEVATION: 3384.4 feet amsl
DRILL METHOD(S): Air Rotary

LOG BY: JBD
DATE: 10/13/94
DRILL DATE: 10/13/94
DRILLER: Ronnie Keith
DRILL: Gardner Denver 1500
DRILL CO.: West Texas Water Well Service

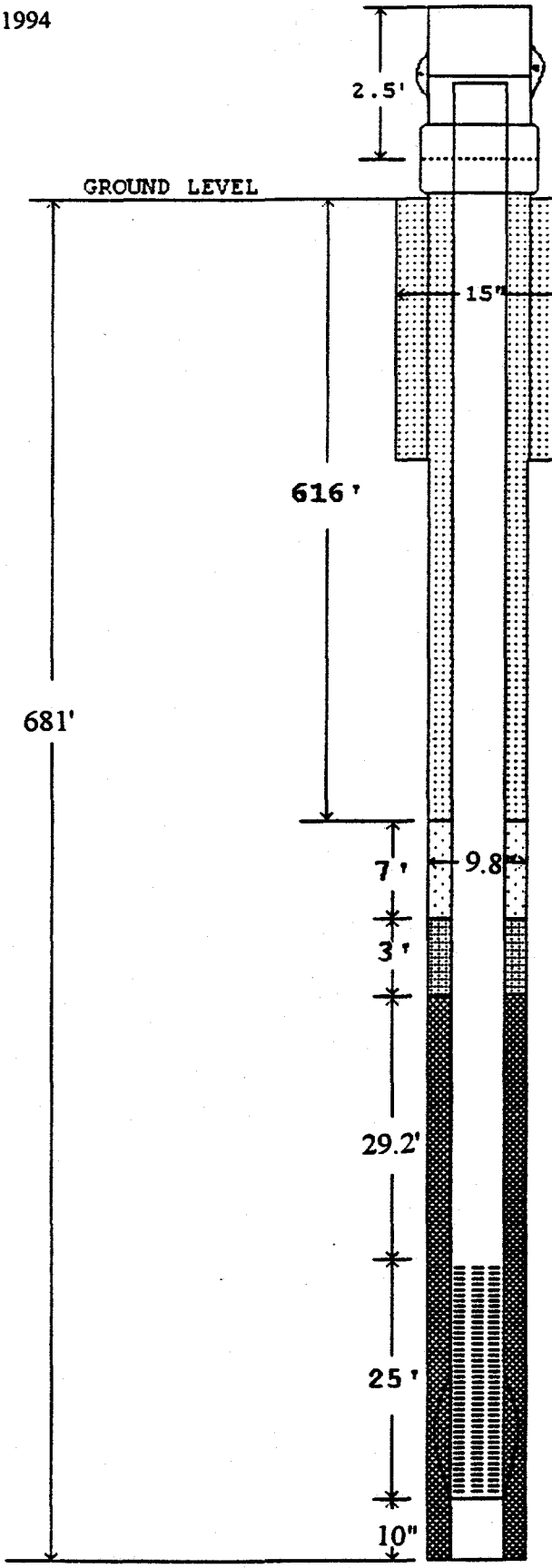
Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
10/13	1	672.0	68		F	highly fractured interval at 673.5 ft grading to more competent rock at 674.4 ft. Contact between Culebra Member and unnamed member is gradational.	Culebra Member of Rustler Formation
4:15		674.0				674.4 - 676.0 ft: compact, gypsiferous, black clay grading to red-brown clay with gypsum interbeds and stringers.	Unnamed Member of Rustler Formation
		676.0					
		678.0					
		680.0					
		682.0					
		684.0					

WQSP #5
HOLE HISTORY

WIPP Project
WQSP #5
Eddy County, New Mexico

October 12-13, 1994

WEST TEXAS WATER WELL SERVICE
RIG #15



2.5 FT EXTENSION WITH LOCKABLE CAP TO PROTECT WELL CASING

10.75 X 0.375 WALL SURFACE CASING CEMENTED IN A 15" HOLE

5" O.D. X 0.280 WALL BLANK FIBERGLASS CASING

CEMENT SLURRY MIX FROM 613 FT TO 1 FT
1 FT BELOW SURFACE
SLURRY IS 7 GALLONS WATER TO 1 CU FT
PORTLAND-ASTM C1510-92

BENTONITE SEAL FROM 623 TO 613 FT

SAND PACK FROM 626 TO 623 FT

8/16 BRADY GRAVEL FROM 681 TO 626 FT

25 FT OF 5" O.D. FIBERGLASS 0.020 SLOT SCREEN

CENTRALIZERS LOCATED AT BOTTOM OF SCREE
TOP OF SCREEN, AND AT 60 FT INTERVALS TO
SURFACE

10" OF BLANK 5" O.D. CASING

WEST TEXAS WATER WELL SERVICE

September 22, 1994

WQSP # 5 & WQSP # 6

9:00 AM - 12:00 PM - Drilled, set 10.75" surface casing, cemented

October 12, 1994

WQSP # 5

6:00 AM - 6:35 AM - Carlsbad to WQSP # 5
6:35 AM - 6:50 AM - Check fluid levels
6:50 AM - 8:00 AM - Finish rigging up
8:00 AM - 12:30 PM - Start drilling from 25'. 10.75" .375W surface nipple pre-set to 25' & cemented to surface
12:30 PM - 3:45 PM - Drilling 9 7/8" hole, started to get wet at 505', shut down for the day
3:45 PM - 4:00 PM - Pull out of hole 3 stands & shut down
4:00 PM - 4:35 PM - WQSP # 5 to Carlsbad

October 13, 1994

WQSP # 5

5:50 AM - 6:30 AM - Carlsbad to WQSP # 5
6:30 AM - 6:45 AM - Check fluid levels
6:45 AM - 8:05 AM - Trip back in hole to start drilling
8:05 AM - 11:15 AM - Drilling 9 7/8" hole from 505' to 648' on mist pump using foam
11:15 AM - 11:30 AM - Circulate hole to clean up
11:30 AM - 12:15 PM - Trip out of hole to set up coring operation.
12:15 PM - 1:45 PM - Pick up core barrel assembly and go in hole to core
1:45 PM - 2:15 PM - Pull up and put on 5' pup joint.
2:15 PM - 4:15 PM - Coring 1st run 8 1/2" bit cutting 4" core
4:15 PM - 4:25 PM - Circulate foam, clean up before T.O.O.H.
4:25 PM - 5:25 PM - T.O.O.H.
5:25 PM - 5:45 PM - Breakout core barrel, lay down inner barrel
5:45 PM - 6:30 PM - Pump out core, recovered 22'10"
6:30 PM - 7:00 PM - Load core tools
7:00 PM - 7:40 PM - WQSP # 5 to Carlsbad

WEST TEXAS WATER WELL SERVICE

October 18, 1994

WQSP # 5

5:50 AM - 7:40 AM - Odessa to WQSP # 5
7:40 AM - 7:50 AM - Move and spot logging trailer
7:50 AM - 8:10 AM - Wait on logger
8:10 AM - 11:00 AM - Run camera in WQSP # 5
11:00 AM - 12:50 PM - Trip pipe back in well
12:50 PM - 2:00 PM - Ream hole from 8 1/2" to 9 7/8" from 648' - 683'
2:00 PM - 2:30 PM - Clean out hole
2:30 PM - 3:05 PM - Pull 8 jts of drill pipe and secure rig for the day
3:05 PM - 4:00 PM - Get load of water & pump diesel
4:00 PM - 4:30 PM - WQSP @ 5 to Carlsbad

11:00 AM - 1:00 PM - Barrett pulled pump out of WQSP # 4

October 19, 1994

WQSP # 5

5:30 AM - 6:30 AM - Carlsbad to WQSP # 5
6:30 AM - 6:40 AM - Check fluid levels
6:40 AM - 8:00 AM - Trip pipe back to bottom & clean out hole
8:00 AM - 8:50 AM - Trip pipe out of hole
8:50 AM - 9:50 AM - Run 2" trimmie line
9:50 AM - 11:20 AM - Run 5" fiberglass casing, screen
11:20 AM - 12:30 PM - Gravel pack well w/8-16 gravel
12:30 PM - 1:00 PM - Mix bentonite seal & pumped
1:00 PM - 1:45 PM - Wait on cement trucks
1:45 PM - 2:30 PM - Started cementing operations
2:30 PM - 3:00 PM - Pull 2" trimmie line
3:00 PM - 3:30 PM - Rig down
3:30 PM - 4:00 PM - Move to WQSP # 3, start rigging up & get load of water
4:00 PM - 4:30 PM - Secure rig and equipment
4:30 PM - 5:10 PM - WQSP # 3 to Carlsbad

October 20, 1994

WQSP # 5

1:30 PM - 5:15 PM - Rigged up on WQSP # 5, started developing well with bailer, made 9 trips. TD of well 683', static water level 394'

WEST TEXAS WATER WELL SERVICE

October 21, 1994

WOSP # 5

Unit # 2

6:35 AM -	7:20 AM -	Arrive on location, check & service unit, prepare to run test pump
7:20 AM -	8:55 AM -	Run 3 HP test pump on 32 joints of 1" galvanized pipe, pump set 672'
8:55 AM -		- Start pumping well @ 13.25 GPM
9:00 AM -		- 12.75 GPM
9:05 AM -		- 11.75 GPM
9:10 AM -		- 11 GPM
9:15 AM -		- 10.25 GPM
9:20 AM -		- 2.50 GPM with 150# backpressure
9:25 AM -		- 2.75 GPM
9:30 AM -		- 2.50 GPM
9:40 AM -		- 3 GPM
9:45 AM -		- 3 GPM shut down & allow to recover
10:10 AM -		- Start surging well to further develop
10:55 AM -		- Start pumping, set rate @ 3:00 PM, 150# backpressure
3:00 PM -		- Pump was shut off, making .8 GPM

October 24, 1994

WOSP # 5

Unit # 2

9:35 AM -	- Start surging
11:35 AM -	- Start test 225 GPM @ 150# back pressure
12:50 PM -	- 1.75 GPM @ 170# back pressure
2:20 PM -	- 2.5 GPM @ 150# back pressure
2:30 PM -	- 2.75 GPM @ 150# back pressure
2:40 PM -	- 1.75 GPM @ 150# back pressure
3:15 PM -	- 1.75 GPM @ 0# back pressure
3:25 PM -	- 1.75 GPM
3:45 PM -	- 1.9 GPM
3:50 PM -	- 1.9 GPM
	Shut down for the day

WEST TEXAS WATER WELL SERVICE

October 25, 1994

WQSP # 5

Unit # 2

6:55 AM -	9:00 AM -	Surge well to further develop, and pump well at intermittent times
9:00 AM -	10:50 AM -	Pump well @ 2.1 GPM down to 1.9 GPM. Shut pump down and add 5 gallons of Clorox bleach to break down any existing polymer left in well between gravel pack & wellbore
10:50 AM -	12:00 PM -	Surge well to help break down and further develop formation
12:00 PM -	4:00 PM -	Install 2 GPM choke and begin pumping well at 2.6 GPM with 170# back pressure
1:00 PM -		- 1.85 GPM @ 70 #
4:00 PM -		- 1.8 GPM @ 50#
		Shut down unit for the day

October 26, 1994

WQSP # 5

Unit # 2

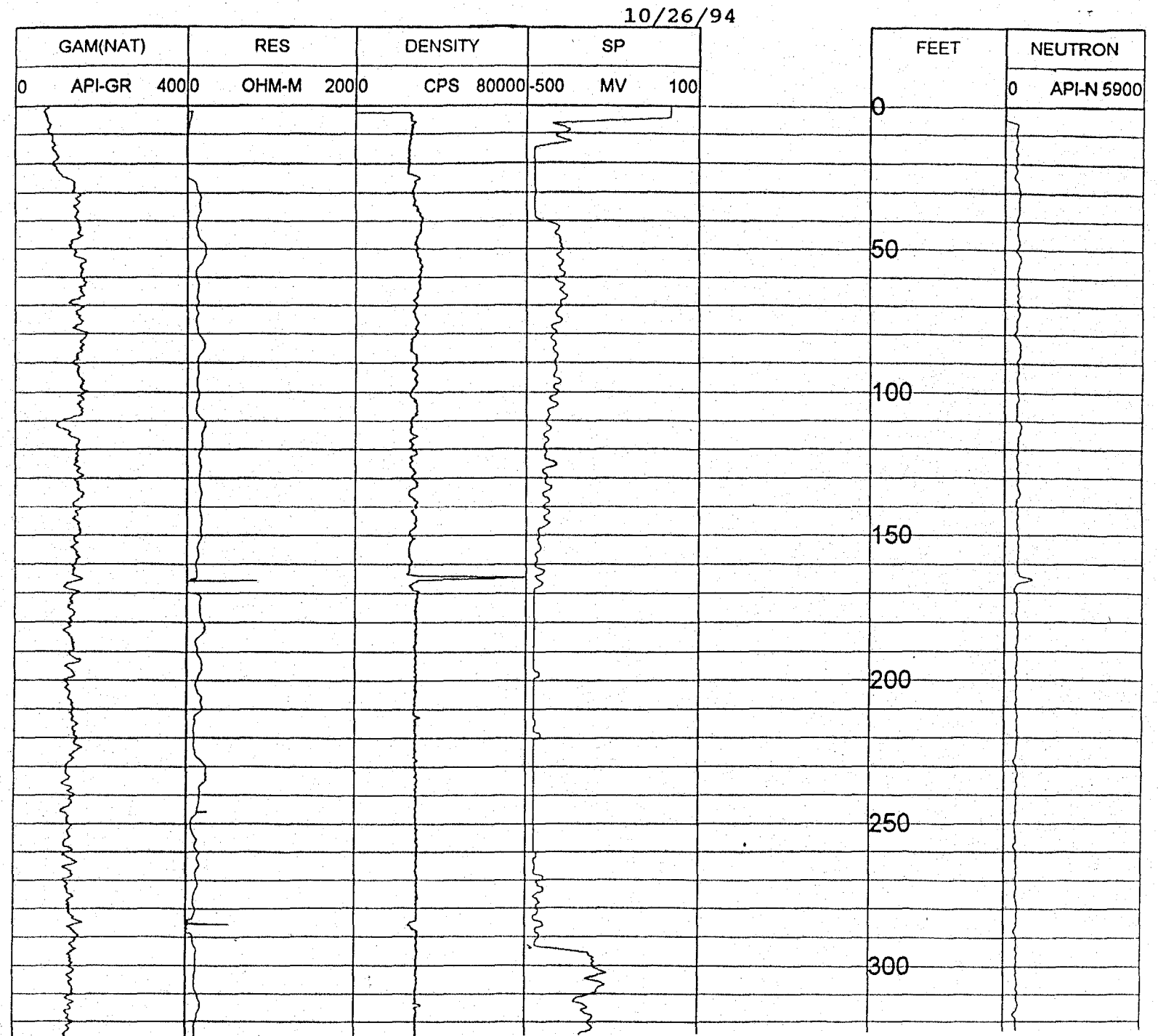
7:00 AM -	7:20 AM -	Arrive on location, service & check unit, rig up and prepare to pull pump
7:20 AM -	9:15 AM -	Pull test pump
9:15 AM -	10:30 AM -	Remain rigged up, load & secure trailer, wait on logging unit
10:30 AM -	2:10 PM -	Run logs on WQSP # 5, rig down, go to WQSP # 3 to log

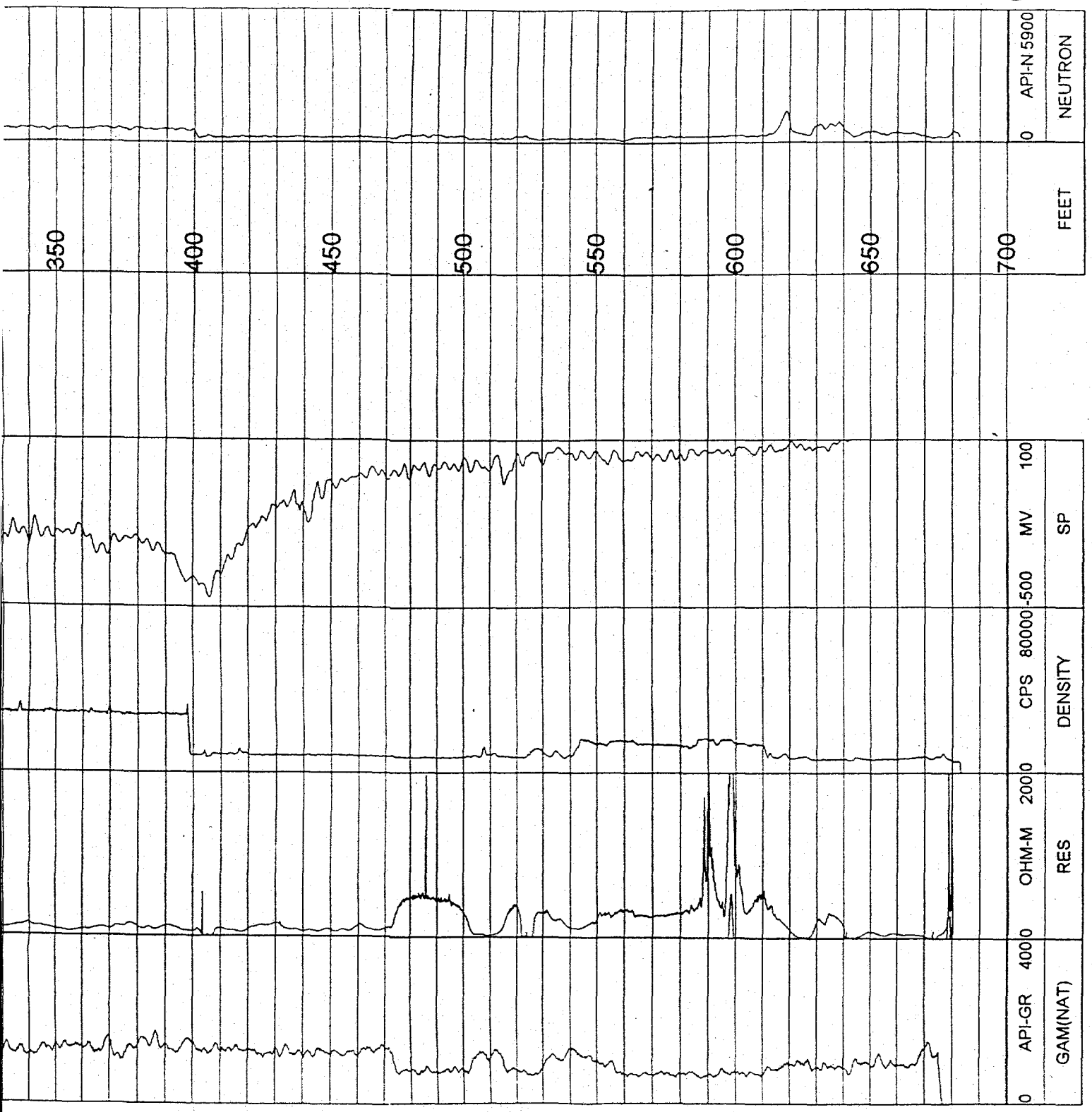
WQSP # 5

Unit # 2

7:00 AM -		- Arrive on location ,service & check unit, rig up and prepare to pull test pump
7:20 AM -	9:15 AM -	Pull test pump
9:15 AM -	10:00 AM -	Load and secure trailer to move to WQSP # 3
10:00 AM -	10:30 AM -	Wait on logging unit
10:30 AM -	2:10 PM -	Run logs and move to WQSP # 3

WQSP #5
GEOPHYSICAL LOGS

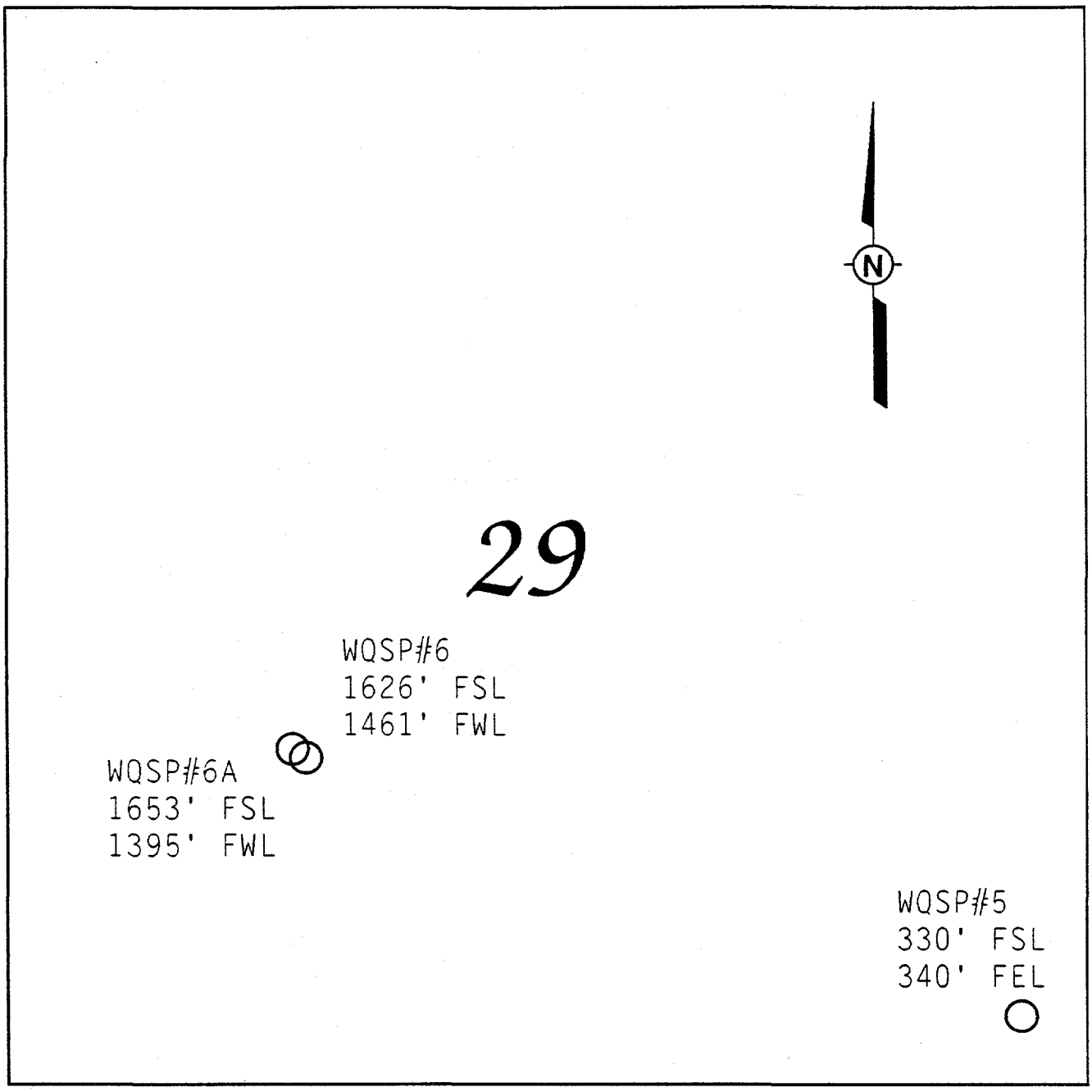

10/26/94
GAM(NAT)
0 API-GR 400
RES
0 OHM-M 200
DENSITY
0 CPS 80000
SP
-500 MV 100
FEET
0
50
100
150
200
250
300
NEUTRON
0 API-N 5900



WQSP #5
Geophysical Logs

WQSP#6

Section 29, T22S, R31E



Location of WQSP #6

WQSP #6
Condensed Well Summary

Location:	Section 29, T22S, R31E 1626 ft from the south line 1461 ft from the west line	
Elevation: (Top of Casing)	3363.8 ft above mean sea level	
Cuttings Description:	M.L. Martin	
Drilling Contractor:	West Texas Water Well Service 3432 W. University, Odessa, Texas 79764 (915) 381-2687 phone (915) 381-7853 fax	
Drilling Record	Date: Bottom of hole: Cored interval: Cuttings:	September 22, to October 4, 1994 617 ft below land surface 568 to 617 ft every 20 ft

WQSP #6
Stratigraphic Summary

Stratigraphic Unit	**Depth Interval Natural Gamma Log (feet)**	**Core Description**
Surficial Deposits/Santa Rosa	0-68	
Dewey Lake Redbeds	68-409	
Rustler Formation	409-620	
• Forty Niner Member	409-474	
• Magenta Member	474-497	
• Tamarisk Member	497-588	568-582 partial
• Culebra Member	588-606	582-607
• Partial lower unnamed member	606-620	607-617 partial
Maximum Recorded Depth	620	617

WQSP #6
CUTTINGS DESCRIPTION

WQSP #6
Cuttings Description *

Date	Time	Sample Number	Depth (feet)	Description
09/22/94	1050	1**	5	Surficial deposits
	1110	2**	25	Mudstone, sandstone, and clay
09/26/94	0903	3	45	Mudstone with green reduction spots
	0914	4	65	Sandstone with green reduction spots
	1015	5	85	Sandstone with green reduction spots
	1030	6	105	Siltstone, trace gypsum
	1043	7	125	Siltstone, damp
	1055	8	145	Siltstone and sand, damp
	1112	9	165	Sandy siltstone, damp
	1147	10	185	Mudstone and sand
	1203	11	205	Mudstone and sandstone
	1245	12	225	Sandstone, mudstone with green reduction spots, gypsum
	1325	13	245	Sandstone, siltstone, and selenite
	1340	14	265	Sandstone, selenite, and siltstone, limited sample
	1410	15	285	Sandstone and sandy siltstone with green reduction spots, selenite
	1435	16	305	Sandstone and gypsum
	1515	17	325	Sandy siltstone, sandstone, selenite
	1540	18	345	Sandy siltstone, sandstone, minor gypsum
	1550	19	365	Sandstone and siltstone with green reduction spots
09/27/94	1010	20	385	Sandy siltstone and sandstone with green reduction spots, minor gypsum
	1045	21	405	Gypsum, sandstone, and sandy siltstone
09/28/94	1035	22	425	Anhydrite, gypsum, and sandstone with green reduction spots
	1155	23	445	Anhydrite and gypsum
	1235	24	465	Anhydrite and gypsum

* Cuttings description is for stratigraphic control not geologic description.

** Auger drilling.

WQSP #6
Cuttings Description (Continued) *

Date	Time	Sample Number	Depth (feet)	Description
	1325	25	485	Anhydrite, gypsum, dolomite
	1410	26	505	Anhydrite, trace dolomite
	1520	27	525	Anhydrite
09/28/94	1645	28	545	Anhydrite and gypsum
	1810	29	565	Mud, minor anhydrite and gypsum, limited sample
	1835	30	568	Anhydrite and mud

* Cuttings description is for stratigraphic control not geologic description.
** Auger drilling.

WQSP #6
CULEBRA CORE DESCRIPTION

PAGE 1 OF 5

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#6 DIA.: 4"

LOCATION: NE1/4 SW1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1626' FSL 1461' FWL

ELEVATION: 3363.8 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/29/94

DRILL DATE: 09/29/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
9/29 10:10	1	568.0 570.0 572.0 574.0 576.0 578.0 580.0	93		F	568.0 - 582.0 ft: light to dark gray mottled microcrystalline anhydrite with 1-2 mm wavy gypsum laminae. Horizontal fracture at 569.7 ft overlain by ~0.75 cm thick gypsum band. Interval of sparsely laminated anhydrite from 570.0 - 571.2 ft with numerous 1-2 mm isolated euhedral gypsum crystals. A prominent 2-4 cm thick continuous gypsum vein (vertical) occurs from 576.0 - 580.0 ft. Gradational contact between Tamarisk Member and underlying Culebra Member.	Tamarisk Member of Rustler Formation

PAGE 2 OF 5

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#6 DIA.: 4"

LOCATION: NE1/4 SW1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1626' FSL 1461' FWL

ELEVATION: 3363.8 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/29/94

DRILL DATE: 09/29/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
9/29		580.0				See previous page.	Tamarisk Member of Rustler Formation
		582.0				582.0 - 585.0 ft: brown-gray microcrystalline dolomite with (0.25-1 cm) open vugs and moderate horizontal fractures ~2 cm wide band of dolomite with rounded anhydrite clasts (~0.5 cm) at 582.2 ft.	Culebra Member of Rustler Formation
	1	584.0	93				
		586.0			GF CF	585.0 - 596.6 ft: light olive gray, thinly laminated microcrystalline dolomite with numerous small open vugs (1-2 mm) and moderate horizontal fracturing. Vugs increase in size, decrease in frequency and are sparse and fibrous gypsum filled at 589.9 ft. A continuous 1-2 mm gypsum-filled fracture occurs from 590.3 - 591.1 ft. Highly fractured clayey intervals with bladed gypsum crystals and numerous open vugs from 589.9 - 590.3 ft and 591.1 - 591.2 ft. (continued on next page)	
		588.0					
		590.0					
		592.0					

PAGE 3 OF 5

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#6 DIA.: 4"

LOCATION: NE1/4 SW1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1626' FSL 1461' FWL

ELEVATION: 3363.8 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/29/94

DRILL DATE: 09/29/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
9/29	1	592.0	93	OV	LF GF	Toward base of unit vugs decrease in size and increase in frequency. Clay filled fractures and thin (0.5-1 mm) gypsum healed fractures increase in frequency with depth. Fractures are thin, wavy, and discontinuous.	Culebra Member of Rustler Formation 2 feet of core loss
		594.0					
1:38		596.0					
9/30	2	598.0	87.5	OV	CF GF	596.6 - 606.85 ft: same dolomite as above. Upper foot interbedded with vuggy (up to 0.25 cm) dolomite rubble in a red-brown mud/clay matrix. 597.6 - 600.2 ft: dolomite is clayey, highly fractured with numerous (1-2 mm) open vugs. Remainder of unit is competent with numerous small vugs, some connected by dissolution to form vertical and horizontal bands up to 3 cm in length. Thin, discontinuous gypsum-healed fractures (1-2 mm) increase in frequency with depth. (continued on next page)	2.5 feet of core loss
		600.0					
		602.0					
		604.0					

WIPP CORE-LOG INVENTORY

INTERA
FORM 1400

BOREHOLE: WQSP#6 DIA.: 4"
LOCATION: NE1/4 SW1/4 Section 29 T22S R31E
ORIENTATION: Vertical Down
COORDINATES: 1626' FSL 1461' FWL
ELEVATION: 3363.8 feet amsl
DRILL METHOD(S): Air Rotary

LOG BY: JBD
DATE: 09/29/94
DRILL DATE: 09/29/94
DRILLER: Ronnie Keith
DRILL: Gardner Denver 1500
DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		604.0					
9/30				OV		Toward base of unit, vugs decrease with some becoming gypsum filled. Contact between Culebra Member and underlying unnamed member is sharp.	Culebra Member of Rustler Formation
					GF		
				ΦV			
		606.0					
				4		606.85 - 608.1 ft: black plastic clay with rare isolated gypsum crystals (1-2 mm).	Unnamed Member of Rustler Formation
				4			
		608.0					
	2					608.1 - 615.2 ft: upper 2 ft black-brown clay interbedded with light gray anhydrite grading to red-brown mudstone with numerous light gray-pinkish anhydrite interbeds, high angle veins, and stringers.	
		610.0	87.5				
		612.0					
		614.0					
						615.2 - 616.6 ft: light-dark gray mottled anhydrite with thin (1-2 mm) wavy gypsum laminae.	
		616.0					

PAGE 5 OF 5

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#6 DIA.: 4"

LOCATION: NE1/4 SW1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1626' FSL 1461' FWL

ELEVATION: 3363.8 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 09/29/94

DRILL DATE: 09/29/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

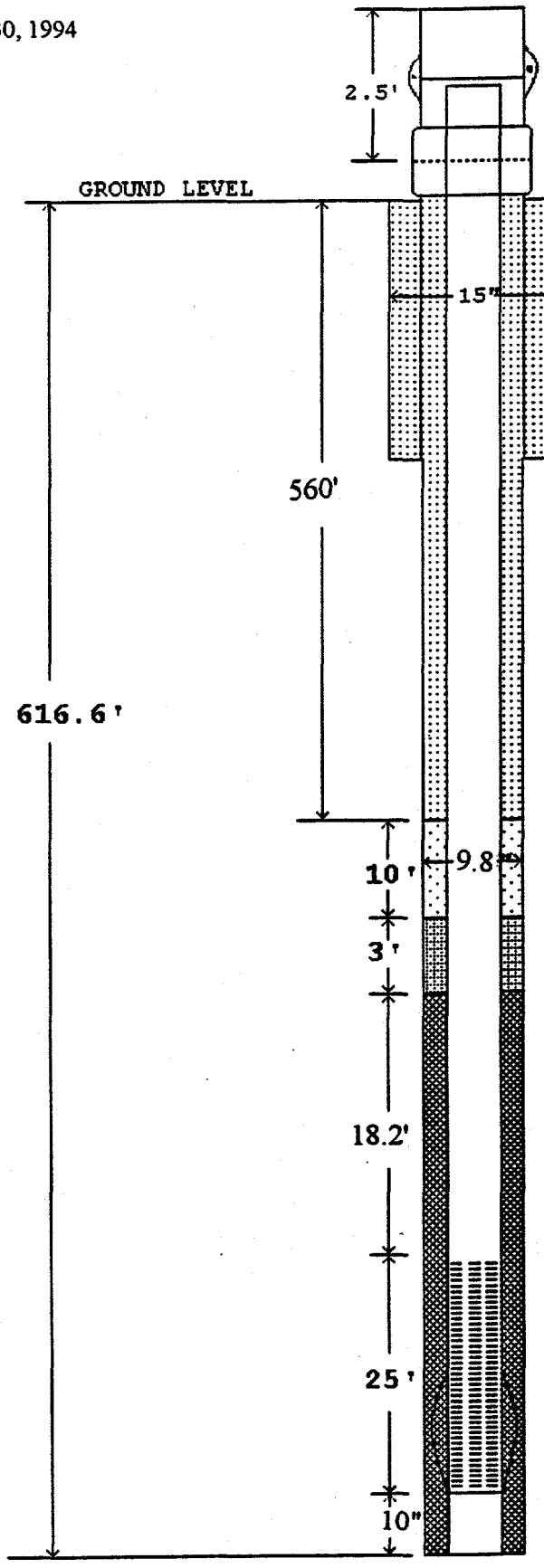
Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
9/30	2	616.0	87.5			See previous page.	Unnamed Member of Rustler Formation
		618.0					
		620.0					

WQSP #6
HOLE HISTORY

WIPP Project
WQSP #6
Eddy County, New Mexico

September 22-30, 1994

WEST TEXAS WATER WELL SERVICE
RIG #15



2.5 FT EXTENSION WITH LOCKABLE CAP TO PROTECT WELL CASING

10.75 X 0.375 WALL SURFACE CASING CEMENTED IN A 15" HOLE

5" O.D. X 0.280 WALL BLANK FIBERGLASS CASING

CEMENT SLURRY MIX FROM 560 FT TO 1 FT
1 FT BELOW SURFACE
SLURRY IS 7 GALLONS WATER TO 1 CU FT
PORTLAND-ASTM C1510-92

BENTONITE SEAL FROM 570 TO 560 FT

SAND PACK FROM 570 TO 567 FT

8/16 BRADY GRAVEL FROM 681 TO 626 FT

25 FT OF 5" O.D. FIBERGLASS 0.020 SLOT SCREEN

CENTRALIZERS LOCATED AT BOTTOM OF SCREE
TOP OF SCREEN, AND AT 60 FT INTERVALS TO SURFACE

10" OF BLANK 5" O.D. CASING

WEST TEXAS WATER WELL SERVICE

September 22, 1994

WQSP # 5 & WQSP # 6

9:00 AM - 12:00 PM - Drilled, set 10.75" surface casing, cemented

September 23, 1994

WQSP #'s 2 & 6

6:00 AM - 6:40 AM - Carlsbad to WQSP # 2
6:40 AM - 8:15 AM - Rigged down on WQSP # 2, cleaned up location & moved to WQSP # 6
8:15 AM - 12:00 PM - Rigged up on WQSP # 6, lined pit, put rotating head on, and shut down for weekend
12:00 PM - 2:00 PM - WQSP # 6 to Odessa

September 26, 1994

WQSP # 6

5:40 AM - 7:40 AM - Odessa to WQSP # 6
7:40 AM - 8:00 AM - Service rig
8:00 AM - 11:20 AM - Drilling 9 7/8" hole on air
11:20 AM - 4:00 PM - Started drilling on air/mist pump due to amount of water being made in Dewey Lake formation. Est. 40-50 GPM
4:00 PM - 4:15 PM - Trip pipe out of hole 200'. Total footage for the day 367'
4:15 PM - 4:30 PM - Secure rig for the day

September 27, 1994

WQSP # 6

6:15 AM - 6:50 AM - Carlsbad to WQSP # 6
6:50 AM - 7:00 AM - Service rig
7:00 AM - 8:10 AM - Fill pits with brine water and mix sw gel
8:10 AM - 9:30 AM - Trip in hole, had 15' of fill, cleaned out & circulated 30 minutes
9:30 AM - 11:40 AM - Drilling 9 7/8" hole on fluid from 367'-415'
11:40 AM - 12:30 PM - Take yoke off drive shaft, return to Odessa for parts
12:30 PM - 4:00 PM - Rig down waiting on parts
4:00 PM - 5:00 PM - Replace parts & ready rig for drilling Wednesday morning

WEST TEXAS WATER WELL SERVICE

September 28, 1994

WQSP # 6

6:00 AM	6:35 AM	Carlsbad to WQSP # 6
6:35 AM	6:45 AM	Check fluid levels
6:45 AM	6:50 AM	Trip pipe back to bottom
6:50 AM	7:50 AM	Drilled 4'
7:50 AM	10:10 AM	Make bit trip
10:10 AM	4:00 PM	Drilling 9 7/8" hole
4:00 PM	4:20 PM	Circulate bottoms up, look as samples
4:20 PM	6:50 PM	Continue drilling to core point. Quit drilling @ 568'
6:50 PM	7:00 PM	WQSP # 6 to Carlsbad

September 29, 1994

WQSP # 6

5:45 AM	6:20 AM	Carlsbad to WQSP # 6
6:20 AM	6:30 AM	Check fluid levels
6:30 AM	6:50 AM	Trip back to bottom
6:50 AM	7:00 AM	Circulate
7:00 AM	7:40 AM	Trip out of the hole - 568'
7:40 AM	8:45 AM	Rig up core tools
8:45 AM	10:10 AM	Trip in the 1st run with core barrel
10:10 AM	10:30 AM	Circulate
10:30 AM	2:30 PM	Coring - very slow on fluid
2:30 PM	2:50 PM	Circulating
2:50 PM	3:40 PM	Coming out of hole 28' cut 596'
3:40 PM	4:00 PM	Breakdown core barrel, lay on ground
4:00 PM	4:30 PM	Pick up core barrel T.I.H.
4:30 PM	5:00 PM	Pump core out of first barrel
5:00 PM	5:15 PM	Secure rig for day

WEST TEXAS WATER WELL SERVICE

September 30, 1994

WQSP # 6

5:50 AM	6:20 AM	Carlsbad to WQSP # 6
6:20 AM	6:30 AM	Check fluid levels
6:30 AM	7:00 AM	Trip pipe and core barrel in hole for 2nd run
7:00 AM	8:30 AM	Clean out 12' of fill before coring
8:30 AM	11:30 AM	Core from 596' - 616.6'
11:30 AM	11:50 AM	Circulate
11:50 AM	1:00 PM	Trip out of hole
1:00 PM	1:40 PM	Lay down core barrel and pump out core
1:40 PM	2:25 PM	Breakdown core tools and load on trailer
2:25 PM	2:50 PM	Trip collars in hole
2:50 PM	3:00 PM	Shut down operations and secure rig for weekend
3:00 PM	5:00 PM	WQSP # 6 to Odessa

October 3, 1994

WQSP # 6

5:30 AM	7:30 AM	Odessa to WQSP # 6
7:00 AM	7:40 AM	Check fluid levels
7:40 AM	8:40 AM	Trip in hole with drill pipe
8:40 AM	11:30 AM	Ream hole from 8 1/2" to 9 7/8"
11:30 AM	12:30 PM	Circulate and condition hole for logging
12:30 PM	1:30 PM	Trip out of hole for logs
1:30 PM	3:30 PM	Log well - 616.60'
3:30 PM	4:00 PM	Shut down operations for day

UNIT 2

5:30 AM	7:30 AM	Odessa to WQSP # 6
7:30 AM	9:00 AM	Unload screen storage pad south of site, and load surface casing on trailer
9:00 AM	10:00 AM	Unload surface casing @ WQSP # 4 and WQSP # 3
10:00 AM	1:30 PM	Set & cement surface on WQSP #'s 3 & 4
1:30 PM	2:00 PM	Load trimmie line on trailer to take to WQSP # 6
2:00 PM	4:00 PM	Help out at WQSP # 6 preparing to run casing 10-4-94

WEST TEXAS WATER WELL SERVICE

October 4, 1994

WQSP # 6

6:00 AM - 6:35 AM - Carlsbad to WQSP # 6
6:35 AM - 6:45 AM - Check fluid levels
6:45 AM - 7:00 AM - Run weighted joint on sandline in well to check for fill - none found
7:00 AM - 7:45 AM - Move rig and reset, prepare to run 2" trimmie line
7:45 AM - 8:30 AM - Run 2" trimmie line
8:30 AM - 10:00 AM - Run 5" OD fiberglass casing & screen. 10' blank, 25' of .020 slot screen, 584.10' of blank casing
10:00 AM - 11:15 Am - Trimmie lined 2100# of 8/16 gravel pack into well
11:15 AM - 12:00 PM - Mixed sw gel/water plug to pump on top of gravel pack for bentonite seal
12:00 PM - 1:45 PM - Wait on cement
1:45 PM - 3:10 PM - Circulate cement from top of bentonite seal to surface
3:10 PM - 3:30 PM - Pull trimmie line
3:30 PM - 4:00 PM - Rig down and move to WQSP # 4
4:00 PM - 5:00 PM - Rig up and line pit on WQSP # 4
5:00 PM - 5:40 PM - WQSP # 4 to Carlsbad

October 5, 1994

WQSP # 6 TD 616.6

1:00 PM - - Arrived on location, set up and grease unit Change out bailers and go in the hole
1:45 PM - - Fluid level @ 174' due to mud left inside casing
1:45 PM - 4:00 PM - Bailed on well to develop, remove mud and fines, made 33 trips with bailer, retrieving 335 gallons of fluid. Shut down for the day, returned to Carlsbad

WEST TEXAS WATER WELL SERVICE

October 6, 1994

WQSP # 6

Unit # 2

6:45 AM	-	Arrive at location, check unit and prepare to bail
6:55 AM	-	Start bailing, water level recovered to 417' overnight
6:55 AM	- 10:00 AM -	Continued bailing well to develop. Bailed water level to 605' in 31 trips, recovering 315 gallons of fluid. Let well set for 10 minutes, fluid level recovered 5 1/2 '
10:00 AM	- 10:45 AM -	Made 5 more runs with bailer, shut down operations to go and get water truck
10:45 AM	- 11:45 AM -	WQSP # 6 to WQSP # 4 to get water truck
11:45 AM	- 12:00 PM -	Dump 20 bbls of fresh water to help break-down mud in form & further develop well
12:00 PM	- 12:10 PM -	Rig up unit to start bailing again
12:10 PM	- 3:35 PM -	Bailed on well - water level 585'
3:35 PM	- 4:45 PM -	Work on hydraulic pump on unit & shut down for the day

October 7, 1994

WQSP # 6

Unit # 2

7:30 AM	- 7:45 AM -	Arrive on location, set up unit & prepare to bail
7:45 AM	- 8:00 AM -	Started bailing well - water level @ 413' made 5 trips with bailer, laid bailer down and prepared to run pump
8:00 AM	- 9:50 AM -	Ran 1 1/2 HP 5 GPM to further develop well, ran air line provided by Ron to determine fluid level, since well is a marginal producer
9:50 AM	- 10:30 AM -	Rig up test equipment, hook up generator to run pump
10:30 AM	-	Start pumping well, meter reading 019393, pumping 7.5 GPM
10:47 AM	-	Stop pumping to let well recover
12:00 PM	-	Start pump @ 6 GPM with 23# back pressure
12:12 PM	-	Stop pump, pressure drop to 0#
1:47 PM	-	Start pump @ 6 GPM 23#
1:51 PM	-	Stop pump
3:00 PM	-	Start pump @ 6 GPM 22#
3:08 PM	-	Stop pump had 4#
3:15 PM	-	Shut down operations

WEST TEXAS WATER WELL SERVICE

October 10, 1994

Unit # 2

8:30 AM - - Arrive @ WQSP # 6, rig up on well to lower pump 10'; top of pump set @ 598'. Airline 99#, swl 364.3'

8:47 AM - - Start pump w/gate valve open - well pumping 7.5 gpm

8:52 AM - - Airline pressure 80#, back pressure 20#, 7.5 gpm, pumping level 408.2'

8:56 AM - - Increased back pressure to 60#, pumping 5.75 gpm

	Airline Pressure	Back Pressure	GPM	Draw-down	Pumping level
8:58 AM -	80#	60#	5.5	94.7'	459.1'
9:00 AM -	48#	60#	5.5	117.8'	482.1'
9:02 AM -		80#	5		
9:04 AM -	42#	80#	5	131.7'	496'
9:05 AM -	40#	80#	5	136.3'	500.6'
9:10 AM -	30#	75#	4.5	159.4'	
9:15 AM -	23#	100#	3.5	175.6'	
9:20 AM -	18#	97#	3.25	187.1'	539.9'
9:25 AM -	13#	110#	2.75	198.7'	563'
9:30 AM -	11#	120#	2	203.3'	567.6'
9:35 AM -	10#	130#	1.25	205.6'	569.9'
9:40 AM -	9#	130#	1.25	207.9'	572.2'
9:45 AM -	8#	129#	1.25	210.2'	574.5'
9:50 AM -	8#	135#	1	210.2'	574.5'
9:55 AM -	7#	135#	.75	212.5'	576.8'
10:00 AM -	6#	135#	.75	214.8'	579.1'
10:05 AM -	6#	135#	.75	214.8'	579.1'
10:10 AM -	5#	135#	.75	217.1'	581.4'
10:20 AM -	5#	135#	.75	217.1'	581.4'
10:30 AM -	5#	135#	.75	217.1'	581.4'
10:40 AM -	<5#	135#	.75	217.1'	581.4'
10:50 AM -	<5#	140#	.50	217.1'	581.4'
11:00 AM -	<5#	140#	.50	217.1'	581.4'
11:15 AM -	<5#	140#	.50+	217.1'	581.4'
11:30 AM -	5#	140#	.50+	217.1'	581.4'

Shut pump off and started recovery test of well

WEST TEXAS WATER WELL SERVICE

October 10, 1994

11:30 AM -	5#
11:31 AM -	5#
11:32 AM -	5#+
11:33 AM -	5#+
11:34 AM -	5#+
11:35 AM -	6#
11:40 AM -	6#+
11:45 AM -	7.5#
11:50 AM -	8#
11:55 AM -	10#
12:00 PM -	10#
12:10 PM -	12#
12:20 PM -	14#
12:30 PM -	17#
12:45 PM -	20#
1:00 PM -	23#
1:30 PM -	29#
2:30 PM -	38#
3:30 PM -	46#
10-11-94	
6:30 AM -	90#
7:30 AM -	92#

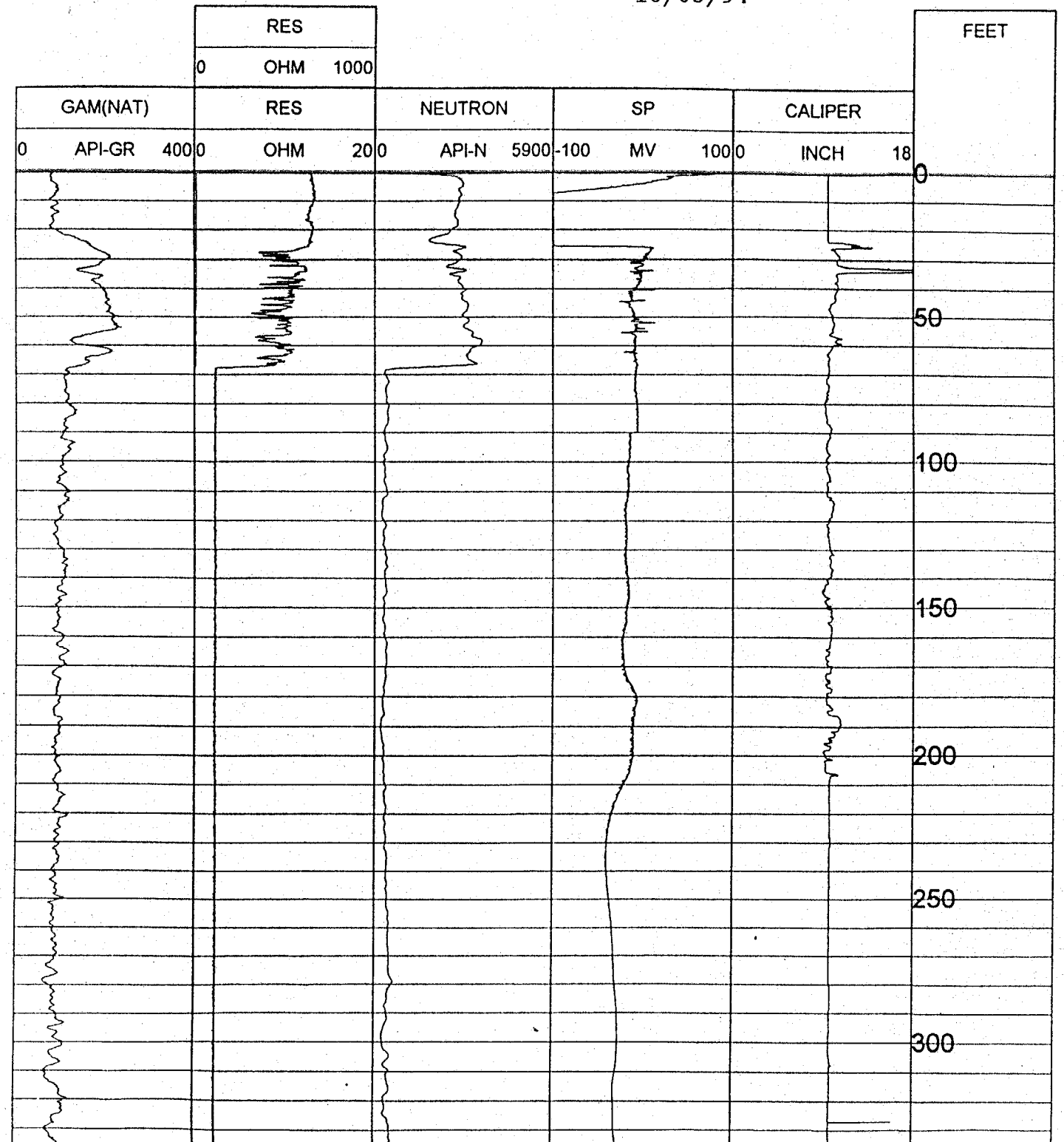
October 12, 1994

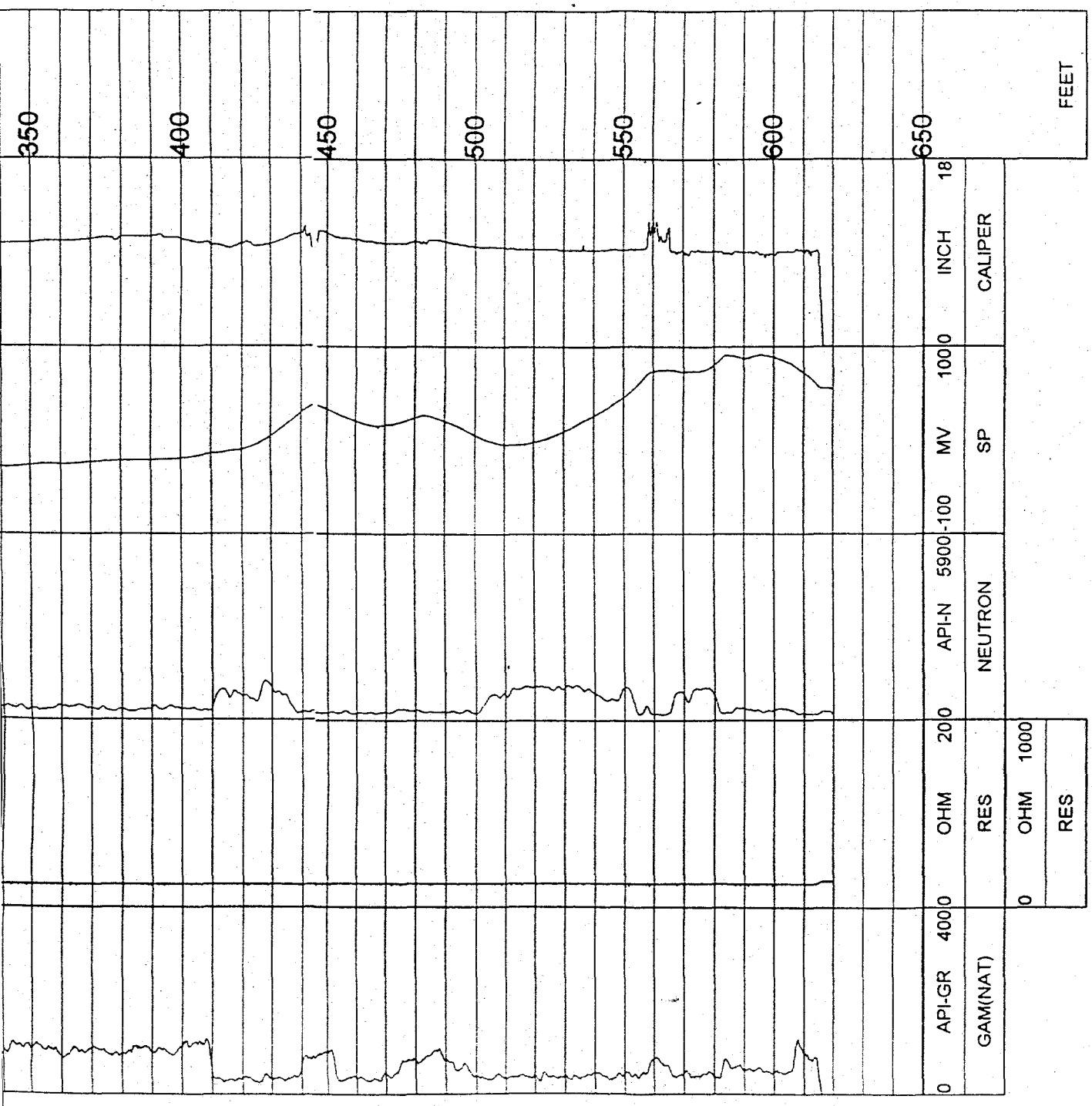
Unit @ 2

8:30 AM -		Arrived on WQSP # 6, rig up pulling unit to pull test pump
9:00 AM -	11:00 AM -	Pulled test pump and moved to WQSP # 4
11:00 AM -	1:30 PM -	Rigged up and waited on cement
1:30 PM -	4:00 PM -	Bailed on well to develop and clean up any fines left by gravel pack TD 800'

WQSP #6
GEOPHYSICAL LOGS

10/03/94

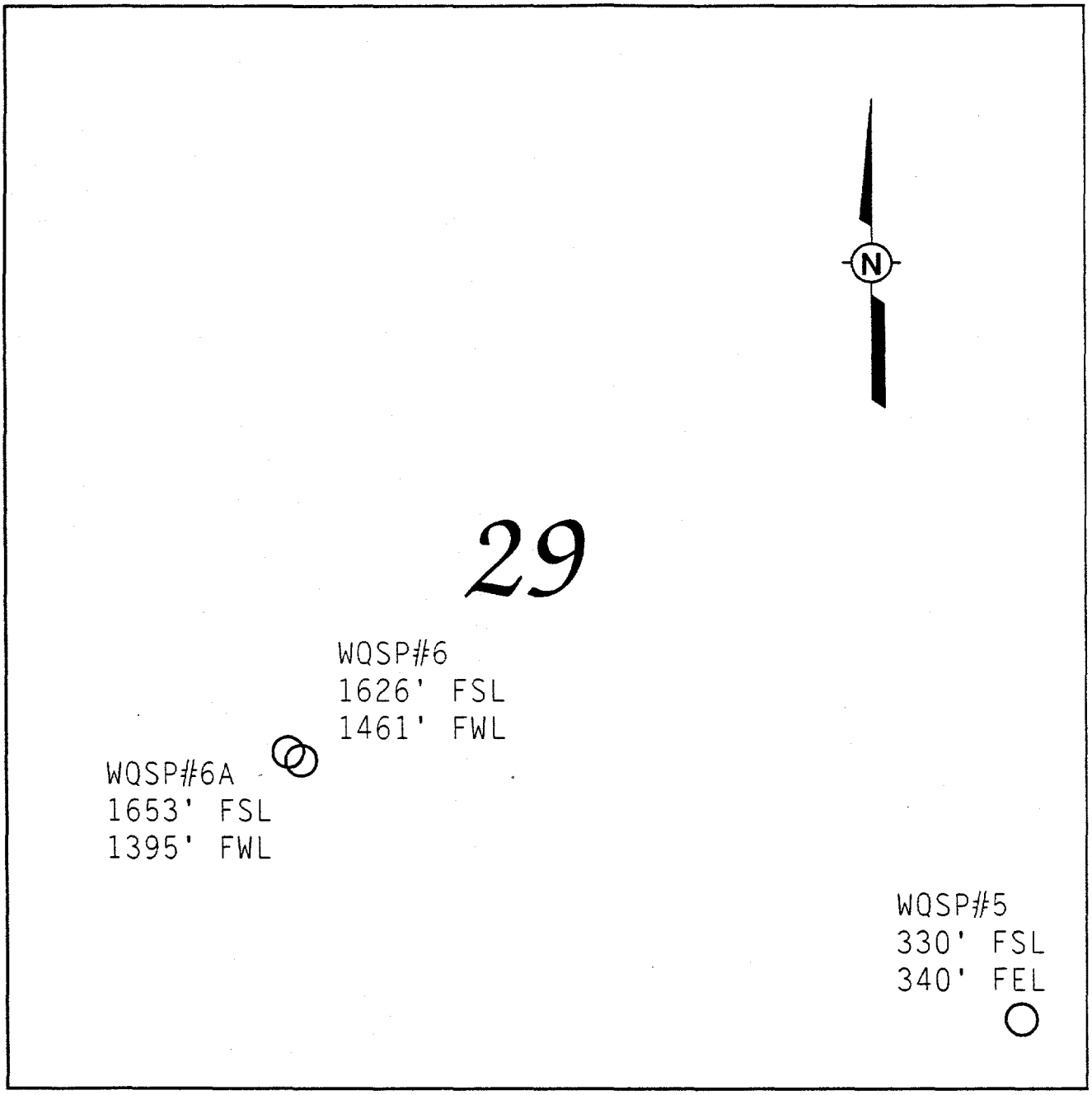

RES
0 OHM 1000
FEET
GAM(NAT)
0 API-GR 400
RES
0 OHM 20
NEUTRON
0 API-N 5900
SP
-100 MV 100
CALIPER
0 INCH 18
0
50
100
150
200
250
300



WQSP #6
Geophysical Logs

WQSP#6a

Section 29, T22S, R31E



Location of WQSP #6a

WQSP #6a
Condensed Well Summary

Location:	Section 29, T22S, R31E 1653 ft from the south line 1395 ft from the west line	
Elevation: (Top of Casing)	3364.7 ft above mean sea level	
Cuttings Description:	M.L. Martin	
Drilling Contractor:	West Texas Water Well Service 3432 W. University, Odessa, Texas 79764 (915) 381-2687 phone (915) 381-7853 fax	
Drilling Record	Date: Bottom of hole: Cored interval: Cuttings:	October 28, to November 1, 1994 225 ft below land surface 160 ft to 220 ft every 20 ft

WQSP #6a
Stratigraphic Summary

Stratigraphic Unit	**Depth Interval Natural Gamma Log (feet)**	**Core Description**
Surficial Deposits/Santa Rosa	0-35	
Dewey Lake Redbeds (partial)	35-220	160-220

WQSP #6a
CUTTINGS DESCRIPTION
(see WQSP 6)

WQSP #6a
DEWEY LAKE FORMATION
CORE DESCRIPTION

PAGE 1 OF 5

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#6a DIA.: 4"

LOCATION: NE1/4 SW1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1653' FSL 1395' FWL

ELEVATION: 3364.7 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/31/94

DRILL DATE: 10/31/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
10/31 10:00		160.0 162.0 164.0 166.0 168.0 170.0 172.0				160.0 - 191.0 ft: light to dark red-brown siltstone with numerous green-gray reduction spots varying in size and frequency. Spots occur randomly and in bands - the majority are 1-2 mm in diameter some form lenses up to 2 cm. In frequent, thin randomly oriented gypsum-filled fractures, clay lenses occur from 180.6-181.2 ft and some coarser grained (sandy) intervals. A broken, rubbly, silty interval occurs from 186.0-188.1 ft underlain by more competent siltstone. Unit has frequent horizontal fractures along bedding planes. At base of unit there is 2.5 ft of core loss.	Dewey Lake Formation

WIPP CORE-LOG INVENTORY

INTERA
FORM 1400

BOREHOLE: WQSP#6a DIA.: 4"

LOCATION: NE1/4 SW1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1653' FSL 1395' FWL

ELEVATION: 3364.7 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/31/94
DRILL DATE: 10/31/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo.	FRACTURE	DESCRIPTION	REMARKS
10/31	1	172.0 174.0 176.0 178.0 180.0 182.0 184.0				160.0 - 191.0 ft: light to dark red-brown siltstone with numerous green-gray reduction spots varying in size and frequency. Spots occur randomly and in bands - the majority are 1-2 mm in diameter some form lenses up to 2 cm. In frequent, thin randomly oriented gypsum-filled fractures, clay lenses occur from 180.6-181.2 ft and some coarser grained (sandy) intervals. A broken, rubbly, silty interval occurs from 186.0-188.1 ft underlain by more competent siltstone. Unit has frequent horizontal fractures along bedding planes. At base of unit there is 2.5 ft of core loss.	Dewey Lake Formation

PAGE 3 OF 5

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#6a DIA.: 4"

LOCATION: NE1/4 SW1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1653' FSL 1395' FWL

ELEVATION: 3364.7 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/31/94

DRILL DATE: 10/31/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		184.0					
						160.0 - 191.0 ft: light to dark red-brown siltstone with numerous green-gray reduction spots varying in size and frequency. Spots occur randomly and in bands - the majority are 1-2 mm in diameter some form lenses up to 2 cm. In frequent, thin randomly oriented gypsum-filled fractures, clay lenses occur from 180.6-181.2 ft and some coarser grained (sandy) intervals. A broken, rubbly, silty interval occurs from 186.0-188.1 ft underlain by more competent siltstone. Unit has frequent horizontal fractures along bedding planes. At base of unit there is 2.5 ft of core loss.	Dewey Lake Formation 2.5' of core loss
		186.0					
	1						
		188.0					
10/31 11:00		190.0					
10/31 12:35		192.0				191.0 - 192.6 ft: crumbly, highly fractured red-brown siltstone with reduction spots (gray-green) and some gray-green clay lenses.	
	2					192.6 - 205.6 ft: see next page.	
		194.0					
		196.0					

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#6a DIA.: 4"

LOCATION: NE1/4 SW1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1653' FSL 1395' FWL

ELEVATION: 3364.7 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/31/94

DRILL DATE: 10/31/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
		196.0				192.6 - 205.6 ft: Competent dark red-brown siltstone with coarsely crystalline anhydrite occurring in 1-2 mm horizontal bands along bedding planes. Numerous reduction spots (1-2 mm, up to 0.5 cm) in varying frequency, isolated and in bands. Thin (1-2 mm) randomly oriented gypsum-healed fractures. Siltstone is coarser grained and appears more porous along bedding planes. Clayey, rubbly intervals occur from 203.2-203.4 ft and 205-205.6 ft.	Dewey Lake Formation
		198.0					
		200.0					
		202.0					
		204.0					
		206.0				205.6 - 220.0 ft: see next page.	
		208.0					

PAGE 5 OF 5

WIPP CORE-LOG INVENTORY

INTERA

FORM 1400

BOREHOLE: WQSP#6a DIA.: 4"

LOCATION: NE1/4 SW1/4 Section 29 T22S R31E

ORIENTATION: Vertical Down

COORDINATES: 1653' FSL 1395' FWL

ELEVATION: 3364.7 feet amsl

DRILL METHOD(S): Air Rotary

LOG BY: JBD

DATE: 10/31/94

DRILL DATE: 10/31/94

DRILLER: Ronnie Keith

DRILL: Gardner Denver 1500

DRILL CO.: West Texas Water Well Service

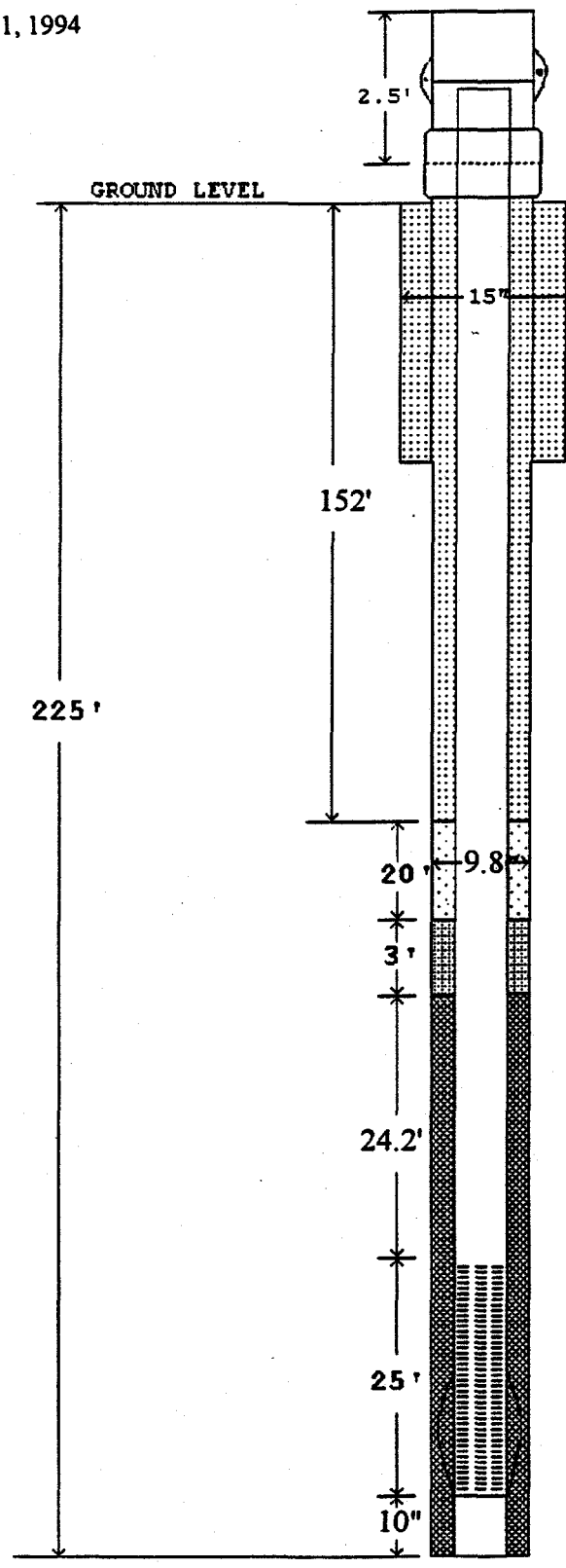
Time/ date	RUN	Depth feet	%	Geo	FRACTURE	DESCRIPTION	REMARKS
10/31	2	208.0 210.0 212.0 214.0 216.0 218.0 220.0				205.6 - 220.0 ft: competent light red-brown siltstone with very prominent, frequent, selenite bands, veins, and stringers. Prominent gray-green reduction bands and lenses. Unit has thin, wavy bedding.	Dewey Lake Formation

WQSP #6a
HOLE HISTORY

WIPP Project
WQSP #6a
Eddy County, New Mexico

October 28-31, 1994

WEST TEXAS WATER WELL SERVICE
RIG #15



2.5 FT EXTENSION WITH LOCKABLE CAP TO PROTECT WELL CASING

10.75 X 0.375 WALL SURFACE CASING CEMENTED IN A 15" HOLE

5" O.D. X 0.280 WALL BLANK FIBERGLASS CASING

CEMENT SLURRY MIX FROM 152 FT TO 1 FT
1 FT BELOW SURFACE
SLURRY IS 7 GALLONS WATER TO 1 CU FT
PORTLAND-ASTM C1510-92

BENTONITE SEAL FROM 172 TO 152 FT

SAND PACK FROM 175 TO 172 FT

8/16 BRADY GRAVEL FROM 225 TO 175 FT

25 FT OF 5" O.D. FIBERGLASS 0.020 SLOT SCREEN

CENTRALIZERS LOCATED AT BOTTOM OF SCREEN, TOP OF SCREEN, AND AT 60 FT INTERVALS TO SURFACE

10" OF BLANK 5" O.D. CASING

WEST TEXAS WATER WELL SERVICE

October 28, 1994

WQSP # 6A

6:00 AM	6:40 AM	Carlsbad to WQSP # 3
6:40 AM	6:50 AM	Check fluid levels
6:50 AM	8:00 AM	Rig down on WQSP # 3
8:00 AM	9:30 AM	Work on rig
9:30 AM	10:10 AM	Rig up on WQSP # 6A
10:10 AM	11:30 AM	Drill 9 7/8" hole from 25′ - 130′
11:30 AM	12:00 PM	Shut down and secure rig for weekend
12:00 AM	2:30 PM	WQSP # 6A to Odessa

October 31, 1994

WQSP # 6A

5:40 AM	7:35 AM	Odessa to WQSP # 6A
7:35 AM	7:50 AM	Check fluid levels
7:50 AM	8:00 AM	Trip pipe in hole
8:00 AM	8:15 AM	Wait on Mary and Ray
8:15 AM	8:40 AM	Drill 9 7/8" hole from 130′ - 160′
8:40 AM	9:00 AM	Trip pipe out of hole & prepare to core
9:00 AM	10:15 AM	Rig up core barrel, trip in hole w/core assembly
10:15 AM	11:10 AM	Core from 160′ - 191′
11:10 AM	11:50 AM	Pull core
11:50 AM	12:05 PM	Pick up 2nd inner barrel
12:05 PM	12:35 PM	Trip in hole with core barrel assembly
12:35 PM	1:20 PM	Coring from 191′ - 220′
1:20 PM	2:00 PM	Trip out of hole and break down core barrel
2:00 PM	2:30 PM	Pump out core
2:30 PM	3:35 PM	Break down core barrel assembly and load on trailer
3:35 PM	3:55 PM	Service rig and shut down for the day
3:55 PM	4:00 PM	WQSP # 6A to Carlsbad

WEST TEXAS WATER WELL SERVICE

November 1, 1994

WQSP # 6A

5:50 AM - 6:30 AM - Carlsbad to WQSP # 6A
6:30 AM - 7:00 AM - Work on rig
7:00 AM - 8:20 AM - Wait on logging unit
8:20 AM - 9:55 AM - Run camera
9:55 AM - 10:55 AM - Run geophysical logs
10:55 AM - 12:10 PM - Trip pipe back in the hole & ream 8 1/2" to 9 7/8" hole from 160' - 225'
12:10 PM - 12:40 PM - Trip out of the hole to run casing
12:40 PM - 1:05 PM - Run trimmie line
1:05 PM - 2:00 PM - Run casing (10" x5" blank, 29.6' x5" fiberglass pipe with 25' .020 slot, 187' of 5" fiberglass blank)
2:00 PM - 2:40 PM - Start gravel packing from 225' - 175'
2:40 PM - 3:10 PM - Mix & pump bentonite seal 175' - 172'
3:10 PM - 4:00 PM - Cement through 2" trimmie line from 152' to surface
4:00 PM - 4:30 PM - Clean up grout machine, trimmie line, secure rig for the day
4:30 PM - 5:15 PM - WQSP # 6A to Carlsbad

November 2, 1994

WQSP # 6A

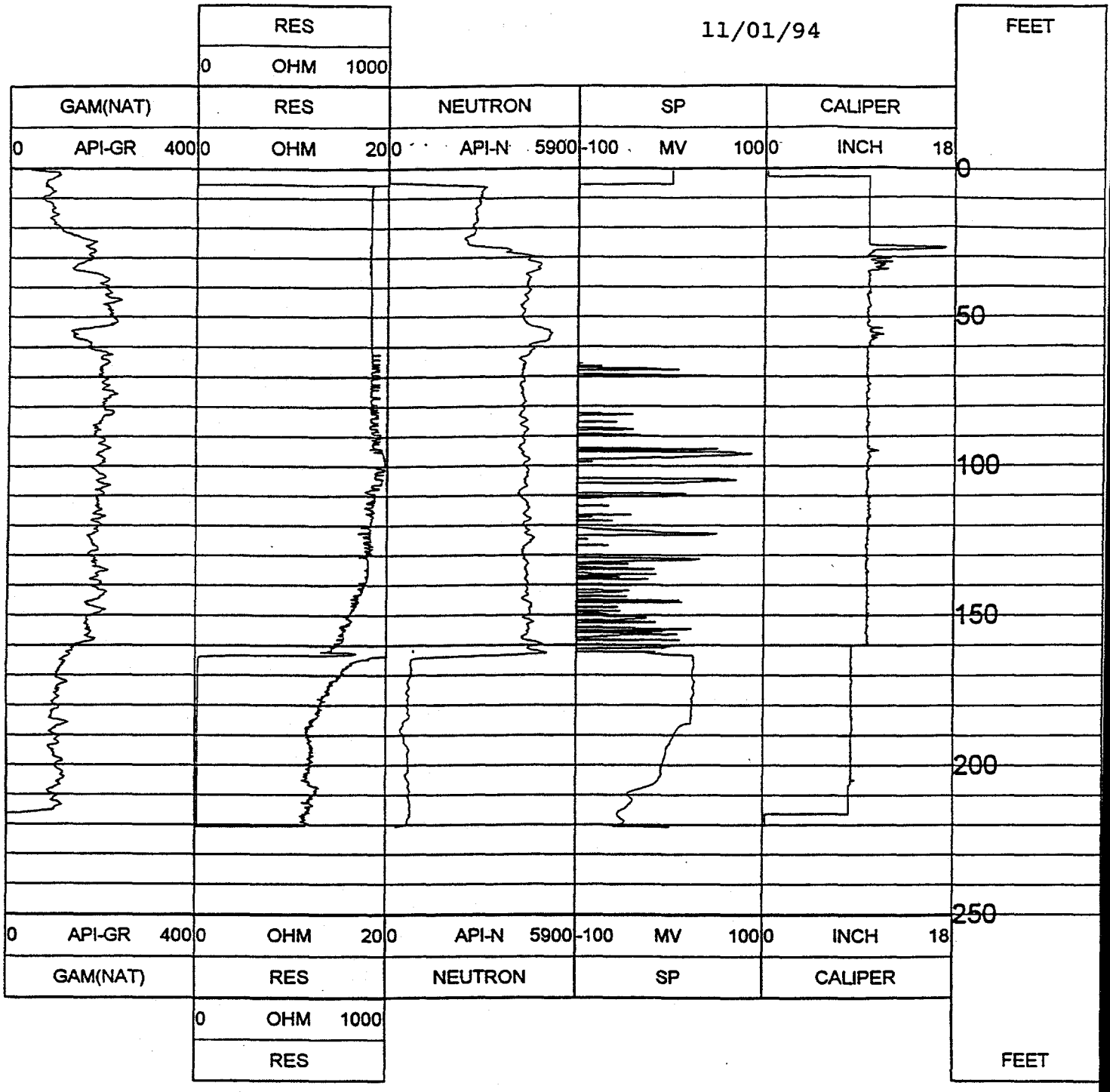
6:00 AM - 6:40 AM - Carlsbad to WQSP # 6A
6:40 AM - 11:15 Am - Rig down, pick up on location, secure load & depart for Odessa

Unit # 2

9:00 AM - 10:00 AM - Made 20 trips with bailer
10:00 AM - 10:45 AM - Run pump in well 6A to develop & test
10:45 AM - 11:15 AM - Rig up discharge and hook up to control box
11:15 AM - 12:00 PM - Wait on generator
12:10 PM - - Start pump to develop well-pumping 30 GPM
12:20 PM - - Pumping 30 GPM, clear no turbidity
12:35 PM - - Pumping 28 GPM, clear-shut off & surge 6 times
12:50 PM - - Started pumping 30 GPM, water clears up within 60 seconds
1:15 PM - - Pumping 28 GPM
1:25 PM - - Pumping 28 GPM
1:45 PM - - Pumping 28 GPM
2:15 PM - - Pumping 28 GPM

WQSP #6a
GEOPHYSICAL LOGS

Century GEOPHYSICAL CORP.



WQSP #6A
Geophysical Logs