GRCC 2003

GIANT
REFINING COMPANY

APR 2003

April 7, 2003

Wayne Price
Environmental Bureau
Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, NM 87505

RE: February/March 2003 Progress Report
Giant Refining Co., Ciniza Refinery GW-032 Discharge Plan

Dear Mr. Price:

As your office has requested, Ciniza is submitting a progress report on the Discharge Plan renewal issues identified in our 12/10/02 meeting. The Draft Permit will be submitted to your office by June 15, 2003.

1. Three additional nested wells around ponds - We anticipate that the drilling will start the first week in June, 2003. We would like to confirm your approval of the proposed sites ASAP so that we can request the funds for this work. It is unlikely that Ciniza will receive the funds unless the state concurs in writing that our plan meets their approval. We will send a letters under separate cover asking for OCD and NMED concurrence.

2. Investigate tank farm area near recovery wells and install possible French drain – Enclosed are logs from the following borings: 656, 657, 658, 659, 665, and 668. These logs represent borings outside the tank farm dikes, to the north, east and northeast, of Tanks 337, 344, and 345. Please see item # 6 below for the area inside the dike.

3. Investigate around old OW-20 high pH area – Enclosed are the original boring log for OW-20 from January, 1981. On January 14 and 15, 2003, Precision Engineering attempted to drill two different replacement wells in the same area as the original OW-20. We were unsuccessful in replacing OW-20 and closed the well on January 15th. You will find the logs for the attempted replacement wells and the well closure report enclosed. For general information, I am enclosing the well closure procedure used by Precision Engineering.

4. Investigate past OW-29. Find possible channels – Enclosed you will find logs for the following borings near and around the area between the NE corner of the tank farm and the North boundary of the plant: b-1(B1), b-3(B3), 643, 648, 649, MP-4, and MP-9.

5. Inspect the truck center – **At your convenience.**

PHONE
505-722-3833
FAX
505-722-0210

ROUTE 3
BOX 7
GALLUP
NEW MEXICO
87301

6. Find out where OW-17 was located. Now closed, but was originally located w/in tank farm. Sonsela wells were closed in this area. – Please see "close up" map of the area near OW-17 and other wells/borings in the area inside the berms of Tanks 337, 344, and 345. Logs enclosed include: 666, 667, RW-5 (recovery well), RW-6 (recovery well). Also enclosed are the original logs and well closure reports for wells: OW-16, OW-17, OW-25 and OW-26.

7. Prevent runoff from the old temporary pond area – **Complete**.

8. Show drainage ditches on drawings – **Will be included w/Discharge Plan Application due to your office by June 15, 2003.**

9. Submit storm water plan – see #8 above

10. Giant wants to monitor only OW-11, 12, 14, 29, 30 and MW 4 – **Groundwater results for all wells sampled in 2002 will be submitted to NMED, RCRA Programs and OCD on June 1, 2003 along with the Discharge Plan Application.**

11. Giant wants to close OW-2 and OW-3 and replace with new ones – see #1 above.

12. Giant does not want to monitor OW-1, OW-9, and OW-10. RCA wants these wells to be checked to make sure they are still under artesian conditions – No additional information.

13. NMED (RCRA) wants MW-1, 4, 5 and SMW-4 monitored (LTU) – **See # 10 above.**

14. RCA wants Pond #2 sampled – **We would like to confirm this before we submit the discharge plan. As we understand this item, the outlet at Pond #2 will be the compliance point for sampling for the wastewater treatment system / evaporation pond system interface. Parameters will be established by OCD as part of the new Discharge Plan. Ciniza would like to confirm this interpretation as soon as possible.**

15. Old API must be rebuilt or demonstrate that it is not leaking – The API Separator is scheduled for cleaning and inspection the week of April 28, 2003.

16. Giant must complete pressure testing all plant drain lines, sumps, including the tank farms, etc. by 6/1/03. – **No further sewer testing was completed in February or March 2003. We would like to propose completing 80% of the sewer testing by 12/31/03 and the last 20% by 12/31/2004.**

17. Giant must complete Discharge Plan submittal by 10/1/03 with monthly progress reports – **In progress. To be submitted by 6/15/03.**

18. RCA wants monthly progress reports. – This report for February and March 2003 will be the last submitted.

19. Issues of geological channels need to be resolved – To be resolved.

20. LWP to spell out in DP all samples to be taken from which wells and analysis, including frequency – **To be determined**.

Please feel free to contact me at 505.722.0227 or @ ***dmancini@giant.com*** with any questions or concerns you have regarding this report. Thank you for your assistance with our Discharge Plan submittal.

Sincerely,

Dorinda Mancini
Environmental Manager, Ciniza Refinery

Enc

CC: Roger Anderson, OCD
Dave Cobrain, HWB
Ed Riege, Env. Superintendent
Matthew Davis, General Manager (w/o enc.)
File

12/10/02 Meeting held with Giant-Ciniza: GW-032 Dorinda Mancini, Ed Riege, LWP, RCA, Dave Cobrain.

Minutes of meeting: OCD to require the following:

1. Three additional nested wells around ponds.

2. Investigate tank farm area near recovery wells and install possible French drain

3. Investigate around old OW-20 high PH area

4. Investigate past OW-29 Find possible channels

5. Inspect the truck center

6. Find out where old OW17 was located. Now closed was inside of tank farm. Sonsela wells were closed in this area.

7. Prevent run-off from old pond area.

8. Show drainage ditches on drawings

9. Submit storm water plan

10. Giant wants to monitor only OW-11,12,14,29, 30 + MW-4

11. Giants wants to close OW-2&3 replace with new ones

12. Giant does not want to monitor OW-1,9,10 RCA wants these wells to be checked to make sure they are still under Artesia conditions.

13. NMED (RCRA) wants MW-1,4,5 SWM-4 old LTU

14. RCA wants pond #2 to be sampled.

15. Old API must be rebuilt or demonstrate it is not leaking.

16. Giant must complete pressure testing all plant drain lines, sumps, including tank farms, etc. by June 1, 2003

17. Giant must complete DP submittal by Oct 1, 2003 with monthly progress reports.

18. RCA wants monthly progress report.

19. Issues of geological channels needs to be resolved.

20. LWP to spell out in DP all samples to be taken from which wells and analysis, including frequency.

LOCATION: SEE SITE PLAN
CINIZA REFINERY

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 97-070
ELEVATION: 6929.2
TOTAL DEPTH: 35.0'
LOGGED BY: TM
DATE: 6-10-97
STATIC WATER: 21.2'
BORING ID: 0656
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-1.0	***//oo**		C	SAND, FINE, CLAYEY, FINE GRAVEL, BROWN, MOIST	0.0-23.0
1.0	***//oo**		C		
1.0-4.5	///**oo//		C	CLAY, SLIGHTLY SANDY, SOME FINE GRAVEL, MOIST, RED BROWN, FIRM TO SOFT, NO ODOR,	0
	///**oo//		C	SOME CHARCOALING	
	///**oo//		C		
	///**oo//		C		
	///**oo//		C	MORE GRAVELLY AT 3.5' TO 3.8'	
	///**oo//		C		
4.5	///**oo//		C		
4.5-4.8	****//***	5.0	C	SAND, FINE, DAMP, SLIGHTLY CLAYEY, PURPLISH BROWN, NO ODOR	
4.8-6.0	///***--/		C	CLAY, VERY SANDY, FINE, SILTY, NO ODOR, PURPLISH BROWN	
6.0	///***--/		C		
6.0-6.2	***//-***		C	SAND, FINE TO MEDIUM, CLAYEY, SLIGHTLY SILTY, MOIST, PURPLE RED, NO ODOR	
6.2-7.8	//***-+//		C	CLAY, VERY SANDY, FINE, SILTY, SOME CALCAREOUSLY INDURATED APPEARING NODULES, FINE	
	//***-+//		C	GRAVEL, SOME VEGETATION IN SAMPLE, DAMP TO MOIST, PURPLISH BROWN	
7.8	//***-+//		C		
7.8-8.5	***//-***		C	SAND, VERY FINE TO FINE, CLAYEY, SILTY, SOME CEMENTED SAND, MOIST, PURPLISH BROWN,	
8.5-8.8	///***///		C	CLAY, SAND, FINE, SAND APPEARS TO BE IN BANDS, NO ODOR, FIRM, MOIST	
8.8-9.2	***///***		C	SAND, FINE, CLAYEY, MOIST, PURPLISH BROWN, SLIGHT ORANGE TINT AT 8.8'	
9.2-11.5	///***///	10	C	CLAY, SANDY, FINE, SOME CHARCOALING AND GYPSUM SPOTS IN SAMPLE, MOIST, SOME ROOT	
	///***///		C	MATTER, HARD, NO ODOR	
	///***///		C		
	///***///		C		
11.5-12.2	///***///		C	CLAY, MOIST, HARD, SLIGHTLY SILTY, HEAVY CHARCOALING, VEGETATION, CALCAREOUS	
12.2	///***///		C	INDURATION OR GYPSUM NODULES, NO ODOR, PURPLISH BROWN	
12.2-14.2	***///***		C	INTERBEDDED SAND AND CLAY	
	///***///		C		
14.2	***///***		C		
14.2-17.0	///****//		C	CLAY, MOIST, PURPLISH BROWN, VERY SANDY, ORANGE SANDY BANDS IN CLAY, VERY THIN	
	///****//	15	C	LAYERS TO 15', NO ODOR, SOME CHARCOALING	
	///****//		C		
	///****//		C		
	///****//		C		
17.0	///****//		C		
17.0-17.5	***//-***		C	SAND, CLAYEY, SILTY, FINE, PURPLISH BROWN WITH ORANGE TINT, NO ODOR	
17.5-18.2	///--*///		C	CLAY, SILTY, SANDY, WET, PURPLISH BROWN, SOFT TO FIRM, SOME VEINING, POSSIBLE ROOTS	
18.2	///--*///		C	DARK GREEN, NO ODOR	
18.2-18.8	****-/***		C	SAND, FINE TO MEDIUM, PURPLISH WITH ORANGE BANDS, SOME BLACK BANDING, SILTY,	
18.8	****-/***		C	SLIGHTLY CLAYEY, NO ODOR	
18.8-19.7	////*-///	20	C	CLAY, MOIST, ROOT MATTER, PURPLISH BROWN, SLIGHTLY SANDY, SOME SILT, NO ODOR	
19.7-19.9	****--***		C	SAND, FINE, MOIST, ORANGE BROWN, SLIGHTLY SILTY, SOME PURPLING, NO ODOR	
19.9-21.2	///-**///		C	CLAY, WET, SLIGHTLY SILTY, SANDY, REDDISH PURPLE, FIRM, NO ODOR	
21.2-22.0	***-//***		C	SAND, FINE, WET, SLIGHTLY WATER BEARING, ORANGE BROWN TO PURPLE, NO ODOR, SLIGHTLY	
22.0	***-//***		C	SILTY, CLAYEY, MODERATELY DENSE	
22.0-22.4	/*/*/*/*/		C	INTERBEDDED CLAY AND SAND	
22.4-27.2	///*oo///		C	CLAY, MOIST, SLIGHTLY SANDY, SOME GYPSUM NODULES OR CEMENTED SAND, COARSE GRAVEL,	

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

LOGGED BY: TM

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

LOCATION: SEE SITE PLAN
CINIZA REFINERY

FILE #: 97-070
ELEVATION: 6929.2
TOTAL DEPTH: 35.0'
LOGGED BY: TM
DATE: 6-10-97
STATIC WATER: 21.2'
BORING ID: 0656
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
22.4-27.2	///*oo///		C	**CLAY**, MOIST, SLIGHTLY SANDY, SOME GYPSUM NODULES OR CEMENTED SAND, COARSE GRAVEL,	23.0-32.0
	///*oo///		C	WHITE, FINE, NO ODOR, REDDISH BROWN	0
	///*oo///		C		
	///*oo///	25	C		
	///*oo///		C		
	///*oo///		C		
	///*oo///		C		
27.2	///*oo///		C		
27.2-27.7	***/oo***		C	**SAND**, FINE TO MEDIUM, **SLIGHTLY WATER BEARING**, SLIGHTLY CLAYEY, FINE GRAVEL, REDDISH	
27.7	***/oo***		C	BROWN WITH PURPLE TINT, NO ODOR	
27.7-28.0	///--*///		C	**CLAY**, SILTY, MOIST TO WET, SLIGHTLY SANDY, RED BROWN, FIRM, NO ODOR	
28.0-28.8	oo//--**o		C	**GRAVEL**, FINE TO COARSE, CLAYEY, SILTY, SANDY, FINE, WET, SOME SANDSTONE NODULES,	
28.8	oo//--**o		C	BONE WHITE, NO ODOR	
28.8-29.0	///**oo//	30	C	**CLAY**, MOIST, SANDY, FINE GRAVEL, RED BROWN, STIFF, NO ODOR	
29.0-32.0	ooo***ooo		C	**GRAVEL**, FINE TO COARSE, SANDY, FINE TO COARSE, PURPLE BROWN, **WATER BEARING**, CLAYEY,	
	ooo***ooo		C	NO ODOR, 30.0'-32.0' MORE COARSE SAND, FINE GRAVEL, **WATER BEARING**	
	ooo***ooo		C		
32.0	ooo***ooo		C		3.0
32.0-35.0	===//*===		C	**CHINLE FORMATION**	
	===//*===		C	PURPLISH WITH LIGHT GREEN BANDING, CLAYEY, SOME SAND, FINE, SOME CEMENTED	
	===//*===		C	SAND AT 35.0', DRY	
	===//*===		C		
	===//*===		C		
35.0	===//*===	35	C		
TOTAL DEPTH					

LOGGED BY: TM

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

LOCATION: SEE SITE PLAN
CINIZA REFINERY

FILE #: 97-070
ELEVATION: 6938.4
TOTAL DEPTH: 40.0'
LOGGED BY: TM
DATE: 6-10-97
STATIC WATER: 34.5'
BORING ID: 0657
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
0.0-1.8	///*o*o//		C	**CLAY**, DAMP, FIRM, SANDY, FINE, SOME FINE GRAVEL, RED BROWN, NO ODOR	0.0-31.0
	///*o*o//		C		0
	///*o*o//		C		
1.8	///*o*o//		C		
1.8-4.5	**-o-/o**		C	**SAND**, FINE TO COARSE, SILTY, SLIGHTLY CLAYEY, SOME FINE GRAVEL, RED BROWN, SOME	
	-o-/o		C	GYPSUM SPOTS, MORE COARSE SAND AT 4.0' TO 4.5', DAMP, NO ODOR	
	-o-/o		C		
	-o-/o		C		
4.5	**-o-/o**		C		
4.5-5.0	/*/*/*/*/	5.0	C	INTERBEDDED CLAY AND SAND	
5.0-5.9	///////		C	**CLAY**, MOIST, SLIGHTLY BLOCKY, WHITE GYPSUM SPOTS, CHARCOALING, SOME ROOTS IN SAMPLE	
5.9	///////		C	REDISH BROWN, VERY DARK TO PURPLE CHARCOALING, NO ODOR, VERY STIFF	
5.9-6.2	*********		C	**SAND**, FINE, SOME COARSE, RED BROWN WITH ORANGE TINT	
6.2-8.5	////-////		C	**CLAY**, MOIST, SLIGHTLY BLOCKY, WHITE GYPSUM SPOTS, CHARCOALING, SOME ROOTS IN SAMPLE	
	////-////		C	REDISH BROWN, VERY DARK TO PURPLE CHARCOALING, NO ODOR, VERY STIFF, SLIGHTLY SILTY	
	////-////		C		
	////-////		C		
8.5-10.0	////-////		C	**CLAY**, SILTY, SANDY, FINE, SOME GYPSUM SPOTTING, DAMP TO MOIST, REDDISH BROWN WITH	
	////-////		C	PURPLE TINT, VERY STIFF TO HARD, MORE FISSLE, NO ODOR, SOME CHARCOALING	
	////-////	10	C		
10.0-11.2	////-////		C	**CLAY**, MOIST, HARD, SLIGHTLY SILTY, SOME CHARCOAL, PURPLISH BROWN, DAMP TO MOIST,	
11.2	////-////		C	NO ODOR	
11.2-12.5	***--/***		C	**SAND**, FINE, SILTY, SLIGHTLY CLAYEY, PURPLISH BROWN, DAMP, NO ODOR	
	--/		C		
12.5	***--/***		C	SILTY AT 12.0'	
12.5-13.2	///--*///		C	**CLAY**, SILTY, SLIGHTY SANDY, FINE, SLIGHTLY FISSLE, DAMP, VERY STIFF, REDDISH BROWN	
13.2-13.8	***--//**		C	**SAND**, VERY FINE TO FINE, SILTY, CLAYEY, DAMP TO MOIST, RED BROWN, NO ODOR	
13.8	***--//**		C		
13.8-14.5	///**--//		C	**CLAY**, SANDY, VERY FINE, SITLY, DAMP TO MOIST, NO ODOR	
14.5-15.0	///**--//	15	C	**CLAY**, SANDY, FINE, PURPLISH BROWN WITH ORANGE TINT, VERY STIFF, NO ODOR, SILTY, DAMP	
15.0-15.2	***--/***		C	**SAND**, FINE, SILTY, SLIGHTLY CLAYEY, REDDISH PURPLE WITH ORANGE TINT, NO ODOR	
15.2-15.7	///--**//		C	**CLAY**, SILTY, SANDY, FINE, ORANGE BANDS OF SAND IN CLAY, DAMP TO MOIST, NO ODOR, RED	
15.7-18.2	///////////		C	BROWN CLAY	
	///////////		C	**CLAY**, HARD, MOIST, REDDISH BROWN, CHARCOALING, BLOCKY, SOME CEMENTED SAND AT 17.0',	
	///////////		C	NO ODOR	
18.2	///////////		C		
18.2-18.7	****-/***		C	**SAND**, FINE, SLIGHTLY SILTY AND CLAYEY, PURPLISH BROWN WITH ORANGE TINT, SOME BLACK	
18.7	****-/***		C	SAND IN BAND FORM	
18.7-20.0	///--***/		C	**CLAY**, SILTY, VERY SANDY, SAND IN ORANGE BANDS, PURPLE BROWN, DAMP TO MOIST, VERY	
	///--***/	20	C	STIFF, NO ODOR	
20.0-21.0	///---**/		C	**CLAY**, VERY SILTY, SANDY, FINE, DAMP TO MOIST, PURPLISH BROWN, NO ODOR	
	///---**/		C		
21.0-22.2	///***--/		C	**CLAY**, VERY SANDY, SILTY, SAND IN ORANGE COLOR, PURPLE BROWN, VERY STIFF, NO ODOR	
	///***--/		C		
22.2-23.5	///***-//		C	LESS SILTY, MORE WHITE GYPSUM SPOTS, SOME CHARCOALING	
	///***-//		C		

LOGGED BY: TM

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

LOCATION: SEE SITE PLAN
CINIZA REFINERY

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 97-070
ELEVATION: 6938.4
TOTAL DEPTH: 40.0'
LOGGED BY: TM
DATE: 6-10-97
STATIC WATER: 34.5'
BORING ID: 0657
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
22.2-23.5	///***-//		C	**LESS SILTY**, MORE WHITE GYPSUM SPOTS, SOME CHARCOALING	
23.5-24.5	///***-//		C	**MORE SANDY**, FINE, SILTY, ORANGE SAND, PURPLE BROWN CLAY	
24.5	///***-//		C		
24.5-25.0	***--//**	25	C	**SAND**, FINE, SILTY, CLAYEY, ORANGISH PURPLE, DAMP, NO ODOR	
25.0-26.2	////*-///		C	**CLAY**, MOIST, REDDISH BROWN WITH PURPLE TINT, SLIGHTLY SANDY, SOME CHARCOALING,	
26.2	////*-///		C	SLIGHTLY SILTY, HARD, NO ODOR	
26.2-26.7	***//--**		C	**SAND**, FINE, CLAYEY, SILTY, MOIST, ORANGISH BROWN, NO ODOR	
26.7-27.5	///***-//		C	**CLAY**, VERY SANDY, VERY FINE TO FINE, SILTY, ORANGE PURPLE, MOIST, HARD, NO ODOR	
27.5	///***-//		C		
27.5-28.5	***--/***		C	**SAND**, VERY FINE TO FINE, SILTY, CLAYEY, ORANGISH PURPLE, MOIST, NO ODOR	
28.5	***--/***		C		
28.5-28.8	////**///		C	**CLAY**, SILTY MOIST, VERY STIFF, SANDY, FINE, PURPLISH BROWN WITH ORANGE TINT, DAMP	
28.8-29.7	***--/***		C	**SAND**, FINE, SILTY, CLAYEY, SOME COARSE, DAMP, NO ODOR (FINE AND COARSE GRAVEL ZONE	
29.7	**-o-/o**	30	C	AT 29.2-29.5)	
29.7-30.5	///***-//		C	**CLAY**, VERY SANDY, SILTY, DAMP TO MOIST, FISSLE, PURPLE BROWN WITH SOME ORANGE AND	
30.5	///***-//		C	BLACK SAND, NO ODOR	
30.5-31.0	***---***		C	**SAND**, VERY FINE TO FINE, SILTY, MOIST, ORANGISH RED TO PURPLISH BROWN, NO ODOR	
31.0-33.8	///*--///		C	**CLAY**, SLIGHTLY SANDY, SILTY, WET, SOME CHARCOAL VEINS, STIFF, REDDISH BROWN	
	///*--///		C		30.0
	///*--///		C		
33.8	///*--///		C		170.0
33.8-35.9	oo//*Soo		C	**GRAVEL**, VERY CLAYEY, SANDY, FINE TO COARSE, SILTY GRAVEL IS FINE TO COARSE, SOME	
	oo//*Soo		C	SOFT SANDSTONE NODULES, SLIGHTLY WATER BEARING AT 34.5'	
	oo//*Soo	35	C	SLIGHTLY WATER BEARING AT 35.2'	200.0
	oo//*Soo		C		
35.9	oo//*Soo		C		
35.9-40.0	===///===		C	**CHINLE FORMATION**	
	===///===		C	**CLAYEY**, PURPLISH BROWN WITH LIGHT GREEN SPOTS, MOIST, BLOCKY	
	===///===		C		
	===///===		C		
	===///===		C		
	===///===		C		
	===///===		C		
40.0	===///===	40	C		
TOTAL DEPTH					

LOGGED BY: TM

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

LOCATION: SEE SITE PLAN
CINIZA REFINERY

FILE #: 97-070
ELEVATION: 6936.2
TOTAL DEPTH: 35.5'
LOGGED BY: TM
DATE: 6-11-97
STATIC WATER: NOT FOUND
BORING ID: 0658
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-1.5	///*o*o//		C	CLAY, SANDY, FINE, FINE TO COARSE GRAVEL, BROWN, DAMP, ROOTS IN SAMPLE, NO ODOR	ALL SAMPLES 0.0
	///*o*o//		C		
	///*o*o//		C		
1.5-3.5	///*o*o//		C	CLAY, SANDY, VERY FINE, SILTY, GYPSUM VEINS, RED BROWN, DAMP TO MOIST, SOME FINE	
	///*o*o//		C	GRAVEL, NO ODOR	
	///*o*o//		C		
3.5	///*o*o//		C		
3.5-4.0	***/o/o**		C	SAND, FINE TO COARSE, CLAYEY, GRAVELLY, FINE AND COARSE, RED BROWN, DAMP, SOME BONE	
4.0	***/o/o**		C	WHITE CEMENTED SAND, NO ODOR	
4.0-4.2	////**///	5.0	C	CLAY, DRY TO DAMP, BROWN AND WHITE GYPSUM VEINS, STIFF, SLIGHTLY SANDY	
4.2-4.7	***o/o/**		C	SAND, FINE TO COARSE, SOME FINE GRAVEL, RED BROWN, CLAYEY, DAMP, NO ODOR	
4.7-5.0	/////////		C	CLAY, DAMP, BROWN AND WHITE GYPSUM VEINS, BLOCKY, STIFF, NO ODOR	
5.0-8.2	***oo-***		C	SAND, FINE TO COARSE, FINE GRAVEL, RED BROWN, DAMP, SLIGHT ORANGE TINT, SLIGHTLY	
	oo-		C	SILTY, NO ODOR	
	oo-		C		
8.2	***oo-***		C		
8.2-9.3	///--*///		C	CLAY, SILTY, SLIGHTLY SANDY, FINE, BROWN, SOME VEINING, ROOTS IN SAMPLE, DAMP TO	
	///--*///		C	MOIST, NO ODOR	
9.3	///--*///		C		
9.3-16.0	****/-***	10	C	SAND, FINE, SOME COARSE, SLIGHTLY CLAYEY, SILTY, REDDISH BROWN, DAMP, NO ODOR	
	****/-***		C		
	****/-***		C		
	****/-***		C		
	****/-***		C		
	****/-***		C		
	****/-***		C		
	****/-***		C		
	****/-***		C	ORANGE SAND AT 13.0' TO 13.2'	
	oo//-		C	VERY GRAVELLY, FINE, MORE CLAYEY, SILTY AT 13.5' TO 15.0'	
	oo//-		C		
	oo//-	15	C		
	oo//-		C		
16.0	**oo//-**		C		
16.0-16.7	///--**//		C	CLAY, SILTY, SANDY, FINE, SOME GYPSUM SPOTS, PURPLISH BROWN, SOME ROOT MATTER,	
16.7	///--**//		C	STIFF, DAMP, NO ODOR	
16.7-19.8	***o*o***		C	SAND, FINE TO COARSE, SOME FINE GRAVEL, DAMP, PURPLISH BROWN, SOME CEMENTED SAND,	
	o*o		C	NO ODOR	
	o*o		C		
	o*o		C		
	o*o		C		
	o*o	20	C		
19.8-21.7	***o*o***		C	SAND, MEDIUM TO COARSE, SOME FINE, CLAYEY, RED BROWN, SOME FINE GRAVEL, DAMP, DENSE	
	o*o		C	CEMENTED SAND, NO ODOR	
21.7	***o*o***		C		
21.7-22.0	---**//--		C	SILT, SANDY, VERY FINE TO FINE, CLAYEY, PURPLISH BROWN, DAMP, STIFF, SAND IS BANDED	
22.0-22.2	****--***		C	SAND, FINE, SLIGHTLY SILTY, DAMP, PURPLISH BROWN WITH ORANGE TINT, NO ODOR	
22.2-23.8	///--**//		C	CLAY, SILTY, SANDY, FINE, SOME WHITE SPOTS, PURPLE BROWN, DAMP, NO ODOR	

LOGGED BY: TM

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

LOCATION: SEE SITE PLAN
CINIZA REFINERY

FILE #: 97-070
ELEVATION: 6936.2
TOTAL DEPTH: 35.5'
LOGGED BY: TM
DATE: 6-11-97
STATIC WATER: NOT FOUND
BORING ID: 0658
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
22.2-23.8	///--**//		C	CLAY, SILTY, SANDY, FINE, SOME WHITE SPOTS, PURPLE BROWN, DAMP, NO ODOR	
23.8-24.0	****--***		C	SAND, VERY FINE TO FINE, SILTY, LIGHT BROWN, DAMP, NO ODOR	ALL SAMPLES
24.0-26.7	///**-///		C	CLAY, SANDY, SILTY, DAMP TO MOIST, PURPLISH BROWN, SOME GYPSUM SPOTS, NO ODOR	0.0
	///**-///	25	C		
	///**-///		C		
	///**-///		C		
	///**-///		C		
26.7-28.2	////**///		C	CLAY, WET, RED BROWN, FIRM, SLIGHTLY SANDY, NO ODOR	
	////**///		C		
	////**///		C		
28.2-29.0	///*o*o//		C	CLAY, SANDY, WET, GRAVELLY, FINE, REDDISH PURPLE, SOME WHITE MEDIUM GYPSUM, NO ODOR	
29.0	///*o*o//		C		
29.0-29.2	ooo***ooo		C	GRAVEL, COARSE, CEMENTED SAND, COARSE, BONE WHITE, MOIST, WHITE, NO ODOR	
29.2-30.5	//o*-s///	30	C	CLAY, WET, GRAVELLY, FINE TO COARSE, SANDY, FINE, SILTY, SANDSTONE, FINE GRAVEL,	
30.5	//o*-s///		C	BONE WHITE, RED BROWN, NO ODOR, MORE GRAVELLY AT 30.0' TO 30.5', NOT WATER BEARING	
30.5-35.5	=========		C	CHINLE FORMATION	
	=========		C	SHALE, RED BROWN, FISSLE, DAMP, HARD	
	=========		C		
	=========		C		
	=========		C		
	=========		C		
	=========		C		
	=========		C		
	=========	35	C		
35.5	=========		C		
TOTAL DEPTH					

LOGGED BY: TM

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

LOCATION: SEE SITE PLAN
CINIZA REFINERY

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 97-070
ELEVATION: 6932.1
TOTAL DEPTH: 20.0'
LOGGED BY: WHK
DATE: 6-11-97
STATIC WATER: 10.0'
BORING ID: 0659
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-3.5	///*o*o//		C	**CLAY**, SANDY, FIRM, SOME SCATTERED FINE GRAVEL, MOIST	0.0-12.0
	///*o*o//		C		0
	///*o*o//		C		
	///*o*o//		C		
	///*o*o//		C		
	///*o*o//		C		
	///*o*o//		C		
3.5	///*o*o//		C		
3.5-7.5	////*////		C	**CLAY**, WET, STIFF, SOME CARBONATE FILIMENTS, VERY SLIGHTLY SANDY, RED BROWN	
	////*////		C		
	////*////	5.0	C		
	////*////		C		
	////*////		C		
	////*////		C		
	////*////		C		
	////*////		C		
7.5	////*////		C		
7.5-8.0	ooS/S/Soo		C	**GRAVEL**, CLAYEY, MAINLY SANDSTONE, FIRM, WET, RED BROWN	
8.0-9.5	****oo***		C	**SAND**, FINE, MODERATLY DENSE, BROWN, SCATTERED FINE GRAVEL, MOIST	
	****oo***		C		
9.5	****oo***		C		
9.5-10.0	ooo//SSoo	10	C	**GRAVEL**, CLAYEY, SANDSTONE AND CHERT, SOME FINE, RED BROWN, DENSE	
10.0-11.0	****//***		C	**SAND**, FINE, SLIGHTLY CLAYEY, **SLIGHTLY WATER BEARING**, SOFT, RED BROWN	
11.0	****//***		C		
11.0-15.3	////*-///		C	**CLAY**, FIRM, WET (NOT WATER BEARING), VERY SLIGHTLY SANDY TO SILTY, BROWN TO	
	////*-///		C	RED BROWN	
	////*-///		C		150
	////*-///		C		
	////*-///		C		
	////*-///		C		
	////*-///		C		
15.3	////*-///	15	C		
15.3-15.6	oooo$Sooo		C	**GRAVEL**, DENSE, RED BROWN, SANDSTONE AND CHERT, MOIST, GRAVEL ROUNDED (TO 1")	5
15.6-20.0	=========		C	**CHINLE FORMATION**	0
	=========		C	**SHALE**, DENSE, RED BROWN, MOIST, FISSLE, SOME GREEN REDUCTION SPOTS	
	=========		C		0
	=========		C		
	=========		C		0
	=========		C		
	=========		C		0
	=========		C		
20.0	=========	20	C		0
TOTAL DEPTH					

LOGGED BY: TM

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

LOCATION: SEE SITE PLAN
CINIZA REFINERY

FILE #: 97-070
ELEVATION: 6934.9
TOTAL DEPTH: 45.0'
LOGGED BY: WHK
DATE: 6-12-97
STATIC WATER: 32.0'
BORING ID: 0665
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
0.0-9.0	///x/x///		C	**CLAY**, WET, RED BROWN, STIFF, SOME TRASH (METAL PIPE, PLASTIC) IN UPPER 2'	
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///	5.0	C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
	///x/x///		C		
9.0	///x/x///		C		
9.0-17.0	///***///		C	**CLAY**, SANDY, WET, RED BROWN, FIRM	
	///***///	10	C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///	15	C		
	///***///		C		
	///***///		C		
	///***///		C		
17.0	///***///		C		
17.0-24.5	////**///		C	**CLAY**, SLIGHTLY SANDY, WET, FIRM, BROWN	
	////**///		C		
	////**///		C		
	////**///		C		
	////**///		C		
	////**///	20	C		
	////**///		C		
	////**///		C		
	////**///		C		
	////**///		C		
	////**///		C		
	////**///		C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

LOCATION: SEE SITE PLAN
CINIZA REFINERY

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 97-070
ELEVATION: 6934.9
TOTAL DEPTH: 45.0'
LOGGED BY: WHK
DATE: 6-12-97
STATIC WATER: 32.0'
BORING ID: 0665
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
17.0-24.5	////**///		C	**CLAY**, SLIGHTLY SANDY, WET, FIRM, BROWN	
	////**///		C		
24.5	////**///		C		
24.5-28.0	*********	25	C	**SAND**, FINE, DAMP TO MOIST, RED BROWN, "SWEET" ODOR (POSSIBLE ADDITIVE OR LIGHT END)	
	*********		C		
	*********		C		
	*********		C		
	*********		C		
	*********		C		
28.0	*********		C		
28.0-34.3	000*S*S00		C	**GRAVEL**, SANDY (SANDSTONE, CHERT), STRONG GASOLINE ODOR (OLD), MOIST TO WET, NOT WATER BEARING, BROWN	
	000*S*S00		C		
	000*S*S00		C		
	000*S*S00	30	C		
	000*S*S00		C		
	000*S*S00		C		
	000*S*S00		C		
	000*S*S00		C		
	000*S*S00		C	**WATER BEARING AT 32.0'- 33.5'**	
	000*S*S00		C		
	000*S*S00		C		
34.3	000*S*S00		C		
34.3-34.5	/////////		C	CLAY, WET, SOFT, BROWN, NO ODOR	
34.5-35.0	*********	35	C	SAND, FINE, WET, BROWN, NO ODOR, MODERATELY DENSE	
35.0-41.0	000***000		C	**GRAVEL**, SANDY, BROWN, WET, NOT WATER BEARING, POSSIBLE WEAK "SWEET" ODOR	
	000***000		C		
	000***000		C		
	000***000		C		
	000***000		C		
	000***000		C		
	000***000		C		
	000***000		C		
	000***000		C		
	000***000		C		
	000***000	40	C		
	000***000		C		
41.0	000***000		C		
41.0-45.0	=========		C	**CHINLE FORMATION**	
	=========		C	**SHALE**, SANDY, RED, SOME RED SPOTS, DRY, HARD	
	=========		C		
	=========		C		
	=========		C		
	=========		C		
	=========		C		
45.0	=========	45	C		
TOTAL DEPTH					

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

LOGGED BY: WHK

LOCATION: SEE SITE PLAN
CINIZA REFINERY

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 97-070
ELEVATION: 6911.3
TOTAL DEPTH: 15.0'
LOGGED BY: WHK
DATE: 6-17-97
STATIC WATER: NOT FOUND
BORING ID: 0668
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
0.0-1.5 1.5	///**oo// ///**oo// ///**oo//		C C C	**CLAY**, SANDY, FINE, GRAVELLY, DRY, RED BROWN, SOFT	ALL SAMPLES NO ODOR
1.5-9.0 9.0	///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***///	5.0	C C C C C C C C C C C C C C C C C C C C	**CLAY**, SANDY, RED BROWN, DRY, HARD, WHITE CARBONATE FILAMENTS, ROOT MATTER	
9.0-11.0 11.0	///*o*/// ///*o*/// ///*o*/// ///*o*///	10	C C C C	**CLAY**, SANDY, RED BROWN, SOFT, WET, SANDIER THAN ABOVE, SOME FINE GRAVEL, SOME CARBONATE NODULES	
11.0-11.7	ooo**/Soo		C	**GRAVEL**, SANDY, CLAYEY, (SANDSTONE, CHERT), MOIST, RED BROWN, DENSE	
11.7-15.0 15.0	========= ========= ========= ========= ========= ========= ========= =========	15	C C C C C C C C	**CHINLE FORMATION** **SHALE**, RED BROWN TO PURPLE, SOME GREEN REDUCTION SPOTS, DENSE TO HARD, MOIST TO DRY FURTHER DOWN	
TOTAL DEPTH					

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

LOGGED BY: WHK

PRECISION ENGINEERING, INC.
P.O. BOX 422 • LAS CRUCES, NM 88004
Ph: (505) 523-7674
FAX: (505) 523-7248 • E-mail: werpei@aol.com

October 20, 1998

Ms. Dorinda Mancini
Giant Refining Company
Ciniza Refinery
Route 3, Box 7
Gallup, New Mexico 87301

Re: Well Closure Procedures

Dear Ms. Mancini,

As you are aware there a variety of monitoring well installation types at the Ciniza Refinery site. The following summarizes a proposed task scenario for a typical well closure at the Ciniza facility.

Task I: Remove all surface vaults and protective casings.

Task II: Determine if the casing has been grouted into the formation.

A: If the casing has been grouted a determination will be made as to the potential for pulling the casing. If the casing cannot be safely extracted or cannot be extracted with reasonable effort, proceed to Task III.

B: If the casing has not been grouted in place, an attempt to pull the casing will be made. If the casing cannot be pulled, the casing will be split to expose the drilling annulus. The casing will be split to a point just above the screens or perforations.

Task III: Grout tremmie tubing will be placed to the bottom of the well with a packer set just above the screens. A light grout consisting of a fluidized portland cement/montmorillonite clay (bentonite) mix will be injected into the screened zone. The grout mix will be pumped into the well and monitored for pressure and volume. The grout will be injected until the injection volume is equal to 1.5 times the calculated volume of the well and pressures indicate intrusion into the formation. A heavy grout will then be injected into the well until pump pressure stabilizes. Injection will stop, pressure will be allowed to drop, the packer(s) will be removed.

A: If the casing has been grouted in place, the remainder of the casing will then be grouted to the surface with a heavy fluidized portland cement/montmorillonite clay (bentonite) grout.

B: If the casing has not been grouted in place, the remaining annulus will be filled with a light grout as described above followed by a heavy grout when the annulus has stopped taking the light grout.

Task IV: The grout will be allowed to cure twenty four (24) hours. Any shrink back will then be filled with grout to the surface.

Task V: A closeout report will be provided to the client for final filing.

If you have any questions or comments, please call our office.

Sincerely,
Precision Engineering, Inc.

William H. Kingsley, P.E.

'ell Closure Repo

505-523-7674

Well Identification: OW-20

Date of Closure: JANUARY 15, 1999

Water Depth At Closure: 32.10' Below Ground Surface

Length of Casing Extracted: 0 ft Interval: -- to --

Length of Perforated Casing: 0 ft Interval: -- to --

Length of Screen Extracted: 0 ft Interval: -- to --

Well Diameter: 4 in Interval: 0 to 59 (measured)

-- in Interval: -- to --

-- in Interval: -- to --

-- in Interval: -- to --

Gravel or Sand Pack Length: 14 ft Interval: 50 to 64
(reported) -- ft Interval: -- to --

-- ft Interval: -- to --

-- ft Interval: -- to --

Estimated Sand/Gravel Pack Void Ratio: 0.45

Estimated Total Well Volume (Including Sand/Gravel Pack): 21.4 ft³

Volume of Grout: 1) 35.8 ft³ Type: 11#-Portland Type I-II/Bentonite
Bentonite 6%

Interval: >50' to

pth: 59'

2) #3 ortland Type I-II/Bentonite
onite 6%

0 to 59'

epth: 59'

3 --

--

: -- to --

Depth: --

Total Grout Volum -eman: William Kingsley

Notes: Grout shrink back @ 24 hr - 0.5'

GROUT VOLUME FOR OW-2D 1-15-99

ESTIMATE

RST 9" ANNULUS - (DRILLED W 7 5/8" OD HSA)

VOLUME OF ANNULUS:

ASSUME BORING EXTENDED TO 83' & BACKFILLED W/CUTTINGS

TO 64' - CUTTING VOID RATIO ~ 0.65

$$\text{VOLUME } 83-64 = \left[(83-64)(0.65)\right]\left[\frac{\pi\,(9/12)^2}{4}\right] = 5.5\ FT^3$$

VOLUME OF GRAVEL PACK -

$$\text{VOLUME } 64-50 = \left[(64-50)(0.45)\right]\left[\frac{\pi\,(9/12)^2}{4}\right] = 2.8\ FT^3$$

VOLUME TO SURFACE

$$\text{VOLUME } 50-0 = \left[50-0\right]\left[\frac{\pi\,(9/12)^2}{4}\right] = 13.1\ FT^3$$

TOTAL VOLUME = 21.4 FT^3

BORING OW-20

SURFACE ELEVATION: 6961 FEET

DEPTH IN FEET	TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)
0									
10									
20									
30									
40									
50									
60									
70									
80									
90									
100									
110									
120									
130									
140									
150									
160									

LABORATORY TEST DATA

PENETRATION RATE MINUTES/FOOT

PENETRATION RATE MINUTES/FOOT	SYMBOLS	DESCRIPTION
5.0, 1.2	FILL	FILL
1.3, 1.7, 1.5, 1.5, 1.9	CL	TRIASSIC PERIOD CHINLE FORMATION GRAY SILTY, FINE SANDY CLAY, SOFT, HIGHLY WEATHERED GRADES WITH SOME GRAVEL-SIZED FRAGMENTS OF LIMESTONE FROM 29 FEET
3.3, 3.0, 2.7, 4.0, 2.3, 3.4	SHALE	40 FEET: SHALE, REDDISH BROWN, SILTY, WITH SOME FINE SAND, AND OCCASIONAL THIN INTERBEDS OF SANDSTONE AND LIMESTONE, SOFT, FRESH
1.6, 3.2	MS	60 FEET: MUDSTONE, REDDISH BROWN, INTERBEDDED WITH LAMINAE OF WHITE TO LIGHT BROWN SANDSTONE, SOFT, FRESH
6.3, 6.0, 6.3	SS	70 FEET: SANDSTONE, BROWN, COARSE-GRAINED, COMPOSED OF QUARTZ WITH MINOR CHERT, AND LIMESTONE, HARD, FRESH
	SHALE	82 FEET: SHALE, GRAY, SILTY WITH SOME FINE SAND, HARD, FRESH

BORING COMPLETED AT 83.0 FEET ON 12/19/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 54.0 TO 64.0 FEET.
GRAVEL PLACED FROM 50.0 TO 64.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 50.2 FEET BELOW GROUND ON 1/5/81.

FILE COPY

LOG OF BORINGS

DAMES & MOORE

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: CINIZA OW-20
Replacement 1 Continuous Sampling

FILE #: 98-199
ELEVATION: Existing
TOTAL DEPTH: 20.0
LOGGED BY: WHK
DATE: 1-14-99
STATIC WATER:
BORING ID: OW-20R1
PAGE: 1 of 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
0	///**////			**Clay,** very fine sandy, some gravel, wet red-brown.	
	///**////				
1.5	///**////				
1.5	***//****			**Sand,** fine, clayey, moist, red-brown.	
2.7	***//****				
2.7	ooo//oooo			**Gravel,** sandstone, clayey, moist, red-brown.	
3.5	ooo//oooo				
3.5	/////////			**Clay,** weak carbonate nodules, hard, wet, red-brown.	
	/////////				
	/////////	5.0			
5.5	/////////				
5.5	///*//*//			**Clay,** sandy, firm, wet, red-brown.	
	///*//*//				
	///*//*//				
	///*//*//				
	///*//*//				
8.3	///*//*//				
8.3	**o**o**o			**Sand,** coarse, gravelly, dense, moist, light brown.	
	oo**o				
	oo**o	10			
	oo**o				
	oo**o				
	oo**o				
	oo**o				
	oo**o				
	oo**o				
13.5	**o**o**o				
13.5	*o*o*o*o*			**Sand/Gravel,** coarse, water bearing (weak), dark grey.	
14.5	*o*o*o*o*				
14.5	/////////	15		**Clay,** soft, wet, not water bearing, grey/black.	
15.0	*********			**Sand,** fine, loose, water bearing, black.	
15.9	*********				
15.9	///*///*/			**Clay,** slightly sandy, firm, wet not water bearing, red-brown.	
	///*///*/				
	///*///*/				
	///*///*/				
18.8	///*///*/				
18.8	//*//*//*			**Clay,** sandy, soft, saturated, glistening (does not make water),	
	//*//*//*			black mottled.	
20.0	//*//*//*	20			

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 8-5/8- OD HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: CINIZA OW-20
Replacement 2 Continuous Sampling

FILE #:	98-199
ELEVATION:	Existing
TOTAL DEPTH:	335.0
LOGGED BY:	WHK
DATE:	1-15-99
STATIC WATER:	29.0
BORING ID:	OW-20 Rep
PAGE:	1 of 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
0-12.5	*********			**Sand,** coarse, sandstone gravel up to three inches at five feet, medium	No odor
	*********			dense, moist, red-brown.	
	*********				
	*********				
	*********				
	*********				
	*********				
	*********				
	*********				
	*********	5.0			
	*********				
	*********				
	*********				
	*********				
	*********				
	*********				
	*********				
	*********				
	*********				
	*********				
	*********				
	*********			more dense	
	*********	10			
	*********				
	*********				
	*********				
	*********				
12.5	*********				
12.5	////**///			**Clay,** fine sandy, soft to firm, wet (not water bearing), red-brown,	
	////**///			laminar banded.	
	////**///				
	////**///				
	////**///	15			
15.4	////**///				
15.4	//--**--/			**Clay,** very silty, fine sandy, soft, wet, red brown.	
	//--**--/				
17.2	//--**--/				
17.2	*********			**Sand,** fine, loose, brown.	
17.5	*********				
17.5	//**--**/			**Clay,** fine sandy, very slightly silty, soft, wet, red-brown.	
	//**--**/				
	//**--**/				
	//**--**/	20			
	//**--**/				
	//**--**/				
	//**--**/				
	//**--**/				
	//**--**/				
23.2	//**--**/				\\/

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 8-5/8" OD HSA

PROJECT: CINIZA OW-20
Replacement 2 Continuous Sampling

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 98-199
ELEVATION: Existing
TOTAL DEPTH: 35.0
LOGGED BY: WHK
DATE: 1-15-98
STATIC WATER: 29.0
BORING ID: OW-20 rep
PAGE: 2 of 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
23.2	//////////	23		**Clay,** soft, wet, red-brown.	No Odor
	//////////				
24.0	//////////				
24.0	**-**-**-			**Sand,** fine, silty, loose, wet (very weak water bearing?), grey overall	Fetted
25.0	**-**-**-	25		with black bands.	Odor
25.0	*********			**Sand,** fine, silty, loose, **water bearing**, brown/grey.	
	*********				
26.4	*********				
26.4	//-//-//-			**Clay,** silty, soft, wet, not water bearing, some grey/black banding.	
27.5	//-//-//-				
27.5	*********			**Sand,** fine, loose, **water bearing,** grey/black.	
28.0	*********				
28.0	//*//*//*			**Clay,** fine sand, stiff, wet, not water bearing, red-brown/grey,	
28.9	//*//*//*				
28.9	**/**/**/	30		**Sand,** clayey, loose, wet, not water bearing, grey.	
	//**/				
	//**/				
	//**/				
31.9	**/**/**/				
31.9	**o**o**o			**Sand,** gravel (sandstone and chert, some degraded shale), moderately dense,	No Odor
	oo**o			wet, not water bearing, dark grey, 3 inch sandstone layer at 33.2-33.5.	
33.5	**o**o**o				
33.5	---------			**Shale,** some reduction mottling, fine blocky, hard, damp to moist, red-brown.	

35.0	---------	35		[CHINLE FORMATION]	
				WHK	

SIZE AND TYPE OF BORING: 8-5/8 OD HSA

LOGGED BY: WHK

5. of OW 14

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6918.6
TOTAL DEPTH: 50.0
LOGGED BY: WHK
DATE: 3-30-95
STATIC WATER: 28.0
BORING ID: B1
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-1.2	***///***		C	Sand, clayey, damp, brown, soft/loose, some fine gravel	0.0
	///	1.0	C		
1.2-5.0	///**--//		C	Clay, sandy, silty, moist to wet, brown, stiff, some root fibers in upper 3'	0.0
	///**--//		C	no odor	
	///**--//		C		
	///**--//		C		
	///**--//		C		
	///**--//		C		
	///**--//		C		
	///**--//		C		
5.0-8.8	///---///	5.0	C	Clay, silty, moist, brown, hard, scattered root fibers	0.0
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
8.8-9.1	000///000		C	Gravel, fine, clayey, damp, brown, dense, silica gravel to 1/2", no odor	0.0
9.1-10.0	///***///	9.0	C	Clay, sandy, damp, brown, hard, some root matter, no odor	0.0
	///***///		C		
10.0-12.4	/////////	10	C	Clay, blocky, moist to wet, brown, hard, root matter, gradational above and below	0.0
	/////////		C		
	/////////		C		
	/////////		C		
	/////////	12	C		
12.4-16.4	///--**//		C	Clay, silty, sandy, sandier @ 14' but gradational, moist to wet, brown, stiff to	0.0
	///--**//		C	hard, does not appear weathered in-situ, slightly fissured, pieces (2-3 mm) of	
	///--**//		C	clay in sandy matrix, root matter	
	///--**//		C		
	///--**//		C		
	///--**//	15	C		
	///--**//		C		
	///--**//	16	C		
16.4-16.7	*********		C	Sand, fine, moist, red brown, loose	0.0
16.7-17.4	///***///	17	C	Clay, sandy, wet, brown, very stiff	
17.4-22.9	///++////		C	Clay, slightly fissured but not as much as above, some 4" slightly sandy zones	0.0
	///++////		C	some carbonate nodules, wet, dark brown, hard	
	///++////		C		
	///++////		C		
	///++////		C		
	///++////		C		
	///++////		C		
	///++////		C		
	///++////		C		
	///**++//		C	Clay, slightly sandy, some carbonate filaments, occasional individual coarse sand	0.0
22.9-30.0	///**++//		C	grains of silica rock, wet, dark brown, soft, no odor, free water on tip of sample	
	///**++//	23	C	but not in samples	

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6918.6
TOTAL DEPTH: 50.0
LOGGED BY: WHK
DATE: 3-30-95
STATIC WATER: 28.0
BORING ID: B1
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	///**++//		C	continued from page 1	
	///**++//	24	C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
	///**++//		C		
30.0-32.5	***/O****	30	C	Sand, slightly clayey, occasional pebbles, weakly water bearing, brown, very soft/loose	0.0
	/O*		C		
	/O*		C		
	/O*		C		
	/O*	32	C		
32.5-39.5	///---+//		C	Clay, silty, some carbonate filaments and staining, more carbonate filaments below 32', wet, saturated but not water bearing, light brown, soft to firm	0.0
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//		C		
	///---+//	39	C		
39.5-41.1	///000///		C	Clay, gravelly, wet, saturated but not water bearing, light brown, soft	0.0
	///000///		C		
	///000///		C		
	///000///	41	C		
41.1-47.1	***OO****		C	Sand, coarse, fine to medium gravelly, water bearing, brown, dense, subrounded to rounded silica rock, some sandstone pieces	0.0
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		
	OO*		C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4'-1/4" HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6918.6
TOTAL DEPTH: 50.0
LOGGED BY: WHK
DATE: 3-30-95
STATIC WATER: 28.0
BORING ID: B1
PAGE: 3

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	000		C	continued from page 2	
	000	47	C		
47.1-50.0	---------		C	CHINLE FORMATION	
	---------		C	Shale, some green mottling, fissle, moist, hard, slightly blocky, no odor	0.0
	---------		C		
	---------		C		
	---------		C		
	---------	50	C		
TD				end 11:00a -- depth to water @ 12:15p 28.0'	
				grout hole with bentonite/cement/8% grout to surface	
				time end 1:15p -- water depth affected by hole collapse	

SIZE AND TYPE OF BORING: 4'-1/4" HSA

LOGGED BY: WHK

Du w Propane Bullet Tank

X

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6917.6
TOTAL DEPTH: 30.0
LOGGED BY: WHK
DATE: 3-30-95
STATIC WATER: 22.3
BORING ID: B3
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-1.3	///**oo//		C	Clay, sandy, gravelly, wet, brown, soft, no odor	0.0
	///**oo//	1.0	C		
1.3-2.7	///**////		C	Clay, fine sandy, wet, brown to red brown, soft, no odor	0.0
	///**////	2.0	C		
2.7-5.0	/////////		C	Clay, wet, very soft, some root matter	0.0
	/////////	3.0	C		
	/////////		C		
	/////////		C		
	/////////		C		
5.0-8.4	/////////	5.0	C	Clay, wet, dark brown, stiff, no odor, some root matter	0.0
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////	8.0	C		
8.4-10.3	///+++///		C	Clay, carbonate filaments common, some carbonate nodules scattered, wet, stiff	0.0
	///+++///	9.0	C	red brown, no odor	
	///+++///		C		
	///+++///	10	C		
10.3-10.6	///ooo///		C	Clay, gravelly, wet, red brown, stiff, no odor	0.0
10.6-12.9	///**+--/	11	C	Clay, fine sandy, silty, wet, light red brown, firm, no odor, scattered fine	0.0
	///**+--/		C	gravel, some root matter, some carbonate filaments, slightly blocky	
	///**+--/		C		
12.9-14.1	///*+++//		C	Clay, slightly sandy, carbonate filaments abundant, wet, brown, firm, carbonate	0.0
	///*+++//	13	C	filaments stain sample, white CCI2, no odor, root matter abundant	
	///*+++//		C		
14.1-14.4	*********	14	C	Sand, fine, moist, light brown, loose, no odor	0.0
14.4-15.3	//***+--/		C	Clay as at 12.9'-14.1' but slightly more fine sand, no odor	0.0
	//***+--/	15	C		
15.3-16.7	***/*****		C	Sand, fine, slightly clayey, moist to wet, brown, loose, no odor	0.0
	/**	16	C		
16.7-18.3	///**////		C	Clay, fine sandy in laminations, wet, dull brown, soft, root matter common, no odor	0.0
	///**////	17	C		
	///**////		C		
	///**////	18	C		
18.3-18.9	/////////		C	Clay, blocky, slabby, wet, dull brown, firm, no odor	0.0
18.9-20.0	///***///	19	C	Clay, very sandy, wet, brown, soft	0.0
	///***///		C		
20.0-24.4	***ooo***	20	C	Sand, very gravelly, rounded to subrounded silica rock, some sandstone white, some	5 (upper 6")
	ooo		C	odor in upper 5", stained black to dark grey, water bearing, dense, multicolored	
	ooo		C	red brown matrix	
	ooo		C		
	ooo		C		
	ooo		C		
	ooo		C		

SIZE AND TYPE OF BORING: 4'-1/4" HSA

LOGGED BY: WHK

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Tank 569
LOCATION: See Boring Plan

FILE #: 95-018
ELEVATION: 6917.6
TOTAL DEPTH: 30.0
LOGGED BY: WHK
DATE: 3-30-95
STATIC WATER: 22.3
BORING ID: B3
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
	000		C		
	000	24	C		
24.4-25.0	---***---		C	CHINLE FORMATION	
	---***---	25	C	Shale, very sandy, weathered, grey, green, no odor, hard	0.0
25.0-30.0	---**----		C	Shale, sandy, fissle, some green grey streaks, moist, hard	0.0
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----		C		
	---**----	30	C		
TD				stop drilling @ 4:05p	
				water @ 4:20p -- 22.3'	
				grout to surface with bentonite/cement	

SIZE AND TYPE OF BORING: 4'-1/4" HSA

LOGGED BY: WHK

PROJECT: Giant Refinery
Ciniza

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6920.1
TOTAL DEPTH: 50.0
LOGGED BY: WHK
DATE: 8/22/96
STATIC WATER: 31.4
BORING ID: 0643
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-1.0	//////////		C	CLAY, LOOSE, DRY, SOFT, RED BROWN	
	//////////		C		
1.0-1.6	***///***		C	SAND, CLAYEY, DARK BROWN, MOIST, SOFT, APPEARS CONTAMINATED	
1.6-6.3	//////////		C	CLAY, RED BROWN, FIRM, SOME ROOT MATTER, MOIST	
	//////////		C		
	//////////		C		
	//////////		C		
	//////////		C		
	//////////		C		
	//////////		C		
	//////////	5.0	C		
	//////////		C		
	//////////		C		
	//////////		C		
6.3-8.5	///***///		C	CLAY, SANDY, VERY FINE, MOIST, FIRM, RED BROWN, SOME ROOT MATTER	
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
8.5-12.3	//////////		C	CLAY, FIRM, RED BROWN, MOIST	
	//////////		C		
	//////////	10	C		
	//////////		C		
	//////////		C		
	//////////		C		
	//////////		C		
	//////////		C		
12.3-12.5	///**-///		C	CLAY, SANDY, SILTY, GRADES TO SILT @ 12.5	
12.5-13.3	---------		C	SILT, DRY, FIRM, MOIST, LIGHT BROWN	
13.3-13.5	///---///		C	CLAY, SILTY	
13.5-13.75	*********		C	SAND, LOOSE, DRY, FINE, BROWN	
13.75-15.8	////*////		C	CLAY, WEAKLY SANDY, BROWN, STIFF, MOIST	
	////*////	15	C		
	////*////		C		
15.8-16.7	///***///		C	CLAY, VERY SANDY (COARSE), WET (NOT WATER BEARING), FIRM, RED BROWN	
	///***///		C		
16.7-17.75	///---///		C	CLAY, SILTY, STIFF, MOIST, RED BROWN	
	///---///		C		
17.75-21.8	//////////		C	CLAY, WET, RED BROWN, STIFF, SOME ROOT MATTER	
	//////////		C		
	//////////		C		
	//////////		C		
	//////////		C		
	//////////	20	C		
	//////////		C		
	//////////		C		
	//////////		C		
21.8-25.3	///***///		C	CLAY, FINE SANDY, WET, HYDROCARBON ODOR, GREY BROWN, SOME BLACK MOTTLING, NOT WATER BEARING, SOFT	
	///***///		C		
	///***///		C		22'-20 ppm

SIZE AND TYPE OF BORING: 4 1/4" ID Hollow Stemmed Auger

LOGGED BY: WHK

PROJECT: Giant Refinery
Ciniza

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6920.1
TOTAL DEPTH: 50.0
LOGGED BY: WHK
DATE: 8-22-96
STATIC WATER: 31.4
BORING ID: 0643
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
21.8-25.3	///***/// ///***/// ///***/// ///***/// ///***///	25	C C C C C	**CLAY**, FINE SANDY, WET, HYDROCARBON ODOR, GREY BROWN, SOME DARK MOTTLING, NOT WATER BEARING, SOFT	22'-20 ppm 24'-29 ppm
25.3-27.0	****/**** ****/**** ****/**** ****/****		C C C C	**SAND**, LOOSE, VERY WET, VERY WEAKLY FLUID BEARING, HYDROCARBON SHEEN, GREY BROWN, CLAYEY	26'-34ppm
27.0-28.1	****/**** ****/****		C C	AS ABOVE BUT RED BROWN, LESS ODOR	
28.1-29.5	///**//// ///**//// ///**////		C C C	**CLAY**, SLIGHTLY SANDY, SOFT, WET, NOT WATER BEARING	28'-48ppm
29.5-31.4	***///*** ***///*** ***///***	30	C C C	**SAND**, CLAYEY, SOFT, WET, NOT WATER BEARING, CANNOT DETECT ODOR, VERY WEAK WATER BEARING	30'-0ppm
31.4-34.8	///***/// ///***/// ///***/// ///***/// ///***/// ///***/// ///***///		C C C C C C C	**CLAY**, SANDY, FINE, SOFT, WET (NOT WATER BEARING), VERY WEAKLY SANDY > 33.0'	32'-0ppm 34'-0ppm
34.8-36.1	***--**** ***--**** ***--****	35	C C C	**SAND**, BROWN, SILTY, GRAVELLY (1"), MOIST, NO ODOR, MODERATELY DENSE **WATER BEARING** 35.0-36.1, NO ODOR	
36.1-41.2	///////// ///////// ///////// ///////// ///////// ///////// ///////// ///////// ///////// /////////	40	C C C C C C C C C C	**CLAY**, LIGHT BROWN, CARBONATE SALTS APPEAR AS WEB-LIKE FILIMENTS, SOME ROOT MATTER, STIFF	36'-0ppm 38'-0ppm 40'-0ppm
41.2-42.7	000000000 000000000 000000000		C C C	**GRAVEL (2")**, CHERT, SANDSTONE, PETRIFIED WOOD, **WATER BEARING**, MULTICOLORED	
42.7-48.0	========= ========= ========= ========= ========= ========= =========	45	C C C C C C C	**SHALE**, RED, DRY/MOIST/WET, DENSE **CHINLE FORMATION**	42'-20ppm 44'-30ppm

SIZE AND TYPE OF BORING: 4 1/4"ID Hollow Stemmed Auger

LOGGED BY: WHK

PROJECT: Giant Refinery
Ciniza

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6920.1
TOTAL DEPTH: 50.0
LOGGED BY: WHK
DATE: 8-22-96
STATIC WATER: 31.4
BORING ID: 0643
PAGE: 3

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
42.7-48.0	=========		C	**SHALE**, RED, DRY/MOIST/WET, DENSE	
	=========		C	**CHINLE FORMATION**	
	=========		C		46'-10ppm
	=========		C		
	=========		C		
48.0-50.0	=========		C	**SHALE**, DARK RED TO PURPLE RED, DRY, DENSE	
	=========		C		48'-0ppm
	=========		C		
	=========	50	C		
TOTAL DEPTH					50'-0ppm
		55			
		60			
		65			

SIZE AND TYPE OF BORING: 4 1/4" ID Hollow Stemmed Auger

LOGGED BY: WHK

PROJECT: Giant Refinery Ciniza

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6917.6
TOTAL DEPTH: 36.5
LOGGED BY: WHK
DATE: 9-4-96
STATIC WATER: 19' @ 27 HRS
BORING ID: 0648
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
0.0-6.2 ... 6.2	///--////	5.0	C C C C C C C C C C C C C	**CLAY**, SLIGHTLY SILTY, ROOT MATTER, RED, BROWN, STIFF, MOIST	PID-0ppm ALL SAMPLES
6.2-7.1 ... 7.1	***///***		C C	**SAND**, CLAYEY, GRADATIONALLY CONTACTS TOP, LOOSE, DRY, RED BROWN	
7.1-8.3 ... 8.3	///---///		C C C	**CLAY**, VERY SILTY, LAMINAR SILT, DRY-DAMP, FIRM, RED BROWN	
8.3-12.3 ... 12.3	---///---	10	C C C C C C C C	**SILT**, CLAYEY, LAMINAR, DAMP-DRY, LIGHT BROWN, FIRM, ROOT MATTER	
12.3-12.8	***---***		C	**SAND**, SILTY, FINE, LOOSE, DRY, RED BROWN	
12.8-14.3 ... 14.3	///---///		C C C	**CLAY**, SILTY, STIFF, DAMP, ROOT MATTER, RED BROWN, SILT LAMINAR	
14.3-16.5 ... 16.5	***00****	15	C C C C	**SAND**, FINE, SCATTERED GRAVEL TO 2", SILTY, RED BROWN, MODERATELY DENSE, DRY-DAMP	
16.5-21.5 ... 21.5	***SS****	20	C C C C C C C C C C	**SAND**, COARSE-FINE, WET, SOME SANDSTONE GRAVEL TO 3", RED BROWN, SOME CLAY @ 19.5-20.0, WATER BEARING @ 20.0	
21.5-25.0	/////////		C C C	LOST SAMPLE-POSSIBLE SOFT, WET, CLAY BASED ON LEFTOVERS IN SAMPLER	

SIZE AND TYPE OF BORING: 4 1/4" ID Hollow Stemmed Auger

LOGGED BY: WHK

PROJECT: Giant Refinery Ciniza

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6917.6
TOTAL DEPTH: 36.5
LOGGED BY: WHK
DATE: 9-4-96
STATIC WATER: 19.0 @ 27 HRS
BORING ID: 0648
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
21.5-25.0 / 25.0	/////////	25	C C C C	LOST SAMPLE-POSSOBLE SOFT, WET, CLAY BASED ON LEFTOVERS IN SAMPLER	PID-0ppm ALL SAMPLES
25.0-28.0 / 28.0	/////////		C C C C C C	**CLAY**, WET, SOFT, RED BROWN	
28.0-30.0 / 30.0	*0*SS*0*0	30	C C C C	**SAND & GRAVEL**, 4" SANDSTONE, CHERT, **WATER BEARING**, **HYDROCARBON ODOR**, LOOSE, MULTICOLORED	
30.0-32.0 / 32.0	S=S=S=S=S		C C C C	**CHINLE FORMATION** SAMPLER REFUSAL-POSSIBLE "SWEET" ODOR, SANDSTONE & SHALE > 30', NO ODOR, DRILL WITHOUT SAMPLER TO 35', MATRIX > 30' GREYGREEN, CEMENTED VERY DENSE ROCK @ 32' DIVE SAMPLER 3"-STUCK IN ROCK	
32.0-36.5 / 36.5	S=S=S=S=S	35	C C C C C C C C C	**SANDSTONE & SHALE**, HARD, CALCARIOUS CEMENTATION, FINE TO COARSE, SHALE, GREEN-RED B	
TOTAL DEPTH		40 45		NOTE: HYDROCARBON ODOR APPEARS TO BE CONCETRATED IN WATER LYING ON CHINLE FORMATION	

SIZE AND TYPE OF BORING: 4 1/4" ID Hollow Stemmed Auger

LOGGED BY: WHK

PROJECT: Giant Refinery
Ciniza

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6913.4
TOTAL DEPTH: 30.0
LOGGED BY: WHK
DATE: 9-4-96
STATIC WATER: 20.0
BORING ID: 0649
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-3.1 / 3.1	///--////		C	**CLAY**, DAMP, MOIST, RED BROWN, STIFF, SLIGHTLY SILTY, ROOT MATTER	PID-0ppm ALL SAMPLES
3.1-4.0 / 4.0	***///***		C	**SAND**, CLAYEY, RED BROWN, MODERATELY DENSE, DRY-DAMP	
4.0-5.0	///---///	5.0	C	**CLAY**, MOIST, RED BROWN, STIFF, SILTY, ROOT MATTER	
5.0-6.0 / 6.0	***///***		C	**SAND**, CLAYEY, RED BROWN, SOME COARSE, MODERATELY DENSE, DAMP	
6.0-6.9 / 6.9	///***///		C	**CLAY**, SANDY, RED BROWN, VERY STIFF, MOIST	
6.9-8.5 / 8.5	///--*///		C	**CLAY**, SLIGHTLY SILTY, WEAKLY SANDY, SOME CHARCOAL, SOME ROOT MATTER, RED BROWN, STIFF	
8.5-8.9	*********		C	**SAND**, MEDIUM, RED BROWN, MODERATELY DENSE, DAMP	
8.9-17.0 / 17.0	///**////	10, 15	C	**CLAY**, SLIGHTLY SANDY, RED BROWN, VERY STIFF, MOIST, SOME SCATTERED GRAVEL	
17.0-17.3	***//****		C	**SAND**, RED BROWN, FINE, MOIST, SLIGHTLY CLAYEY, LOOSE	
17.3-23.2	///00////	20	C	**CLAY**, WET, RED BROWN, STIFF, SCATTERED FINE GRAVEL (RARE), SOME WHITE FILIMENTS OF CALCIUM CARBONATE SALTS	

SIZE AND TYPE OF BORING: 4 1/4" ID Hollow Stemmed Auger

LOGGED BY: WHK

PROJECT: Giant Refinery
Ciniza

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6913.4
TOTAL DEPTH: 30.0
LOGGED BY: WHK
DATE: 9-4-96
STATIC WATER: 20.0
BORING ID: 0649
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
23.2-25.0	000***/00 000***/00 000***/00 000***/00	25	C C C C	**GRAVEL**, SANDY, CHERT, SANDSTONE, SLIGHTLY CLAYEY, RED BROWN, DENSE, **WATER BEARING**	PID-0ppm ALL SAMPLES
25.0-30.0	===***=== ===***=== ===***=== ===***=== ===***=== ===***=== ===***=== ===***=== ===***=== ===***=== ===***===	30	C C C C C C C C C C C	**CHINLE FORMATION** **SHALE**, SANDY, RED BROWN/GREEN INTERBEDS, DENSE, MOIST, NOT WATER BEARING	
30.0 TOTAL DEPTH		35 40 45			

SIZE AND TYPE OF BORING: 4 1/4" ID Hollow Stemmed Auger

LOGGED BY: WHK

PRECISION ENGINEERING, INC.

LOCATION: SEE SITE PLAN

LOG OF TEST BORINGS

FILE #: 97 032
ELEVATION: 6901.38
TOTAL DEPTH: 30 '
LOGGED BY: WHK
DATE: 3-23-97
STATIC WATER: NOT FOUND
BORING ID: MP-4
PAGE: 1

DEPTH	PILOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
0.0-17.1			C	CLAY, SOFT IN UPPER 2 FEET THEN STIFF, WET, RED BROWN, SOME ROOT MATTER AND	ALL SAMPLES
			C	SLICKENSIDED JOINTING	0
			C		
			C		
			C		
			C		
			C		
			C		
			C		
		5.0	C		
			C		
			C		
			C		
			C		
			C		
			C		
			C		
			C		
			C		
		10	C	HARD GREATER THAN 10.0'	
			C		
			C		
			C		
			C		
			C		
			C		
			C		
			C		
			C		
		15	C		
			C		
			C		
			C		
17.1			C		
17.1-18.5			C	SILT, GREY BROWN, MODERATELY DENSE, CLAYEY, LAMINATED, DAMP	
			C		
18.5			C		
18.5-21.5			C	SAND, CLAYEY, MOIST, MODERATELY DENSE, LIGHT RED BROWN, (Qe)	
			C		
		20	C	MORE CLAY GREATER THAN 20.0 FEET	
			C		
			C		
			C		
			C		
			C		
			C		

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

LOGGED BY: WHK

LOCATION: SEE SITE PLAN

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #	97-032
ELEVATION	6901.38
TOTAL DEPTH	30.0'
LOGGED BY	WHK
DATE:	3-23-97
STATIC WATER:	NOT FOUND
BORING ID	MP-4
PAGE:	2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
23.2	///oo////		C	CLAY, GREY, SOME PEBBLES, MOIST-WET, VERY STIFF	ALL SAMPLES
23.2-30.0	===***===		C	CHINLE FORMATION	0
	===***===		C	SHALE, SANDY, FISSLE, RED AND GREY WHERE SANDIER, HARD, MOSTLY RED SHALE, DAMP-DRY	
	===***===	25	C		
	===***===		C		
	===***===		C		
	===***===		C		
	===***===		C		
	===***===		C		
	===***===		C		
	===***===		C		
	===***===		C		
	===***===		C		
30.0	===***===	30	C		
TOTAL DEPTH					
		35			
		40			
		45			

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

LOGGED BY: WHK

Sheet: 1 of 2

Bore Point: TWO

Water Elev: 25.2'

Boring No.: MP-9

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

File #: 96-054

Site: CINIZA REFINERY GALLUP, NM

Elevation: 6916.0

Date: 4-3-96

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	%M	L	PI	CLASS.
	0.0-17.3			2.5, 5.0, 7.5, 10, 15	C	CLAY, DARK RED BROWN, HARD, MOIST, SLIGHTLY SILTY; SLIGHTLY SANDY @ 10.0'				
	17.3-20.2			20	C	CLAY, DARK RED BROWN, FIRM, WET (NOT WATER BEARING), SOME PEBBLES TO ~ 1" PRESENT, PEBBLES ARE MAINLY SANDSTONE				
	20.2-21.8				C	CLAY, VERY SANDY, WET/SATURATED, SOME FREE WATER ON SAMPLE, VERY WEAK THOUGH SOFT, BROWN				
	21.8-22.5				C	SAND, SOFT, VERY CLAYEY, SOME FREE WATER, (WEAK), BROWN				

Size & Type of Boring: 4-1/4" ID Hollow Stemmed Auger

Logged By: WHK

Sheet: 2 OF 2

Bore Point: TWO

Water Elev: 25.2'

Boring No.: MP-9

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

File #: 96-054

Site: CINIZA REFINERY GALLUP, NM

Elevation: 6916.0

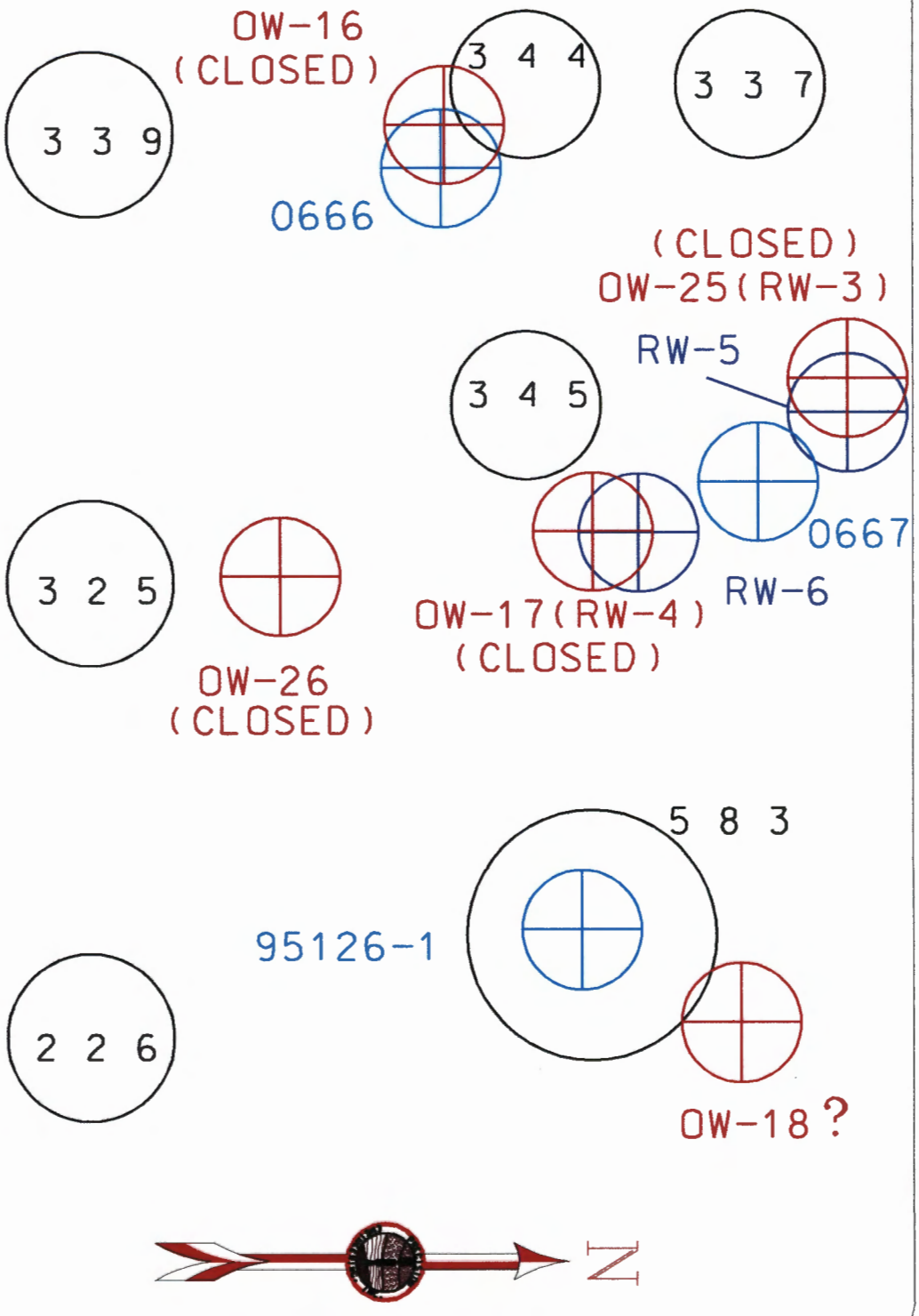
Date: 4-3-96

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	%M	L	PI	CLASS
	22.5-25.2		///**/ ///**/ ///**/ ///**/	25	C C C C	CLAY, BROWN, FIRM, WET (NOT WATER BEARING), WHITE FILIMENTS, CALCAREOUS OR SULFATE, SOME VERY THIN SANDS THAT ARE NOT WATER BEARING				
	25.2-25.8		****** ******		C C	SAND, FINE, WATER BEARING, BROWN, SOFT				
	25.8-26.7		//////		C	CLAY, WET, FIRM, BROWN				
	26.7-28.3		****** ****** ******		C C C	SAND, FINE TO MEDIUM, WATER BEARING, (POOR), LOOSE TO MEDIUM DENSE, BROWN				
	28.3-30.0		////// ////// ////// //////	30	C C C C	CLAY, BROWN, FIRM, WET, (NOT WATER BEARING)				
	30.0-30.9		***//* ***//*		C C	SAND, FINE, MEDIUM, CLAYEY, BROWN, WATER BEARING				
	30.9-31.2		000000 000000		C C	GRAVEL, TO 4", WATER BEARING, BROWN, DENSE, MAINLY SANDSTONE GRAVEL				
	31.2-33.3		SSS**S SSS**S SSS**S		C C C	CHINLE FORMATION SHALE, GREEN BROWN, SANDY, SOME RED BROWN PARTINGS, WET, DENSE				
	TD			35	C C C C C					
				40	C C C C C C C C C C					
				45	C C C C C C C C C C C C					

Size & Type of Boring: 4-1/4" ID Hollow Stemmed Auger

Logged By: WHK

OW-17(RW-4) Vicinity Map



PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

LOCATION: SEE SITE PLAN
CINIZA REFINERY

FILE #: 97-070
ELEVATION: 6938.2
TOTAL DEPTH: 20.0'
LOGGED BY: WHK
DATE: 6-17-97
STATIC WATER: NOT FOUND
BORING ID: 0666
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-2.5	///***///		C	CLAY, SANDY, MOIST, SOFT, ~~LIGHT RED~~ BROWN	~~0.0-13.2~~ ~~NO ODOR~~
	///***///		C		
	///***///		C		
	///***///		C		
2.5	///***///		C		
2.5-3.8	****--***		C	SAND, FINE, SILTY, NO PLASTICITY, MOIST, LOOSE, RED BROWN	
	****--***		C		
3.8	****--***		C		
3.8-6.3	*********		C	SAND, MEDIUM, MULTICOLORED RED BROWN, LOOSE, MOIST	
	*********	5.0	C		
	*********		C		
	*********		C		
6.3	*********		C		
6.3-6.9	///--**//		C	CLAY, SILTY, SANDY, RED BROWN, FIRM, WET	
6.9-8.0	****oo***		C	SAND, COARSE, GRAVELLY, LOOSE, MOIST, RED BROWN	
8.0	****oo***		C		
8.0-9.6	//////////		C	CLAY, STIFF, CARBONATE FILAMENTS AS CRACK FILLING, RED BROWN, WET	
	//////////		C		
9.6	//////////		C		
9.6-10.0	****oo***	10	C	SAND, COARSE, GRAVELLY, RED BROWN, MOIST, LOOSE, MEDIUM DENSE	
10.0-13.2	////**///		C	CLAY, FINE, SANDY, RED BROWN, SOFT, WET	
	////**///		C		
	////**///		C		
	////**///		C		
	////**///		C		
13.2	////**///		C		
13.2-13.4	*********		C	SAND, FINE, RED BROWN, LOOSE, MOIST	~~13.2-14.8~~
13.4-14.3	////**///		C	CLAY, FINE, SANDY, RED BROWN, SOFT, WET	~~WEAK ODOR~~
14.3	////**///		C		
14.3-14.6	*********	15	C	SAND, FINE, RED BROWN, MOIST, LOOSE	~~14.8-20.0~~
14.6-14.8	///***///		C	CLAY, SANDY, BROWN, WET, NOT WATER BEARING, SOFT	~~NO ODOR~~
14.8-15.4	//////////		C	CLAY, RED BROWN, WET, STIFF, (POSSIBLE WEATHERED SHALE)	
15.4-20.0	=========		C	~~CHINLE FORMATION~~	
	=========		C	SHALE, RED, DAMP TO DRY, FISSLE, HARD, CRUMBLY	
	=========		C		
	=========		C		
	=========		C		
	=========		C		
	=========		C		
20.0	=========	20	C		
TOTAL DEPTH					

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

LOCATION: SEE SITE PLAN
CINIZA REFINERY

FILE #: 97-070
ELEVATION: 6938.6
TOTAL DEPTH: 35.0'
LOGGED BY: WHK
DATE: 6-17-97
STATIC WATER: NOT FOUND
BORING ID: 0667
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-2.0	///**--//		C	CLAY, FINE, SANDY, SILTY, WET, BROWN	0.0-29.5 NO ODOR
	///**--//		C		
	///**--//		C		
2.0	///**--//		C		
2.0-4.2	***ooo***		C	SAND, GRAVELLY, FINE, BROWN, MOIST, LOOSE	
	ooo		C		
	ooo		C		
4.2	***ooo***		C		
4.2-5.0	///***///		C	CLAY, SANDY, SOME CARBONATE NODULES AND FILAMENTS, STIFF, MOIST TO WET, BROWN	
5.0	///***///	5.0	C		
5.0-7.8	*********		C	SAND, FINE TO MEDIUM, BROWN, MOIST TO DAMP, LOOSE	
	*********		C		
	*********		C		
	*********		C		
	*********		C		
7.8	*********		C		
7.8-9.0	///--**//		C	CLAY, SILTY, FINE, SANDY, MOIST TO WET, BROWN, STIFF	
9.0	///--**//		C		
9.0-9.2	ooo***ooo		C	GRAVEL, SANDY, BROWN, DAMP, LOOSE	
9.2-12.0	////**///	10	C	CLAY, VERY FINE, SANDY, MOIST TO WET, SOFT, RED BROWN	
	////**///		C		
	////**///		C		
	////**///		C		
12.0	////**///		C		
12.0-14.5	///---///		C	CLAY, SILTY, WET, BROWN, SOFT	
	///---///		C		
	///---///		C		
	///---///		C		
14.5	///---///		C		
14.5-18.1	*********	15	C	SAND, VERY FINE, BROWN, MODERATELY DENSE, MOIST	
	*********		C		
	*********		C		
	*********		C		
	*********		C		
	*********		C		
18.1	*********		C		
18.1-19.0	///***///		C	CLAY, SANDY, SOFT, BROWN, WET	
19.0	///***///		C		
19.0-20.4	***ooo***		C	SAND, GRAVELLY, BROWN-MULTICOLOR, DENSE, MOIST	
	ooo	20	C		
20.4	***ooo***		C		
20.4-23.0	////**///		C	CLAY, SLIGHTLY VERY FINE, SANDY, SOFT, RED BROWN, WET, WATER ON SURFACE OF SAMPLE	
	////**///		C	22.8'-23.0', DOES NOT APPEAR WATER BEARING	
	////**///		C		
	////**///		C		
	////**///		C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

LOCATION: SEE SITE PLAN
CINIZA REFINERY

FILE #: 97-070
ELEVATION: 6938.6
TOTAL DEPTH: 35.0'
LOGGED BY: WHK
DATE: 6-17-97
STATIC WATER: NOT FOUND
BORING ID: 0667
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
23.0-29.5	//////////		C	CLAY, SANDY, LAMINAR, STIFF, WET, RED BROWN, GRADES SANDIER FURTHER DOWN	0.0-29.5 NO ODOR
	//////////		C		
	//////////		C		
	//////////	25	C		
	////*////		C		
	////*////		C		
	////**///		C		
	////**///		C		
	///***///		C		
	///***///		C		
	///***///		C		
	///***///		C		
29.5	///***///		C		
29.5-32.8	*********	30	C	SAND, COARSE, DARK GREY, MOIST, MEDIUM DENSE, WATER BEARING, VERY GRAVELLY AT 31.0' FREE HYDROCARBON AND WATER ON TOP OF SHALE	WEAK HYDROCARBON ODOR
	*********		C		
	*********		C		
	*********		C		
	*********		C		
	*********		C		
32.8	*********		C		STRONG
32.8-35.0	=========		C	CHINLE FORMATION	NO ODOR
	=========		C	SHALE, HARD, DRY TO DAMP, RED BROWN, CRUMBLY (WITH DIFFICULTY), REDUCTION SPOTS	
	=========		C		
35.0	=========	35	C		
TOTAL DEPTH					

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 4 1/4" ID CONTINUOUS FLIGHT HSA

PRECISION ENGINEERING, INC.

PROJECT: CINIZA REFINERY

LOG OF TEST BORINGS

FILE #: 97-070
ELEVATION: 6942.5
TOTAL DEPTH: 40.0 FEET
LOGGED BY: WHX
DATE: 8/27/97
STATIC WATER: 31.0 FEET
BORING ID: RW-5
PAGE: 1 OF 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
0.0-3.8	***-/-***		C	SAND, SILTY, CLAYEY, SOME PEBBLES, WET, NO ODOR, RED-BROWN, FILL LOOSE	
	-/-		C		
	-/-		C		
	-/-		C		
	-/-		C		
	-/-		C		
	-/-		C		
3.8	***-/-***		C		
3.8-8.9	***///***		C	SAND, CLAYEY, WET, DENSE, RED-BROWN, SOME FINE GRAVEL	
	///	5.0	C		
	///		C		
	///		C		
	///		C		
	///		C		
	///		C		
	///		C		
8.5	***///***		C		
8.5-8.9	/////////		C	CLAY, WET, STIFF, RED-BROWN	
8.9-9.7	///***///		C	CLAY, VERY FINE SANDY, STIFF, RED-BROWN, WET, LAMINAR BANDING	
9.7-9.8	*********	10	C	SAND, FINE, WHITE, MOIST, LOOSE	
9.8-10.0	///***///		C	CLAY, VERY FINE SANDY, STIFF, RED-BROWN, WET, LAMINAR BANDING	
10.0-13.8	/////////		C	CLAY, SOFT, BROWN TO RED-BROWN, FINE, BLOCKY, VERY WET, LAMINAR BANDING	
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
13.8	/////////		C		
13.8-14.5	///***///		C	CLAY, VERY FINE SANDY, RED-BROWN, MODERATELY DENSE, WET/MOIST	
14.5-14.6	**********	15	C	SAND, VERY FINE, MOIST, LOOSE, WHITE TO LIGHT BROWN, LAMINAR BANDING	
14.6-16.5	////**///		C	CLAY, WET, SOFT, SLIGHTLY FINE SANDY, NO STRUCTURE	
	////**///		C		
16.5	////**///		C		
16.5-18.0	***-/-***		C	SAND, SILTY, CLAYEY, LAMINAR BANDING, MEDIUM DENSE, MOIST	
	-/-		C		
18.0	***-/-***		C		
18.0-20.0	***//oo**		C	SAND, CLAYEY, GRAVELLY, VERY DENSE, MOIST, VERY COMPACT, MEDIUM SAND, RED-BROWN,	
	***//oo**		C	SOME 1-2" GRAVEL	
	***//oo**		C		
20.0	***//oo**	20	C		
20.0-21.5	///--*///		C	CLAY, VERY SILTY, SANDY (VERY FINE), WET, SOFT, SLIGHTLYBLOCKY, BROWN	
	///--*///		C		
21.5	///--*///		C		
21.5-22.9	///***///		C	CLAY, VERY FINE, SANDY, WET, SHOWS FREE WATER IF WORKED, LAMINAR BANDING	
	///***///		C		
22.9	///***///		C		

LOGGED BY: WHX

SIZE AND TYPE OF BORING: 9 1/4" O.D. H.S.A.

PRECISION ENGINEERING, INC.

PROJECT: CINIZA REFINERY

LOG OF TEST BORINGS

FILE #:	97-070
ELEVATION:	6942.5
TOTAL DEPTH:	40.0 FEET
LOGGED BY:	WHK
DATE:	8/27/97
STATIC WATER:	31.0 FEET
BORING ID:	RW-5
PAGE:	2 OF 3

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
22.9-24.1	///**////		C	CLAY, VERY FINE, SANDY, AS ABOVE BUT LESS MOISTURE	
24.1	///**////		C		
24.1-25.0	000//*000		C	GRAVEL, CLAYEY, WET/MOIST. SOME GREATER THAN 3" SANDSTONE PIECES	
25.0	000//*000	25	C		
25.0-28.0	////*////		C	CLAY, SLIGHTLY FINE SANDY, WET, LAMINAR BANDING, BROWN TO RED-BROWN, STIFF	
	////*////		C		
	////*////		C		
	////*////		C		
	////*////		C		
28.0	////*////		C		
28.0-28.6	**********		C	SAND, FINE, DENSE, MOIST, VERY STRONG HYDROCARBON ODOR, LIGHT BROWN, SOME PEBBLES	
28.6-30.0	***SHSH**		C	SANDSTONE, SHALEY, HYDROCARBON ODOR, HARD, FRACTURED, LIGHT GREEN TO WHITE,	
	***SHSH**		C	ARGILLACEOUS	
30.0	***SHSH**	30	C		
30.0-31.0	***SHSH**		C	SANDSTONE AND SHALE PIECES, HYDROCARBON ODOR, HARD, WHITE/GREEN MOTTLED	
31.0	***SHSH**		C		
31.0-34.0	000000000		C	GRAVEL, FINE, VERY WET, WATER BEARING, DENSE	
	000000000		C		
	000000000		C		
	000000000		C		
	000000000		C		
34.0	000000000		C		
34.0-40.0	SHSH**SHS		C	SHALE, SANDY, HARD, FISSLE, GREY/RED, DRY, NO ODOR	
	SHSH**SHS	35	C		
	SHSH**SHS		C		
	SHSH**SHS		C		
	SHSH**SHS		C		
	SHSH**SHS		C		
	SHSH**SHS		C		
	SHSH**SHS		C		
	SHSH**SHS		C		
	SHSH**SHS		C		
	SHSH**SHS		C		
40.0	SHSH**SHS	40	C		
TD					

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 9 1/4" O.D. H.S.A.

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Cinizza Refinery

FILE #:	97-070
ELEVATION:	6972.6
TOTAL DEPTH:	38.5 FEET
LOGGED BY:	WHK
DATE:	8/27/97
STATIC WATER:	31.5 FEET
BORING ID:	RW-6
PAGE:	1 OF 2

DEPTH	PLOT	SAMPLE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	FID (ppm)
0-5.0	/oo/o/oo/		C	Gravel, fine, clayey, moderatly dense, moist, red-brown, some pieces to 2".	
	/oo/o/oo/		C		
	/oo/o/oo/		C		
	/oo/o/oo/		C		
	/oo/o/oo/		C		
	/oo/o/oo/		C		
	/oo/o/oo/		C		
	/oo/o/oo/		C		
	/oo/o/oo/		C		
5.0	/oo/o/oo/	5.0	C		
5.0-8.0	//-*-*///		C	Clay, silty, very fine sand, red-brown, soft, wet, laminar banding.	
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		
8.0	//-*-*///	8.0	C		
8.0-9.0	*********		C	Sand, fine, red-brown, moist, loose.	
9.0	*********		C		
9.0-12.5	*********		C	Sand, fine, red-brown, laminar banding, moist, some medium, mostly fine, medium dense.	
	*********	10	C		
	*********		C		
	*********		C		
	*********		C		
	*********	12	C		
12.5	*********		C		
12.5-13.5	/////////		C	Clay, wet, brown, laminar banding, fine blocky blocky, soft.	
13.5	/////////		C		
13.5-15.0	/***/***/		C	Sand, fine, clayey, moist, medium dense, red-brown, laminar banding.	
	/***/***/		C		
15.0	/***/***/	15	C		
15.0-17.0	/////////		C	Clay, very fine sandy, silty, wet, soft, red-brown, laminated.	
	/////////		C		
	/////////		C		
17.0	/////////		C		
17.0-17.4	*********		C	Sand, medium, loose, light brown, moist.	
17.4-23.0	//-*-*///		C	Clay, very fine sandy, silty, wet, soft, red-brown, laminated, some thin cleaner sand.	
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///	20	C		
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 9 1/4" O.D. H.S.A.

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Cinaza Refinery

FILE #: 97-070
ELEVATION: 6972.6
TOTAL DEPTH: 38.5 FEET
LOGGED BY: WHK
DATE: 8/27/97
STATIC WATER: 31.5 FEET
BORING ID: EW-6
PAGE: 2 OF 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
17.4-23.0	//-*-*///		C	Clay, very fine sandy, silty, wet, soft, red-brown, laminated, some	
	//-*-*///		C	thin cleaner sand.	
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		
23.0	//-*-*///		C		
23.0-23.5	**/***/**		C	Sand, coarse, clayey, dense, red-brown, moist.	
23.5-31.5	**/*//*/*		C	Sand, clayey, fine, wet, red-brown, laminar banding, moderately dense.	
	**/*//*/*		C		
	**/*//*/*	25	C		
	**/*//*/*		C		
	**/*//*/*		C		
	**/*//*/*		C		
	**/*//*/*		C		
	**/*//*/*		C		
	**/*//*/*		C		
	**/*//*/*		C		
	**/*//*/*		C		
	**/*//*/*		C		
	**/*//*/*		C		
	**/*//*/*		C		
	**/*//*/*	30	C		
	**/*//*/*		C		
	**/*//*/*		C		
31.5	**/*//*/*		C		
31.5-33.5	**O**O***		C	Sand, gravelly, strong hydrocarbon odor, water bearing, grey-brown, dense.	
	OO***		C		
	OO***		C		
33.5	**O**O***		C		
33.5-38.5	ShShShSh		C	Shale, green-grey, sandy, hard, dry, no odor.	
	ShShShSh		C		
	ShShShSh	35	C		
	ShShShSh		C		
	ShShShSh		C		
	ShShShSh		C		
	ShShShSh		C		
	ShShShSh		C		
	ShShShSh		C		
	ShShShSh		C		
T.D. 38.5			C		
			C		
		40	C		
			C		
			C		
			C		
			C		
			C		
			C		

LOGGED BY: WHK

SIZE AND TYPE OF BORING: 9 1/4" O.D. H.S.A.

WELL CLOSURE RECORD

WELL IDENTIFICATION: OW-16

LOCATION	
STATE:	NEW MEXICO
COUNTY:	McKINLEY
LOCAL COORDINATES OR TOWNSHIP AND RANGE:	PLANT LOCALS: N3797.65, W1373.78
OWNER:	GIANT REFINING COMPANY, 505-722-3833
CONTACT:	DORINDA MANCINI, ENVIRONMENTAL DEPARTM
CLOSURE COMPANY:	PRECISION ENGINEERING, INC., 505-523-7674
CONTACT:	WILLIAM H. KINGSLEY
CLOSURE DATE:	FEBRUARY 25, 1998
REASON FOR CLOSURE:	POTENTIAL FOR AQUIFER CONTAMINATION

DETAIL OF CLOSURE PROCEDURE:

1) PULL GROUND SURFACE FINISH SET
2) SPLIT SCREEN/CASING BELOW EXISTING GROUT LINE
3) SET TREMMIE TO BOTTOM OF THE WELL
4) INJECT GROUT TO DISPLACE CONTENTS OF THE WELL TO THE SURFACE
5) CAPTURE WELL CONTENTS
6) SET PRESSURE PACKER ABOVE CASING SPLIT
7) INJECT GROUT UNDER PRESSURE TO A MINIMUM OF CALCUALTED WELL GRAVEL PACK VOLUME
8) PULL TREMMIE/PACKER AND GROUT TO SURFACE

REQUIRED GROUT VOLUME OF THIS WELL: 22 CU FT
ACTUAL GROUT VOLUME INJECTED IN THIS WELL: 38 CU FT
MAX INJECTION PRESSURE: 600 PSI

BORING OW-16

SURFACE ELEVATION: 6942 FEET

DEPTH IN FEET	LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)
0									
10									
20									
30									
40									
50									
60									
70									
80									
90									
100									
110									
120									
130									
140									
150									
160									

PENETRATION RATE MINUTES/FOOT	SYMBOLS	DESCRIPTION
2.5	SM	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY FINE SAND WITH SOME GRAVEL, SOFT, HIGHLY WEATHERED
2.5		
5.0		
6.7	SS	12 FEET: SANDSTONE, RED, FINE-GRAINED, HARD, FRESH
5.0	SHALE	15 FEET: SHALE, RED, SANDY, HARD, FRESH
5.0		
5.0		
5.0		
5.0		
5.0		
10.0	SS	47 FEET: SANDSTONE, GRAY, FINE-TO MEDIUM-GRAINED, CALCAREOUS, HARD, FRESH
4.3	SHALE	50 FEET: SHALE, GRAY, SILTY, WITH SOME FINE SAND, HARD, FRESH

BORING COMPLETED AT 54.6 FEET ON 12/2/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 44.6 TO 54.6 FEET.
GRAVEL PLACED FROM 36.0 TO 54.6 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 26.8 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

WELL CLOSURE RECORD

WELL IDENTIFICATION: OW-17

LOCATION	
STATE:	NEW MEXICO
COUNTY:	McKINLEY
LOCAL COORDINATES OR TOWNSHIP AND RANGE:	PLANT LOCALS: N3855.99, W1209.40
OWNER:	GIANT REFINING COMPANY, 505-722-3833
CONTACT:	DORINDA MANCINI, ENVIRONMENTAL DEPARTM
CLOSURE COMPANY:	PRECISION ENGINEERING, INC., 505-523-7674
CONTACT:	WILLIAM H. KINGSLEY
CLOSURE DATE:	FEBRUARY 25, 1998
REASON FOR CLOSURE:	POTENTIAL FOR CROSS CONTAMINATION/ WELL REPLACED

DETAIL OF CLOSURE PROCEDURE:

1) PULL GROUND SURFACE FINISH SET
2) SPLIT SCREEN/CASING BELOW EXISTING GROUT LINE
3) SET TREMMIE TO BOTTOM OF THE WELL
4) INJECT GROUT TO DISPLACE CONTENTS OF THE WELL TO THE SURFACE
5) CAPTURE WELL CONTENTS
6) SET PRESSURE PACKER ABOVE CASING SPLIT
7) INJECT GROUT UNDER PRESSURE TO A MINIMUM OF CALCUALTED WELL GRAVEL PACK VOLUME
8) PULL TREMMIE/PACKER AND GROUT TO SURFACE

REQUIRED GROUT VOLUME OF THIS WELL: 29 CU FT
ACTUAL GROUT VOLUME INJECTED IN THIS WELL: 43 CU FT
MAX INJECTION PRESSURE: 525 PSI

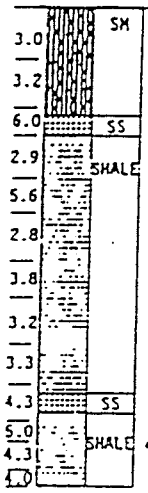
BORING OW-17

SURFACE ELEVATION: 6941 FEET

DEPTH IN FEET	TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)
0									
10									
20									
30									
40									
50									
60									
70									
80									
90									
100									
110									
120									
130									
140									
150									
160									

PENETRATION RATE MINUTES/FOOT

SYMBOLS



DESCRIPTION

TRIASSIC PERIOD

CHINLE FORMATION

REDDISH BROWN SILTY FINE SAND WITH SOME GRAVEL-SIZED FRAGMENTS OF LIMESTONE AND SANDSTONE, SOFT, HIGHLY WEATHERED

11 FEET: SANDSTONE, REDDISH BROWN, FINE-GRAINED, NONCALCAREOUS, HARD, FRESH

13 FEET: SHALE, REDDISH BROWN, SANDY, SOFT, FRESH

GRADES HARD FROM 27.5 TO 30.0 FEET

GRADES GRAY FROM 31 FEET

GRADES WITH THIN LIMESTONE AND SANDSTONE INTERBEDS FROM 39 FEET

40 FEET: SANDSTONE, GRAY, FINE-GRAINED, SILTY, CALCAREOUS, HARD, FRESH

42 FEET: SHALE, GRAY, SILTY, SANDY, WITH SOME GRAVEL-SIZED FRAGMENTS OF CHERT AND LIMESTONE AND OCCASIONAL THIN INTERBEDS OF LIMESTONE, HARD, FRESH

BORING COMPLETED AT 50.0 FEET ON 1/3/81.

4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 38.0 TO 50.0 FEET.

GRAVEL PLACED FROM 24.0 TO 50.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.

GROUND WATER LEVEL MEASURED AT 31.8 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

DAMES & MOORE

WELL CLOSURE RECORD

WELL IDENTIFICATION: OW-25

LOCATION	
STATE:	NEW MEXICO
COUNTY:	McKINLEY
LOCAL COORDINATES OR TOWNSHIP AND RANGE:	PLANT LOCALS: N3960.15, W1270.80
OWNER:	GIANT REFINING COMPANY, 505-722-3833
CONTACT:	DORINDA MANCINI, ENVIRONMENTAL DEPARTM
CLOSURE COMPANY:	PRECISION ENGINEERING, INC., 505-523-7674
CONTACT:	WILLIAM H. KINGSLEY
CLOSURE DATE:	FEBRUARY 24, 1998
REASON FOR CLOSURE:	POTENTIAL FOR CROSS CONTAMINATION/ WELL REPLACED

DETAIL OF CLOSURE PROCEDURE:

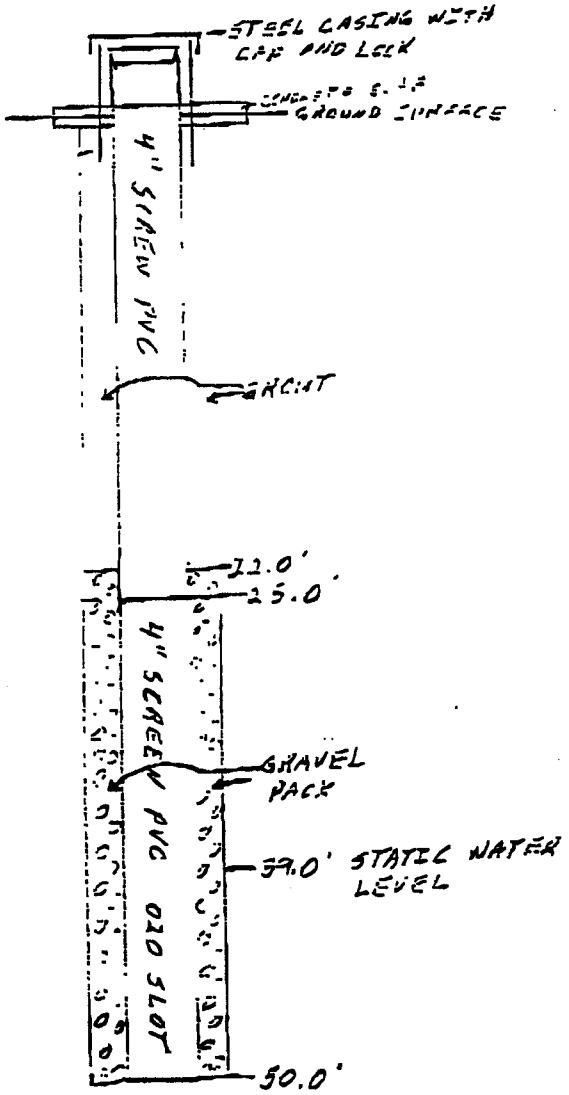
1) PULL GROUND SURFACE FINISH SET
2) SPLIT SCREEN/CASING BELOW EXISTING GROUT LINE
3) SET TREMMIE TO BOTTOM OF THE WELL
4) INJECT GROUT TO DISPLACE CONTENTS OF THE WELL TO THE SURFACE
5) CAPTURE WELL CONTENTS
6) SET PRESSURE PACKER ABOVE CASING SPLIT
7) INJECT GROUT UNDER PRESSURE TO A MINIMUM OF CALCUALTED WELL GRAVEL PACK VOLUME
8) PULL TREMMIE/PACKER AND GROUT TO SURFACE

REQUIRED GROUT VOLUME OF THIS WELL: 27 CU FT
ACTUAL GROUT VOLUME INJECTED IN THIS WELL: 40 CU FT
MAX INJECTION PRESSURE: 500 PSI

CINIZA REFINERY

OW-25

DRILLED: JUNE 28, 1990



FORMATION LOG

Depth (ft)	Formations
0-7	Clay
7-28	Red sandy clay
28-39	Clay with sand layers
39-50	Sand with thin clay layers

DRILLER NOT KNOWN

WELL CLOSURE RECORD

WELL IDENTIFICATION: OW-26

LOCATION	
STATE:	NEW MEXICO
COUNTY:	McKINLEY
LOCAL COORDINATES OR TOWNSHIP AND RANGE:	PLANT LOCALS: N3730.74, W1188.93
OWNER:	GIANT REFINING COMPANY, 505-722-3833
CONTACT:	DORINDA MANCINI, ENVIRONMENTAL DEPARTM
CLOSURE COMPANY:	PRECISION ENGINEERING, INC., 505-523-7674
CONTACT:	WILLIAM H. KINGSLEY
CLOSURE DATE:	FEBRUARY 26, 1998
REASON FOR CLOSURE:	POTENTIAL FOR AQUIFER CONTAMINATION

DETAIL OF CLOSURE PROCEDURE:

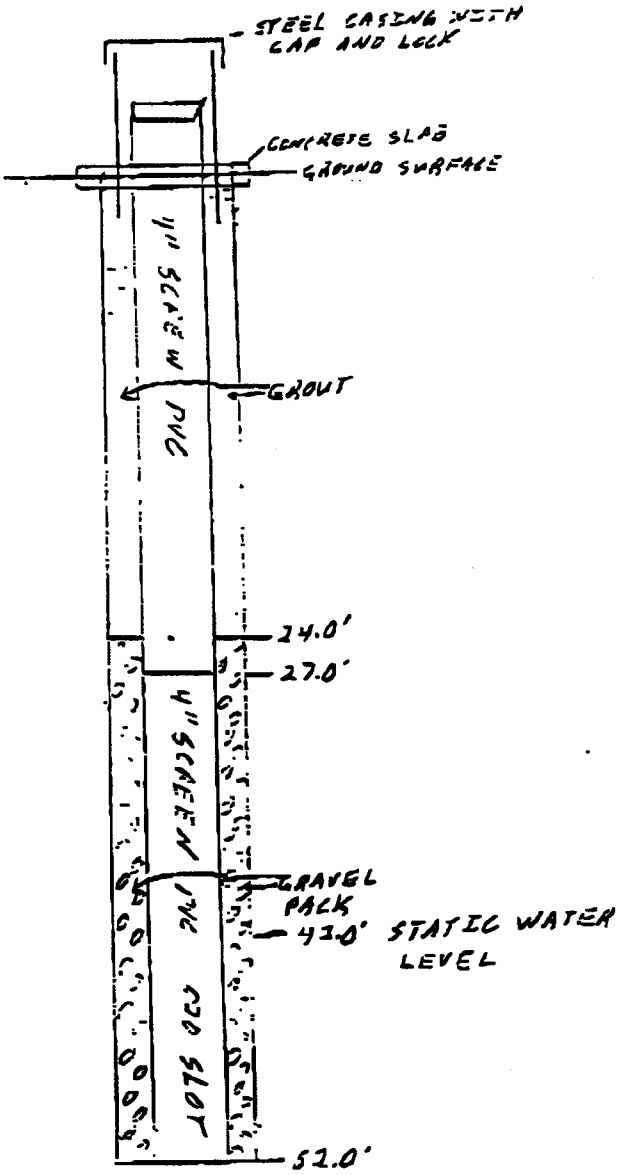
1) PULL GROUND SURFACE FINISH SET
2) SPLIT SCREEN/CASING BELOW EXISTING GROUT LINE
3) SET TREMMIE TO BOTTOM OF THE WELL
4) INJECT GROUT TO DISPLACE CONTENTS OF THE WELL TO THE SURFACE
5) CAPTURE WELL CONTENTS
6) SET PRESSURE PACKER ABOVE CASING SPLIT
7) INJECT GROUT UNDER PRESSURE TO A MINIMUM OF CALCUALTED WELL GRAVEL PACK VOLUME
8) PULL TREMMIE/PACKER AND GROUT TO SURFACE

REQUIRED GROUT VOLUME OF THIS WELL: 22 CU FT
ACTUAL GROUT VOLUME INJECTED IN THIS WELL: 35 CU FT
MAX INJECTION PRESSURE: 575 PSI

CINIZA REFINERY

OW-26

DRILLED; JUNE 29, 1990



FORMATION LOG

Depth (ft)	Formation
0-5	Clay
5-19	Red sandy clay
19-42	Red clay with sand layers
42-52	Sand with thin clay layers

GRAVEL DRILLER NOT KNOWN