GW - ____32____

MONITORING REPORTS

DATE:

WELL LOG INFORMATION

TABLE 1

91**

WELL ELEVATION AND CAPACITY DATA

WELL	CASING DIAMETER (inches)	T.O.C. * (feet)	B.O.C. * (feet)	CAPACITY (gallon per foot)	TOTAL DEPTH (feet)
MW-1	5	6878.52	6746.5	1.02	132.02
MW-2	5	6880.84	6740.6	1.02	140.24
MW-4	5	6882.54	6760.4	1.02	122.14
MW-5	4	6883.32	6750.3	0.74	133.02
SMW-1	2	6883.29	6834.20	0.163	?
SMW-2	2	6884.44	6827.10	0.163	50.24
SMW-3	2	6884.56	6838.70	0.163	45.86
SMW-4	2	6880.08	6807.80	0.163	72.22
SMW-5	2	6878.02	6801.80	0.163	76.22
SMW-6	2	6880.71	6807.60	0.163	73.11
OW-1	4	6868.00	6773.96	0.74	94.04
OW-2	4	6871.00	6810.00	0.74	61.0
OW-3	4	6876.00	6809.30	0.74	66.73
OW-11	4	6923.89	6857.27	0.74	66.62
OW-24	4	6880.00	6815.00	0.74	65.0

* T.O.C. - Top of Casing
B.O.C. - Bottom of Casing

** Update of 1989 Sample and Analysis Plan.

MONITORING WELL MW-1

SURFACE ELEVATION: 6876 FEET
(Unsurveyed)

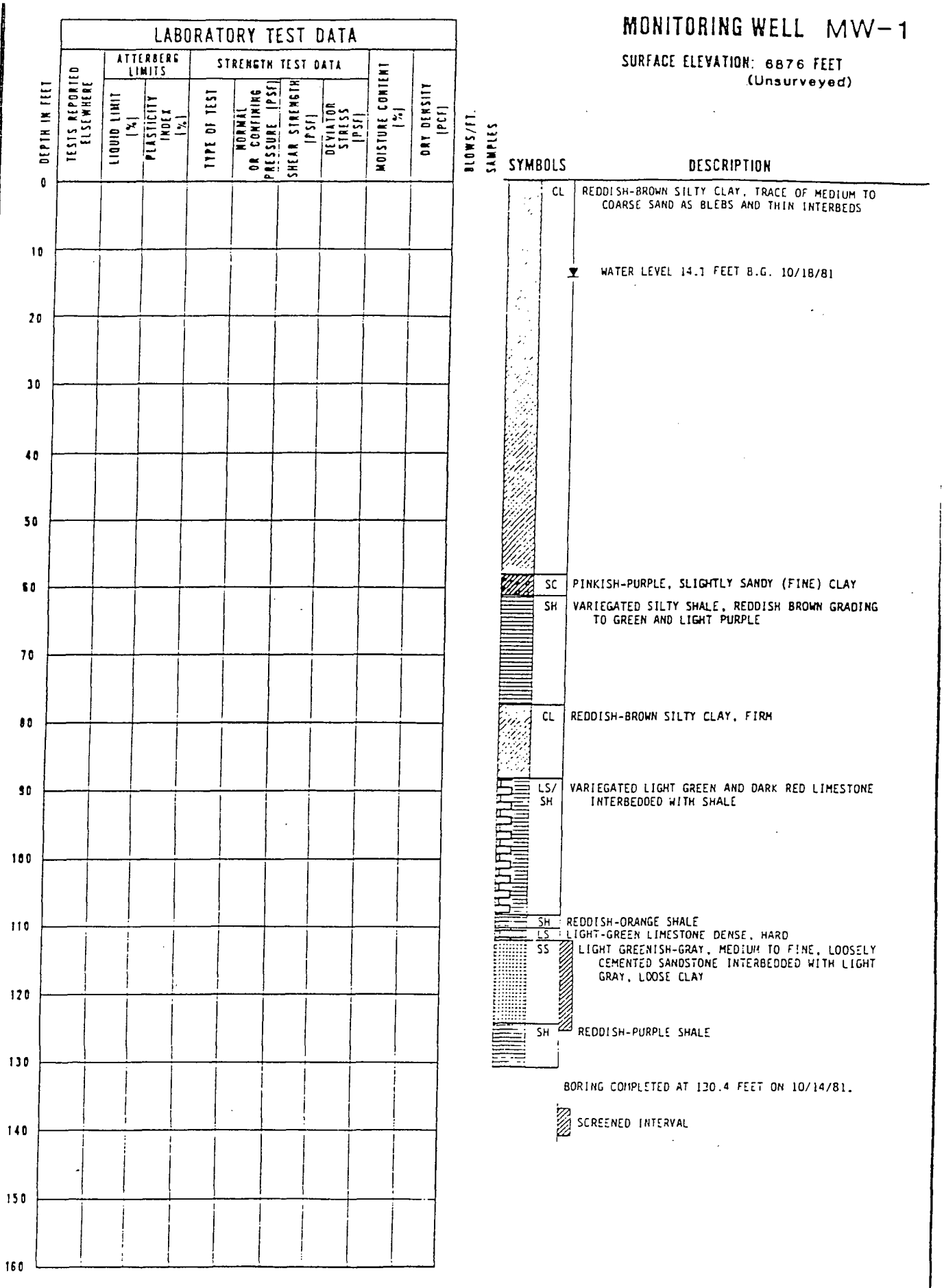


FIGURE 30.2-1

MONITORING WELL MW-2

SURFACE ELEVATION: 6877 FEET
(Unsurveyed)

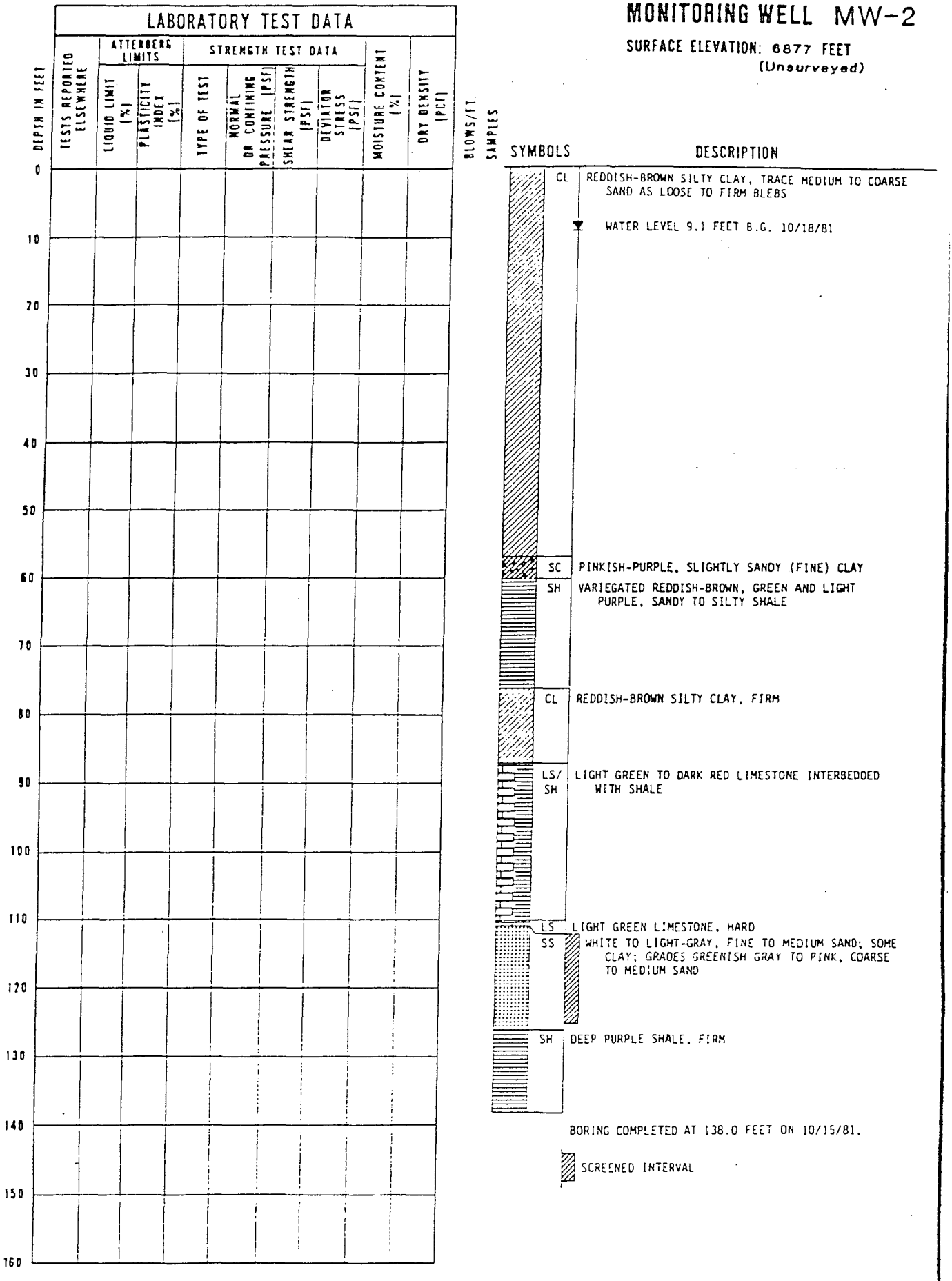
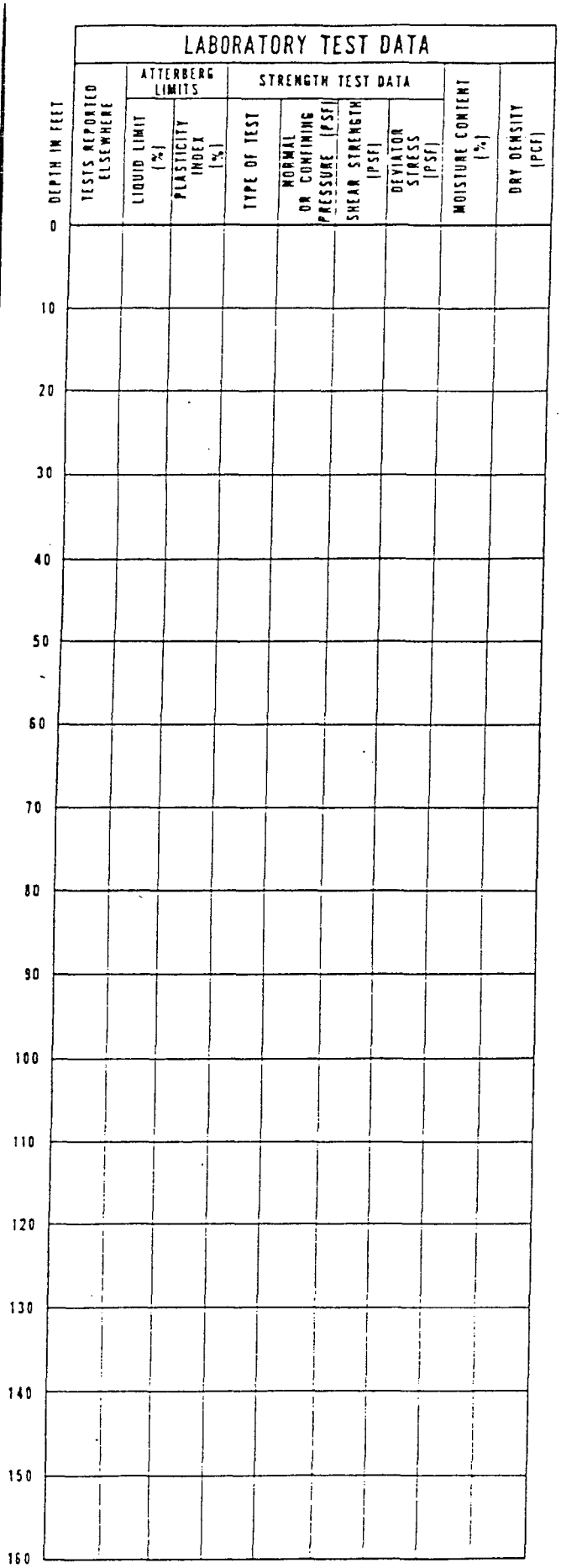


FIGURE 30.2-2

MONITORING WELL MW-4

SURFACE ELEVATION: 6883 FEET
(Unsurveyed)



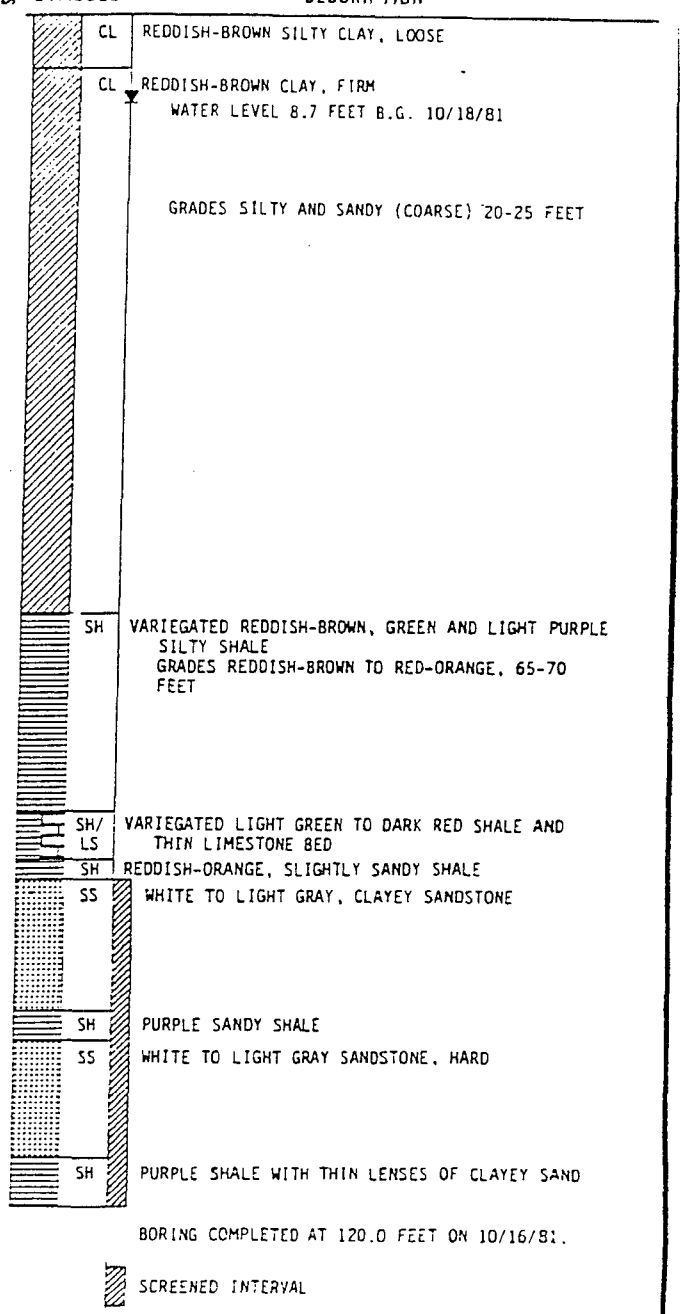


FIGURE 30.2-4

CCL

WELL LOGGING FO

Client Giant Well Number MW-5

1/4 1/4 1/4 1/4 S T R State New Mexico

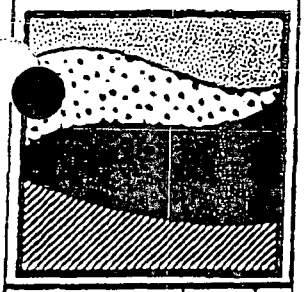
County Contractor Stewart Bros.

Spud Date 7/23/86 Completion Date 7/28/86

Logs Run Lithology Logged By Selke

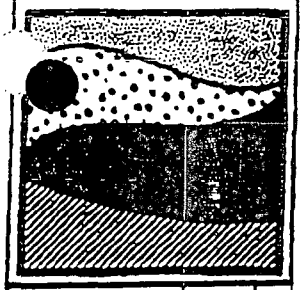
Elevation Spud In (Fm.) Chinle Formation

Remarks Drilled w/failing F-10 rig - hollow stem auger to 65' and rotary core to 135'. Rig and all tools steam cleaned prior to drilling split spoon and cutting samples w/auger - core w/rotary



DEPTH	LITHO.	RECOV.	RUN	FROM	TO	SAMPLE DEPTH	REMARKS
0			1	0	3.5	0.0 3.5	0-30.0 Reddish-brown, silty clay w/minor sandy lenses.
5							
			2	3.5	8.5	8.5-10.0 38 blows	
10			3	8.5	13.5	13.5	
15							
			4	13.5	18.5	18.5-20 90 blows	
20			5	18.5	23.5	23.5	
25							
			6	23.5	28.5	28.5-30.0 26 blows	
			7	28.5	30.0	30.0-31.5	
30			8	30.0	31.5	31.5-33.0	30.0-35.0 fn-med grained grading to slightly clayey silt to fn sand w/minor clay lenses
			9	31.5	33.0	33.0-34.5	
35			10	33.0	34.5	34.5-36.0	
			11	34.5	36.0	36.0-37.5	35.0-50 Reddish-brown clay w/locally minor silt and silty clay
			12	36.0	37.5	37.5-39.0	
40			13	37.5	40.0	40.0-41.5	
			14	40.0	42.5	42.5-44.0	
45							

GCL



WELL LOGGING F. M

Client Giant Well Number MW-5

__1/4__1/4__1/4__1/4 S__T__R__ State New Mexico

County _____ Contractor Stewart Bros.

Spud Date 7/23/86 Completion Date 7/29/86

Logs Run Lithology Logged By Selke

Elevation _____ Spud In (Fm.) Chinle Formation

Remarks

DEPTH	LITHO.	RECOV.	RUN	FROM	TO	SAMPLE DEPTH	REMARKS
45			15	42.5	45.0	45.0-46.5	
			16	45.0	47.5	47.5-49.8 57 blows	
50			17	47.5	50.0	50.0-51.5 43 blows	
			18	50.0	52.5	52.5-54.0 53 blows	50-53 Reddish-brown clay w/minor sand/gravel lenses
			19	52.5	55.0	55.0-56.5 54 blows	
55			20	55.0	57.5	57.5-59.0 100 blows	53-97 Reddish to purple shale and/or clay w/greenish colored blebs
60			21	57.5	60.0	60.0-61.5	
			22	60.0	68.5		
65			23	68.5	77	68.5-77	
70							
75							
80			24	77	87	77-87	
85							
90							

GCL

WELL LOGGING FL .

Client Giant Well Number MW-5

__1/4__1/4__1/4__1/4 S__T__R__ State New Mexico

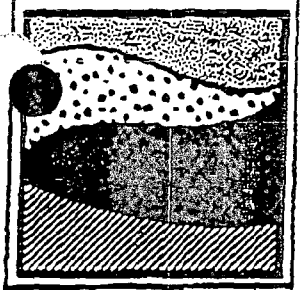
County _____ Contractor Stewart Bros

Spud Date 7/23/86 Completion Date 7/29/86

Logs Run Lithology Logged By Selke

Elevation 6901.8 Spud In (Fm.) Chinle Formation

Remarks TOC

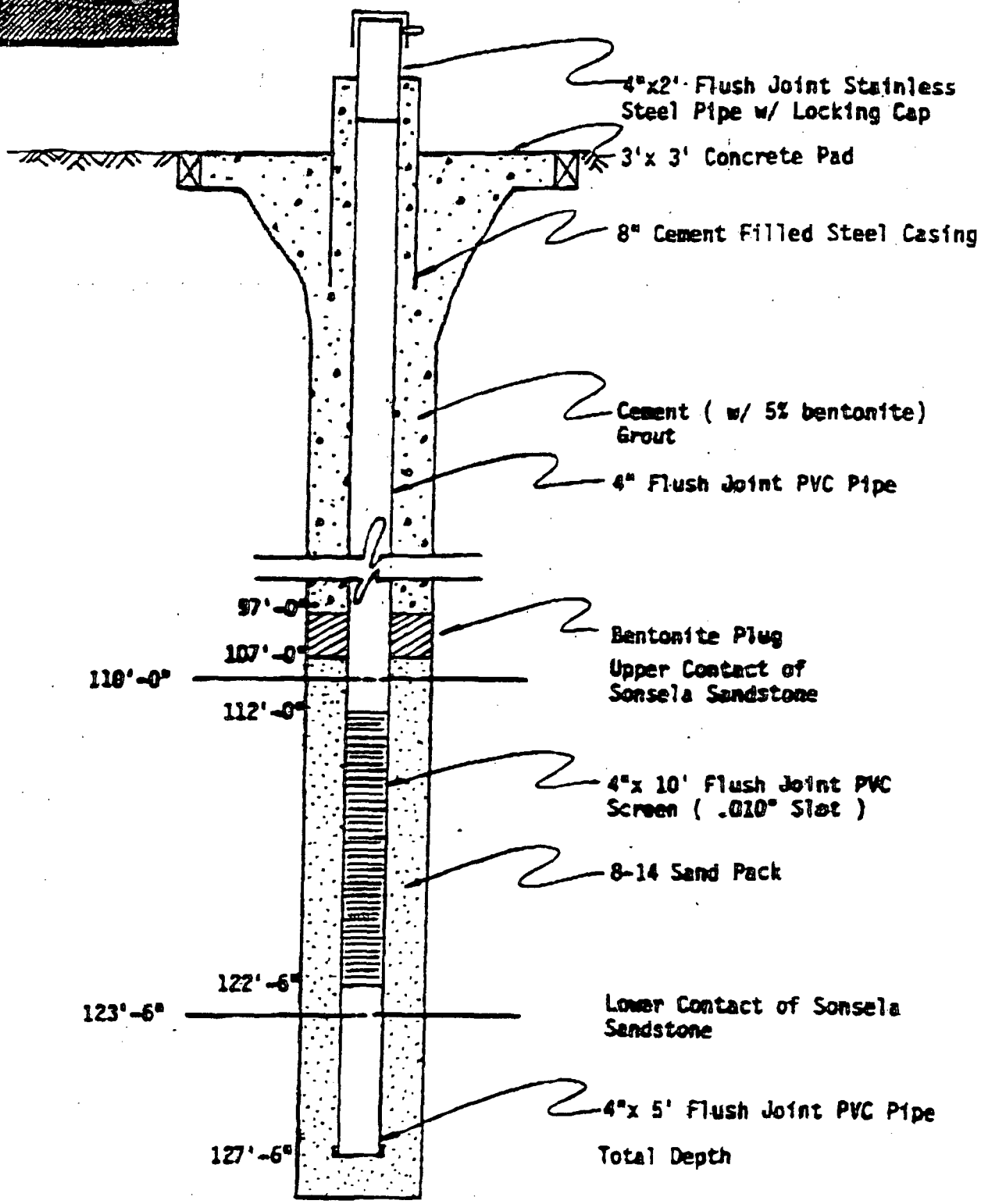


DEPTH	LITHO.	RECOV.	RUN	FROM	TO	SAMPLE DEPTH	REMARKS
90							
95							
						97-107	97-103 Reddish shale w/limestone stringers
			25	97	107		
100							
BENTONITE PLUG							103-106.5 red shale/clay
105							
						107-117	106.5-110 reddish colored limestone w/greenish white blebs
TOP OF SAND PACK			25	107	117		
110							
							110-123.5 grayish to reddish (?) colored, fine to medium grained, subrounded to rounded, moderately well sorted, moderately well indurated, quartz sandstone. Bedding planes dipping approx. 15°.
SCREEN							
115							
						117.0-125.0	
120			27	117	125		
							123.5-127 Basal conglomerate is similar colored to above sandstone but less consolidated than sandstone.
125							
						125.0-134	
			28	125	134		
							127-134 dk red clay/shale
130							
135							

GCL

COMPLETION DIAGRAM

MW-5

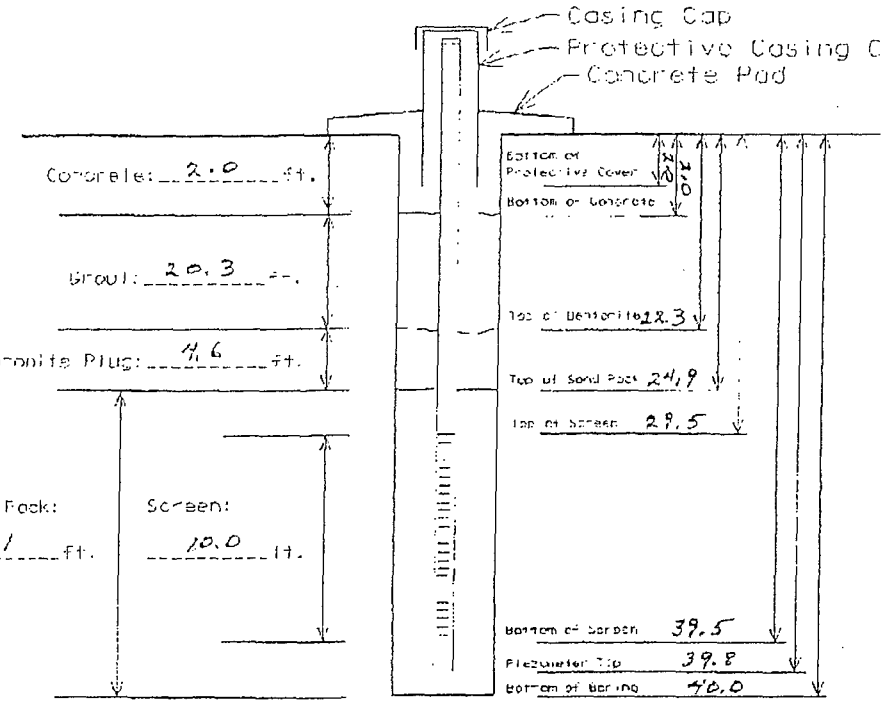


PRECISION ENGINEERING, INC.

505 523 7074

Installation Diagram

Monitoring Well No. RW-5



Boring Diameter: 9.25"

Sand pack: 20-40 Bollards Type/Size: 3" STEEL PIPE

Bentonite: 3/8" CHIP Screen Type/Size: 4" SCH 40 PVC/0.010" MACHINE SLOT

Cement/Grout: 6% BENT./CEMENT Riser Type/Size: 4" SCH 40 FLUSH JOINT PVC

Water: 30.0 Locking Expendable Casing Plug? YES Site Northing: 5959.0

Other: PRODUCT 28.2 (8-27-97) Bottom Cap Used? YES Site Easting: 12560

Project #: 97-070 Project Name: GIANT REFINING - CINIZA Elevation: 4942.5 (GROUND)

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: 3[redacted] FEET
BORING ID: B[redacted]
PAGE: 1 OF 2

DEPTH	PLOT	SAMPLE	SAMPLE TYPE	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	
	///	S-8	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: WHK

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 FEE
LOGGED BY: WHK
DATE: 8/27/97
STATIC WATER: 31.0 FEE
BORING ID: RW-5
PAGE: 2 OF 2

DEPTH	PLOT	SAMPLE	SAMPLE TYPE	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			C	GRAVEL, CLAYEY, WET/MOIST, SOME GREATER THAN 3" SANDSTONE PIECES	
25.0		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	HARD, FINE, DENSE, MOIST, VERY STRONG HYDROCARBON ODOR, LIGHT BROWN, SOME PEBBLES	
28.6-30.0			C	SANDSTONE, SHALEY, HYDROCARBON ODOR, HARD, FRACTURED, LIGHT GREEN TO WHITE,	
			C	ARGILLACEOUS	
30.0		30	C		
30.0-31.0			C	SANDSTONE AND SHALE PIECES, HYDROCARBON ODOR, HARD, WHITE/GREEN MOTTLED	
31.0			C		
31.0-34.0			C	GRAVEL, FINE, VERY WET, WATER BEARING, DENSE	
			C		
			C		
			C		
			C		
34.0			C		
34.0-40.0			C	SHALE, SANDY, HARD, FISSLE, GREY/RED, DRY, NO ODOR	
		35	C		
			C		
			C		
			C		
			C		
			C		
			C		
			C		
			C		
			C		
40.0		40	C		
TD					

LOGGED BY: WHK

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

PRECISION ENGINEERING, INC.

PROJECT: Cinizа Refinery

LOG OF TEST BORINGS

FILE #: 97-070
ELEVATION: 6972.6
TOTAL DEPTH: 38.5 FEET
LOGGED BY: WHK
DATE: 8/27/97
STATIC WATER: 31.[redacted] FT
BORING ID: RW-6
PAGE: 1 OF 2

DEPTH	PLOT	SAMPLE	SAMPLE TYPE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	Pb (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	
	**********	10	C	dense.	
	**********		C		
	**********		C		
	**********		C		
	**********	17	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	
	//-*-*///		C	thin cleaner sand.	
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///	20	C		
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		
	//-*-*///		C		

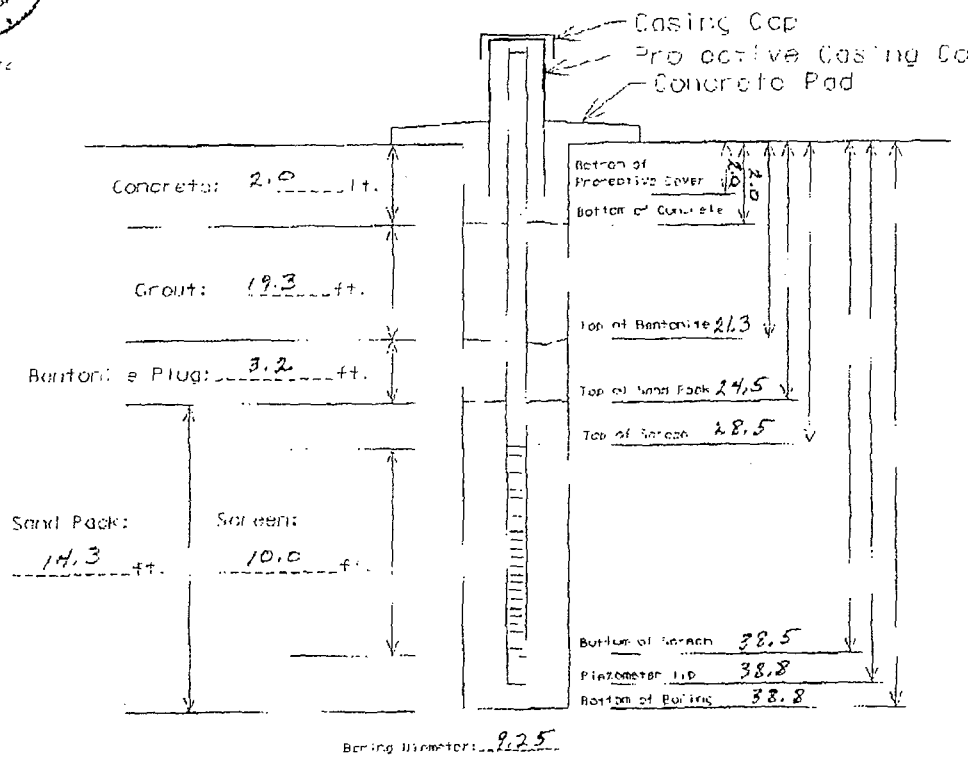
LOGGED BY: WHK

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

CISTON ENGINEERING, INC.
505-523-7674

Installation Diagram

Monitoring Well No. RW-6



Boring Diameter: 9.25

Sand Type: 20-40

Bentonite: 3/8" CHIP

Cement/Grout: 6% BENT./CEMENT

Water: 31.5

Other: PROJECT 27.5

Project #: 97-070

Project Name: GIANT REFINING-CINIZA

Boring: Type/Size: 3" STEEL PIPE

Screen: Type/Size: 4"S 40 PVC/0.010" MACHINE SLOT

Riser: Type/Size: 4" SCH 40 FLUSH JOINT PVC

Locking Expendable Casing Plug? YES

Bottom Cap Used? YES

Site Northing: 3376.0

Site Easting: 1208.0

Elevation: 6972.6 (GROUND)

PRECISION ENGINEERING, INC.

PROJECT: Ciniza Refinery

LOG OF TEST BORINGS

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: MW-6
PAGE: 2 OF 2

DEPTH	PLOT	SAMPLE	SAMPLE TYPE	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 thin cleaner sand.	
	//-*-*///		C		
	//-*-*///		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		
	**/*//*/*	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

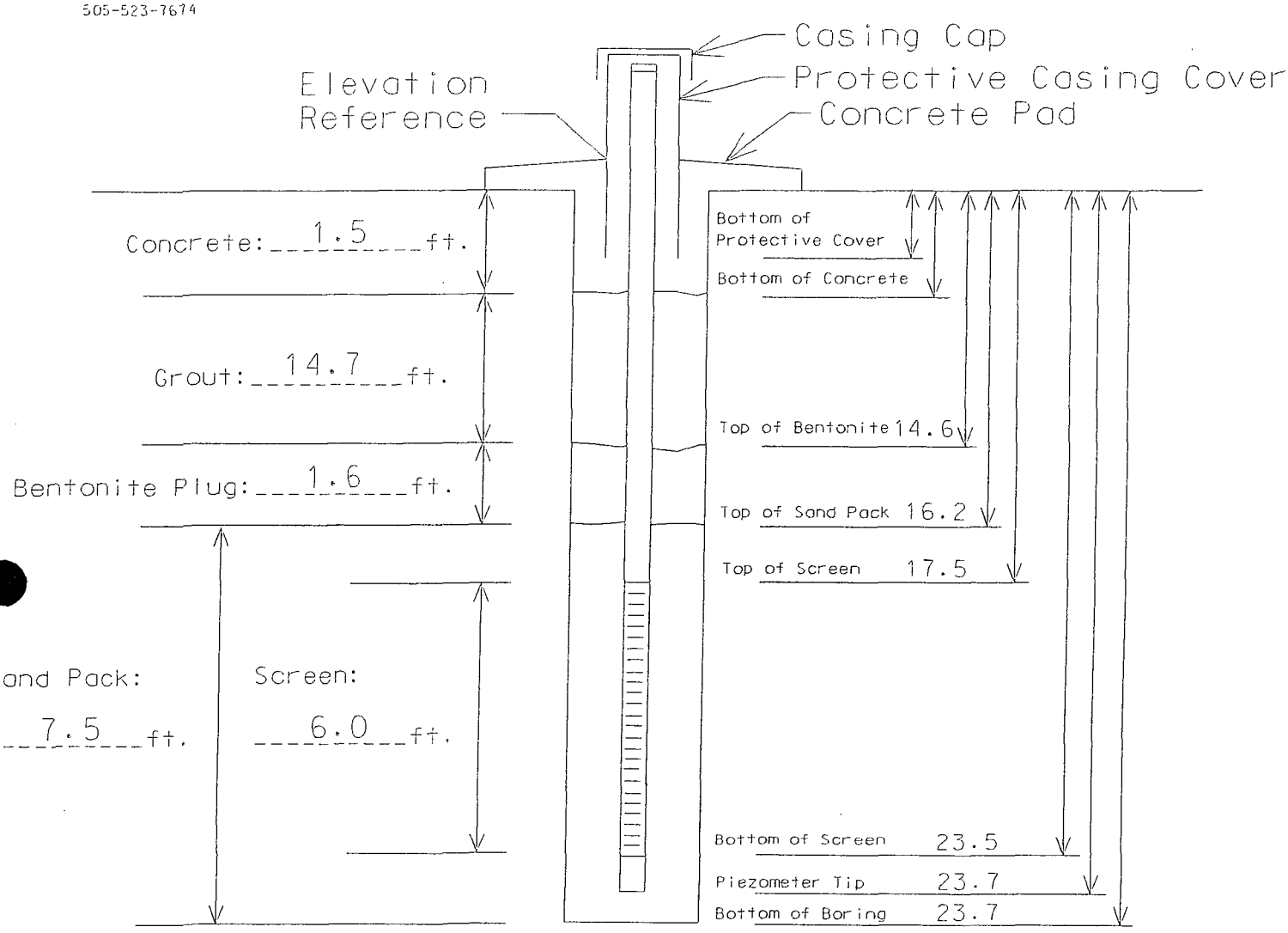
SIZE AND TYPE OF BORING: 9 1/4" O.D. H.S.A.

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. GWM-1



Boring Diameter: 8 5/8"

Sand Type: 20-40 SILICA

Bollards, Type/Size: NONE INSTALLED

Bentonite: 3/8" CHIPS

Screen Type/Size: 2", #10 SLOT, SCH 40 PVC

Cement/Grout: 6% BENTONITE/CEMENT

Riser Type/Size: 2", SCH 40 PVC

Water: NONE

Locking Expandable Casing Plug? YES

Site Northing: TBD

Other: ---

Bottom Cap Used? YES

Site Easting: TBD

Project #: 03-118

Project Name: POND 1 GROUNDWATER OBSERVATION

Elevation: TBD

Sheet: 2 OF 2
Bore Point: SW corner of Pond 1

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundry Wells

Water Elevation: Not Encountered
Boring No.: GWM-1

Log of Test Borings

Elevation: TBD
Date: 7/8/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	21.5-24.0		////////// //////////	22.0	**Sand**, gravelly				
	22.5-24.0		////////// ////////// //////////		**Petrified Forest Formation, Painted Desert Member, Mudstone**, weathered, red-purple, reduction spots, hard, moist, blocky/crumbly				
	24.0				T.D.				
				25.0					
					Screened interval 18-24'				
				30.0					
				35.0					
				40.0					
					Clay, black, wet,				

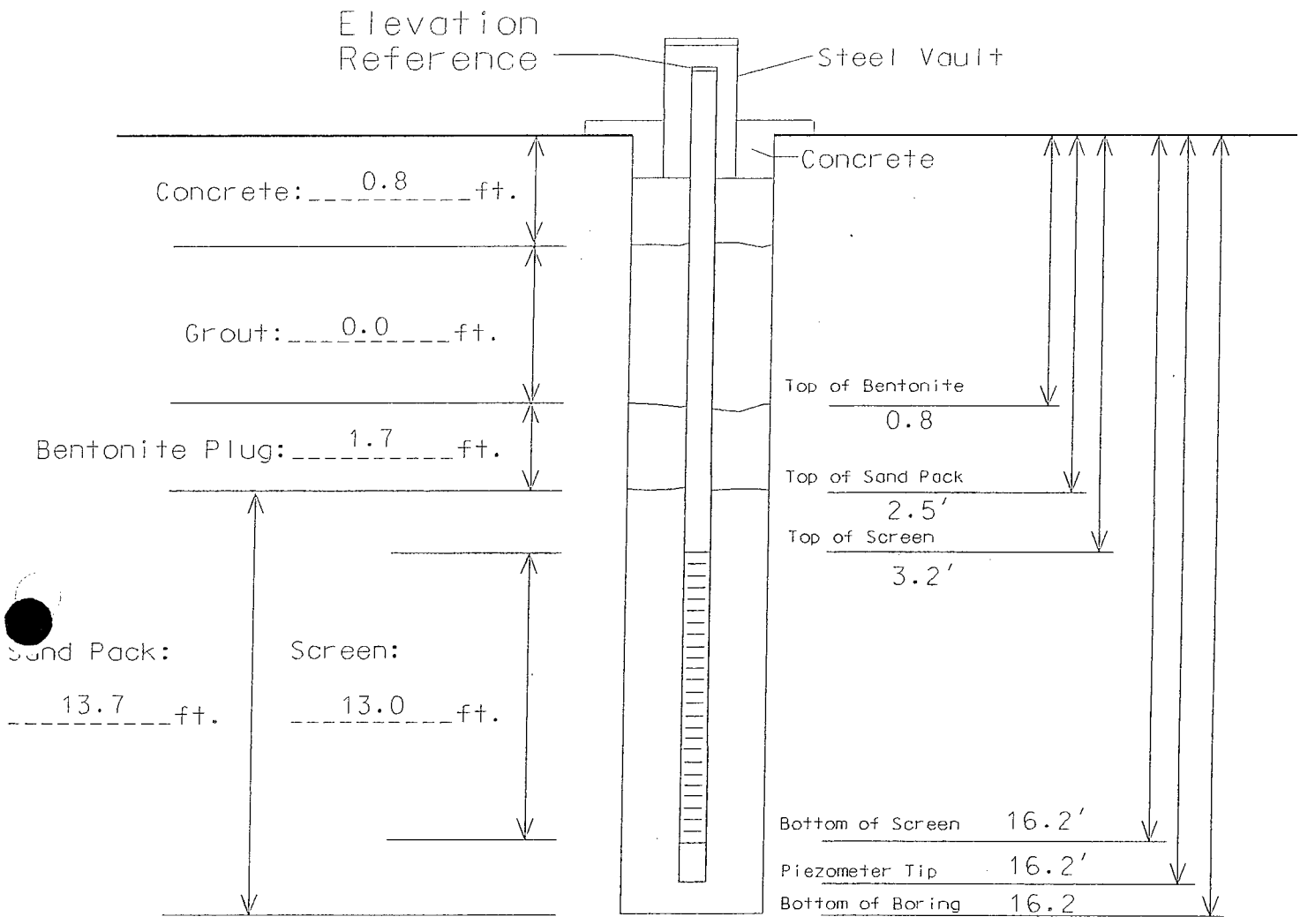
SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger LOGGED BY: NS

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. GWM 2



Boring Diameter: 8 5/8"

Sand Type: 10-20 Silica

Bollards, Type/Size: NA

Bentonite: 3/8" Chips

Screen Type/Size: 2" PVC Sch. 40, 0.10" Slotted

Cement/Grout: NA

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: 2244.46

Bottom Cap Used? Yes

Site Easting: 3864.28

Other:

Project #: 05-099

Project Name: Ciniza Refinery

Elevation: 6913.17

Sheet: 1 OF 1
Bore Point: 10' S, 4'E of GMW-1
Water Elevation: Not Encountered
Boring No.: GWM-2

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 05-099
Site: Giant-Ciniza
Elevation: 6913.17
Date: 9/25/2005

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0.0-0.5				**Clay**, Gravelly (From Roadfill), Wet, Sandy, Red/Brown				
	0.5-5.0				**Clay**, Red/Brown, Some Silt, Very Fine Sand In Thin Seams, Wet, Firm				
				2.5					
				5.0					
	5.0-10.0				**Same As Above**				
				7.5					
				10.0					
	10.0-14.7				**Same As Above**, No Sand				
	14.7-15.0				**Clay**, Fine Sand, Red/Brown, Soft, Root Matter, Wet				
				15.0					
	16.2				TD Set Well @ 16.2' 13.0' - 2" PVC Sch. 40 #10 Slot Screen 3.2' - 2" PVC Sch. 40 Riser to Ground Surface 10-20 Sand From Bottom of Hole to 2.5' Below Ground Surface, 3/8 Bentonite Chip to 8"				
				20.0	Below Ground Surface, Hydrated Chips Set Above Ground Surface Finish with 4'x4' Concrete Pad. Top of Casing ~ 3.0' Above Ground Surface				

IZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER LOGGED BY: WHK

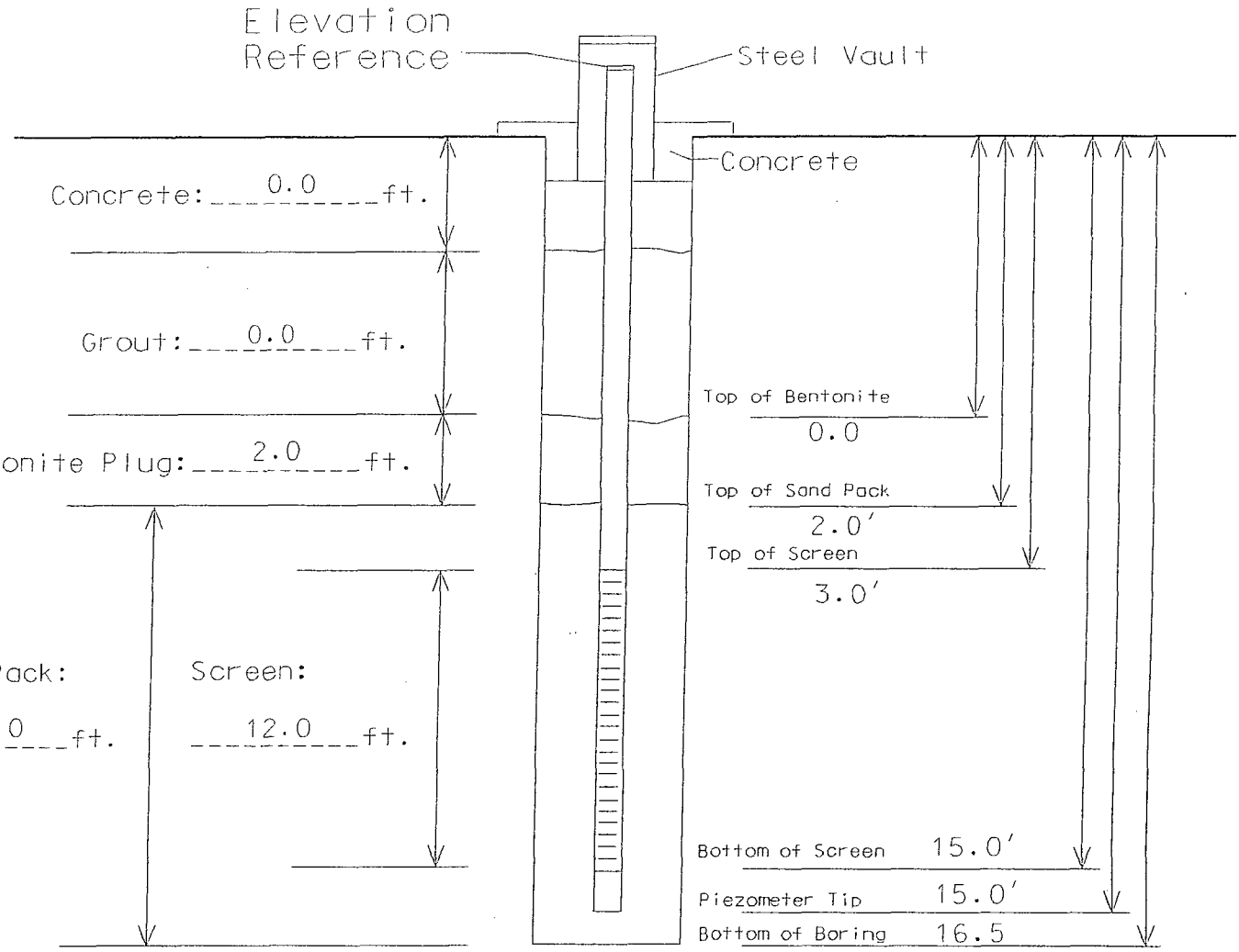
.bill\Projects\2005\05099GWM2-3\[GWM 2.xls]Sheet1

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. GWM 3



Boring Diameter: 8 5/8"

Sand Type: 10-20 Silica

Bollards, Type/Size: NA

Bentonite: 3/8" Chips

Screen Type/Size: 2" PVC Sch. 40, 0.10" Slotted

Cement/Grout: NA

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: 2233.38

Bottom Cap Used? Yes

Site Easting: 4110.05

Other:

Project #: 05-099

Project Name: Ciniza Refinery

Elevation: 6912.65

Sheet: 1 OF 1
Bore Point: NW Corner of Pond 1
Water Elevation: Not Encountered
Boring No.: GWM-3

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 05-099
Site: Giant-Ciniza

Elevation: 6912.65
Date: 9/25/2005

Log of Test Borings

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0.0-0.25				**Clay**, Gravelly, Hard, Red Brown, Wet				
	0.25-5.0				**Clay**, Very Silty, Sandy, Very Sandy, Wet, Red/Brown, Stiff				
				2.5					
				5.0					
	5.0-10.0				**Clay**, Very Sandy, Slightly Silty, Wet, Red/ Brown, Stiff				
				7.5					
				10.0					
	10.0-15.0				**Clay**, Wet, Red/Brown, Firm, Root Matter @ 14.5'				
				15.0					
	16.0								
	16.0-16.1				**Clay**, Sandy, Some Gravel, Very Wet, Moisture on Surface, Red/Brown				
	16.1-16.5				**Clay**, Some Pebbles, Wet, No Free Water, Red/Brown				
	16.5				TD				
				20.0	Plug Boring with 3/8 Bentonite Chips to 15.0' 12.0' of 2" Sch. 40 PVC #10 Slot Screen, 3.0' of 2" Sch. 40 PVC Riser, Above Ground Finish with 4'x4' Concrete Pad. 10-20 Sand from 15.0' to 2.0', 3/8 Bentonite Chips from 2.0' to Surface Top of Casing ~ 3.0' Above Ground Surface				

IZE & TYPE OF BORING: 4 1/4" ID HOLLOW STEMMED AUGER LOGGED BY: WHK

Sheet: OF 2
Bore Point: 12' West of BW1

Precision Engineering, Inc.
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Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW1A

Log of Test Borings

Elevation: Existing
Date: 11/10/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			////////// ////////// ////////// ////////// //////////	22.0					
	24.5-24.7		********		**Sand**, very fine, silty, dry, loose, light red-brown				
	24.7-26.5		/*/*/*/*/*/ /*/*/*/*/*/ /*/*/*/*/*/	25.0	**Clay**, very sandy, silty hard, damp, red-brown crumbly				
	26.5-28.5		**-**-**- **-**-**- **-**-**- **-**-**-		**Sand**, very fine, silty, dry, slightly clayey, occasional < 1cm clay beds, loose-moderate dense, very light brown				
	28.5-30.5		//*//*//*// //*//*//*// //*//*//*// //*//*//*//	30.0	**Clay**, slightly sandy, silty, firm-stiff, very light red-brown, damp, occasional laminar salt bed, dry, very crumbly in hand				
	30.5-31.3		//*//*//*//		**Clay**, sandy, gradational with above dry, stiff-hard, very light brown				
	31.3-32.3		//*//*//*//						
	32.3-32.9		********		**Sand**, very fine, loose, silty, slightly clayey, moderate dense, very light brown, dry				
	32.9-33.2		//*//*//*//						
	33.2-35.0		//*//*//*//		**Clay**, slightly sandy, firm, dry, very light brown crumbles easily				
			********						
			********		**Sand**, very silty, dry, very light brown, moderate, dense				
			//*//*//*//						
			//*//*//*// //*//*//*//	35.0	**Clay**, slightly sandy, silty, hard, dry, crumbly, very light red-brown, graditional contacts				
	35.0-40.0		////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	40.0	**Clay**, red-brown, "Fat", damp, crumbly in hand carves smooth vitrius surface with knife, hard, 2 lamini of very fine sand in 5' run				
					T.D. 40.0				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 1 OF 2
Bore Point: 12' West of BW1

Precision Engineering, Inc.
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Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW1A

Log of Test Borings

Elevation: Existing
Date: 11/10/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-4.0	Continuous	////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	2.5	**Clay**, firm, red-brown, moist				
	4.0-5.0		////////// ////////// //////////	5.0	**Clay**, silty, firm-stiff, red-brown, wet				
	5.0-10.0		////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	7.5 10.0	**Clay**, firm-stiff, red-brown, wet ("Fat Clay")				
	10.0-20.0		////////// //////////	15.0 20.0	**Clay**, stiff, red-brown, wet ("Fat Clay")				
	20.0-24.5		////////// ////////// //////////		**Clay**, hard, damp-moist, some slickensides, (shrink swell), brittle, slightly silty @ 21.0-21.3				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 1 OF 3
Bore Point: Dike 7-8 intersection

Precision Engineering, Inc.
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505-523-7674

File #: 03-118
Site: Ciniza Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW1B

Log of Test Borings

Elevation: Existing
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-4.0	Continuous	//////////		**Clay**, firm, red-brown, moist				
			//////////						
			//////////						
			//////////						
			//////////	2.5					
			//////////						
			//////////						
	4.0-5.0		//////////		**Clay**, silty, firm-stiff, red-brown, wet				
			//////////						
			//////////	5.0					
	5.0-10.0		//////////		**Clay**, firm-stiff, red-brown, wet ("Fat Clay")				
			//////////						
			//////////						
			//////////						
			//////////	7.5					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	10.0					
	10.0-20.0		//////////		**Clay**, stiff, red-brown, wet ("Fat Clay")				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	15.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	20.0					
	20.0-24.5		//////////		**Clay**, hard, damp-moist, some slickensides,				
			//////////		(shrink swell), brittle, slightly silty @ 21.0-21.3				
			//////////						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 3 OF 3
Bore Point: Dike 7-8 intersection

Precision Engineering, Inc.
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505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW1B

Log of Test Borings

Elevation: Existing
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////	44.0					
			//////////						
			//////////	45.0					
	45.0-50.0		//////////		**Same as above**				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	50.0					
	50.0-52.0		**/**/**/		**Sand**, clayey, moderate dense, dark red-purple,				
			//**/		damp				
			//**/						
	52.0-55.0		//////////		**Clay**, dark red-purple, hard, moist-wet, crumbles				
			//////////		in hand sample				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	55.0					
	55.0-58.2		/*/*/*/*/*/		**Clay**, very sandy, red-purple, hard, brittle, moist-				
			/*/*/*/*/*/		wet, gradition of sand is greater with depth				
			/*/*/*/*/*/						
			/*/*/*/*/*/						
			/*/*/*/*/*/						
			/*/*/*/*/*/						
	58.2-59.8		**/**/**/		**Sand**, slightly clayey, mottled red-grey, dry, dense				
			//**/		dense-very dense, pebbles of limestone, chert				
	59.8-60.0				and sandstone				
				60.0	**Petrified Forest Formation of the Painted**				
	60.0-65.0				**Desert Member**. **Clay**,(claystone), red, carbonate				
					nodules, (white), hard, crumbly, damp-moist				
					Same as above, some grey mottling, fissile				
					at 60.0'				
	T.D.			65.0	Set well in boring, see well diagram				
					.010" Slotted PVC Screen: set in 64.6'-54.6' interva				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 1 OF 5
Bore Point: Offset BW1 5'

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW 1 C

Log of Test Borings

Elevation: TBD
Date: 11/10/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-4.0	Continuous	//////////		**Clay**, firm, red-brown, moist				
			//////////						
			//////////						
			//////////						
			//////////	2.5					
			//////////						
			//////////						
	4.0-5.0		//////////		**Clay**, silty, firm-stiff, red-brown, wet				
			//////////						
			//////////	5.0					
	5.0-10.0		//////////		**Clay**, firm-stiff, red-brown, wet ("Fat Clay")				
			//////////						
			//////////						
			//////////						
			//////////	7.5					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	10.0					
	10.0-20.0		//////////		**Clay**, stiff, red-brown, wet ("Fat Clay")				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	15.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	20.0					
	20.0-24.5		//////////		**Clay**, hard, damp-moist, some slickensides,				
			//////////		(shrink swell), brittle, slightly silty @ 21.0-21.3				
			//////////						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 1 OF 5
Bore Point: Offset BW1 5'

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW 1 C

Log of Test Borings

Elevation: TBD
Date: 11/10/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			////////// ////////// ////////// ////////// //////////	22.0					
	24.5-24.7		********		**Sand**, very fine, silty, dry, loose, light red-brown				
	24.7-26.5		/*/*/*/*/*/ /*/*/*/*/*/ /*/*/*/*/*/	25.0	**Clay**, very sandy, silty hard, damp, red-brown crumbly				
	26.5-28.5		**-**-**- **-**-**- **-**-**- **-**-**-		**Sand**, very fine, silty, dry, slightly clayey, occasional < 1cm clay beds, loose-moderate dense, very light brown				
	28.5-30.5		//*//*//*// //*//*//*// //*//*//*// //*//*//*//	30.0	**Clay**, slightly sandy, silty, firm-stiff, very light red-brown, damp, occasional laminar salt bed, dry, very crumbly in hand				
	30.5-31.3		//*//*//*//		**Clay**, sandy, gradational with above dry, stiff-hard, very light brown				
	31.3-32.3		//*//*//*//						
	32.3-32.9		********		**Sand**, very fine, loose, silty, slightly clayey, moderate dense, very light brown, dry				
	32.9-33.2		//*//*//*//						
	33.2-35.0		//*//*//*//		**Clay**, slightly sandy, firm, dry, very light brown crumbles easily				
			********						
			********		**Sand**, very silty, dry, very light brown, moderate, dense				
			//*//*//*//						
			//*//*//*//		**Clay**, slightly sandy, silty, hard, dry, crumbly, very light red-brown, graditional contacts				
			//*//*//*//	35.0					
	35.0-40.0		////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	40.0	**Clay**, red-brown, "Fat", damp, crumbly in hand carves smooth vitrius surface with knife, hard, 2 lamini of very fine sand in 5' run				
	40.0-45.0		////////// ////////// ////////// ////////// ////////// //////////		**Same as above**, 1 sand laminae				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 1 OF 5
Bore Point: Offset BW1 5'

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 9' bgs
Boring No.: BW 1 C

Log of Test Borings

Elevation: TBD
Date: 11/10/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////	44.0					
			//////////						
			//////////	45.0					
	45.0-50.0		//////////		**Same as above**				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	50.0					
	50.0-52.0		**/**/**/		**Sand**, clayey, moderate dense, dark red-purple,				
			//**/		damp				
			//**/						
	52.0-55.0		//////////		**Clay**, dark red-purple, hard, moist-wet, crumbles				
			//////////		in hand sample				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	55.0					
	55.0-58.2		/*/*/*/*/*/		**Clay**, very sandy, red-purple, hard, brittle, moist-				
			/*/*/*/*/*/		wet, *gradition of sand is greater with depth*				
			/*/*/*/*/*/						
			/*/*/*/*/*/						
			/*/*/*/*/*/						
			/*/*/*/*/*/						
	58.2-59.8		**/**/**/		**Sand**, slightly clayey, mottled red-grey, dry, dense				
			//**/		dense-very dense, pebbles of limestone, chert				
	59.8-60.0				and sandstone				
				60.0	**Petrified Forest Formation of the Painted**				
	60.0-65.0				**Desert Member**. **Clay**,(claystone), red, carbonate				
					nodules, (white), hard, crumbly, damp-moist				
					Same as above, some grey mottling, fissile				
					at 60.0'				
	T.D.			65.0	Set well in boring, see well diagram				
					.010" Slotted PVC Screen: set in 64.6'-54.6' interva				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 4 OF 5
Bore Point: Offset BW1 5'

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW 1 C

Log of Test Borings

Elevation: TBD
Date: 11/10/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-65.0	Continuous		65.0	See Stratigraphic Log From BW 1				
	65.0-119.0				**Mudstone/Siltstone** interbedded, blocky, damp-dry, dense **Chinle Group, Petrified Forest Formation, Painted Desert Member**				
				75.0					
				85.0					
				95.0					
				105.0					
				115.0					
	119.0-131.0				**Petrified Forest Formation,** **Sandstone**, white, hard, some pebbles of quartzite and mafic rock, interbedded claystone and silt-stone				
				125.0					
	131.0-134.5				**Sandstone**, very hard, clean, quartz, water bearing				
	134.5-145.0			135.0	**Mudstone**, grey, moist, firm				
				145.0					
	145.0-152.0				**Siltstone/Mudstone**, grey, sandy				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 5 OF 5
Bore Point: Offset BW1 5'

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW 1 C

Log of Test Borings

Elevation: TBD
Date: 11/10/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
				151.0					
	152.0-154.0				**Sandstone**, white-light grey, hard, silty				
				155.0					
	T.D.			157.0	Set well in boring, see well diagram				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 1 OF 3
Bore Point: 10' West of BW2B

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 25.9' bgs
Boring No.: BW 2A

Log of Test Borings

Elevation: TBD
Date: 11/10/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0.0-5.0	Continuous	//////////		**Clay**, firm, red-brown, moist-wet, roots, white nodules				
			//////////						
			//////////						
			//////////						
			//////////	2.5					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	5.0					
	5.0-7.4		//////////		**Clay**, firm-stiff, red-brown, moist-wet				
			//////////						
			//////////						
			//////////						
	7.4-7.8		********	7.5	**Sand**, silty/clayey, red-brown, charcoal, moist				
			********						
			********						
			********						
			********						
	7.8-10.0		//////////	10.0	**Clay**, firm, red-brown, wet, mottled				
			//////////						
	10.0-11.0		//////////	11.0	**Clay**, firm, red-brown, wet				
	11.0-11.5		//-//-//-//		**Clay**, silty, pinkish-brown, wet,				
	11.5-14.2		//-//-//-//		**Clay**, firm, red-brown, wet,				
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
	14.2-15.0		//////////		**Clay**, silty, pinkish-brown, wet,				
			//////////						
	15.0-15.2		//-//-//-//	15.0	**Clay**, silty, pinkish-brown, wet,				
	15.2-17.7		//////////		**Clay**, firm, red-brown, wet, mottled				
			//////////						
			//////////						
			//////////						
			//////////						
	17.7-20.0		//////////		**Clay**, firm, dark brown, some red mottling, wet				
			//////////						
			//////////						
			//////////						
			//////////	20.0					
	20.0-24.4		//////////		**Clay**, firm, dark brown, wet				
			//////////						
			//////////						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: WHK

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Sheet: 2 OF 3
Bore Point: 10' West of BW2B

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza Boundary Wells

Water Elevation: 25.9' bgs
Boring No.: BW 2A

Log of Test Borings

Elevation: TBD
Date: 11/10/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			////////// ////////// ////////// ////////// //////////	22.0					
	24.4-24.8		********		**Sand**, fine, red-brown, white grains, dry				
	24.8-25.0		******** ******** ********	25.0	**Silt**, pinkish-brown, dry				
	25.0-26.2		//////////		**Clay**, firm, silty, reddish brown w/ pinkish-brown				
	26.2-26.7		//////////		mottling, wet				
	26.7-27.3		********		**Sand**, very fine, pinkish-brown moist				
	27.3-29.0		- - - - - -		**Silt**, pinkish-brown, damp				
	29.0-30.0		////////// //////////		**Clay**, firm, silty, pinkish- brown to reddish-brown, mottled, damp, small carbonate nodules				
			////////// //////////	30.0	**Clay**, reddish-brown, damp, small carbonate nodules				
	30.0-31.2		- - - - - -		**Silt**, pinkish-brown, mottled, damp				
	31.2-34.3		////////// ////////// ////////// ////////// ////////// //////////		**Clay**, firm, red-brown, moist (32.5-32.6 grey mottled clay)				
	34.3-35.0		- - - - - - - - - - - -	35.0	**Silt**, pinkish-brown, dry				
	35.0-40.0		//-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-//	40.0	**Clay**, red-brown, firm, silty, mottled pinkish-brown moist				
	40.0-40.9		//////////		**Clay**, red-brown, firm, moist				
	40.9-41.8		////////// //////////		**Clay**, red-brown, soft, wet				
	41.8-42.9		//-//-//-// //-//-//-//		**Sand**, very fine, silty, red-brown, thin clay stringers black laminations, water bearing				
	42.9--43.5		//////////		**Clay**, red-brown, soft, wet				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger LOGGED BY: WHK

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Sheet: 3 OF 3
Bore Point: 10' West of BW2B

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 25.9' bgs
Boring No.: BW 2A

Log of Test Borings

Elevation: TBD
Date: 11/10/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	43.5-44.7		////////// //////////		**Clay**, red-brown, firm, wet				
	44.7-45.0		**/**/**/	45.0	**Sand**, clayey, red-brown, soft, wet				
	45.0-45.6		**/**/**/		**Sand**, clayey, red-brown, soft, water bearing				
	45.6-48.5		////////// ////////// ////////// ////////// //////////		**Clay**, red-brown, firm, wet				
	48.5-48.8		**/**/**/		**Sand**, clayey, red-brown, soft, wet				
	48.8-50.0		////////// ////////// //////////	50.0	**Clay**, red-brown, firm, wet, grey reduction spots				
	50.0-55.0		////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	55.0	**Clay**, red-brown, firm, moist (2.0' of sample recovered)				
	55.0-60.0		//*//*//*// //*//*//*// //*//*//*// //*//*//*// //*//*//*// //*//*//*//		**Clay**, sandy, firm, brown, saturated (6" of sample recovered)				
	58.2-59.8		**/**/**/ **/**/**/ **/**/**/ **/**/**/	60.0	**Sand**, slightly clayey, mottled red-grey, dry, dense dense-very dense, pebbles of limestone, chert and sandstone				
	60.0-64.7		********* ********* ********* ********* ********* ********* *********		**Sand**, fine, brown, loose, water bearing, 1" clay stringer from 61.0 to 61.2' (1.2' of sample recovered)				
	64.7-65.0		////////// ////////// //////////		**Clay**, red-brown, firm, wet T.D. 65.0'				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 1 OF 5
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 28.5' bgs
Boring No.: BW2B

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0.0-5.0	Continuous	////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	2.5 5.0	**Clay**, firm, red-brown, moist-wet, roots, white nodules				
	5.0-7.4		////////// ////////// ////////// //////////		**Clay**, firm-stiff, red-brown, moist-wet				
	7.4-7.8		******** ******** ******** ******** ********	7.5	**Sand**, silty/clayey, red-brown, charcoal, moist				
	7.8-10.0		////////// //////////	10.0	**Clay**, firm, red-brown, wet, mottled				
	10.0-11.0		//////////	11.0	**Clay**, firm, red-brown, wet				
	11.0-11.5		//-//-//-//		**Clay**, silty, pinkish-brown, wet,				
	11.5-14.2		//-//-//-// //-//-//-// //-//-//-// //-//-//-//		**Clay**, firm, red-brown, wet,				
	14.2-15.0		////////// //////////		**Clay**, silty, pinkish-brown, wet,				
	15.0-15.2		//-//-//-//	15.0	**Clay**, silty, pinkish-brown, wet,				
	15.2-17.7		////////// ////////// ////////// ////////// //////////		**Clay**, firm, red-brown, wet, mottled				
	17.7-20.0		////////// ////////// ////////// ////////// //////////	20.0	**Clay**, firm, dark brown, some red mottling, wet				
	20.0-24.4		////////// ////////// //////////		**Clay**, firm, dark brown, wet				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: WHK

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Sheet: 2 OF 5
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 28.5' bgs
Boring No.: BW2B

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////	22.0					
			//////////						
			//////////						
			//////////						
			//////////						
	24.4-24.8		********		**Sand**, fine, red-brown, white grains, dry				
	24.8-25.0		********	25.0	**Silt**, pinkish-brown, dry				
			********						
			********						
	25.0-26.2		//////////		**Clay**, firm, silty, reddish brown w/ pinkish-brown				
	26.2-26.7		//////////		mottling, wet				
	26.7-27.3		********		**Sand**, very fine, pinkish-brown moist				
	27.3-29.0		- - - - - -		**Silt**, pinkish-brown, damp				
	29.0-30.0		//////////		**Clay**, firm, silty, pinkish- brown to reddish-brown,				
			//////////		mottled, damp, small carbonate nodules				
			//////////		**Clay**, reddish-brown, damp, small carbonate				
			//////////	30.0	nodules				
	30.0-31.2		- - - - - -		**Silt**, pinkish-brown, mottled, damp				
	31.2-34.3		//////////		**Clay**, firm, red-brown, moist				
			//////////		(32.5-32.6 grey mottled clay)				
			//////////						
			//////////						
			//////////						
			//////////						
	34.3-35.0		- - - - - -		**Silt**, pinkish-brown, dry				
			- - - - - -						
			- - - - - -	35.0					
	35.0-40.0		//-//-//-//		**Clay**, red-brown, firm, silty, mottled pinkish-brown				
			//-//-//-//		moist				
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//	40.0					
	40.0-40.9		//////////		**Clay**, red-brown, firm, moist				
	40.9-41.8		//////////		**Clay**, red-brown, soft, wet				
			//////////						
	41.8-42.9		//-//-//-//		**Sand**, very fine, silty, red-brown, thin clay stringers				
			//-//-//-//		black laminations, water bearing				
	42.9--43.5		//////////		**Clay**, red-brown, soft, wet				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 3 OF 5
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 28.5' bgs
Boring No.: BW2B

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	43.5-44.7		////////// //////////		**Clay**, red-brown, firm, wet				
	44.7-45.0		**/**/**/	45.0	**Sand**, clayey, red-brown, soft, wet				
	45.0-45.6		**/**/**/		**Sand**, clayey, red-brown, soft, water bearing				
	45.6-48.5		////////// ////////// ////////// ////////// //////////		**Clay**, red-brown, firm, wet				
	48.5-48.8		**/**/**/		**Sand**, clayey, red-brown, soft, wet				
	48.8-50.0		////////// ////////// //////////	50.0	**Clay**, red-brown, firm, wet, grey reduction spots				
	50.0-55.0		////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	55.0	**Clay**, red-brown, firm, moist (2.0' of sample recovered)				
	55.0-60.0		//*//*//*// //*//*//*// //*//*//*// //*//*//*// //*//*//*// //*//*//*//		**Clay**, sandy, firm, brown, saturated (6" of sample recovered)				
	58.2-59.8		**/**/**/ **/**/**/ **/**/**/ **/**/**/	60.0	**Sand**, slightly clayey, mottled red-grey, dry, dense dense-very dense, pebbles of limestone, chert and sandstone				
	60.0-64.7		********* ********* ********* ********* ********* ********* *********		**Sand**, fine, brown, loose, water bearing, 1" clay stringer from 61.0 to 61.2' (1.2' of sample recovered)				
	64.7-65.0		////////// ////////// //////////		**Clay**, red-brown, firm, wet				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

Sheet: 4 OF 5
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 28.5' bgs
Boring No.: BW2B

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	65.0-70.0		//////////	65.0	**Clay**, dark brown, firm, some red-brown mottling, wet				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	70.0					
	70.0-75.0		//////////		**Clay**, dark brown, firm, wet				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	75.0					
	75.0-79.5		//////////		**Clay**, red brown, firm, wet				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
	79.5-82.5		//////////		**Clay**, red brown, firm, wet, grey reduction spots				
			//////////	80.0					
			//////////						
			//////////						
			//////////						
			//////////						
	82.5-84.5		**/**/**/		**Sand**, clayey, red-brown, moderate dense, some gravels (sandstone and limestone), weakly water bearing				
			//**/						
			//**/						
			//**/						
	84.5-85.0		//////////		**Petrified Forest Formation, Painted Desert Mem Mudstone**, weathered, red-brown, grey-green reduction spots, hard, moist-wet, blocky/crumbly				
			//////////	85.0					
			//////////						
			//////////						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 5 OF 5
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 28.5' bgs
Boring No.: BW2B

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	85.0-90.0		//////////	86.0	**Mudstone**, weathered, red-brown, grey-green reduction spots, hard, moist-wet, blocky/crumbly, mottled, thin bedded to laminar, more laminar > 86'				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	90.0					
	T.D.				Set well in boring				
					.010" Slotted PVC Screen: set in 80'-90' interval				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 1 OF 8
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 11.0 bgs
Boring No.: BW2C

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0.0-5.0	Continuous	//////////		**Clay**, firm, red-brown, moist-wet, roots, white nodules				
			//////////						
			//////////						
			//////////						
			//////////	2.5					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	5.0					
	5.0-7.4		//////////		**Clay**, firm-stiff, red-brown, moist-wet				
			//////////						
			//////////						
			//////////						
	7.4-7.8		********	7.5	**Sand**, silty/clayey, red-brown, charcoal, moist				
			********						
			********						
			********						
			********						
	7.8-10.0		//////////	10.0	**Clay**, firm, red-brown, wet, mottled				
			//////////						
	10.0-11.0		//////////	11.0	**Clay**, firm, red-brown, wet				
	11.0-11.5		//-//-//-//		**Clay**, silty, pinkish-brown, wet,				
	11.5-14.2		//-//-//-//		**Clay**, firm, red-brown, wet,				
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
	14.2-15.0		//////////		**Clay**, silty, pinkish-brown, wet,				
			//////////						
	15.0-15.2		//-//-//-//	15.0	**Clay**, silty, pinkish-brown, wet,				
	15.2-17.7		//////////		**Clay**, firm, red-brown, wet, mottled				
			//////////						
			//////////						
			//////////						
			//////////						
	17.7-20.0		//////////		**Clay**, firm, dark brown, some red mottling, wet				
			//////////						
			//////////						
			//////////						
			//////////	20.0					
	20.0-24.4		//////////		**Clay**, firm, dark brown, wet				
			//////////						
			//////////						

SIZE & TYPE OF BORING: 6-1/4" OD Air Rotary
LOGGED BY: WHK

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Sheet: 2 OF 8
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 11.0 bgs
Boring No.: BW2C

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////	22.0					
	24.4-24.8		********		**Sand**, fine, red-brown, white grains, dry				
	24.8-25.0		********	25.0	**Silt**, pinkish-brown, dry				
	25.0-26.2		//////////		**Clay**, firm, silty, reddish brown w/ pinkish-brown				
	26.2-26.7		//////////		mottling, wet				
	26.7-27.3		********		**Sand**, very fine, pinkish-brown moist				
	27.3-29.0		- - - - - -		**Silt**, pinkish-brown, damp				
	29.0-30.0		//////////		**Clay**, firm, silty pinkish-brown to reddish-brown,				
			//////////		mottled, damp, small carbonate nodules				
			//////////		**Silt**, pinkish-brown, mottled, damp				
			//////////	30.0	nodules				
	30.0-31.2		- - - - - -		**Silt**, pinkish-brown, mottled, damp				
	31.2-34.3		//////////		**Clay**, firm, red-brown, moist				
			//////////		(32.5-32.6 grey mottled clay)				
	34.3-35.0		- - - - - -		**Silt**, pinkish-brown, dry				
			- - - - - -						
			- - - - - -	35.0					
	35.0-40.0		//-//-//-//		**Clay**, red-brown, firm, silty, mottled pinkish-brown				
			//-//-//-//		moist				
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//	40.0					
	40.0-40.9		//////////		**Clay**, red-brown, firm, moist				
	40.9-41.8		//////////		**Clay**, red-brown, soft, wet				
			//////////						
	41.8-42.9		//-//-//-//		**Sand**, very fine, silty, red-brown, thin clay stringers				
			//-//-//-//		black laminations, water bearing				
	42.9--43.5		//////////		**Clay**, red-brown, soft, wet				

SIZE & TYPE OF BORING: 6-1/4" OD Air Rotary **LOGGED BY:** WHK

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Sheet: 3 OF 8
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 11.0 bgs
Boring No.: BW2C

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	43.5-44.7		////////// //////////		**Clay**, red-brown, firm, wet				
	44.7-45.0		**/**/**/	45.0	**Sand**, clayey, red-brown, soft, wet				
	45.0-45.6		**/**/**/		**Sand**, clayey, red-brown, soft, water bearing				
	45.6-48.5		////////// ////////// ////////// ////////// //////////		**Clay**, red-brown, firm, wet				
	48.5-48.8		**/**/**/		**Sand**, clayey, red-brown, soft, wet				
	48.8-50.0		////////// ////////// //////////	50.0	**Clay**, red-brown, firm, wet, grey reduction spots				
	50.0-55.0		////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	55.0	**Clay**, red-brown, firm, moist 2.0' of sample recovered				
	55.0-60.0		//*//*//*// //*//*//*// //*//*//*// //*//*//*// //*//*//*// //*//*//*//		**Clay**, sandy, firm, brown, saturated (6" of sample recovered)				
	58.2-59.8		**/**/**/ **/**/**/ **/**/**/ **/**/**/	60.0	**Sand**, slightly clayey, mottled red-grey, dry, dense dense-very dense, pebbles of limestone, chert and sandstone				
	60.0-64.7		********* ********* ********* ********* ********* ********* *********		**Sand**, fine, brown, loose, water bearing, 1" clay stringer from 61.0 to 61.2' (1.2' of sample recovered)				
	64.7-65.0		////////// ////////// //////////		**Clay**, red-brown, firm, wet				

SIZE & TYPE OF BORING: 6-1/4" OD Air Rotary
LOGGED BY: WHK

C:\Documents and Settings\hwb_rp05\My Documents\Giant Ciniza\Bound

Sheet: 4 OF 8
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 11.0 bgs
Boring No.: BW2C

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	65.0-70.0		//////////	65.0	**Clay**, dark brown, firm, some red-brown mottling, wet				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	70.0					
	70.0-75.0		//////////		**Clay**, dark brown, firm, wet				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	75.0					
	75.0-79.5		//////////		**Clay**, red brown, firm, wet				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
	79.5-82.5		//////////		**Clay**, red brown, firm, wet, grey reduction spots				
			//////////	80.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
	82.5-84.5		**/**/**/		**Sand**, clayey, red-brown, moderate dense, some gravels (sandstone and limestone), weakly water bearing				
			//**/						
			//**/						
			//**/						
	84.5-85.0		//////////		**Petrified Forest Formation, Painted Desert Mem** **Mudstone**, weathered, red-brown, grey-green reduction spots, hard, moist-wet, blocky/crumbly				
			//////////	85.0					
			//////////						
			//////////						

SIZE & TYPE OF BORING: 6-1/4" OD Air Rotary **LOGGED BY:** WHK

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Sheet: 6 OF 8
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 11.0 bgs
Boring No.: BW2C

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	85.0-90.0		//////////	86.0	**Mudstone**, weathered, red-brown, grey-green reduction spots, hard, moist-wet, blocky/crumbly, mottled, thin bedded to laminar, more laminar > 86'				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	90.0					
	90.0-151.0		//////////		**Mudstone/Siltstone** interbedded, blocky, damp-dry, dense **Chinle Group, Petrified Forest Formation, Painted Desert Member** blocky, damp-dry, dense **Chinle Group, Petrified Forest Formation, Painted Desert Member**				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	95.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	100.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	105.0					
			//////////						
			//////////						

SIZE & TYPE OF BORING: 6-1/4" OD Air Rotary
LOGGED BY: WHK

Sheet: 6 OF 8
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 11.0 bgs
Boring No.: BW2C

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	110.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	115.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	120.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	125.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						

SIZE & TYPE OF BORING: 6-1/4" OD Air Rotary
LOGGED BY: WHK

Sheet: 7 OF 8
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 11.0 bgs
Boring No.: BW2C

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	130.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	135.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	140.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
	143.0-165.0		********		**Petrified Forest Formation**				
			********		**Sandstone**, very argillaceous, green-white				
			********		weakly water bearing, (easily drilled)				
			********	145.0					
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********						

SIZE & TYPE OF BORING: 6-1/4" OD Air Rotary **LOGGED BY:** WHK

Sheet: 5 OF 8
Bore Point: NW of Pond 11

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 11.0 bgs
Boring No.: BW2C

Log of Test Borings

Elevation: TBD
Date: 10/28/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			********						
			********	150.0					
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********	155.0					
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********	160.0					
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********						
			********	165.0					
			////////////		**Siltstone/Mudstone**, interbedded as above				
			////////////						
			////////////						
			////////////						
			////////////						
			////////////						
			////////////						
			////////////						
			////////////						
			////////////						
			////////////	170.0	T.D.				

SIZE & TYPE OF BORING: 6-1/4" OD Air Rotary
LOGGED BY: WHK

Sheet: 2 OF 3
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW3A

Log of Test Borings

Elevation: Existing
Date: 6/15/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-5.0		//////////	0.0	**Clay**, red-brown, firm, blocky, moist, roots from 0-2'				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	5.0					
	5.0-9.0		//////////		**Clay**, dark brown, firm, blocky, moist				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
	9.0-9.3		//////////		**Clay**, red-brown, slightly silty, firm, moist				
	9.3-12.0		//////////		**Clay**, dark brown to red-brown, firm, blocky, moist				
			//////////	10.0					
			//////////						
			//////////						
			//////////						
	12.0-12.2		- - - - -		**Silt**, clayey, light brown, crumbly, damp-dry				
	12.2-15.0		//////////		**Clay**, red-brown, firm, blocky, damp-moist				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	15.0					
	15.0-18.0		//////////		**Clay**, brown, hard, blocky, moist, 16.5 to 17.0' mottled dark and light brown, calcite nodules				
			//////////						
			//////////						
			//////////						
			//////////						
	18.0-20.0		*******		**Sand**, very fine, reddish-brown, loose, dry				
			*******						
			*******						
			*******						
			*******	20.0					
	20.0-24.3		*******		**Sand**, very fine, reddish, loose, dry, thin clay stringer, 2.5' recovered				
			*******						
			*******						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** KM/NS

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Sheet: 2 OF 3
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW3A

Log of Test Borings

Elevation: Existing
Date: 6/15/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////	22.0	**Clay**, red-brown, firm, blocky, moist, roots from 0-2'				
	24.3-24.6		*- - --*		**Silt**, sandy, light brown, firm, dry				
	24.6-25.0		- - - - -		**Silt**, light brown, hard, moist				
			- - - - -	25.0					
	25.0-27.0		*- - --*		**Silt**, sandy, light brown, loose, dry				
			- - --						
			- - --						
	27.0-30.0		/- - -/- -		**Silt**, some clay, mottled (silt is tan, clay is red-brown), hard, damp				
			/- - -/- -						
			/- - -/- -						
			/- - -/- -						
			/- - -/- -						
			/- - -/- -						
			/- - -/- -	30.0					
	30.0-35.0		//-//-//-//		**Clay**, silty, red-brown, mottled, hard, moist				
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//						
			//-//-//-//	35.0					
	35.0-37.0		//-//-//-//		**Clay**, silty, red-brown, mottled, hard, moist				
			//-//-//-//						
			//-//-//-//						
	37.0-40.0		//////////		**Clay**, red-brown, hard, moist				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	40.0					
	40.0-41.0		//////////		**Clay**, red-brown, hard, moist, blocky				
	41.0-41.6		/- - -/- -		**Silt**, clayey, red-brown mottled, firm, moist				
	41.6-42.0		- - - - -		**Silt**, very fine sand, red-brown, soft, damp				
	42.0-43.0		*******		**Sand**, very fine, some silt, tan grading to red-brown, loose, dry, siltier at bottom				
			*******						
			*******						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** KM/NS

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Sheet: 3 OF 3
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW3A

Log of Test Borings

Elevation: Existing
Date: 6/15/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	43.0-45.0		////////// ////////// //////////	43.5	**Clay**, some silt, red-brown, mottled, firm, moist horizontal laminations, coarsing upward to sand				
	45.0-46.7		**-**-** **-**-** **-**-** **-**-**	45.0	**Sand**, very fine, silty, red-brown, loose, damp				
	46.7-47.3		- - - - - -		**Silt**, red-brown, firm, damp				
	47.3-48.3		//-//-//-// //-//-//-//		**Clay**, silty, red-brown mottled, blocky, firm, moist				
	48.3-50.0		////////// ////////// ////////// //////////	50.0	**Clay**, red-brown, small amount of grey mottling, hard, wet, limonite at 49.0'				
					T.D. 50.0				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: KM/NS

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Sheet: 1 OF 4
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW3B

Log of Test Borings

Elevation: Existing
Date: 10/15/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-5.0		//////////	0.0	**Clay**, red-brown, firm, blocky, moist, roots from 0-2'				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	5.0					
	5.0-9.0		//////////		**Clay**, dark brown, firm, blocky, moist				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
	9.0-9.3		//////////		**Clay**, red-brown, slightly silty, firm, moist				
	9.3-12.0		//////////		**Clay**, dark brown to red-brown, firm, blocky, moist				
			//////////	10.0					
			//////////						
			//////////						
			//////////						
	12.0-12.2		- - - - -		**Silt**, clayey, light brown, crumbly, damp-dry				
	12.2-15.0		//////////		**Clay**, red-brown, firm, blocky, damp-moist				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	15.0					
	15.0-18.0		//////////		**Clay**, brown, hard, blocky, moist, 16.5 to 17.0' mottled dark and light brown, calcite nodules				
			//////////						
			//////////						
			//////////						
			//////////						
	18.0-20.0		*******		**Sand**, very fine, reddish-brown, loose, dry				
			*******						
			*******						
			*******						
			*******	20.0					
	20.0-24.3		*******		**Sand**, very fine, reddish, loose, dry, thin clay stringer, 2.5' recovered				
			*******						
			*******						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** KM/NS

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Sheet: 2 OF 4
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW3B

Log of Test Borings

Elevation: Existing
Date: 11/11/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			////////// ////////// ////////// //////////	22.0	**Clay**, red-brown, firm, blocky, moist, roots from 0-2'				
	24.3-24.6		*- - --*		**Silt**, sandy, light brown, firm, dry				
	24.6-25.0		- - - - - - - - - -	25.0	**Silt**, light brown, hard, moist				
	25.0-27.0		*- - --* *- - --* *- - --*		**Silt**, sandy, light brown, loose, dry				
	27.0-30.0		/- - -/- - /- - -/- - /- - -/- - /- - -/- - /- - -/- - /- - -/- -	30.0	**Silt**, some clay, mottled (silt is tan, clay is red-brown), hard, damp				
	30.0-35.0		//-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-//	35.0	**Clay**, silty, red-brown, mottled, hard, moist				
	35.0-37.0		//-//-//-// //-//-//-// //-//-//-//		**Clay**, silty, red-brown, mottled, hard, moist				
	37.0-40.0		////////// ////////// ////////// ////////// ////////// ////////// //////////	40.0	**Clay**, red-brown, hard, moist				
	40.0-41.0		//////////		**Clay**, red-brown, hard, moist, blocky				
	41.0-41.6		/- - -/- -		**Silt**, clayey, red-brown mottled, firm, moist				
	41.6-42.0		- - - - -		**Silt**, very fine sand, red-brown, soft, damp				
	42.0-43.0		******* ******* *******		**Sand**, very fine, some silt, tan grading to red-brown, loose, dry, siltier at bottom				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** KM/NS

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Sheet: 3 OF 4
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW3B

Log of Test Borings

Elevation: Existing
Date: 10/15/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	43.0-45.0		////////// ////////// //////////	43.5	**Clay**, some silt, red-brown, mottled, firm, moist horizontal laminations, coarsing upward to sand				
	45.0-46.7		**-**-** **-**-** **-**-** **-**-**	45.0	**Sand**, very fine, silty, red-brown, loose, damp				
	46.7-47.3		- - - - - -		**Silt**, red-brown, firm, damp				
	47.3-48.3		//-//-//-// //-//-//-//		**Clay**, silty, red-brown mottled, blocky, firm, moist				
	48.3-50.0		////////// ////////// ////////// //////////	50.0	**Clay**, red-brown, small amount of grey mottling, hard, wet, limonite at 49.0'				
	50.0-55.0		////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	55.0	**Clay**, red-brown, small amount of grey mottling, hard, wet, limonite at 49.0', slightly softer than above (sticky)				
	55.0-57.5		////////// ////////// ////////// //////////		**Clay**, red-brown, stiff, wet, some charcoal at 56.0' as laminar partings				
	57.5-57.7		//*//*//*//		**Clay**, red-brown, sandy, clay soft on both sides not water bearing but wetter than above and below				
	57.7-60.0		//*//*//*// //////////						
			////////// ////////// //////////	60.0	**Clay**, red-brown, very stiff, wet, sticky, slickensided when sampled, some grey reduction marks as random striations, looks dendritic in 3D, occasional charcoal pieces				
	60.0-61.8		//////////		**Clay as above**				
	61.8-62.0		*******		**Sand**, clayey, red-brown, loose-soft, wet				
	62.0-62.4		//////////		**Clay**, red-brown, firm, wet, some scattered charcoal				
	62.4-63.2		//////////						
	63.2-66.2		******* ****		**Clay**, sandy, brown-grey, soft, very wet, not water bearing				
			******* *******		**Sand**, silty, fine, red-brown, water bearing, some clay, limonite stain, laminar banded				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: KM/NS

Sheet: 4 OF 4
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: Not Encountered
Boring No.: BW3B

Log of Test Borings

Elevation: Existing
Date: 10/15/2003

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			******* ******* *******	65.0					
	66.2-69.6		////////// ////////// ////////// ////////// //////////		**Clay**, light red, very stiff, wet, some scattered reduction spots				
	69.6-69.8		*******		**Sand**, clayey, red-brown, moist				
	69.8-71.8		////////// ////////// ////////// ////////// //////////	70.0	**Clay**, red-brown, stiff, wet, occasional red spots				
	71.8-72.2		//*//*//*//		**Clay**, coarse sandy, dark red-brown, wet				
	72.2-72.4		//////////		**Clay**, red-brown, stiff, wet				
	72.4-72.8		********		**Sand**, clayey, red-brown, moderate dense,				
	72.8-74.0		********		loose, wet				
	74.0-75.0		//////////		**Clay**, coarse sandy, very stiff, wet, rare pebbles				
			////////// ////////// ////////// ////////// //////////	75.0	**Chinle Group, Petrified Forest Formation, Painted Desert Member** **Mudstone**, purple, hard, damp, blocky/crumbly, green-grey reduction webs and occasional				
			//////////		spots				
	T.D.				Set well in boring .010" Slotted PVC Screen: set in 62'-72' interval				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** KM/NS

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Sheet: 4 OF 8
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 6.9' bgs
Boring No.: BW3C

Log of Test Borings

Elevation: Existing
Date: 7/20/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	0-5.0		//////////	0.0	**Clay**, red-brown, firm, blocky, moist, roots from 0-2'				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	5.0					
	5.0-9.0		//////////		**Clay**, dark brown, firm, blocky, moist				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
	9.0-9.3		//////////		**Clay**, red-brown, slightly silty, firm, moist				
	9.3-12.0		//////////		**Clay**, dark brown to red-brown, firm, blocky, moist				
			//////////	10.0					
			//////////						
			//////////						
			//////////						
	12.0-12.2		- - - - -		**Silt**, clayey, light brown, crumbly, damp-dry				
	12.2-15.0		//////////		**Clay**, red-brown, firm, blocky, damp-moist				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	15.0					
	15.0-18.0		//////////		**Clay**, brown, hard, blocky, moist, 16.5 to 17.0' mottled dark and light brown, calcite nodules				
			//////////						
			//////////						
			//////////						
			//////////						
	18.0-20.0		*******		**Sand**, very fine, reddish-brown, loose, dry				
			*******						
			*******						
			*******						
			*******	20.0					
	20.0-24.3		*******		**Sand**, very fine, reddish, loose, dry, thin clay stringer, 2.5' recovered				
			*******						
			*******						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

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Sheet: 4 OF 8
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 6.9' bgs
Boring No.: BW3C

Log of Test Borings

Elevation: Existing
Date: 7/20/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			////////// ////////// ////////// //////////	22.0	**Clay**, red-brown, firm, blocky, moist, roots from 0-2'				
	24.3-24.6		*- - --*		**Silt**, sandy, light brown, firm, dry				
	24.6-25.0		- - - - - - - - - -	25.0	**Silt**, light brown, hard, moist				
	25.0-27.0		*- - --* *- - --* *- - --*		**Silt**, sandy, light brown, loose, dry				
	27.0-30.0		/- - -/- - /- - -/- - /- - -/- - /- - -/- - /- - -/- - /- - -/- -	30.0	**Silt**, some clay, mottled (silt is tan, clay is red-brown), hard, damp				
	30.0-35.0		//-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-// //-//-//-//	35.0	**Clay**, silty, red-brown, mottled, hard, moist				
	35.0-37.0		//-//-//-// //-//-//-// //-//-//-//		**Clay**, silty, red-brown, mottled, hard, moist				
	37.0-40.0		////////// ////////// ////////// ////////// ////////// ////////// //////////	40.0	**Clay**, red-brown, hard, moist				
	40.0-41.0		//////////		**Clay**, red-brown, hard, moist, blocky				
	41.0-41.6		/- - -/- -		**Silt**, clayey, red-brown mottled, firm, moist				
	41.6-42.0		- - - - -		**Silt**, very fine sand, red-brown, soft, damp				
	42.0-43.0		******* ******* *******		**Sand**, very fine, some silt, tan grading to red-brown, loose, dry, siltier at bottom				

E & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger — LOGGED BY: WHK

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Sheet: 4 OF 8
Bore Point: N. Ponds-see plan

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Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 6.9' bgs
Boring No.: BW3C

Log of Test Borings

Elevation: Existing
Date: 7/20/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
	43.0-45.0		////////// ////////// //////////	43.5	**Clay**, some silt, red-brown, mottled, firm, moist horizontal laminations, coarsing upward to sand				
	45.0-46.7		**_**_** **_**_** **_**_** **_**_**	45.0	**Sand**, very fine, silty, red-brown, loose, damp				
	46.7-47.3		- - - - - -		**Silt**, red-brown, firm, damp				
	47.3-48.3		//-//-//-// //-//-//-//		**Clay**, silty, red-brown mottled, blocky, firm, moist				
	48.3-50.0		////////// ////////// ////////// //////////	50.0	**Clay**, red-brown, small amount of grey mottling, hard, wet, limonite at 49.0'				
	50.0-55.0		////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// ////////// //////////	55.0	**Clay**, red-brown, small amount of grey mottling, hard, wet, limonite at 49.0', slightly softer than above (sticky)				
	55.0-57.5		////////// ////////// ////////// //////////		**Clay**, red-brown, stiff, wet, some charcoal at 56.0' as laminar partings				
	57.5-57.7		//*//*//*//		**Clay**, red-brown, sandy, clay soft on both sides				
	57.7-60.0		//*//*//*// //////////		not water bearing but wetter than above and below				
			////////// ////////// //////////	60.0	**Clay**, red-brown, very stiff, wet, sticky, slickensided when sampled, some grey reduction marks as random striations, looks dendritic in 3D, occasional charcoal pieces				
	60.0-61.8		//////////		**Clay as above**				
	61.8-62.0		*******		**Sand**, clayey, red-brown, loose-soft, wet				
	62.0-62.4		//////////		**Clay**, red-brown, firm, wet, some scattered charcoal				
	62.4-63.2		//////////						
	63.2-66.2		******* **** ******* *******		**Clay**, sandy, brown-grey, soft, very wet, not water bearing **Sand**, silty, fine, red-brown, water bearing, some clay, limonite stain, laminar banded				

E & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger LOGGED BY: WHK

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Sheet: 4 OF 8
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 6.9' bgs
Boring No.: BW3C

Log of Test Borings

Elevation: Existing
Date: 7/20/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			*******	65.0					
			*******						
			*******						
	66.2-69.6		//////////		**Clay**, light red, very stiff, wet, some scattered reduction spots				
			//////////						
			//////////						
			//////////						
			//////////						
	69.6-69.8		*******		**Sand**, clayey, red-brown, moist				
	69.8-71.8		//////////		**Clay**, red-brown, stiff, wet, occasional red spots				
			//////////	70.0					
			//////////						
			//////////						
			//////////						
	71.8-72.2		//*//*//*//		**Clay**, coarse sandy, dark red-brown, wet				
	72.2-72.4		//////////		**Clay**, red-brown, stiff, wet				
	72.4-72.8		********		**Sand**, clayey, red-brown, moderate dense, loose, wet				
	72.8-74.0		********						
	74.0-92.0		//////////		**Clay**, coarse sandy, very stiff, wet, rare pebbles				
			//////////		**Chinle Group, Petrified Forest Formation, Painted Desert Member**				
			//////////	75.0	**Mudstone**, purple, hard, damp, blocky/crumbly, green-grey reduction webs and occasional spots				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	80.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	85.0					
			//////////						
			//////////						
			//////////						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger LOGGED BY: WHK

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Sheet: 5 OF 8
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 6.9' bgs
Boring No.: BW3C

Log of Test Borings

Elevation: Existing
Date: 7/20/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	90.0					
			//////////						
			//////////						
			//////////						
			//////////						
	92.0-94.0		********		Sand, yellow-brown, hard, dry				
			********						
			********						
			********						
	94.0-105.0		//////////		Mudstone/Siltstone, yellow-brown, hard, dry				
			//////////	95.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	100.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	105.0					
	105-110.0		**/**/*/**		Sandstone, mudstone, silt, interbedded, dense, dry				
			//*/**						
			//*/**						
			//*/**						
			//*/**						
			//*/**						

E & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger LOGGED BY: WHK

Sheet: 6 OF 8
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 6.9' bgs
Boring No.: BW3C

Log of Test Borings

Elevation: Existing
Date: 7/20/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//*/**						
			//*/**						
			//*/**						
			//*/**	110.0					
			//////////		**Mudstone/Siltstone**, smooth drilling but dense, some fine sandy stringers encountered, 125-130' dark red-brown, not water bearing				
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	115.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	120.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	125.0					
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: WHK

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Sheet: 7 OF 8
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
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505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 6.9' bgs
Boring No.: BW3C

Log of Test Borings

Elevation: Existing
Date: 7/20/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			//////////	130.0					
	130-155.0		*/-*/-*/-		**Mudstone/Siltstone/Sandstone**, interbedded, sandstone drills hard, white mudstone/Siltstone red-brown				
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-	135.0					
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-	140.0					
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-	145.0					
			/-/-*/-		**Sandstone**, weakly water bearing, white, hard, quartz				
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-						
			/-/-*/-	150.0					
			/-/-*/-						
			/-/-*/-						

E & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger — LOGGED BY: WHK

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Sheet: 8 OF 8
Bore Point: N. Ponds-see plan

Precision Engineering, Inc.
P.O. Box 422
Las Cruces, NM 88004
505-523-7674

File #: 03-118
Site: Ciniza
Boundary Wells

Water Elevation: 6.9' bgs
Boring No.: BW3C

Log of Test Borings

Elevation: Existing
Date: 7/20/2004

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR,ETC.)	%M	LL	PI	CLASS.
			/-/-*/- */-*/-*/- */-*/-*/- */-*/-*/- */-*/-*/- */-*/-*/- */-*/-*/- */-*/-*/-	155.0					
					T.D. 155.0'				

SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger
LOGGED BY: WHK

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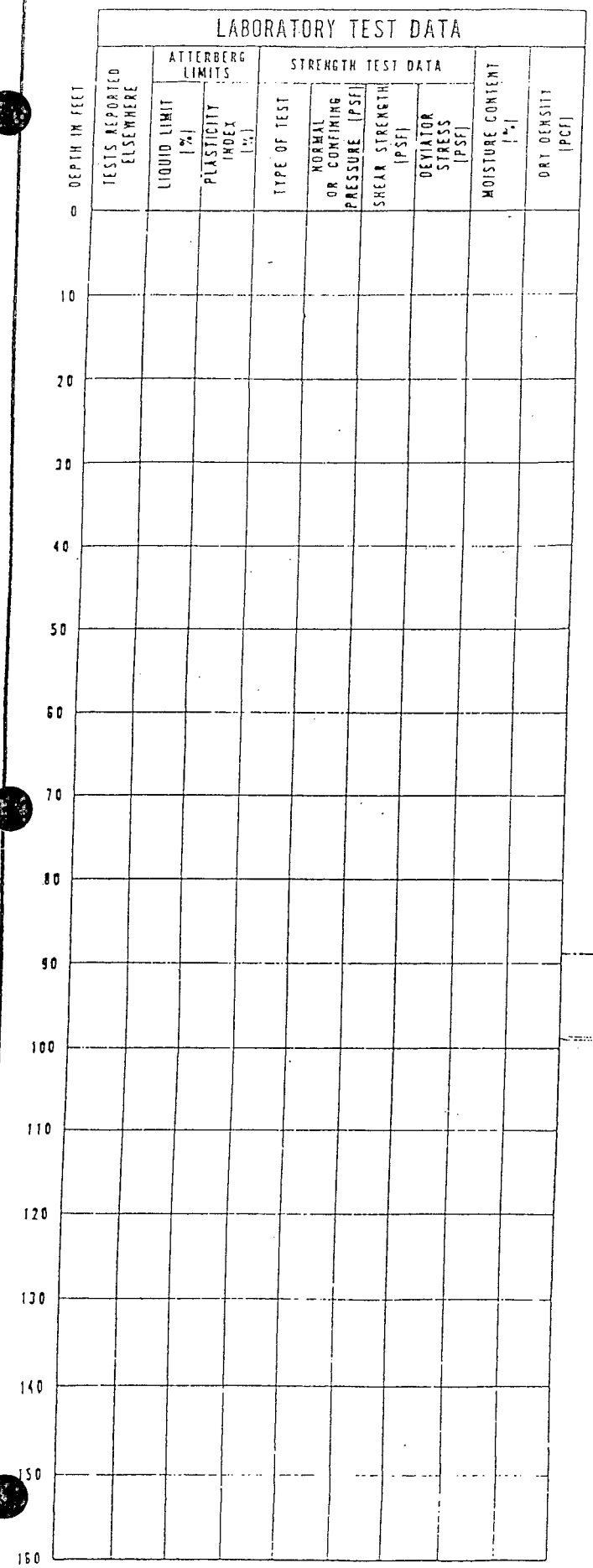
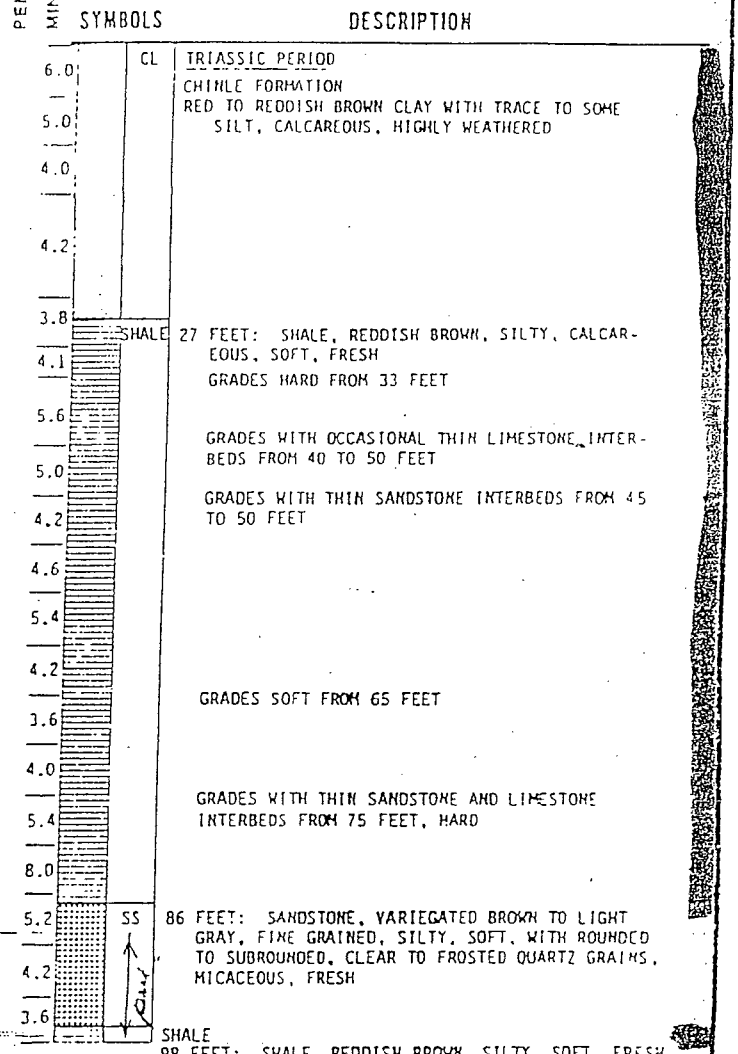
BORING OW-1

SURFACE ELEVATION: 6868 FEET





KEY TO BORINGS
ROCK SYMBOLS

SHALE SANDSTONE MUDSTONE

NOTES:

1. PENETRATION RATE IN MINUTES PER FOOT WAS DETERMINED BY THE TIME REQUIRED TO DRILL EACH INTERVAL SHOWN WITH A CABLE TOOL RIG.
2. ESTIMATES OF SOIL CONSISTENCY AND ROCK STRENGTH ARE BASED ON PENETRATION RATE USING THE FOLLOWING CRITERIA:
   - < 4.2 MIN./FT.-SOFT
   - > 4.2 MIN./FT.-HARD
3. ELEVATION GIVEN IN FEET ABOVE MEAN SEA LEVEL.
4. SOIL CLASSIFICATION IS BASED ON UNIFIED SOIL CLASSIFICATION SYSTEM (PLATE A2-1).
5. ALL DEPTHS REFER TO DEPTH BELOW GROUND.
6. SEE PLATE 1 FOR LOCATION OF WELLS.

LOG OF BORINGS

BORING OW-2

SURFACE ELEVATION: 6871 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

SYMBOLS	PENETRATION RATE MINUTES/FOOT	DESCRIPTION
ML	1.8	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY CLAY, SOFT, HIGHLY WEATHERED
	2.0	▼ 7-6-84
	3.0	
SHALE	4.0	34 FEET: SHALE, REDDISH BROWN, SILTY, CALCAREOUS, SOFT, FRESH
	2.4	
	3.5	
	1.9	GRADES BROWN FROM 50 FEET
	2.0	GRADES WITH SOME FINE SAND FROM 58 FEET
	1.4	
	2.0	SILT AND FINE SAND GRADES OUT FROM 70 FEET
	1.4	GRADES DARK GRAY FROM 75 FEET
	1.0	GRADES WITH TRACE TO SOME SILT FROM 80 FEET
	2.3	
SHALE	2.5	83 FEET: SHALE, DARK BROWN TO BLACK, WITH SOME SAND AND GRAVEL-SIZED FRAGMENTS OF PETRIFIED WOOD, HARD
	10.0	GRADES GRAY FROM 88 FEET
	7.8	
	11.2	
	7.5	GRADES PURPLE TO GRAY FROM 100 FEET
	7.0	
	5.0	GRADES SOFT FROM 110 FEET
	3.4	
	4.4	GRADES HARD FROM 120 TO 125 FEET
	5.0	GRADES REDDISH BROWN FROM 125 FEET, SOFT
	3.8	GRADES HARD FROM 130 FEET
	5.0	
	5.4	GRADES TO PURPLE AND REDDISH BROWN FROM 135 FEET
	5.0	
SS		143 FEET: SANDSTONE, BROWN, FINE-GRAINED, SUB-ANGULAR, CALCAREOUS, WELL SORTED, SOFT
SHALE	4.0	162.5 FEET: SHALE, PURPLE TO REDDISH BROWN, WITH SOME SILT, HARD
	3.6	
	4.6	
	5.0	

BORING COMPLETED AT 163.0 FEET ON 10/31/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 48.0 TO 68.0 FEET.
GRAVEL PLACED FROM 43.0 TO 68.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 31.2 FEET BELOW GROUND 1/5/81.

LOG OF BORINGS

BORING OW-10

SURFACE ELEVATION: 6872 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 (PSI)	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

	SYMBOLS	DESCRIPTION
1.0	CL	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY CLAY, SOFT, HIGHLY WEATHERED
1.4	ML	GRADES WITH TRACE TO SOME MEDIUM TO FINE-GRAINED SAND-SIZED PARTICLES OF CHERT, PETRIFIED WOOD, AND LIMESTONE FROM 5 FEET
2.0	CL	10 FEET: REDDISH BROWN SILTY FINE-GRAINED SAND, WITH SOME CLAY, SOFT, HIGHLY WEATHERED 13 FEET: REDDISH BROWN SILTY CLAY WITH SOME SAND, SOFT, HIGHLY WEATHERED SAND GRADES OUT FROM 16 FEET GRADES WITH SAND FROM 24 FEET GRADES WITH OCCASIONAL THIN INTERBEDS OF SANDSTONE FROM 28 FEET
2.8	SS	34 FEET: SANDSTONE, COLOR VARIES FROM DARK AND REDDISH BROWN TO WHITE TO LIGHT GRAY, SILTY, FINE-GRAINED, NONCALCAREOUS, SOFT, FRESH
3.0		
6.7		GRADES BROWN FROM 45 FEET
2.9		
4.6		
5.0	SHALE	63 FEET: SHALE, GRAY TO PURPLISH GRAY, SILTY, WITH OCCASIONAL THIN INTERBEDS OF TAN TO BROWN, FINE-GRAINED, CALCAREOUS SANDSTONE, HARD, FRESH

BORING COMPLETED AT 68.0 FEET ON 11/25/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 40.0 TO 60.0 FEET.
GRAVEL PLACED FROM 36.0 TO 68.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 1.7 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

BORING OW-11

SURFACE ELEVATION: 5923 6823 FEET
Date Completed 12/30/80
Coordinates 1365 N, 1455 W

LABORATORY TEST DATA

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 (PSI)	STRENGTH TEST DATA: SHEAR STRENGTH (PSI)	STRENGTH TEST DATA: DEVIATION STRESS (PSI)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)
0									
10									
20									
30									
40									
50									
60									
70									
80									
90									
100									
110									
120									
130									
140									
150									
160									

GRAVEL

PENETRATION RATE MINUTES/FOOT	SYMBOLS	DESCRIPTION
1.6	SM	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY FINE SAND, SOFT, HIGHLY WEATHERED
1.4		GRADES WITH GRAVEL-SIZED FRAGMENTS OF FINE SANDSTONE AND LIMESTONE FROM 7 FEET
2.4	SHALE	13 FEET: SHALE, GRAY, SILTY, WITH OCCASIONAL THIN INTERBEDS OF WHITE SANDSTONE, SOFT, FRESH
3.0		GRADES WITH REDDISH BROWN SANDSTONE INTERBEDS FROM 20 FEET
6.5		GRADES WITH LAYER OF WHITE, FINE-GRAINED SANDSTONE FROM 23 TO 24 FEET
2.4		
12.5	SS	30 FEET: SANDSTONE, WHITE, FINE-GRAINED, WITH GRAVEL-SIZED FRAGMENTS OF CHERT, OCCASIONAL THIN INTERBEDS OF REDDISH BROWN FINE-GRAINED SANDSTONE, THINLY BEDDED, HARD, FRESH
4.4		
5.5		
4.0	SHALE	40 FEET: SHALE, GRAY TO PURPLE, SILTY AND SANDY, SOFT, FRESH
3.1		
4.3		GRADES WITH SOME SAND FROM 47 FEET
5.0		GRADES GRAY AND HARD FROM 50 TO 55 FEET
8.0		
2.3		GRADES WHITE TO LIGHT GRAY FROM 55 FEET, SOFT
3.3		
4.0		
2.3		
3.6		GRADES PURPLE FROM 68 FEET
2.3		
4.3		GRADES GRAY FROM 78 FEET
4.5		
2.7		
3.0		
3.5		
4.0		GRADES WITH OCCASIONAL THIN INTERBEDS OF LIMESTONE AND GRAVEL-SIZED FRAGMENTS OF CHERT FROM 92 FEET
4.3		
3.5		
3.3		
4.5		GRADES REDDISH BROWN FROM 103 FEET
2.7		
4.5		
2.0		GRADES GRAY AND HARD FROM 110 FEET
8.5		
5.0		GRADES SOFT WITH NO INTERBEDS FROM 114 FEET
2.3		
2.3		GRADES PURPLISH GRAY FROM 117 FEET
2.7		
3.0		
2.2		
2.3		
2.2		
2.7		GRADES GRAY FROM 140 FEET
3.3		
2.7		
2.2		

BORING COMPLETED AT 150.0 FEET ON 12/30/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 43.0 TO 65.0 FEET.
GRAVEL PLACED FROM 35.0 TO 65.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 20.2 FEET BELOW GROUND ON 1/5/81.
Bottom of casing 65.73'

LOG OF BORINGS

DAMES & MOORE

MONITORING WELL IDENTIFICATION REPORT

NEW MEXICO ENVIRONMENT DEPARTMENT
HAZARDOUS WASTE SECTION
P.O. BOX 26110
SANTA FE, NEW MEXICO 87502

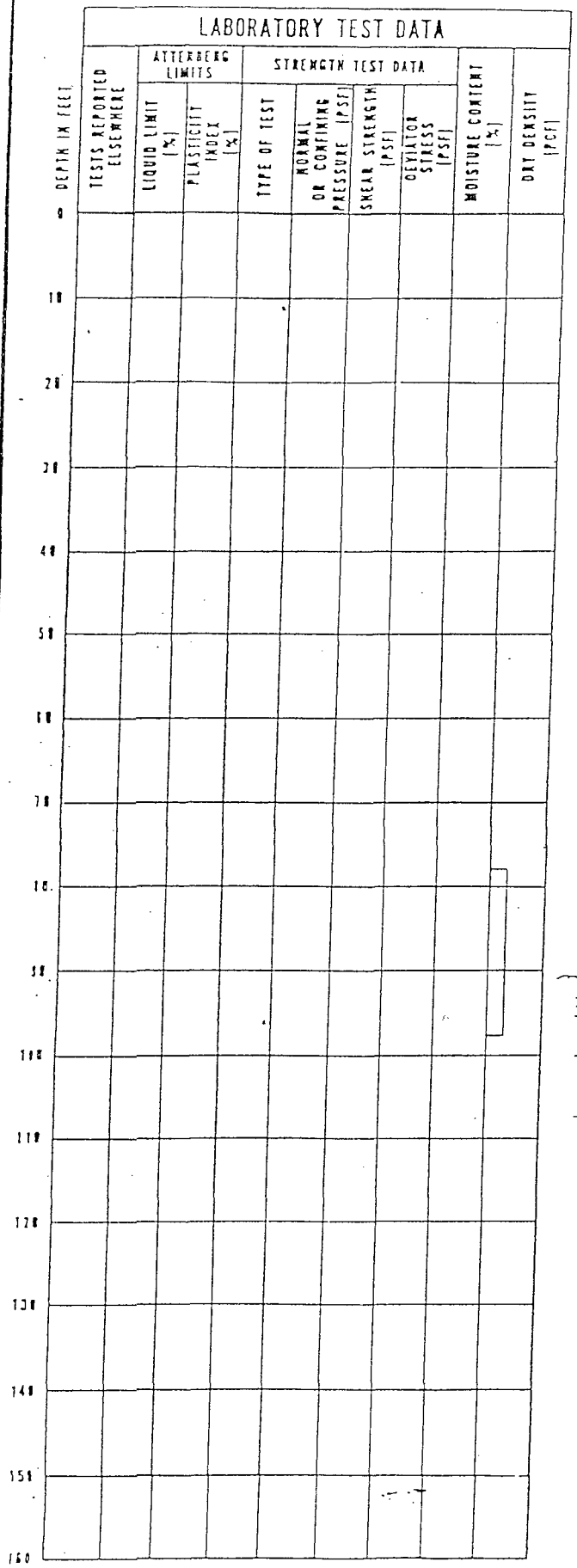
FACILITY NAME	Giant Refining Co. - Ciniza
EPA I.D. NUMBER	NMD000333211-2
COUNTY	McKinley
WELL NUMBER	SMW-5
WELL LOCATION (LONGITUDE)	108 26' 03"
WELL LOCATION (LATITUDE)	35 29' 41"
NEW MEXICO STATE PLANE	(X) 320,778.61 (Y) 1,636,054.28
AQUIFER NAME	Ciniza Sand
AQUIFER CONFINED? xx	UNCONFINED?
WELL INSTALLATION DATE	9-25-85
DRILLING METHOD	HLWAG
INNER CASING DIAMETER	2.0"
BOREHOLE DIAMETER	6.5"
CASING MATERIAL	SS304
METHOD OF DEVELOPMENT	Compr
ELEV. BOTTOM OF BOREHOLE	6800.68
ELEV. BOTTOM OF WELL CASING	6801.78
ELEV. BOTTOM OF SCREENED INT.	6804.78
ELEVATION OF SCREENED INTERVAL	6824.78
SURVEYED ELEVATION OF CASING TOP	6878.02

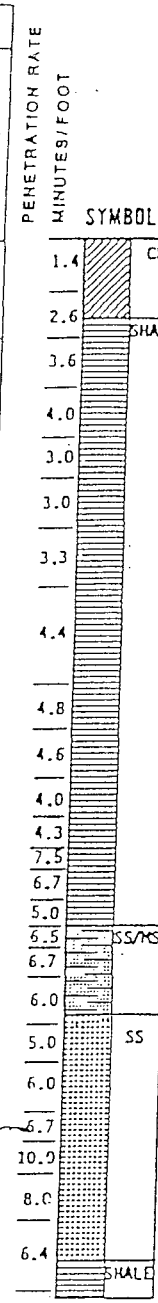
DATE OF REPORT 2-26-96

SIGNATURE Dorinda Mancini
NAME (TYPED) Dorinda Mancini

BORING OW-13

SURFACE ELEVATION: 6914 FEET





DESCRIPTION

TRIASSIC PERIOD

CHINLE FORMATION

REDDISH BROWN SILTY FINE SANDY CLAY, SOFT, HIGHLY WEATHERED

GRADES WITH GRAVEL FROM 3 TO 6 FEET

8 FEET: SHALE, REDDISH BROWN, SILTY WITH SOME FINE SAND, SOFT, FRESH

GRADES WITH THIN LIMESTONE INTERBEDS FROM 26 TO 32 FEET

GRADES GRAY AND HARD FROM 40 FEET

GRADES REDDISH BROWN FROM 55 FEET

70 FEET: SANDSTONE, WHITE TO GRAY, FINE-GRAINED, INTERBEDDED WITH REDDISH BROWN SANDY MUDSTONE, THIN BEDDED, HARD, FRESH

79 FEET: SANDSTONE, LIGHT BROWN, FINE-GRAINED WITH SOME MEDIUM TO COARSE GRAINS, SLIGHTLY CALCAREOUS, COMPOSED OF QUARTZ WITH MINOR LIMESTONE, HARD, FRESH

104 FEET: SHALE, REDDISH BROWN, SANDY, WITH OCCASIONAL THIN INTERBEDS OF SANDSTONE AND LIMESTONE, HARD, FRESH

BORING COMPLETED AT 108.0 FEET ON 12/10/80.
BORING ALLOWED TO CAVE FROM 98.2 TO 104.0 FEET.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 78.2 TO 98.2 FEET.
GRAVEL PLACED FROM 74.0 TO 98.2 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 23.2 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

DAMES & MOORE

BORING OW-14

SURFACE ELEVATION: 6923 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
2.0 / 1.7 / 1.6 / 1.7 / 2.6 — CL	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY, FINE SANDY CLAY, CALCAREOUS, SOFT, HIGHLY WEATHERED
2.6 / 2.2 / 2.6 / 2.4 — SM	24 FEET: REDDISH BROWN SILTY, VERY FINE SAND, SOFT, HIGHLY WEATHERED
5.0 / 4.0 — SS	39 FEET: SANDSTONE, BROWN, FINE-TO COARSE-GRAINED SILTY, WITH OCCASIONAL THIN INTERBEDS OF LIMESTONE, HARD, FRESH

BORING COMPLETED AT 45.0 FEET ON 12/17/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 35.0 TO 45.0 FEET.
GRAVEL PLACED FROM 30.0 TO 45.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 25.8 FEET BELOW GROUND ON 1/5/81.

BAP 209

LOG OF BORINGS

DAMES & MOORE

BORING OW-12

SURFACE ELEVATION: 6930 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/6 INCHES

PENETRATION RATE	SYMBOLS		DESCRIPTION
3.3		GM	TRIASSIC PERIOD
6.4		SS	CHINLE FORMATION
6.4			LIGHT BROWN FINE SAND WITH GRAVEL-SIZED FRAGMENTS OF CHERT, LIMESTONE, AND PETRIFIED WOOD, SOFT, HIGHLY WEATHERED
4.0			3 FEET: SANDSTONE, LIGHT BROWN, FINE-GRAINED WITH SOME MEDIUM TO COARSE GRAINS, COMPOSED OF QUARTZ WITH MINOR CHERT AND LIMESTONE, HARD, FRESH
15.0			GRADES SOFT FROM 17 FEET
2.5			GRADES HARD FROM 20 TO 24 FEET
3.8		SHALE	24 FEET: SHALE, REDDISH BROWN, SILTY, SANDY, WITH GRAVEL-SIZED FRAGMENTS OF PETRIFIED WOOD AND LIMESTONE, SOFT, FRESH
6.2			
6.7			GRADES HARD FROM 29 FEET
5.0			
3.0			GRADES SOFT FROM 40 FEET
3.0			
			GRADES HARD FROM 49 FEET
4.2			
4.4			
6.3		SS	61 FEET: SANDSTONE, GRAY, SILTY, FINE-TO MEDIUM-GRAINED, CALCAREOUS, HARD, FRESH
3.3		SHALE	64 FEET: SHALE, GRAY, SILTY, SANDY, SOFT, FRESH
3.3			
3.4			
3.6			
3.4			
			GRADES HARD FROM 90 FEET
5.3			
5.0			
4.3			
5.0		SS	104 FEET: SANDSTONE, GRAY TO BLUISH GRAY, FINE-GRAINED, THINLY BEDDED, NONCALCAREOUS, WITH INTERBEDDED REDDISH BROWN SANDY MUDSTONE, HARD, FRESH
5.6			GRADES BROWN FROM 112 FEET
4.8			
4.0			
5.0			
4.3			
5.0			
8.3			
5.0		SHALE	143 FEET: SHALE, GRAY, SILTY, SANDY, HARD, FRESH

SCARLEN

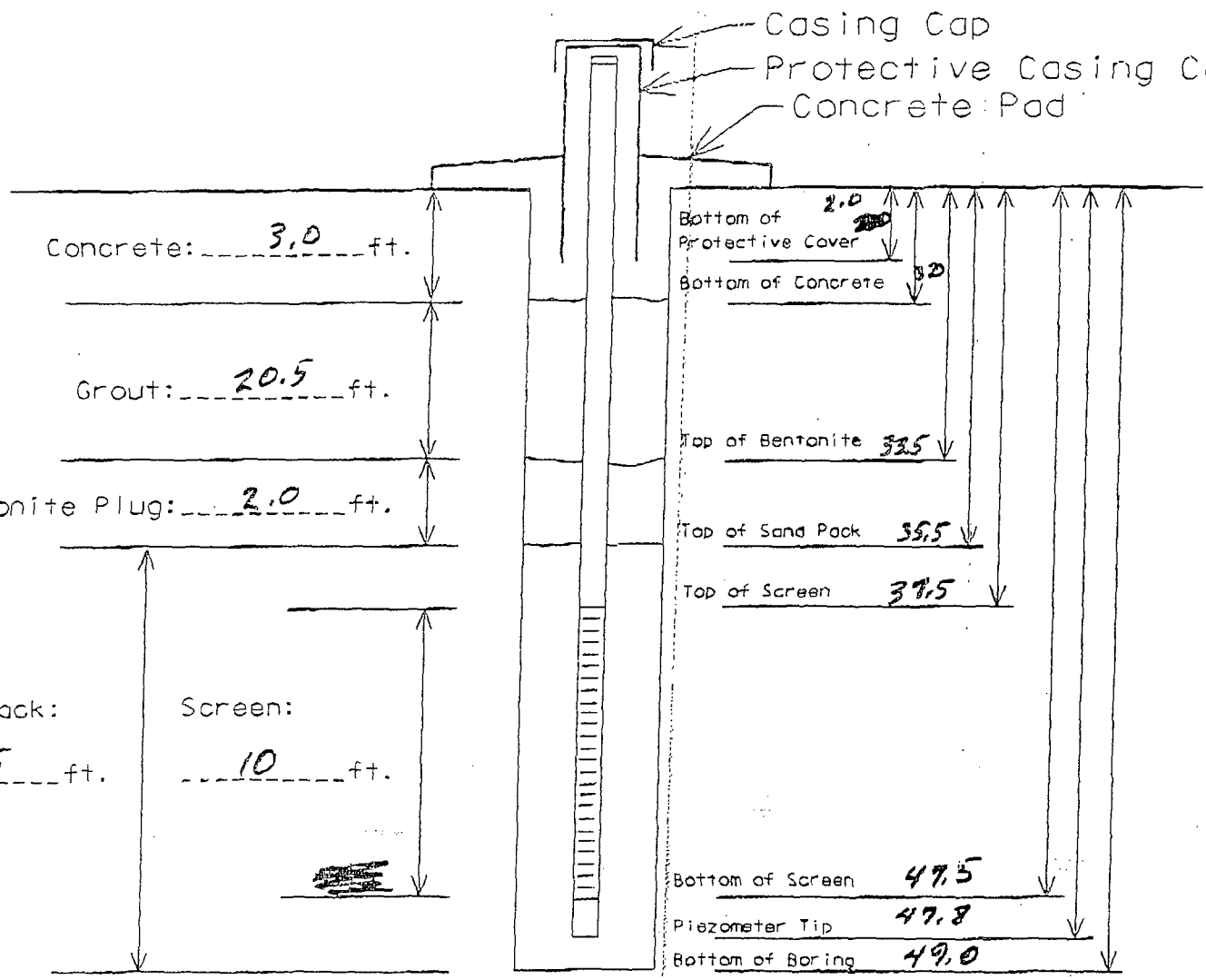
DORINDA

BORING COMPLETED AT 145.0 FEET ON 12/15/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 117.8 TO 137.8 FEET.
GRAVEL PLACED FROM 105.0 TO 137.8 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 47.3 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

Installation Diagram

Monitoring Well No. MW29



Boring Diameter: 8 3/8

Sand Type: COLORADO 20-40 SILICA

Bentonite: 3/8" PELLETIZED

Cement/Grout: 6% BENT./CEMENT

Bollards, Type/Size: —

Screen Type/Size: 4" ID / 10 SLOT (.010), PVC

Riser Type/Size: 4" ID / PVC

Water: —

Other: —

Locking Expandable Casing Plug? YES

Bottom Cap Used? YES

Site Northing:

Site Easting:

Project #:

Project Name: CINIZA REFINERY

Elevation:

PRECISION ENGINEERING INC.
505-523-7674

PRECISION ENGINEERING, INC.

PROJECT: Giant Refinery Ciniza

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6913.5
TOTAL DEPTH: 49.0
LOGGED BY: WHK
DATE: 8-23-96
STATIC WATER: 30.6
BORING ID: OW-29(06
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION/COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-6.9	///--////		C	CLAY, SLIGHTLY SILTY, DAMP TO DRY, DARK RED BROWN, STIFF	PID=0ppm ALL SAMPLES
	///--////		C		
	///--////		C		
	///--////		C		
	///--////		C		
	///--////		C		
	///--////		C		
	///--////		C		
	///--////		C		
	///--////	5.0	C		
	///--////		C		
	///--////		C		
	///--////		C		
6.9	///--////		C		
6.9-7.4	///**////		C	CLAY, SLIGHTLY SANDY, ROOT MATTER, RED BROWN, MOIST, STIFF	
7.4-10.6	///---///		C	CLAY, SILTY, ROOT MATTER, RED BROWN, MOIST, SOME CALCIUM CARBONATE NODULES < 2 mm, STIFF-HARD	
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///	10	C		
10.6	///---///		C		
10.6-14.3	/////////		C	CLAY, RED BROWN, WET, STIFF	
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
14.3	/////////		C		
14.3-14.7	///**////		C	CLAY, SLIGHTLY SANDY, MOIST, STIFF, RED BROWN	
14.7-14.9	///---///	15	C	CLAY, SILTY, STIFF, MOIST, RED BROWN	
14.9-16.0	***//****		C	SAND, SLIGHTLY CLAYEY, DENSE, MOIST, RED BROWN	
16.0	***//****		C		
16.0-20.5	/////////		C	CLAY, MOIST, RED BROWN, HARD, CHARCOAL @ 19-20'	
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////	20	C		
20.5	/////////		C		
20.5-22.2	///***///		C	CLAY, SANDY, CHARCOAL, RED BROWN, STIFF, MOIST	
	///***///		C		
22.2	///***///		C		
22.2-24.3	///---///		C	CLAY, SILTY, SILT IN LAMINATIONS, DRY-MOIST	
	///---///		C		

LOGGED BY: WHK

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

PRECISION ENGINEERING, INC.

PROJECT: Giant Refinery
Cinita

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6913.5
TOTAL DEPTH: 49.0
LOGGED BY: WHK
DATE: 8-23-96
STATIC WATER: 30.6
BORING ID: OW-29(0644)
PAGE: 2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
22.2-24.3	///---///		C	CLAY, SILTY, SILT IN LAMINATIONS, DRY-MOIST	PID=0ppm ALL SAMPLES
	///---///		C		
24.3	///---///		C		
24.3-36.8	///**////	25	C	CLAY, ROOT MATTER, RED BROWN, STIFF, MOIST, SLIGHTLY BLOCKY, SOME CARBONATE NODULES APPROXIMATELY 1/2 cm AT 26.0-27.5, FRACTURES DURING SAMPLING FORM SLICKENSIDED SURFACES, SLIGHTLY SANDY 33.5-33.8', WET > 35'	
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////	30	C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////	35	C		
	///**////		C		
	///**////		C		
36.8	///**////		C		
36.8-37.1	*********		C	SAND, LIGHT BROWN, WET, MEDIUM, DENSE	
37.1-39.6	////0////		C	CLAY, LIGHT BROWN, WET, SOFT, SOME 3/4" GRAVEL RARE	
	////0////		C		
	////0////		C		
	////0////		C		
	////0////		C		
39.6	////0////		C		
39.6-40.4	///***///	40	C	CLAY, COARSE SANDY, WET, SOFT, LIGHT BROWN, CALCIUM CARBONATE	
40.4	///***///		C		
40.4-43.4	///**////		C	CLAY, LIGHT BROWN, WET, SOFT, SLIGHTLY SANDY > 42.5'	
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
	///**////		C		
43.4	///**////		C		
43.4-47.0	000//0000		C	GRAVEL, SLIGHTLY CLAYEY, CHERT, LIMESTONE, PETRIFIED WOOD, SANDSTONE, MULTICOLORED TO LIGHT RED BROWN, DENSE, WATER BEARING, SANDIER >45'	
	000//0000		C		
	000//0000	45	C		
	000//0000		C		
	000//0000		C		

LOGGED BY: WHK

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

PRECISION ENGINEERING, INC.

PROJECT: Giant Refinery Ciniza

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6913.5
TOTAL DEPTH: 49.0
LOGGED BY: WHK
DATE: 8-23-96
STATIC WATER: 30.6
BORING ID: OW-29(06
PAGE: 3

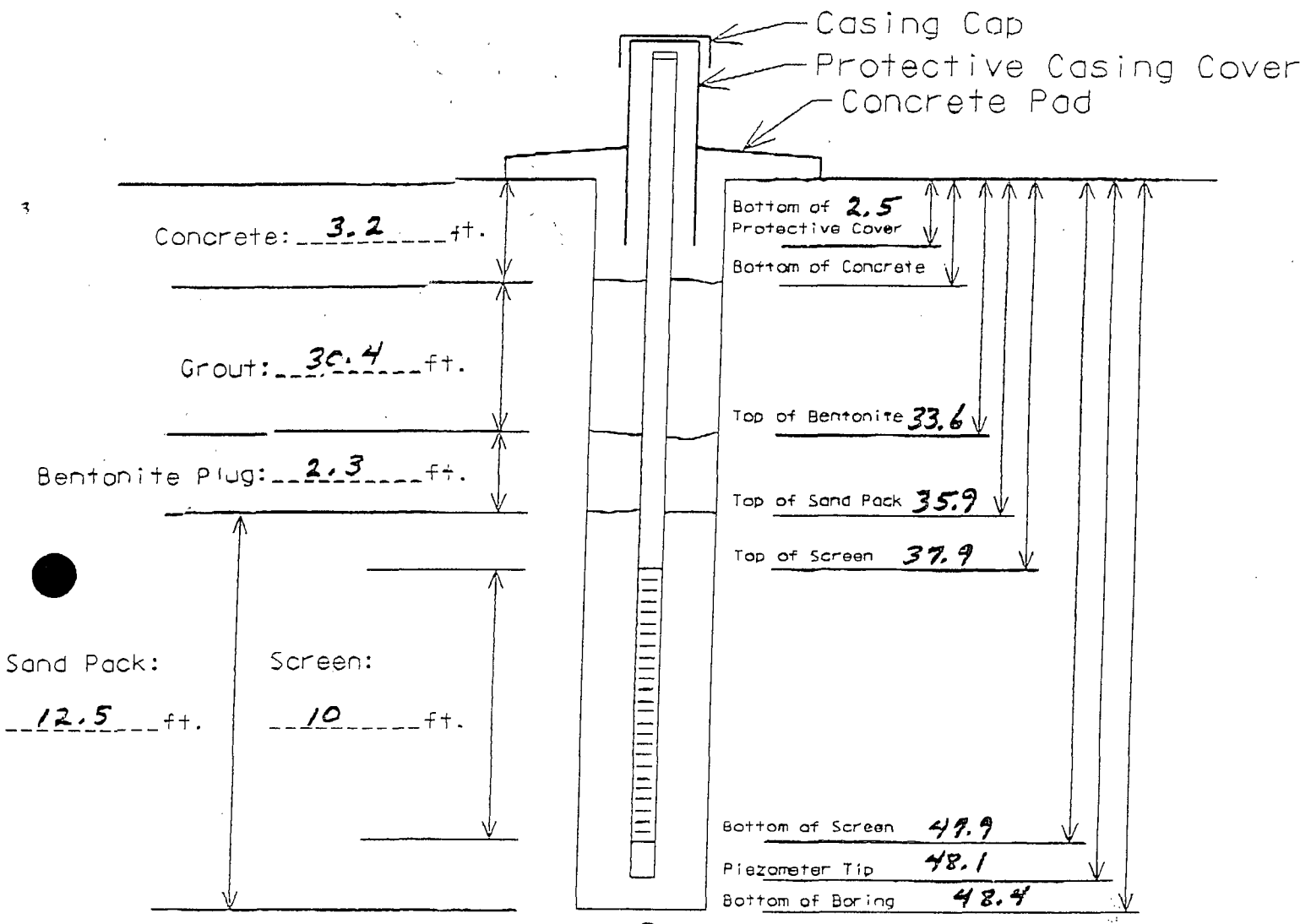
DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE CONDITION/COLOR GRAINSIZE ETC.)	PID (ppm)
43.4-47.0	000//0000		C	GRAVEL, SLIGHTLY CLAYEY, CHERT, LIMESTONE, PETRIFIED WOOD, SANDSTONE, MULTICOLORED	PID=0ppm ALL SAMPLES
47.0	000//0000		C	TO LIGHT RED BROWN, DENSE, WATER BEARING, SANDIER > 45'	
47.0-49.0	==========		C	SHALE, RED PURPLE, DENSE, DAMP-MOIST (APPEARS DRY), NO WATER	
TOTAL DEPTH		50		NOTE: COMPLETED AS A 4" MONITORING WELL. SEE COMPLETION DIAGRAM.	
		55			
		60			
		65			

LOGGED BY: WHK

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

Installation Diagram

Monitoring Well No. MW-30



Boring Diameter: 8 5/8"

Sand Type: 20-40

Bollards, Type/Size: NONE

Bentonite: PELPLUG, TA-30 3/8" PELLETS

Screen Type/Size: 4" ID, #10, SCH40 PVC

Cement/Grout: 6% BENTONITE/CEMENT

Riser Type/Size: 4" ID, SCH 40, PVC

Water: POTABLE

Locking Expandable Casing Plug? YES

Site Northing: 5099.3

Other:

Bottom Cap Used? YES

Site Easting: 360.0

Project #: 96-134

Project Name: CINIZA REFINERY INVESTIGATION

Elevation: 6913.5

[illegible] ENGINEERING

505-523-7674

PRECISION ENGINEERING, INC.

PROJECT: Giant Refinery
Ciniza

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6921.6
TOTAL DEPTH: 48.4
LOGGED BY: WHK
DATE: 8-28-96
STATIC WATER: 24.4
BORING ID: OW-30(0647)
PAGE: 1

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
0.0-6.5	///---///		C	CLAY, SILTY, DRY, RED BROWN, FIRM, SOME ROOT MATTER	PID-0ppm ALL SAMPLES
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///		C		
	///---///	5.0	C		
	///---///		C		
	///---///		C		
6.5	///---///		C		
6.5-13.1	/////////		C	CLAY, RED BROWN, MOIST, STIFF, SOME ROOT MATTER, SOME CARBONATE NODULES < 1 cm	
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////	10	C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
13.1	/////////		C		
13.1-13.8	///***///		C	CLAY, SANDY, CARBONATE NODULES APPROXIMATELY 3mm, STIFF, DAMP, RED BROWN	
	///***///		C		
13.8	///***///		C		
13.8-16.5	///---///	15	C	CLAY, SILTY, DAMP-MOIST, RED BROWN, STIFF	
	///---///		C		
	///---///		C		
16.5	///---///		C		
16.5-22.5	/////////		C	CLAY, VERY STIFF, RED BROWN, MOIST	
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////	20	C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
22.5	/////////		C		
22.5-23.2	/////////		C	CLAY, SILTY, STIFF, MOIST, BROWN	

LOGGED BY: WHK

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

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

PROJECT: Giant Refinery Ciniza

FILE #:	96-133
ELEVATION:	6921.6
TOTAL DEPTH:	48.4
LOGGED BY:	WHK
DATE:	8-28-96
STATIC WATER:	24.4
BORING ID:	OW-30(0647)
PAGE:	2

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	PID (ppm)
23.2-23.8	***---***		C	SAND, FINE, SILTY, BROWN, DAMP, MODERATELY DENSE	PID=0ppm ALL SAMPLES
23.8	***---***		C		
23.8-24.3	///---///		C	CLAY, SILTY, BROWN, VERY STIFF, MOIST	
24.3-39.7	/////////	25	C	CLAY, BROWM, VERY STIFF, MOIST, SOME CARBONATE SPECKS > 28'	
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////	30	C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////	35	C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
39.7	/////////		C		
39.7-41.7	///***///	40	C	CLAY, SANDY, WET, SOFT, RED BROWN, SANDIER @ 41.2-41.7	
	///***///		C		
	///***///		C		
41.7	///***///		C		
41.7-42.6	/////////		C	CLAY, BLACK, WET, ABUNDANT CHARCOAL, SOFT, SOME ROOT MATTER	
42.6	/////////		C		
42.6-44.2	///--*///		C	CLAY, LIGHT BROWN, WET, SOFT, VERY SLIGHTLY SANDY, SILTY	
	///--*///		C		
44.2	///--*///		C		
44.2-47.3	000SSS000		C	GRAVEL, WATER BEARING, CHERT, SANDSTONE, SOME LIMESTONE, MODERATELY DENSE	
	000SSS000	45	C		
	000SSS000		C		
	000SSS000		C		

LOGGED BY: WHK

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

PRECISION ENGINEERING, INC.

PROJECT: Giant Refinery
Ciniza

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 6921.6
TOTAL DEPTH: 48.4
LOGGED BY: WHK
DATE: 8-28-96
STATIC WATER: 24.4
BORING ID: OW-30(06
PAGE: 3

DEPTH	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	PID (ppm)
44.2-47.3 47.3	000SSS000 000SSS000 000SSS000		C C C	**GRAVEL**, **WATER BEARING**, CHERT, SANDSTONE, SOME LIMESTONE, MODERATELY DENSE	PID=0ppm ALL SAMPLES
47.3-48.4	========== ==========		C C	**SHALE**, **CHINLE FORMATION**, MOIST, HARD, RED TO WHITE (CARBONATE INDURATION)	
TOTAL DEPTH		50 55 60 65		NOTE: STATIC WATER ELEVATION 33.5 @ .5 HOURS AND 24.4 @ 72 HOURS	

LOGGED BY: WHK

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

Bill Crampton

TABLE 2
SUMMARY OF WELL DATA

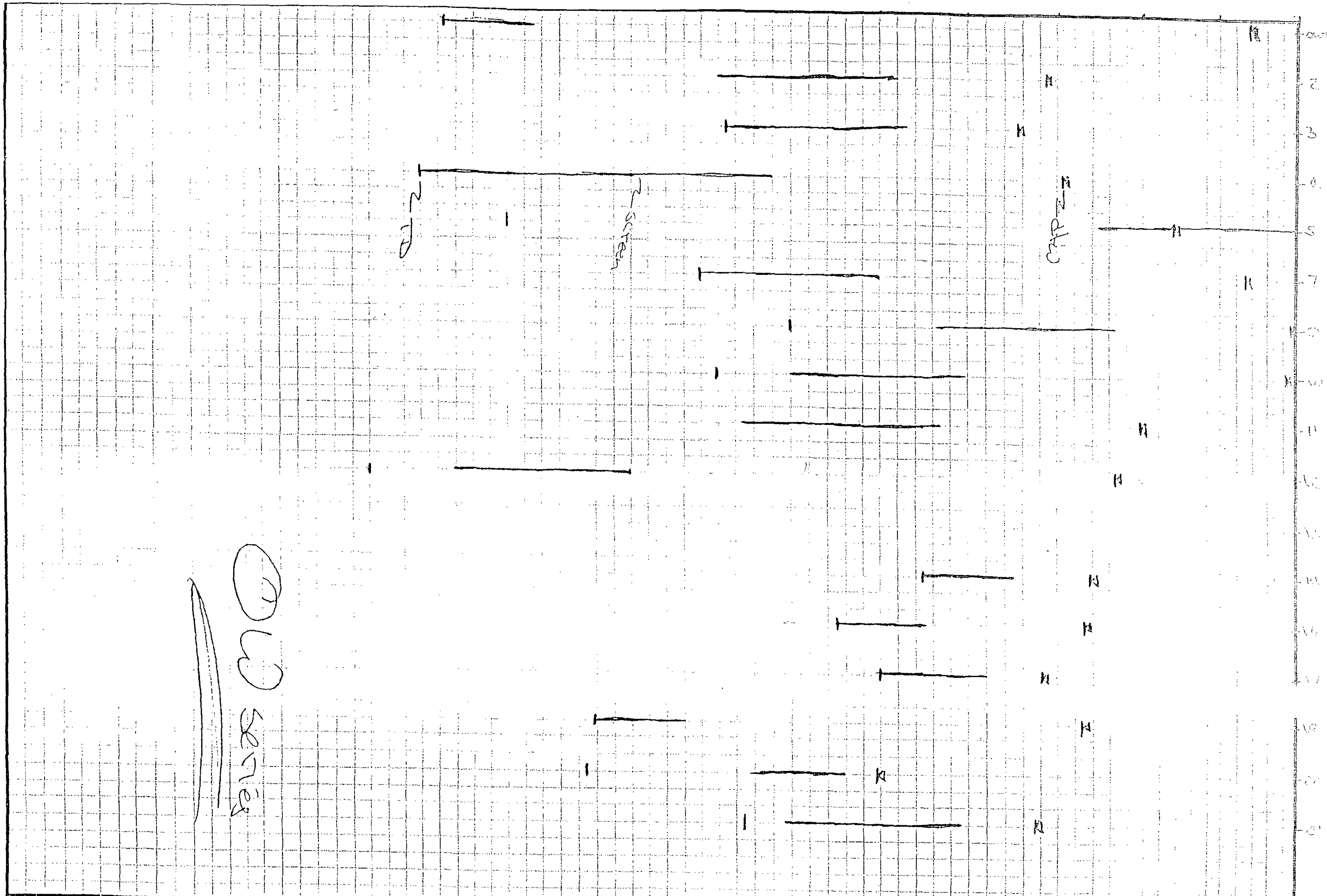
review suitability of wells for sampling when perforations are not located in the aquifer

NAME	COORDINATES [1] NORTH	COORDINATES [1] WEST	GROUND [1] ELEVATION	TOTAL DEPTH (ft)	DATE COMPLETED	AQUIFER [3][4] INTERVAL (ft)	DEPTH OF [2] WATER TABLE (ft)	ELEVATION WATER TABLE (ft)
OW-1	3190	5150	6868	99.5	11/10/80	86-98	6.4	6861.6
OW-2	5985	5125	6871	163	10/31/80	143-162.5	31.2	6839.8
OW-3	5855	4220	6876	67	11/04/80	-	34.4	6841.6
OW-4	4960	3565	6881	102	11/07/80	100-102	29.2	6851.8
OW-5	4325	2970	6882	92	11/12/80	82-92	16.2	6865.8
OW-7	3875	3740	6872	70	11/18/80	-	6.7	6865.3
OW-9	2215	3445	6873	60	11/21/80	23-46	0.6	6872.4
OW-10	2710	3470	6872	68	11/25/80	34-63	1.7	6870.3
OW-11	1365	1455	6923	150	12/30/80	30-40	20.2	6902.8
OW-12	4490	1540	6939	145	12/15/80	104-143	47.3	6891.7
OW-13	4790	970	6914	108	12/10/80	70-104	23.2	6890.8
OW-14	4245	495	6923	45	12/17/80	39-45	25.8	6897.2
OW-16	3800	1365	6942	55	12/02/80	47-50	26.8	6915.2
OW-17	3885	1195	6941	50	1/03/81	40-42	31.8	6909.2
OW-18	3955	1020	6932	82	12/04/80	61-82	-	?
OW-20	2965	410	6961	83	12/19/80	70-82	50.2	6910.8
OW-24	5475	3875	6878	65	1/02/81	-	32.5	6845.5
				1,505				

[1] Estimated - survey required

[3] Depth underlined is maximum depth of well

[4] Does not include zones of sandy shale below



Continental Environmental Services

TITLE from GTRF O6E Geoscience Consultants 1/86 Table 3-1

| screen
≥ ditto
— TD

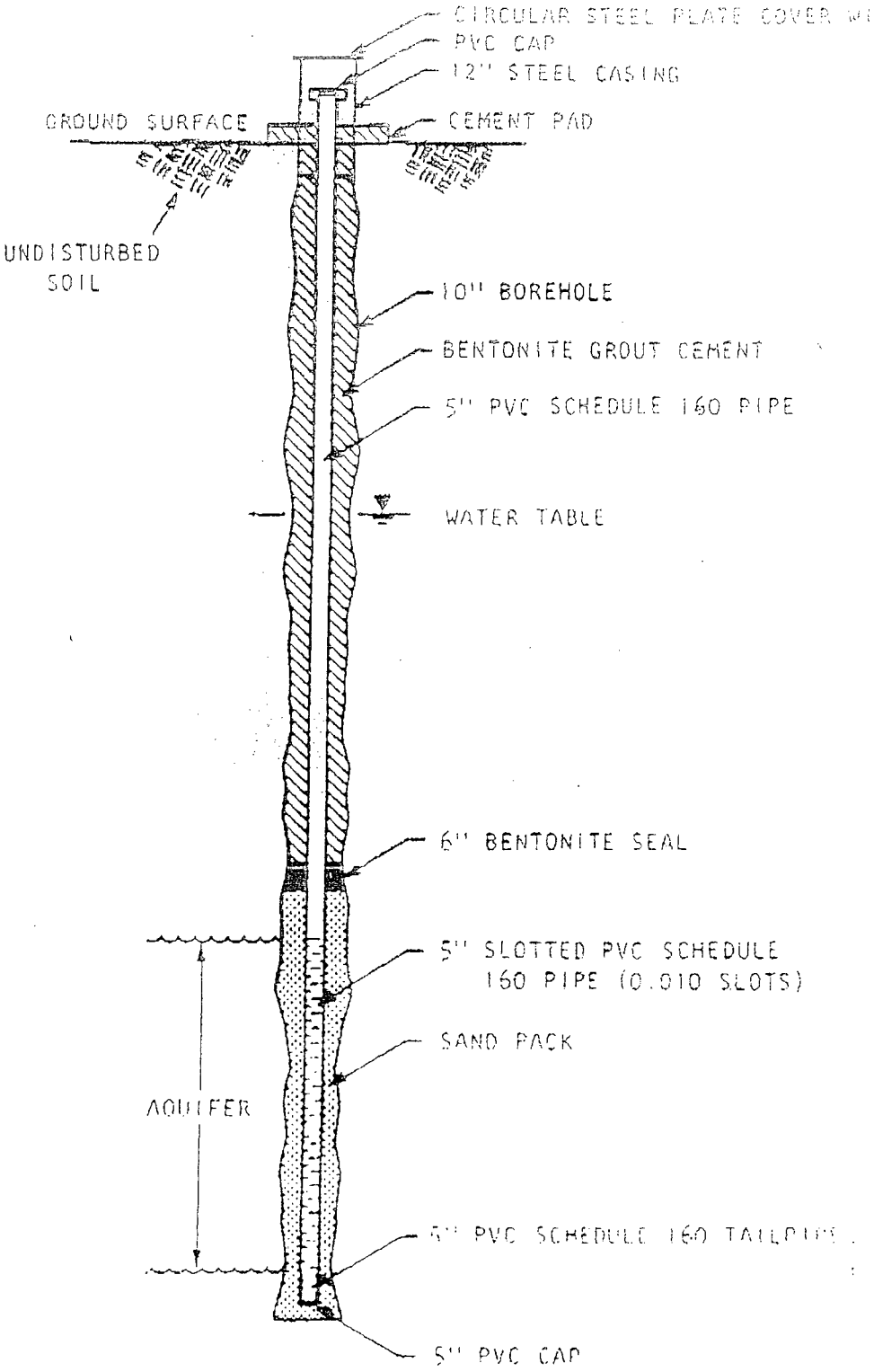
OW series

SCALE:

DATE:

REVISION:

LITEPOINT

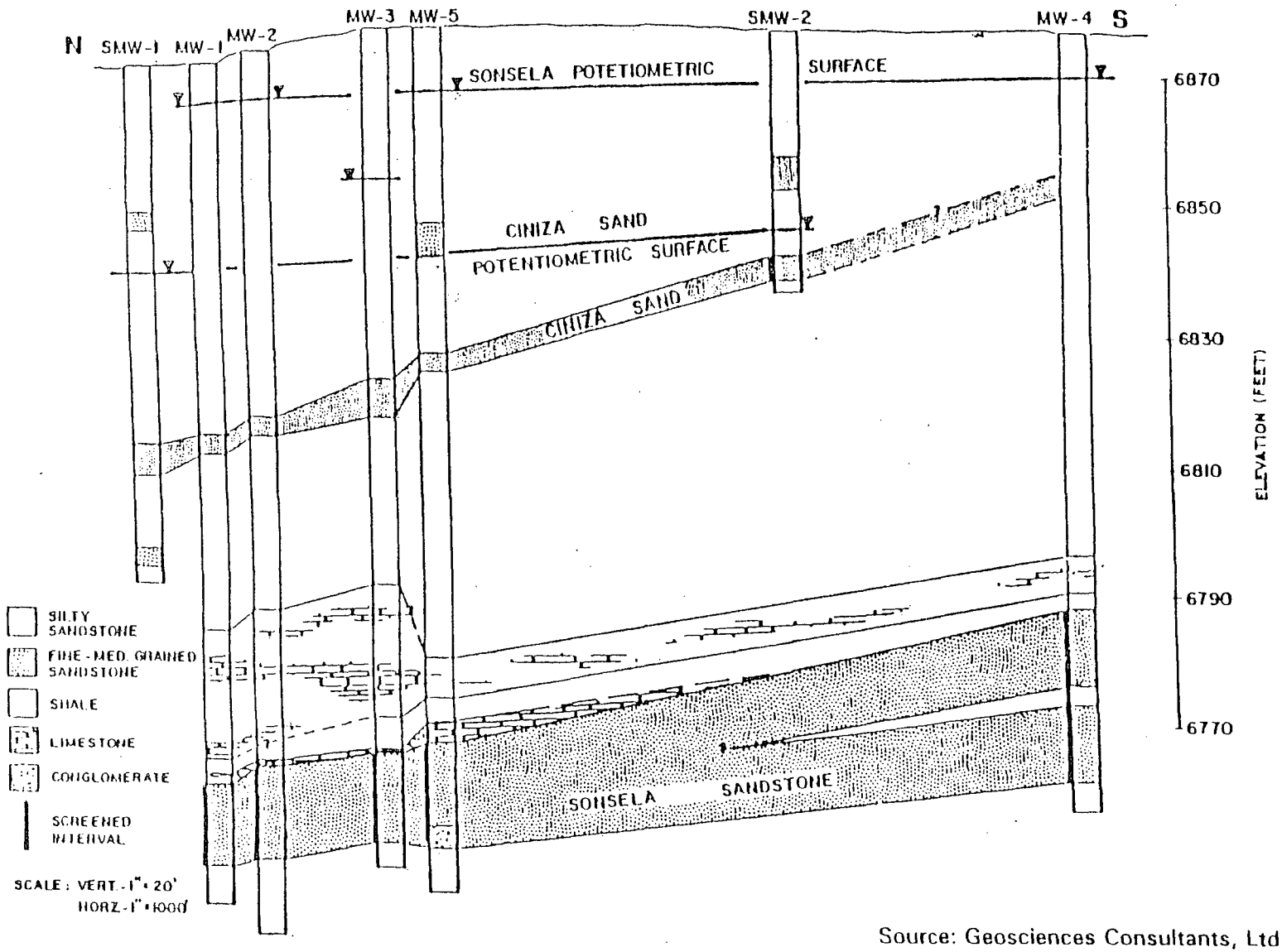


PREPARED FOR Shell Oil Co.

MONITORING WELL CONSTRUCTION DETAILS

BY Dames & Moore Plate 5

WELL I.D	(YES/NO)	RATIONALE
MW-1	NO	Well logged, documented installation in the Sonsela.
MW-2	NO	Well logged, documented installation in the Sonsela.
MW-3	NO	Well logged, documented installation in the Sonsela.
MW-4	NO	Well logged, documented installation in the Sonsela.
MW-5	NO	Well logged, documented installation in the Sonsela.
SMW-1	YES	Well is no longer monitored. Connects fluvial sands with zone on top of Chinle shale.
SMW-2	YES	Well is no longer monitored. Connects fluvial sands with zone on top of Chinle shale.
SMW-3	YES	Connects fluvial sands with zone on top of Chinle shale.
SMW-4	YES	Connects fluvial sands with zone on top of Chinle shale.
SMW-5	YES	Connects fluvial sands with zone on top of Chinle shale.
SMW-6	YES	Produces no water.

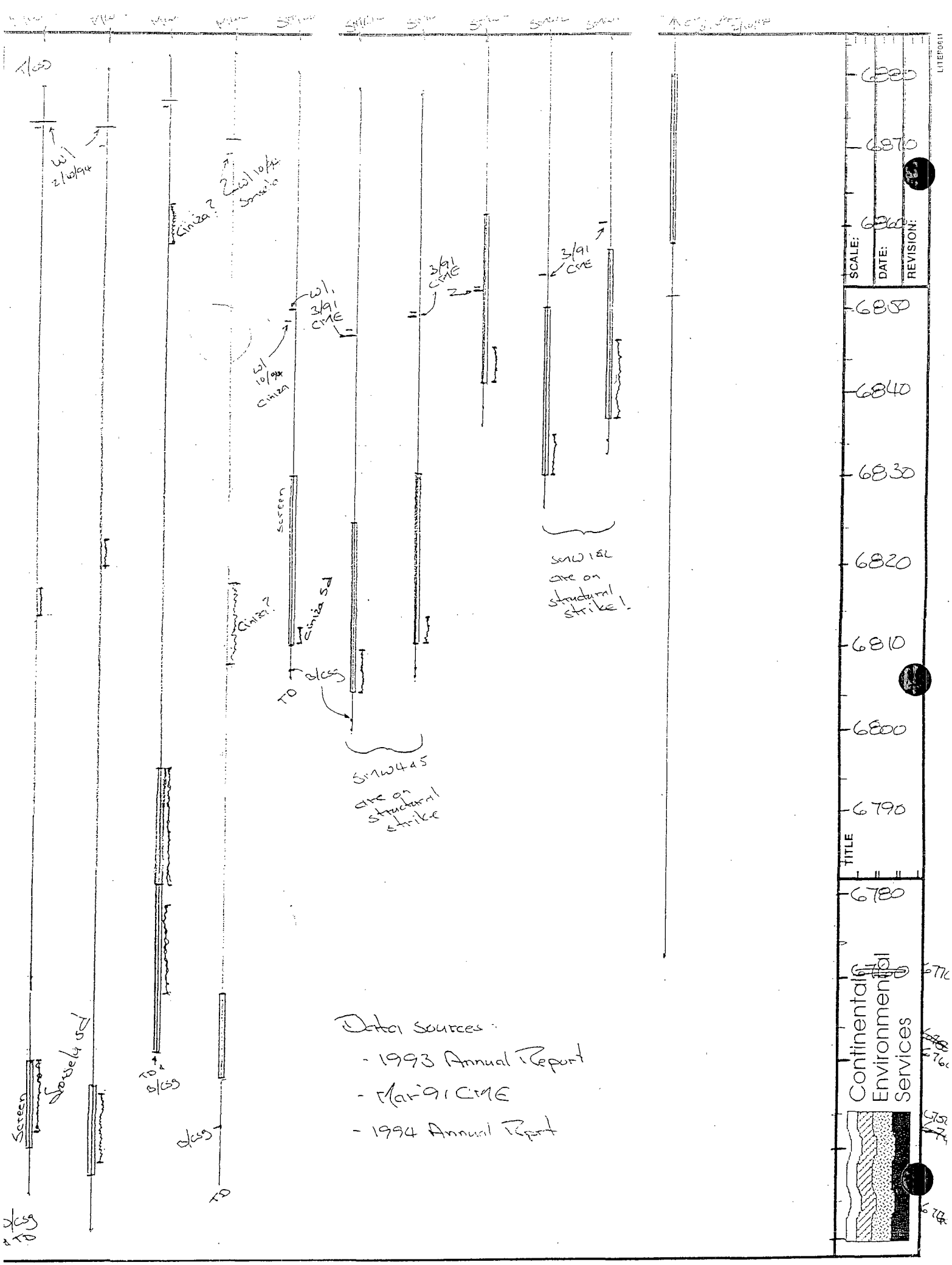


Source: Geosciences Consultants, Ltd. 1986

SEC DONOHUE
Environment & Infrastructure

FIGURE 3
GEOLOGIC CROSS SECTION

CINIZA REFINERY
GIANT REFINING COMPANY
GALLUP, NEW MEXICO

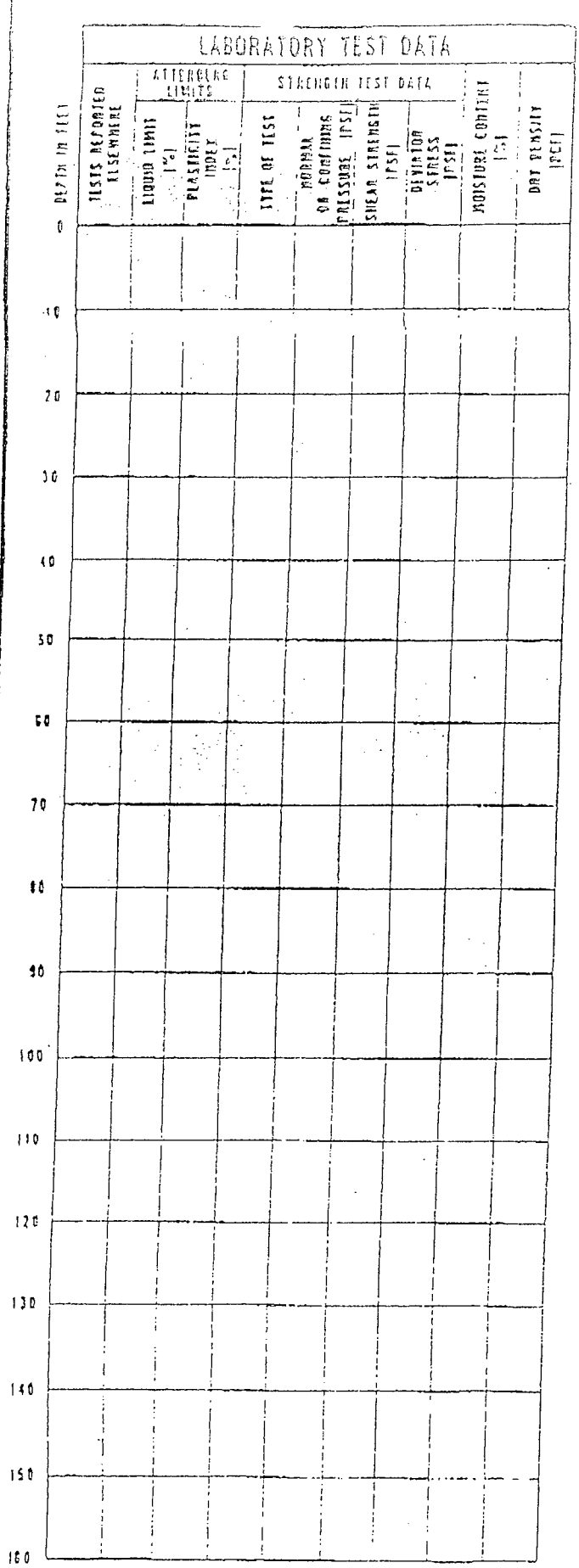


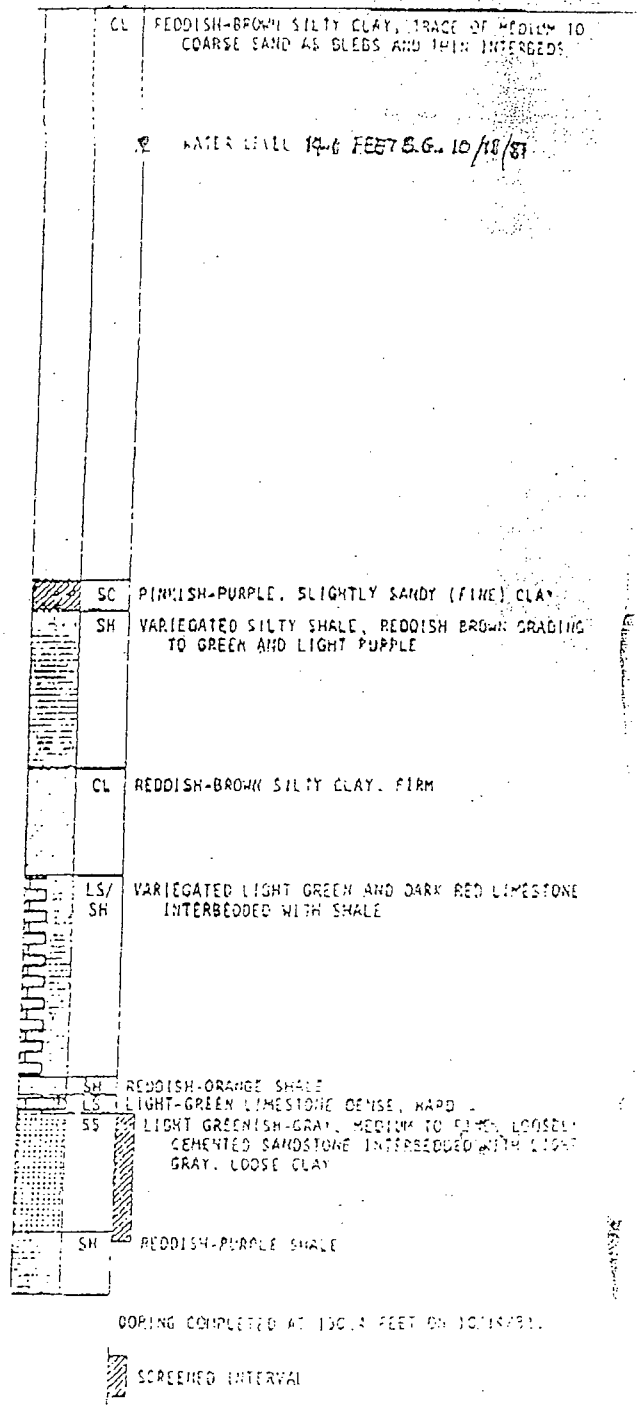
Data sources:

- 1993 Annual Report
- Mar-91 CME
- 1994 Annual Report

MONITORING WELL MW-1

SURFACE ELEVATION: 6676 FEET
(Unsurveyed)





MONITORING WELL IDENTIFICATION REPORT

NEW MEXICO ENVIRONMENT DEPARTMENT
HAZARDOUS WASTE SECTION
P.O. BOX 26110
SANTA FE, NEW MEXICO 87502

FACILITY NAME		Giant Refining Co. - Ciniza
EPA I.D. NUMBER		NMD000333211-2
COUNTY		McKinley
WELL NUMBER		MW-1
WELL LOCATION (LONGITUDE)		108 25' 36"
WELL LOCATION (LATITUDE)		35 29' 08"
NEW MEXICO STATE PLANE	(X) (Y)	320,903.76 1,636,112.13
AQUIFER NAME		Sonsela
AQUIFER CONFINED? xx		UNCONFINED?
WELL INSTALLATION DATE		10-14-81
DRILLING METHOD		Cable
INNER CASING DIAMETER		5.0"
BOREHOLE DIAMETER		10.0"
CASING MATERIAL		PVC

MONITORING WELL IDENTIFICATION REPORT

NEW MEXICO ENVIRONMENT DEPARTMENT
HAZARDOUS WASTE SECTION
P.O. BOX 26110
SANTA FE, NEW MEXICO 87502

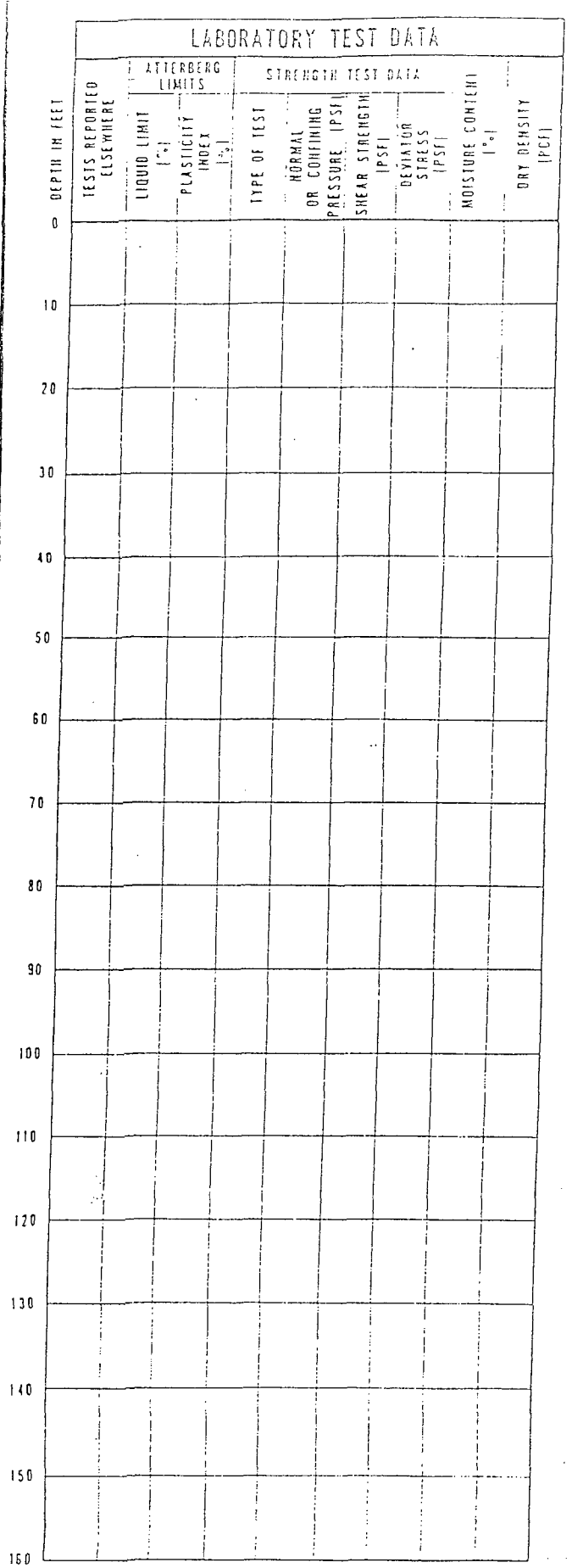
FACILITY NAME	Giant Refining Co. - Ciniza
EPA I.D. NUMBER	NMD000333211-2
COUNTY	McKinley
WELL NUMBER	MW-1
WELL LOCATION (LONGITUDE)	108 25' 36"
WELL LOCATION (LATITUDE)	35 29' 08"
NEW MEXICO STATE PLANE	(X) 320,903.76 (Y) 1,636,112.13
AQUIFER NAME	Sonsela
AQUIFER CONFINED? xx	UNCONFINED?
WELL INSTALLATION DATE	10-14-81
DRILLING METHOD	Cable
INNER CASING DIAMETER	5.0"
BOREHOLE DIAMETER	10.0"
CASING MATERIAL	PVC
METHOD OF DEVELOPMENT	Compr
ELEV. BOTTOM OF BOREHOLE	6745.80
ELEV. BOTTOM OF WELL CASING	6745.80
ELEV. BOTTOM OF SCREENED INT.	6750.80
ELEVATION OF SCREENED INTERVAL	6760.80
SURVEYED ELEVATION OF CASING TOP	6878.52

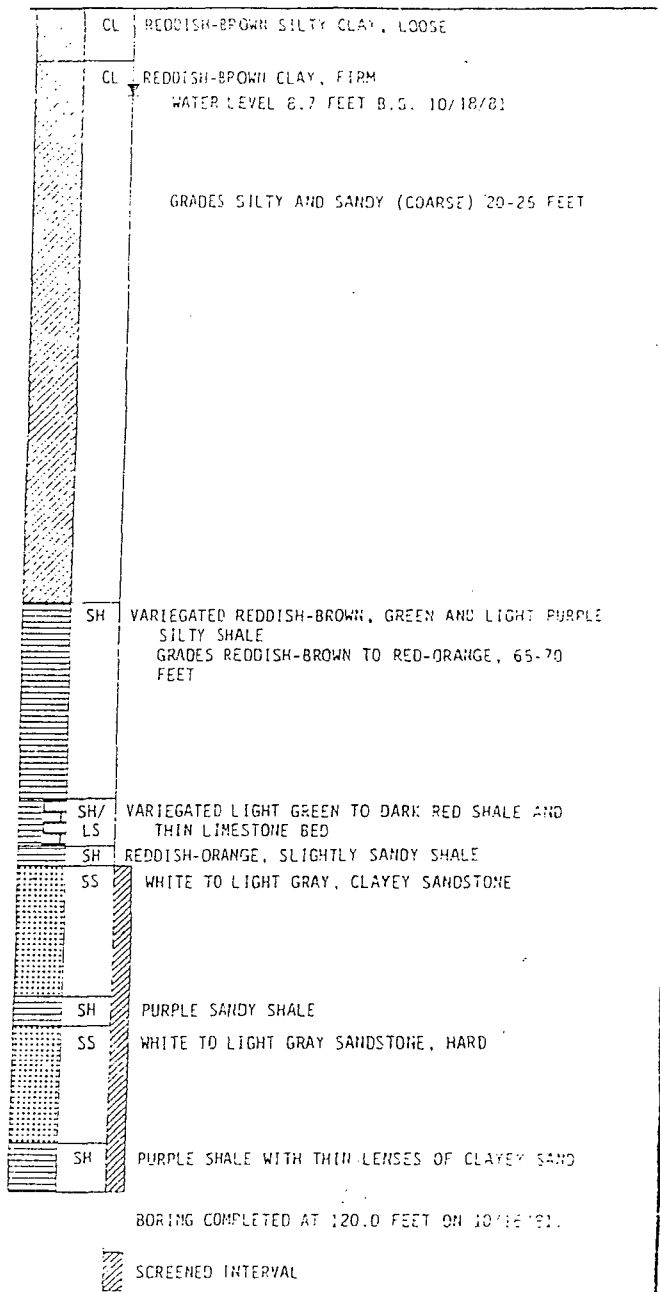
DATE OF REPORT 2-26-96

SIGNATURE Dorinda Mancini
NAME (TYPED) Dorinda Mancini

MONITORING WELL MW-4

SURFACE ELEVATION: 6883 FEET
(Unsurveyed)





MONITORING WELL IDENTIFICATION REPORT

NEW MEXICO ENVIRONMENT DEPARTMENT
HAZARDOUS WASTE SECTION
P.O. BOX 26110
SANTA FE, NEW MEXICO 87502

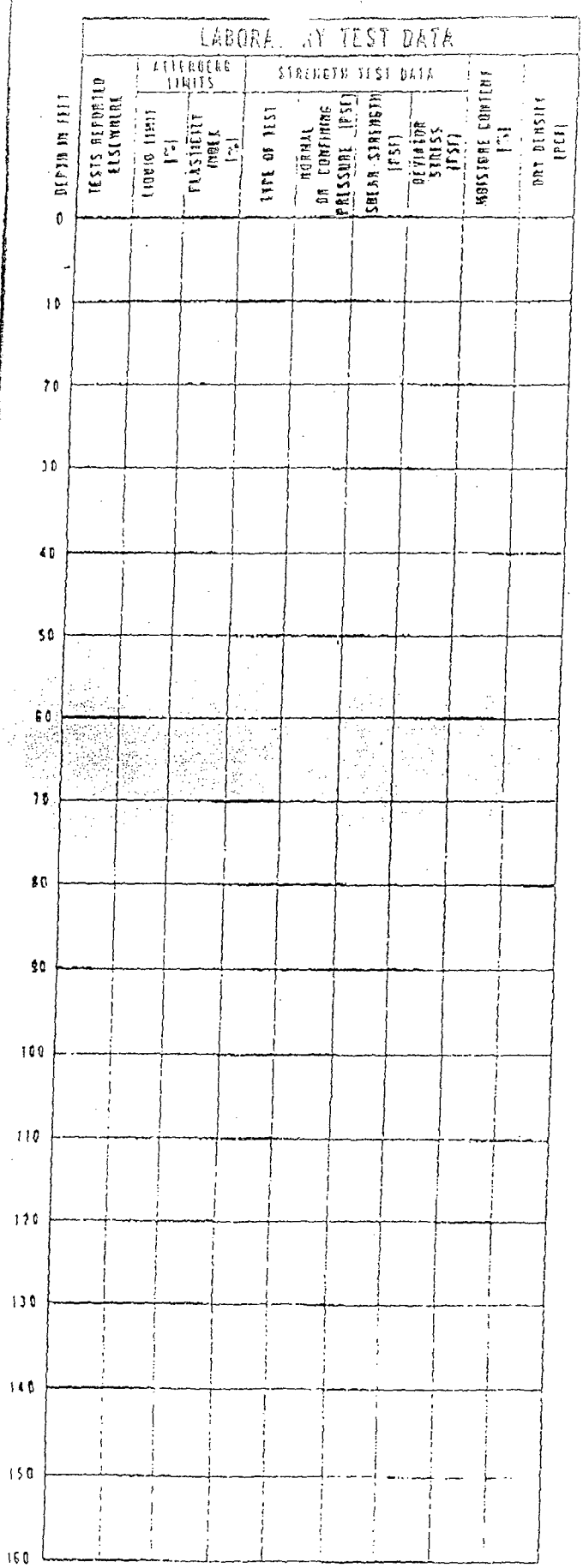
FACILITY NAME	Giant Refining Co. - Ciniza
EPA I.D. NUMBER	NMD000333211-2
COUNTY	McKinley
WELL NUMBER	MW-4
WELL LOCATION (LONGITUDE)	108 26' 54"
WELL LOCATION (LATITUDE)	35 29' 30"
NEW MEXICO STATE PLANE	(X) 321,602.07 (Y) 1,635,066.25
AQUIFER NAME xx	Sonsela
AQUIFER CONFINED?	UNCONFINED?
WELL INSTALLATION DATE	10-16-81
DRILLING METHOD	Cable
INNER CASING DIAMETER	5.0"
BOREHOLE DIAMETER	10.0"
CASING MATERIAL	PVC
METHOD OF DEVELOPMENT	Compr
ELEV. BOTTOM OF BOREHOLE	6761.60
ELEV. BOTTOM OF WELL CASING	6761.60
ELEV. BOTTOM OF SCREENED INT.	6761.60
ELEVATION OF SCREENED INTERVAL	6781.60
SURVEYED ELEVATION OF CASING TOP	6882.54

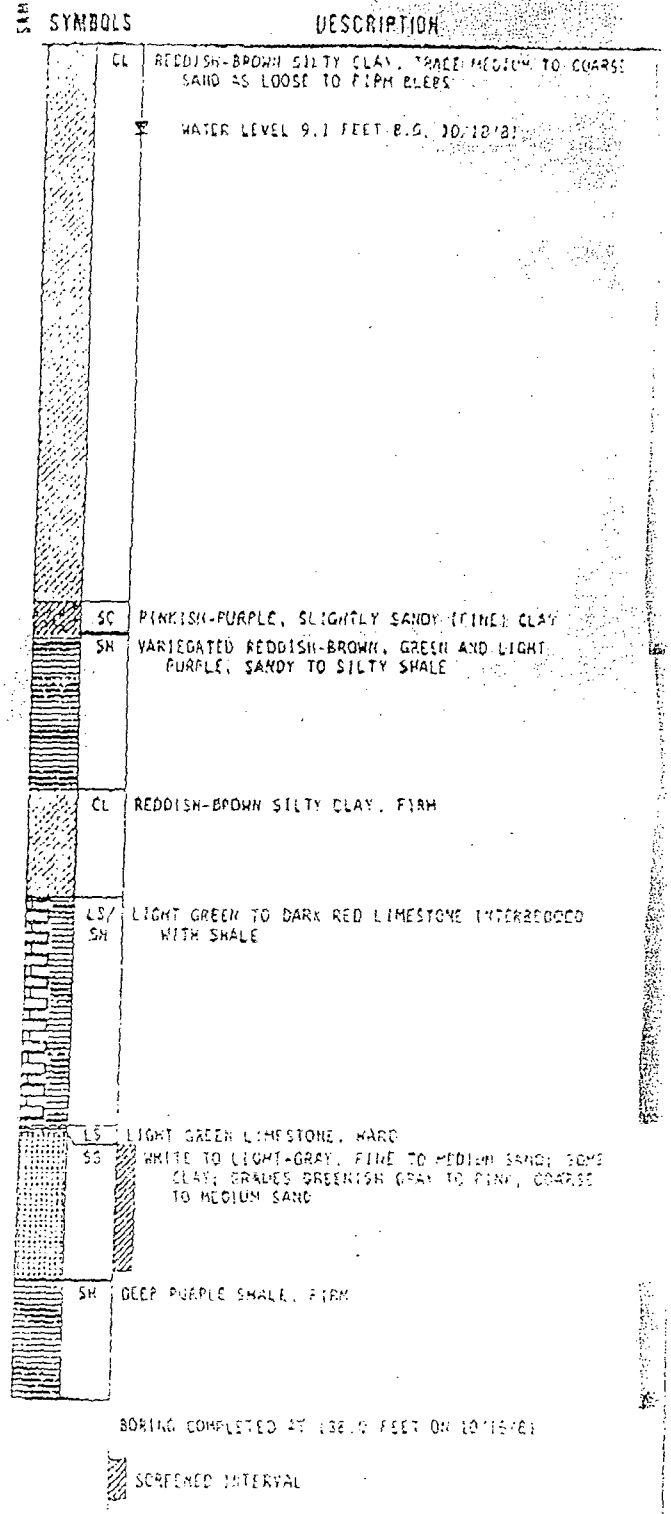
DATE OF REPORT 2-26-96

SIGNATURE Dorinda Mancini
NAME (TYPED) Dorinda Mancini

MONITORING WELL MW-2

SURFACE ELEVATION: 6877 FEET
(Unsurveyed)





DAMES & MOORE

MONITORING WELL IDENTIFICATION REPORT

NEW MEXICO ENVIRONMENT DEPARTMENT
HAZARDOUS WASTE SECTION
P.O. BOX 26110
SANTA FE, NEW MEXICO 87502

FACILITY NAME	Giant Refining Co. - Ciniza
EPA I.D. NUMBER	NMD000333211-2
COUNTY	McKinley
WELL NUMBER	MW-2
WELL LOCATION (LONGITUDE)	108 26' 00"
WELL LOCATION (LATITUDE)	35 29" 43"
NEW MEXICO STATE PLANE	(X) 321,035.35 (Y) 1,636,184.06
AQUIFER NAME	Sonsela
AQUIFER CONFINED? xx	UNCONFINED?
WELL INSTALLATION DATE	10-15-81
DRILLING METHOD	Cable
INNER CASING DIAMETER	5.0"
BOREHOLE DIAMETER	10.0"
CASING MATERIAL	PVC
METHOD OF DEVELOPMENT	Compr
ELEV. BOTTOM OF BOREHOLE	6741.90
ELEV. BOTTOM OF WELL CASING	6741.90
ELEV. BOTTOM OF SCREENED INT.	6747.90
ELEVATION OF SCREENED INTERVAL	6847.90
SURVEYED ELEVATION OF CASING TOP	6880.84

DATE OF REPORT 2-26-96

SIGNATURE Dorinda Mancini
NAME (TYPED) Dorinda Mancini

History of Drilling Water Well No. 2

North Well

Well No. 2 was spudded in on September 24, 1956, by a Franks 5,000 Rotary Rig owned by The Barron Drilling Company of Farmington, New Mexico. A 12-3/4" bit was used to a depth of 227 feet, the depth at which the alluvial fill was depleted and no further surface water was encountered. The hole was then reamed with a 20" reamer back to the 227 foot level and 16" O.D. casing was set and cemented by The Halliburton Company. It should be noted that the sand stratum in this well carried much deeper than in Well No. 1. A total of 200 sacks of cement was used to cement the 227 feet of surface casing.

The hole was reduced to a 15" hole, using a 12-3/4" bit after the cement had set for 24 hours. The drilling was moderately easy until a hard formation was hit at 312 feet and continued through the stratum at 390 feet. The conglomerate at 390 feet did not contain water although it had all the necessary characteristics. From 400 feet to 580 feet, the stratum was very hard and slow drilling - Mudstone, which contained considerable gypsum and gravel mineral particles. In this formation, there was some mud dilution as it was necessary to bring the mud weight up to 11.0 pounds. The second water pay was hit in the aquifer of sandstone from 580 feet to 620 feet. This was not, however, the Glorietta formation, but does produce some water pay. Drilling became very slow and one more aquifer was hit in the lower red member at 630 feet which produced a small quantity of water. The first indication of the Glorietta was struck at 725 feet but this aquifer was only 15 feet in thickness. However, it seemed to yield considerable water as mud dilution became a problem. It was now necessary to go to 12 pound mud to hold the drive from this level. The main Glorietta formation was struck at 792 feet and carried through to 885 feet.

At 950 feet, a crevice was struck and circulation was lost completely. It was necessary to add over 600 sacks of lost-circulation material before the crevice could be plugged. After circulation was restored, the crevice was cemented by The Halliburton Company from 945 feet to 965 feet and allowed to set for 24 hours. Drilling was then resumed and the hole drilled through the cement with no further trouble. The Yeso formation played out at 1,070 feet and the drilling stopped.

The 12" casing was run and, due to caving, was stuck at 965 feet, the point at which the crevice cementing was terminated. It was then necessary to clear the hole with a 9-3/4" bit and run a second string of pipe. The 8-7/8" O.D. casing was set at 950 feet to 1,075 feet and a cement plug at the bottom.

The well was shot perforated by Schlumberger, six (6) shots to the foot, alternating six shots of jets and six shots of bullets as indicated on the well graph. After perforating, the well flowed 270 gpm artesian and developed 140 pounds shut-in pressure.

Smith Machinery Company ran the pumping test with a 10" turbine set at 600 feet. The results of which indicated that the well will produce 370 gpm steady at 600 feet which is 100 to 150 feet above the main producing aquifer in this well. With a submersible pump set at 900 feet, this well should produce at least 500 gpm with no detrimental effects on the well.

J. E. Druley
January 14, 1957

(1)

	Thickness (feet)	Depth (feet)
Sandstone, grayish-red (5R 4/2), very-fine to very-coarse grained; gravel up to 6mm across; angular to subangular; pebbles are sandy siltstone; some clay; noncalcareous - small gravel scattered.	30	340
Siltstone, grayish-red (5R 4/2); fine to coarse sand and pebbles of sandstone and siltstone common; limonite and dark minerals rare; calcareous. Siltstone, grayish-red (5R 4/2) and white; very fine to fine frosted grains of quartz sand; dark minerals common, mica rare, secondary calcite abundant. Siltstone, grayish-red (5R 4/2); limonite and dark minerals rare; gypsum abundant; calcareous	50	390
Conglomerate, grayish-red (5R 4/2) and white, very-fine to fine pebbles of siltstone and sandstone, angular to subrounded; some calcareous material	10	400
Mudstone, grayish-red (5R 4/2); slightly shaly parting; minor limonite; noncalcareous; some gravel Mudstone, grayish-red (10R 4/2) to grayish-red-purple mottled with white; minor limonite; calcareous Mudstone, grayish-red (10R 4/2) to grayish-red-purple; minor limonite; calcareous; very-fine to fine gravel composed of grayish-red siltstone and sandstone common, more dark minerals in gravel than in 390-400 foot interval Mudstone, grayish-red (10R 4/2); gypsum common; calcareous Mudstone, grayish-red (10R 4/2) to dark-reddish-brown (10R 3/4); partly sandy; quartz and dark minerals rare, gypsum abundant; calcareous	178	578
Lower Red member:		
Sandstone, light-gray (N7) to grayish-red-purple (5RP 4/2), very-fine grained to silty; poorly sorted; abundant quartz and dark minerals, minor limonite; calcareous Sandstone, light-gray (N7) to grayish-purple (5RP 4/2), very-fine grained to coarse grained; poorly sorted; some very-fine gravel; grains are stained and frosted quartz, minor dark minerals, and siltstone; calcareous; gravel increases in lower part	43	621
Mudstone, grayish-red-purple (5RP 4/2) and white; minor gypsum; some clear to frosted quartz sands and minor dark minerals; calcareous Mudstone, pale-reddish-brown (10R 5/4) and white; gypsum common; some sand and gravel; calcareous	24	645
Sandstone, light-brownish-gray (5YR 6/1) to pale-reddish-brown (10R 5/4), very-fine to medium-grained; poorly sorted; stained and frosted quartz abundant, dark minerals common, limonite rare; noncalcareous	26	671

	Thickness (feet)	Depth (feet)
YESO FORMATION:		
Upper member:		
Mudstone, grayish-red (10R 4/2); grayish-red-purple (5RP 4/2), and light-gray (N7); dark minerals rare, minor limonite; partly calcareous	10	895
Sandstone, grayish-orange-pink (5YR 7/2) to pale-red (10R 6/2), very-fine to fine grained; subrounded to rounded; minor dark minerals and limonite; calcareous Sandstone, very-pale-orange (10YR 8/2), very-fine grained and silty; sorting poor to medium; clear quartz; silica cement; dark minerals and limonite rare; noncalcareous	55	950
Crevice	10	960
Sandstone, moderate-orange-pink (5YR 8/4), very-fine to fine grained and silty; poorly sorted; clear to frosted quartz, silica cement; dark minerals and limonite rare; calcareous Sandstone, pale-red (10R 6/2) to pale-brown (5YR 5/2), very-fine to fine grained and silty; clear and stained quartz, dark minerals and limonite common; calcareous Sandstone, white to pinkish-gray (5YR 8/1), very-fine grained; subrounded; sorting good; clear quartz, silica cement, dark minerals and limonite rare; noncalcareous	80	1,040
Siltstone, light-brown (5YR 6/4) to moderate-brown (5YR 4/4); has appearance of soil; some quartz sand and bands of white calcareous material; highly calcareous Siltstone, grayish-red (5R 4/2) and white; grains of frosted quartz and dark minerals rare; medium calcareous; some light-olive-gray (5Y 6/1), finely crystalline limestone and some dark minerals and mica in lower part; noncalcareous	10	1,050
Sandstone, light-olive-gray (5Y 6/1) and yellowish-gray very-fine grained and silty; some medium quartz grains; poorly sorted; noncalcareous; some greenish-gray (5GY 6/1) calcareous mudstone	20	1,070
Mudstone, grayish-red (5R 4/2); fine grained quartz and dark minerals common; calcareous	5	1,075

J.E.D.

TEST DATA

Water Well No. 2

Test Pump: 10" Peerless, 12 Stages, Set at 600 Feet

Pumping Level - Feet	GPM	Remarks
285	220	Muddy - 1 Hour
365	260	Pumped - 1 Hour
465	290	Pumped - 1 Hour
510	330	Pumped - 1 Hour
600	370	Pumped - 4 Days

Note: At a pumping rate of 370 GPM at 600 feet, the pumping level raised to 550 feet after four days pumping. The well recovered it's artesian flow of 270 GPM in 14 minutes after pump was shut off. Shut-in pressure on this well is 140 psig, the same as Well No. 1.

J.E.D.
1/14/57

Post-it® Fax Note 7671	Date 10/8/03	# of pages ▶ 21
To Diane Kuenes	From D Adams	
Co./Dept.	Co.	
Phone #	Phone #	
Fax # 505-326-3747	Fax #	

January 27, 2000

Ciniza Refinery Water Well #4

—

Gallup, New Mexico
File No.: 99-058

Submitted To:

Mr. Eddie Stalcup
Giant Refining Company
Route 3, Box 7
Gallup, New Mexico
87301

History of Drilling Water Well #4
Ciniza Refining Company

The well was spudded in on November 12, 1999 with a Gardner-Denver 2000, Rig #10, owned and operated by United Drilling Inc. of Roswell, NM. The pilot hole was drilled using a 7 7/8" J33 (carbide button) bit to depth of 175' to a sandstone bed competent to anchor the surface casing below the alluvium and shallow water producing zones. The Sonsela member of the Chinle Formation was encountered at a depth of 15' to 85' which produced some water (not measured) that thinned the drilling mud.

The hole was reamed to 32" with three passes. The first was a 17 1/2" mill tooth bit and the hole extended an additional five feet to allow for the length of the reamer and pilot bit. The mill tooth seemed to drilled faster than the button bit, especially in the mudstone. The 17 1/2" bit was used as the pilot for the 24" reamer and also on the 32" reamer. Both reamers had open ports, not jets, at the cones, which did not keep the mudstone from balling up on the cones and slowed drilling.

Twenty four inch surface casing was run to a depth of 175'. The casing was a welded, flush joint. Concern was expressed by the drilling contractor that the casing might collapse if cemented in one stage so it was decided to cement in two stages. Cement was tremmied from bottom to top by the drilling contractor. Two yards of concrete were required to bring the cement to surface after shrink back.

A 9 7/8" mill tooth bit was used to extend the pilot hole from below the surface casing. The mill tooth penetrated the mudstones better than the previously used button bit.

Sloughing of the mudstones in the Chinle Formation mixed with cuttings throughout the hole masking the strata being drilled. After electric/nuclear logs were run, the strata could better be determined.

Formation water began thinning the drilling mud at 570', interbedded sandstone and mudstone were encountered at this depth. An increase in pit volume was apparent at 620'. Drilling had stopped at 650' for the night and was flowing 13.5 gallons per minute the next morning. The drilling contractor had been working daylight tour only but began 24 hour operations when the well started flowing. The viscosity was increased from 45 to 55 and the weight increased from 9.9 to 11.5 lbs./gal. This viscosity and weight stabilized the water flow but not the sloughing of the Chinle formation. Drilling rates averaged 5 minutes per foot.

Hard sandstone was encountered at 655'. The bit seemed to be locked up at 735' but when pulled for inspection it was undergauge and replaced. A 9 7/8" button bit was installed and reamed 150' back to bottom. After 240' of dense sandstone drilling was stopped and the hole was logged. Using the E-logs and neutron-density logs the formations were identified and it was decided to continue drilling.

A 7 7/8" inch button bit (original pilot bit) was used and more collars were added to increase weight. Until this point the hole had remained almost vertical but started deviating dramatically with the extra weight.

Limestone was encountered at 1060' which is in the Yeso Formation and drilling was stopped at 1076'.

Reaming for the production casing began from the bottom of the surface casing to 775' with a 17 1/2" bit. A cone from the 17 1/2" bit was lost and was washed to the bottom with the 7 7/8" bit. The reaming was accomplished using 9 lbs./gal. mud to make up volume and allowed to thin as the well began to flow.

A 13 3/8" threaded casing was to be run from surface to 750' but because of deviation the casing could only be run to 733'. The casing was cemented from the bottom to top by BJ Well Services from Farmington, NM.

The hole was reamed with a 12 1/2" bit from 775 to 1075' and the well was completed open hole below 733'.

Initial flow rate after drilling was 120 gallons per minute with dissolved solids at 1300 ppm.

To increase production the lower Chinle Formation was perforated. The casing was perforated by Schlumberger from 560'-715' at eight shots per foot using tubing guns with jet shot.

The initial flow rate after perforation was approximately 150 gallons per minute and dissolved solids at 600 ppm.

CINIZA WATER WELL #4
(Replacement of water well #1)

UNITED DRILLING CO. Roswell, NM
Rig #10, Gardner-Denver 2000
Measurements from kelly bushing 6' above ground
Bit 7 7/8" J33 button bit.

11-12-99
Alluvium

0-5 Sand, fine to medium, red-brown, sub angular, chert, quartz-frosted; some petrified wood pieces, some clay.

5-10 Gravel, sandy, coarse, sub-angular, sandstone, quartz, chert.

10-15 Clay, red-brown, slightly sandy.

Chinle Formation
Petrified Forest Member

Sonsela Sandstone Bed (12')

15-20 Sandstone, fine to medium, quartz, chert.

20-25 Sandstone, fine, mainly quartz, some frosting, sub-rounded to rounded, chert.

25-30 Sandstone, fine, well sorted, calcite cemented, sub-rounded, typically frosted ~1% dark lithics, cuttings are coarse sand size. Hard drilling.

30-35 Same as above.
33-34' mudstone stringer.

11-13-99

35-40 Sandstone, very fine, well sorted, round to sub-rounded, some frosting, dominately quartz, <10% other, <1% dark lithics. Easier drilling

40-45 Same as above, ~1% dark lithics, some shaly stringers.

45-50 Same as above, dense again at 50'.

50-55 Same as above with shaly stringers throughout, sandstone is dense, chert/quartz fine grains, quartz rounded, frosted 50%; shale is dark red to purple; chert appears to be associated with the shale, shaly @ 54'.

55-60 Shale/mudstone purple with light blue to white chert.

60-65 Shale/mudstone purple to dark red, some grey pieces, dense, shale/mudstone interbedded ~1'.
Drilling Rate: 2 min/ft.

65-70 Mudstone/shale interbedded, some chert/silicious chips, some blue-green shale, white appears to be gypsum, very soft/friable when wet, suspect high montmorillonite content.

70-75 Sandstone, fine, well sorted, 1% dark lithics, few limestone pieces, silica cemented, hard drilling.

75-80 Sandstone, quartz, well sorted, very fine, silica cemented hard (mature); some thin shale interbeds (dark purple), hard, fissile, softens in water (montmorillonite?); some black shards of silica rock with copper colored veins (phlogopite).

80-85 Sandstone, white well sorted, very fine, rounded to well rounded, weaker than above.

85 Bottom of Sonsela Sandstone Bed

85-90 Mudstone-shaly (fissile) soft, purple to white or light grey, fissile, feels sticky (montmorillonite), some quartz grains, relatively easy drilling.

90-95 Same as above with 10% white pieces, purple primary, very sticky and soft when wet.

95-100 Same as above.

100-105 Same as above some blue-green interbedded with purple layers.

105-110 Same as above.

110-115 Same as above.

115-120 Same as above, slightly more light green to white mudstone.

Deviation survey @ 100' = 1/2 degree.

120-125 Same as above.

125-130 Same as above.

130-135 Same as above.

135-140 Same as above.

140-145 Same as above, slightly denser drilling, slightly brighter red-purple.

145-150 Same as above, softer drilling.

150-155 Same as above, firmer drilling ~1ft/min.

155-160 Same as above.

160-165 Same as above.

165-170 Same as above.

170-175 Same as above. @172 hard drilling. Very fine sandstone, some chert interbedded with sandstone. Drilling rates as follows: 172-173: 6 min; 173-174: 3 min; 174-175: 12 min. Circulate to run casing.

Terminated pilot hole to ream for surface casing.

Went from 7 7/8" bit to 17 1/2" bit.

11-14-99
Began reaming 17 1/2" hole, slow drilling in sandstone, 80' drilled.

11-15-99
Deviation survey @ 90' = 1/4 degree. (5.25"/100')

Sonsela making some water and diluting mud, mixed mud.

175-180 Same as above, easier drilling with the mill tooth bit. Sandstone, very fine, super mature, white, well sorted silica cement, interbedded with mudstone.

Increased depth of hole to allow for the larger reamers to reach the 175' depth.

Deviation survey @ 160' = 1/8 degree. (2"/100')

11-16-99
Start drilling 24" hole.

11-17-99
Drill 24" hole to 135' progress slow. Pull bit to inspect, cones are clogged with clay.

11-18-99
Mix mud, clean off pilot bit and reaming bit, finish reaming 24" hole.

11-19-99

Begin Reaming 32". Using 32" reamer with 17 1/2" pilot. Cannot get 17 1/2" plus 24" and 32" reamer in the hole since substructure is only 6 feet high.
Thirty two inch bit may "waller" unless lightly loaded.

11-20-99
Ream 32" hole.

11-21-99
Ream 32" hole.

11-22-99
Finish reaming 32" hole, condition and circulate hole. Lay down pipe and collars and reamer, run tremmie pipe, remove rotary table. 1:30-4:00pm wait on orders. Giant agreed to allow structural welders to place surface casing-will not allow on production casing. 4:00-7:30 pm run 175' of 24" casing and cutoff.

11-23-99
Replace rotary table, adjust tremmie, place first 8 yards of cement on outside of casing.

11-24-99
Place second 8 yards of cement.

11-25-99 thru 11-28-99
Shutdown for Thanksgiving.

11-29-99
Place 2 yards concrete at top of casing (15'). Mixed mud began drilling 9 7/8" SDC mill tooth bit (Smith) 1:30 pm.

180-185 Siltstone, hard, white/light tan, slightly cemented, some carbonate pieces (appears to be cement); some mudstone.

185-190 Mudstone, (claystone) dense, grey-blue to light brown, some very thin siltstone lenses.

190-195 Same as above.

195-200 Same as above.

200-205 Mudstone, dense, blue-grey, more siltstone than above, some chert/quartz grains, amber to yellow-brown in the (claystone, siltstone) matrix.

205-210 Same as above.
Drilling Rate: 2.5 min/ft.

210-215 Same as above, better cutting returns.

215-220 Sandstone, 50%, red-purple, very fine, well sorted, stained yellow, effervesces with HCl; mudstone, 50%, red-purple and white (soft), chert.

220-225 Mudstone, red-purple, white (soft), no sandstone, clear quartz with impurities (black specs).

225-230 Same as above.
Drilling Rate: 225-235 1ft/min.

230-235 Same as above, amber quartz grains.

235-240 Same as above, 2% sandstone, clear and stained (yellow to red) effervesces.

240-245 Same as above, 1% stained sandstone, chert.

245-250 Same as above, no sandstone, plus chert.

250-255 Same as above, 1% clear sandstone, chert.

255-260 Same as above.

260-265 Mudstone, red-purple, 2% blue-grey, no sandstone or chert.

265-270 Same as above, 10% blue-grey.

270-275 Same as above, 30% blue-grey.

275-280 Same as above.

Deviation survey @ 248' = 1/4 degree.

Stuck in hole at 275' cuttings fell back in and stuck bit while running deviation survey. Circulated and freed pipe.

11-30-99
Mud flowing from casing approximately 1 gpm.
Viscosity 36 seconds.

280-285 Mudstone, Same as above.

285-290 Sandstone/siltstone interbedded. Sandstone is partially silica cemented, some carbonate cemented (50%/50%), multicolored silica particles in sandstone; siltstone is red-purple, weak (easily broken). Sandstone 60% of section.

290-295 Sandstone/siltstone, with interbedded dark lithic particles (50%), 40% sandstone, siltstone is more competent (dense). Drilling Rate: 2 ft/min.

295-300 Same as above, slightly more siltstone, 70%, red-purple.

300-305 Sandstone, (70%) white, little staining, carbonate cement; some mudstone, 80% red-purple, 20% blue-green.
Drilling Rate: 2 min/ft

305-310 Mudstone, red-purple, some minor sandstone pieces (likely washed up), some limonite staining.
Drilling Rate: 2 min/ft.

310-315 Same as above.

315-320 Same as above.

320-325 Same as above, 10% sandstone

Viscosity 46 seconds.

325-330 Mudstone, red-purple 90%, grey 5%, sandstone 5%.

330-335 Same as above.

335-340 Same as above, no sandstone.

340-345 Same as above.

345-350 Same as above. Drilling Rate: 1 min/ft.

350-355 Same as above.

Viscosity 45 seconds

355-360 Same as above. Drilling Rate: 3 min/ft.

360-365 Same as above.

365-370 Same as above.

370-375 Same as above, purple mudstone, firmer.
Drilling Rate: 4 ft/min.

Deviation survey @ 248' = 1/4 degree.

375-380 Same as above. Viscosity 46 seconds;

380-385 Same as above.

385-390 Same as above. Drilling Rate: 2 min/ft.

390-395 Same as above.

395-400 Same as above but brighter red, some very thin gypsum plates.

400-405 Same as above, firmer, especially the blue-grey material
Drilling Rate: 4 min/ft.

405-410 Mudstone, brown-red, firmer.

Viscosity: 46 seconds; Weight: 8.9 lbs/gal.

410-415 Same as above.

415-420 Same as above.

420-425 Same as above.

425-430 Same as above. Drilling Rate: 3-4 min/ft.

430-435 Same as above.

435-440 Same as above.

440-445 Same as above. Drilling Rate: 1-2 min/ft.

Viscosity: 44 seconds; Weight: 9.9 lbs/gal.

445-450 Same as above.

450-455 Same as above.

455-460 Same as above. Dense.

12-1-99

Well flowing 1 gpm.
Viscosity; 46 seconds; Weight: 9.1 lbs/gal.

460-465 Same as above.

465-470 Same as above.

Deviation survey @ 435' = 3/8 degree.

470-475 Same as above.

475-480 Same as above (mainly claystone).

Viscosity: 43 seconds; Weight: 9.3 lbs/gal.

480-485 Same as above, slightly more red, some blue-grey mottling ~15%. Pits gaining volume.

485-490 Mudstone, red-brown, red-purple, 5-10% grey mottling; siltstone, yellow-red, brown, slightly calcareous.

490-495 Same as above.

495-500 Same as above.

500-505 Same as above.

505-510 Same as above with ~2% sandstone white and dark lithics (50%-50%).

510-515 Same as above.

515-520 Same as above.

520-525 Same as above.

Viscosity: 58 seconds; Weight: 9.9 lbs/gal. Mixed 10 sacks gel.

525-530 Same as above with some siltstone; ~10% sandstone, white, hard, calcareous cement, quartz (50%) dark lithics (50%), very fine grained.

530-535 Same as above with ~1% sandstone.

535-540 Same as above.

Viscosity: 48 seconds; Weight: 9.9 lbs/gal.
Drilling Rate: 2 min/ft.

540-545 Same as above.

Blue Water Creek and Shinarump Undifferentiated

545-550 Same as above, 50% grey, 50% red, soft to firm .

Drilling Rate: 4 min/ft.

550-555 Same as above with some gypsum.

555-560 Same as above.

Drilling Rate: 5 min/ft from 558-573. (At 573' increased rotation speed to try to increase drill rate)

560-565 Same as above some firmer grey.

565-570 Same as above, 60% red, 40% grey

570-575 Same as above, 70% red, 30% grey.

575-580 Same as above, 50% grey, 50% red, a few sandstones grains.

580-585 Same as above.

585-590 Same as above, ~2% sandstone, quartz with silica cement.

590-595 Same as above some limonite.

Drilling Rate: 5 min/ft.

595-600 Same as above, a little siltier, 5% sandstone, very fine to fine, some limonite staining.

Viscosity: 43 seconds; Weight: 9.9 lbs/gal.

600-605 Same as above, silty mudstone, white and yellow stained, sandstone 10%.

605-610 Same as above with red sandstone, 15%.

610-615 Same as above, 5% sandstone.

615-620 Same as above, 5% sandstone. Less limonite.

Viscosity: 39 seconds; Weight: 9.9 lbs/gal.

620-625 Same as above, 3% sandstone.

Pit volume appears to have increased since morning.

625-630 Same as above.

630-635 Same as above.

Mixed mud. Viscosity: 57 seconds; Weight: 10.0 lbs/gal.
Larger and more cuttings. 30% sandstone (origin?)
Lowered pit approximately 1 foot at 2:30 pm. Full again at 4:30 pm.

635-640 Silty mudstone, red, firm to soft; sandstone, red, soft, very fine, slightly calcareous cement.

640-645 Sandstone, red-purple, some white, some mudstone, primarily siltstone, sandstone is typically dark colored minerals, very fine but some larger particles, rounded, some limonite.
Drilling Rate: 5 min/ft.

Viscosity: 56 seconds; Weight: 10.4 lbs/gal.

645-650 Sandstone, clean, well rounded, quartz and dark lithics, silica cement, some limonite stained.

Viscosity: 55 seconds; Weight: 10.6 lbs/gal.

12/3/99

Well flowing-estimate 10 gpm (end of pipe not reachable)

12/4/99
Flowing clear - measured 13 1/2 gpm

Deviation survey @623' = 7/16 degrees.

Drilling Rate: 2 min/ft.

650-655 Sandstone, red; mudstone, grey, most likely cave in.

Viscosity: 55 seconds; Weight: 11.5 lbs/gal.

655-660 Same as above, 5% light grey sandstone, well rounded, quartz, silica cement.

660-665 Sandstone, red, very fine, 5% light grey sandstone, red and white chert, grey mudstone, some gypsum.

665-670 Sandstone, red, 50%, some light grey sandstone, some limonite; grey, mudstone.

670-675 Same as above. Red sandstone consists of quartz, sub-rounded, red stained, very fine; grey mudstone.
Drilling Rate: 4 min/ft.

675-680 Mudstone, grey; sandstone, light red, soft; siltstone, firm. Small piece of well rounded gravel (silica), 20% purple silty mudstone.

680-685 Sandstone, light red, soft, 50%; light grey sandstone, firm, 20%; 10% of sandstone is strongly calcareous; purple silty mudstone.
Drilling Rate: 4-5 min/ft.

Viscosity: 50 seconds; Weight: 11.5 lbs/gal.

685-690 Sandstone 60% light red; 20% purple siltstone; 20% grey mudstone, some dark grains and is firmer.

690-695 Sandstone, 80%; light red, soft, very fine, well sorted, stained quartz, and light grey, finer, lithics in well sorted quartz, calcareous; 20% silty, grey mudstone; some limestone.

695-700 Light red, well sorted, soft, calcareous sandstone; medium grey mudstone, silty, some limonite.
Drilling Rate: 10 min/ft.

700-705 Sandstone, red-brown, firm, calcareous when crushed, very fine, quartz with red stain, pale red, silty to very fine sandstone, hard, quartz and dark minerals, 80%; mudstone, grey and purple mudstone (20%).

705-710 Sandstone, 60% light red; 20% red mudstone; 10% light grey sandstone with limonite; 10% sandstone with angular red mudstone clasts to very fine sand, calcareous when crushed, hard.
Drilling Rate: 10 min/ft

710-715 Same as above.

Pump not pumping well. Viscosity 78. Half of volume as before.

715-720 Same as above with more grey and red mottled mudstone, and gypsum.

Moenkopi Formation (820')

720-725 Sandstone, pale red, 60%, effervesces when broken; mudstone, grey, 20%, 5% mottled; 5% limestone.
Drilling Rate: 10 min/ft, Viscosity 90, Weight 11.5

725-730 Same as above.

Trip bit; locked up

12/5/99
Bit O.K. - 2 jets plugged - clean bit and return trip (did not change bit). Bit in excellent condition otherwise.

Viscosity: 74 seconds; Weight: 11.5 lbs/gal.

Circulate, pebbly chert and other silica rocks, sandstone - pale red, fine not calcareous, quartz grains in pale red matrix, some (approximately 10%) dark lithic rock grains also - also medium grey mudstone (15%) rounded, easily broken by hand. Very slow drilling. Still poor pumping. 730-731 Calcite infilling (1/4") 6:50am - Shut down - no progress (3/4') since 4:40am. Trip bit still locking up. Bit worn, replaced with carbide button, (Security).

12/6/99
Work on pumps. Trip back in hole. Ream 150 feet with new button fit - old button bit was undergauge.
6:15pm - Drilling Rate: 12 min/ft

730-735 Sandstone, pale red to light red, 70%, well sorted quartz, slight staining, red sandstone; 30% grey mudstone, dark purple mudstone.

735-740 Same as above. 10% white sandstone, same characteristics as the pale red - some dark chert, some white mudstone.
Drilling Rate: 20 min/ft.

Viscosity: 50 seconds; Weight: 11.5 lbs/gal.

740-745 Same as above. 10% white mudstone mottled with purple; grainy (gypsum?).
Drilling Rate: 15 min/ft,

Viscosity: 40 seconds; Weight: 11.4 lbs/gal.

745-750 Same as above. Some cherty limestone (?) fizzles some.

Deviation survey @ = 7/16 degrees.

Viscosity: 46 seconds; Weight: 11.5 lbs/gal.

12/6/99
11:50pm - Swivel leaking
Viscosity: 46 seconds; Weight: 11.4 lbs/gal.

750-755 Sandstone, 50% light red, 40% pale red, to 10% white, very fine, well sorted, clear quartz, very fine dark lithics, non-calcareous, angular to sub-angular; 1-2% overall limestone, grey-green to grey. 1% dark red mudstone.
Drilling Rate: 8 - 10 min/ft

755-760 Same as above, effervesces when particles are crushed, mudstone approximately 15%, hard drilling.
Drilling Rate: 8-10 min/ft.

760-765 Same as above, pale red sandstone, frosted, 60%, sandstone is non-calcareous; approximately 10% mudstone, some grey claystone approximately 2%.
Drilling Rate: 12-13 min/ft

Viscosity: 66 seconds; Weight: 11.6 lbs/gal.

765-770 Same as above.

770-775 Same as above, approximately 40% mudstone - dark red/purple with minor grey to light blue white, sandstone still very light red to tan, angular to sub-angular, quartz frosted, well sorted, some red staining gives overall light red color, non-calcareous, red staining very slightly calcareous.

775-780 Same as above. Minor limestone pieces are angular - sub-angular, well sorted quartz, non-calcareous/mudstone is calcareous.

Drilling Rate: 9-10 min/ft. Bit bounced significantly in this interval.

780-785 Same as above. Some clear, some frosted, mainly angular, very fine; approximately 30% purple, 15% grey - blue mudstone.
Drilling Rate: 7-10 min/ft.

Viscosity: 50 seconds; Weight: 11.6 lbs/gal.

785-790 Sandstone, 50% white, quartz, well sorted, very fine, angular to sub-angular dark lithic rock, rare mica, very weakly calcareous; approximately 5% mudstone, primarily blue grey, some brown-red/purple,
Drilling Rate:7-10 min/ft.

790-795 Same as above.
Drilling Rate:6-7 min/ft.

Viscosity: 52 seconds; Weight: 11.8 lbs/gal.

795-800 Same as above.

800-805 Same as above, Drilling Rate:8-10 min/ft.

805-810 Same as above, Drilling Rate:8 min/ft.

810-815 Same as above, Drilling Rate:6-7 min/ft.

Viscosity: 51 seconds; Weight: 11.8 lbs/gal.

815-820 Same as above, Drilling Rate:8-10 min/ft.

820-825 Same as above, Drilling Rate:12 min/ft.

825-830 Same as above.

830-835 Same as above.

835-840 Same as above, some less red,
Drilling Rate:11 min/ft.

Viscosity: 52 seconds; Weight: 11.9 lbs/gal.

840-845 Same as above, more tan, less pale red, 80% tan 20% pale red.
Drilling Rate: 20 min/ft.

Glorietta Formation (846')

845-850 Same as above.
Drilling Rate:5-8 min/ft.

Viscosity: 51 seconds; Weight: 11.9 lbs/gal.

850-855 Same as above, slightly yellow tan-yellow a little easier to break.

855-860 Same as above, only 2% lithics in sandstone.
Drilling Rate:8 min/ft.

Viscosity: 52 seconds; Weight: 11.9 lbs/gal.

860-865 Same as above, less yellow.
Drilling Rate: 10 min/ft.

865-870 Same as above, tan.

Viscosity: 51 seconds; Weight: 11.9 lbs/gal.

870-875 Same as above, some yellow mostly tan, one fracture face with red staining.

Table has been popping some, approximately 30 feet.

875-880 Same as above.
Drilling Rate:10 min/ft.

Viscosity: 55 seconds; Weight: 11.9 lbs/gal.

12/7/99

880-885 Same as above.

885-890 Same sandstone, shows more mudstone (red-purple) than above approximately 30%, many sandstone pieces show fracture dendritic psilomelane, hematite coating on faces, non-calcareous.
Drilling Rate: 20 min/ft.

890-895 Same as above, non-calcareous, angular, clear but some frosted, very fine approximately 15-20% mudstone.

Viscosity: 54 seconds; Weight: 11.9 lbs/gal.

895-900 Mudstone plus sandstone interbeds, sandstone as above, mudstone (887-993), mudstone dark red-purple, non-calcareous, mudstone/sandstone approximately 60/40%, suspect rate in mudstone approximately 40 min/ft, sandstone 6-10 min/ft.

Viscosity: 56 seconds; Weight: 12 lbs/gal.

900-905 Sandstone, same sandstone as above, approximately 20% mudstone, slow drilling appears to be in mudstone.
Drilling Rate: 9-12 min/ft.

Viscosity: 57 seconds; Weight: 12 lbs/gal.

905-910 Same as above.

12/8/99 Drilling 1:05 pm
7 7/8 bit. 15,000 lbs on bit
Drilling Rate:5 min/ft.
Viscosity: 46 seconds; Weight: 11.8 lbs/gal.

910-915 Same sandstone plus slough from trip, mostly red purple mudstone, wall cake balls.

915-920 Sandstone, white as above plus red purple mudstone 50/50%, as above, one piece of light red very, very fine sandstone, non-calcareous, one piece of greenish-grey mudstone, 10% grey mudstone.
Drilling Rate:8-10 min/ft.

920-925 Sandstone-red purple mudstone-grey mudstone (softer than red-purple) 40/30/30%.

925-930 Same as above, sandstone plus red-purple mudstone plus grey mudstone.
Drilling Rate: 12 min/ft.

Viscosity: 48 seconds; Weight: 11.8 lbs/gal.

935-940 Sandstone, white, very few lithics, sub-angular, well sorted, 40%, slightly calcareous when crushed; red brown mudstone 40%; grey plus purple mudstone, 20% mottled together.
Drilling Rate:10 min/ft.

Viscosity: 49 seconds; Weight: 11.9 lbs/gal.

940-945 Sandstone, white to tan (as above); purple plus grey mudstone, soft red brown mudstone, blocky, firmer.

945-950 Same as above.

Yeso Formation (948')
950-955 Red brown mudstone 60% (grey mottled modules); 35% sandstone, very slightly calcareous; 5% greenish grey mudstone.

955-960 Mudstone, red brown, blocky in appearance, 30%; mudstone, red purple, 30%; sandstone, tan white, slightly calcareous, 30%; greenish grey mudstone with quartz sand, lithics were green modules 8%; red sandstone with quartz lithics, banded as to silt and sand, a few grey mud balls.
Viscosity: 48 seconds; Weight: 12 lbs/gal.

Deviation survey @ 928' = 1 1/4 degrees

960-965 Sandstone, light grey (same as above); 40%-mudstone red brown 30%; red purple 5%; light grey mudstone, medium soft 20%; grey mud balls 5%.
Drilling Rate: 10-12 min/ft.

965-970 Sandstone, light grey to tan 60%; red brown mudstone 35%; red purple 5%.

12/9/99 1:20 am

970-975 Sandstone, strongly calcareous when broken, light grey, very fine, angular to sub-angular, quartz, flakes crumble easily, some red brown mudstone washes up with sandstone-suspect washout from above.
Drilling Rate:12 min/ft.

Viscosity: 46 seconds; Weight: 12 lbs/gal.

975-980 Same as above.

980-985 Sandstone as above; red brown mudstone, some medium grey mudstone 60/40%, sandstone/mudstone approximately 50/50%, mudstone/sandstone is likely interbedded although some washing may be occuring-caliper log will tell
Drilling Rate: 9-10 min/ft.

Viscosity: 51 seconds; Weight: 12 lbs/gal.

985-990 Mudstone, red brown 90%, grey/purple 10%, minor light blue grey, some mottled red brown/blue grey, crumbly, few pieces of sandstone but rare.
Drilling Rate:7-10 min/ft.

990-995 Sandstone/mudstone 50/50%, sandstone is very fine, weakly calcareous, light blue grey-very light red, quartz, rounded to sub-rounded, slightly frosted to clear; mudstone 50/50%, red brown-light blue grey-medium grey, some mudstone washing from above.
Drilling Rate:5-6 min/ft.

Viscosity: 52 seconds; Weight: 12.1 lbs/gal.

995-1000 Same as above, some chert.
Drilling Rate: 5-6 min/ft.

Viscosity: 55 seconds; Weight: 12.2 lbs/gal.

1000-1005 Same as above, slightly more mudstone-approximately 60%, grey mudstone is slightly calcareous.

1005-1010 Same as above, some chert, sandstone is calcareous when broken.
Drilling Rate:7-10 min/ft.

Viscosity: 7-10 seconds; Weight: 12.2 lbs/gal.

1010-1015 Same as above, mudstone/sandstone approximately 70/30%; mudstone red brown/blue grey approximately 80/20%.

1015-1020 Sandstone, very slightly calcareous, sub-rounded, generally clear, very fine light grey-white, crumbles easily; approximately 25% shale that appears to have sloughed from walls above (large pieces), red brown and mottled, medium to light brown grey.

1020-1025 Same as above.

1025-1030 Same as above, some blue green mudstone pieces, some (minor) dark red sandstone, very fine non-calcareous, some clay balls with sample, added water and cleaned pit.
Drilling Rate:7-9 min/ft.

Viscosity: 43 seconds; Weight: 11.8 lbs/gal.

1030-1035 Same as above.

1035-1040 Same as above.

1040-1045 Same as above, 40% sandstone.

1045-1050 Same as above, 70% sandstone, sandstone appears a little coarser.

1050-1055 Same as above, 70% sandstone, some sandstones have slightly larger quartz grains, sub-rounded, clear.
Drilling Rate: 10 min/ft.
Viscosity: 56 seconds; Weight: 11.6 lbs/gal.

1055-1060 Same as above, 60% sandstone, dark grey, hard limestone 20%.

Rotary table very noisy at 1057'.

1060-1065 Limestone, hard, dark grey to grey 60/30%, red purple mudstone 10%, sandstone grey, limestones may be partially dolomitized.
Drilling Rate:10 min/ft.

Viscosity: 48 seconds; Weight: 11.6 lbs/gal.

1065-1070 Limestone 70%, red brown 15%, red purple, 18%, white soft to clay balls 8%, grey mudballs 8%.

Total depth 1076 feet

Deviation survey @ 1040' = 1 1/2 degrees

12/10/99 - 12/15/99

Ream 17 1/2"to 775'.
Set 13 3/8" casing to 731' and cement.
Cone lost off reaming bit. Washed hole to 1075'.
Cone at 1076'.

12/16/99

Begin reaming 12" hole. Well completed as open hole from 731' to 1020. The 7 7/8" rathole is from 1020' to 1076'.

Well shut in pressure, before perforating, on 1/10/00 was 112 psi with unrestricted flow at approximately 110 gpm.

Perforated 13 3/8" casing with 8 shots per foot from 560'-715' to increase production.

1/27/00

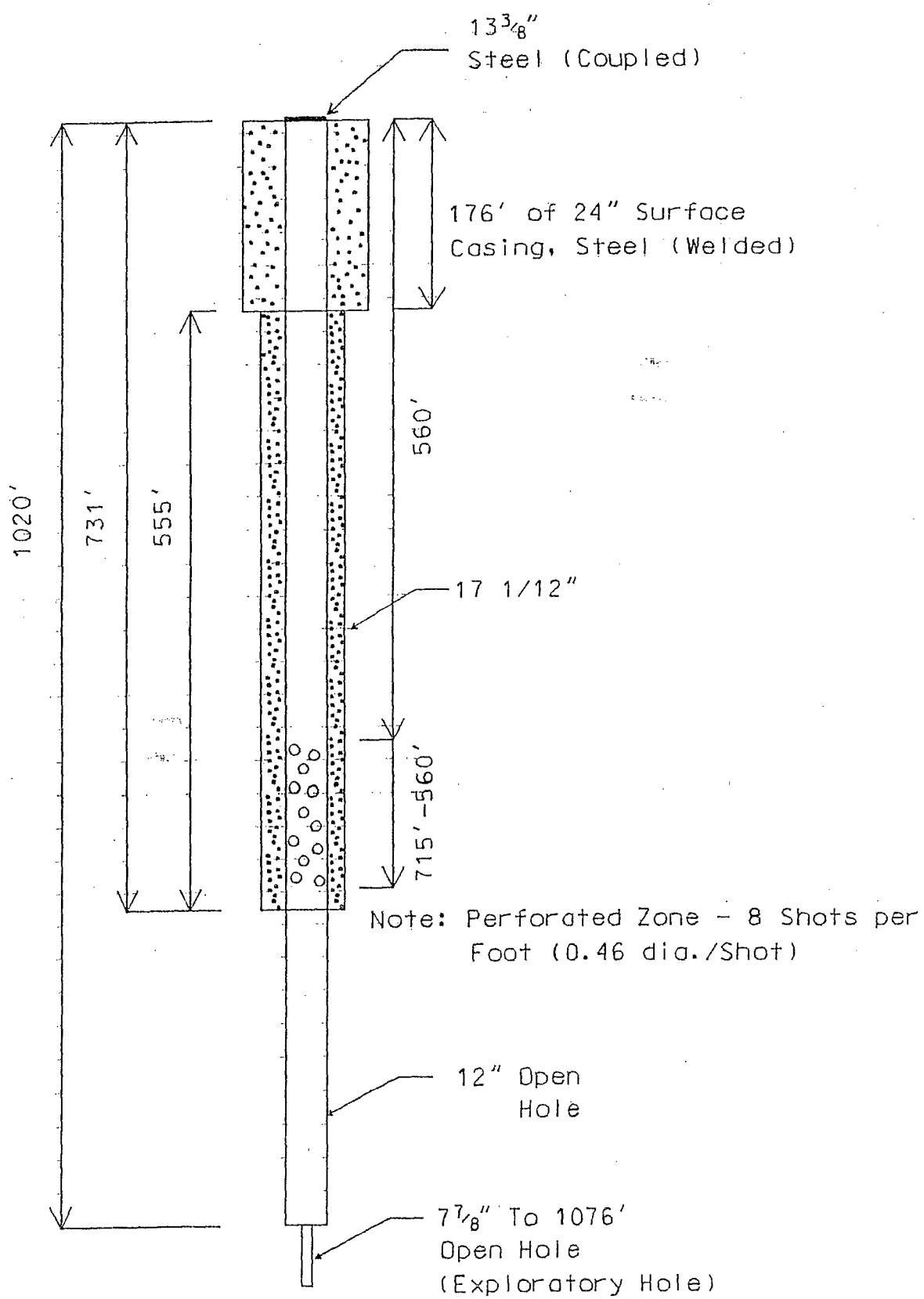
Unrestricted flow not measured at the time of this report.

CINIZA REFINERY

COMPLETION DIAGRAM

CINIZA WELL #4

Note: All Elevations From Kelly Bushing



Note: Perforated Zone - 8 Shots per Foot (0.46 dia./Shot)

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BORING OW-20

SURFACE ELEVATION: 6001 FEET

LABORATORY TEST DATA

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

I think these wells are no longer used??

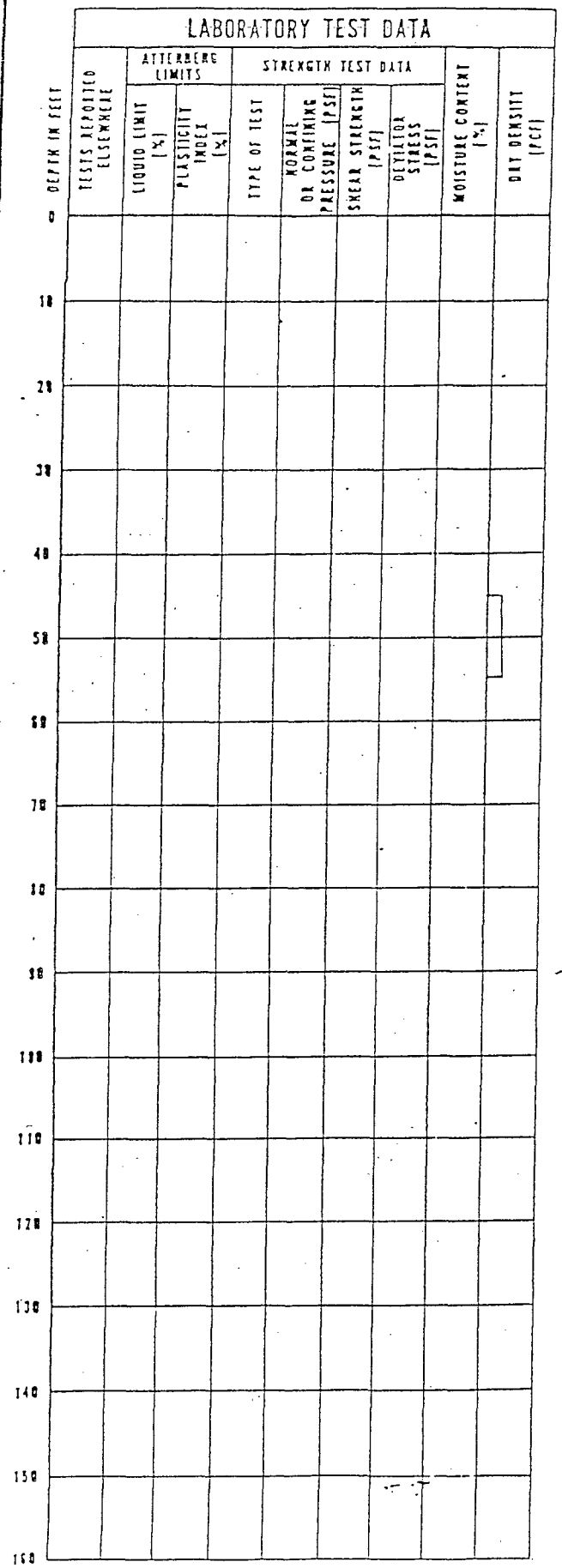
FILE COPY

LOG OF BORINGS

DAMES & MOORE

BORING OW-16

SURFACE ELEVATION: 6942 FEET



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		
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-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

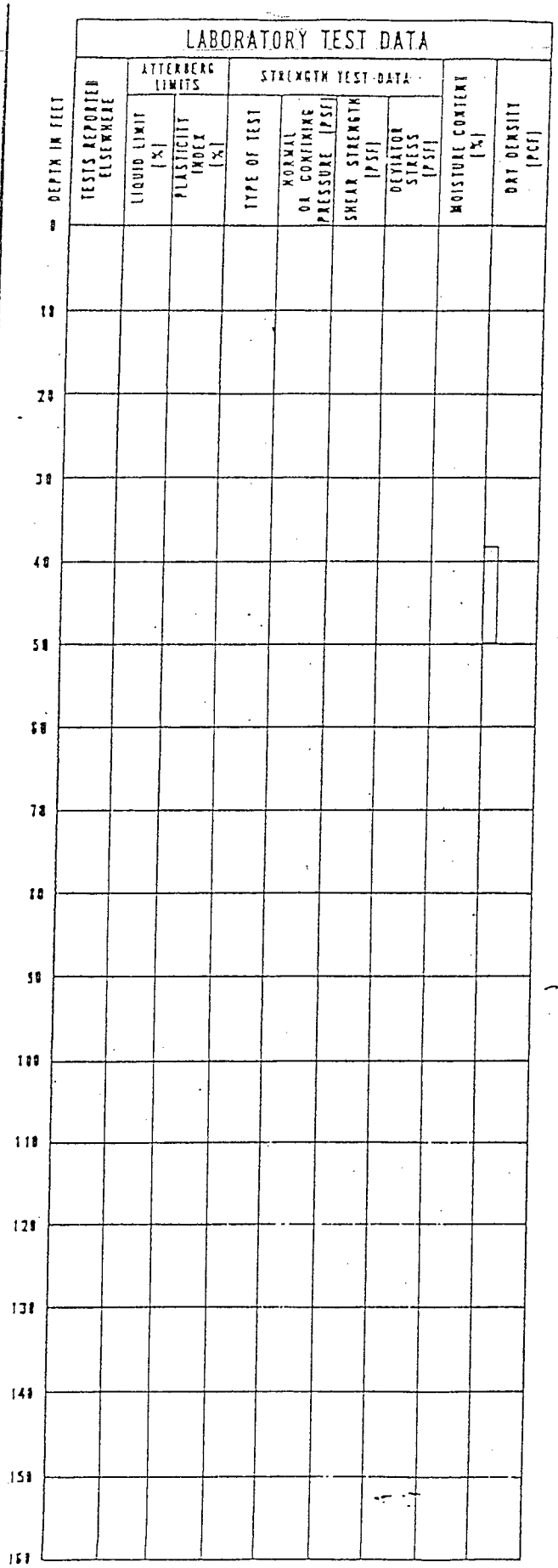
DETAIL OF CLOSURE PROCEDURE:

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-17

SURFACE ELEVATION: 6941 FEET



PENETRATION RATE MINUTES/FOOT

SYMBOLS		DESCRIPTION
3.0	SM	TRIASSIC PERIOD
3.2		CHINLE FORMATION
6.0	SS	REDDISH BROWN SILTY FINE SAND WITH SOME GRAVEL-SIZED FRAGMENTS OF LIMESTONE AND SANDSTONE, SOFT, HIGHLY WEATHERED
2.9	SHALE	11 FEET: SANDSTONE, REDDISH BROWN, FINE-GRAINED, NONCALCAREOUS, HARD, FRESH
5.6		13 FEET: SHALE, REDDISH BROWN, SANDY, SOFT, FRESH
2.8		GRADES HARD FROM 27.5 TO 30.0 FEET
3.8		GRADES GRAY FROM 31 FEET
3.2		GRADES WITH THIN LIMESTONE AND SANDSTONE INTERBEDS FROM 39 FEET
3.3		40 FEET: SANDSTONE, GRAY, FINE-GRAINED, SILTY, CALCAREOUS, HARD, FRESH
4.3	SS	42 FEET: SHALE, GRAY, SILTY, SANDY, WITH SOME GRAVEL-SIZED FRAGMENTS OF CHERT AND LIMESTONE AND OCCASIONAL THIN INTERBEDS OF LIMESTONE, HARD, FRESH
5.0		
4.3	SHALE	
1.0		

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

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., 505-523-7677
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

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:

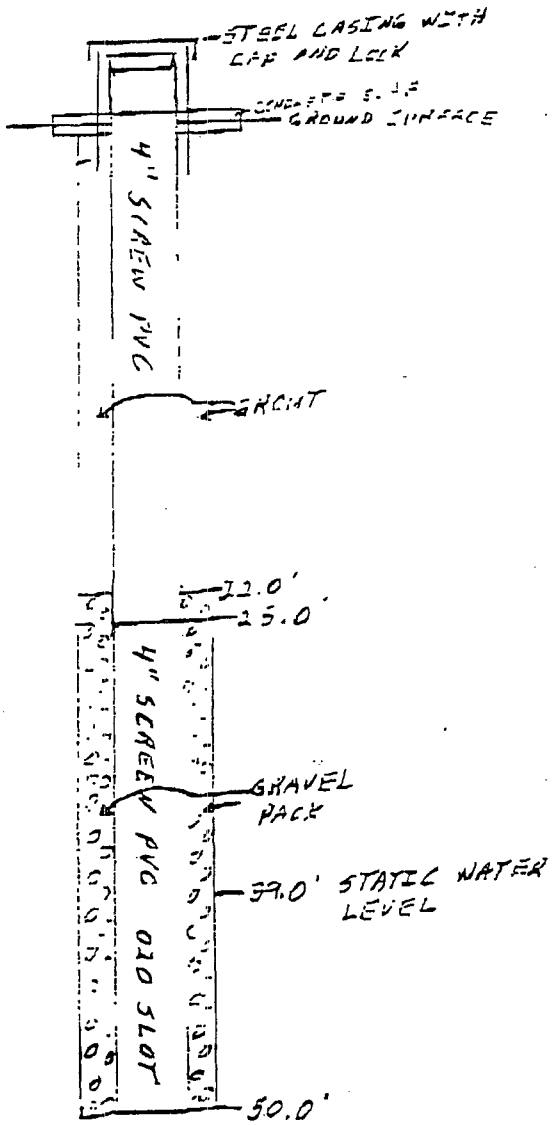
1) PULL GROUND SURFACE FINISH SET
2) SPLIT SCREEN/CASING BELOW EXISTING GROUT LINE
3) SET TREMMIE TO BOTTOM OF THE WELL
4) INJECT GROUT TO DISPLACE CONTENTS OF THE WELL TO THE SURFACE
5) CAPTURE WELL CONTENTS
6) SET PRESSURE PACKER ABOVE CASING SPLIT
7) INJECT GROUT UNDER PRESSURE TO A MINIMUM OF CALCUALTED 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 29, 1990



FORMATION LOG

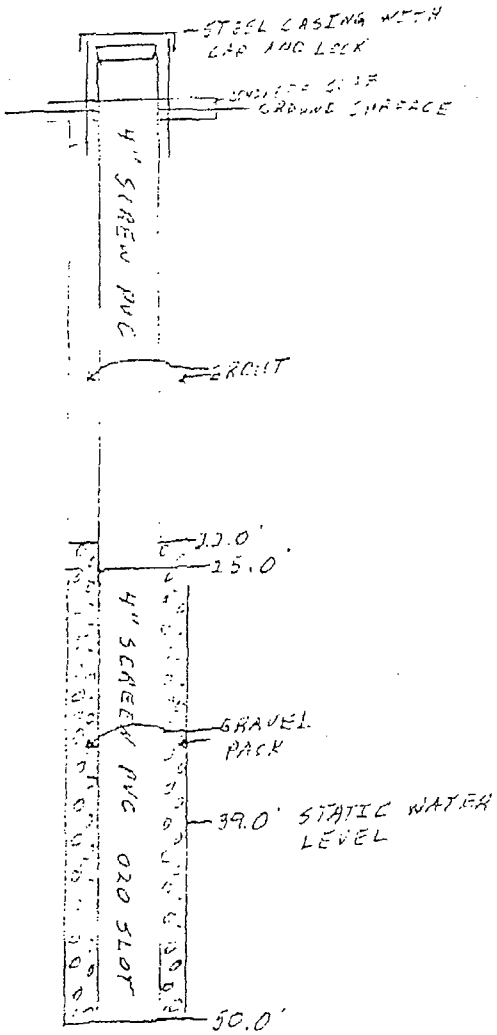
Depth(ft)	Formation
0-7	Clay
7-25	Red sandy clay
25-37	Clay with sand layers
37-50	Sand with thin clay layers

DRILLER NOT KNOWN

CINIZA REFINERY

OW-25

DRILLED: JUNE 28, 1990



FORMATION LOG

Depth (ft)	Formation
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:

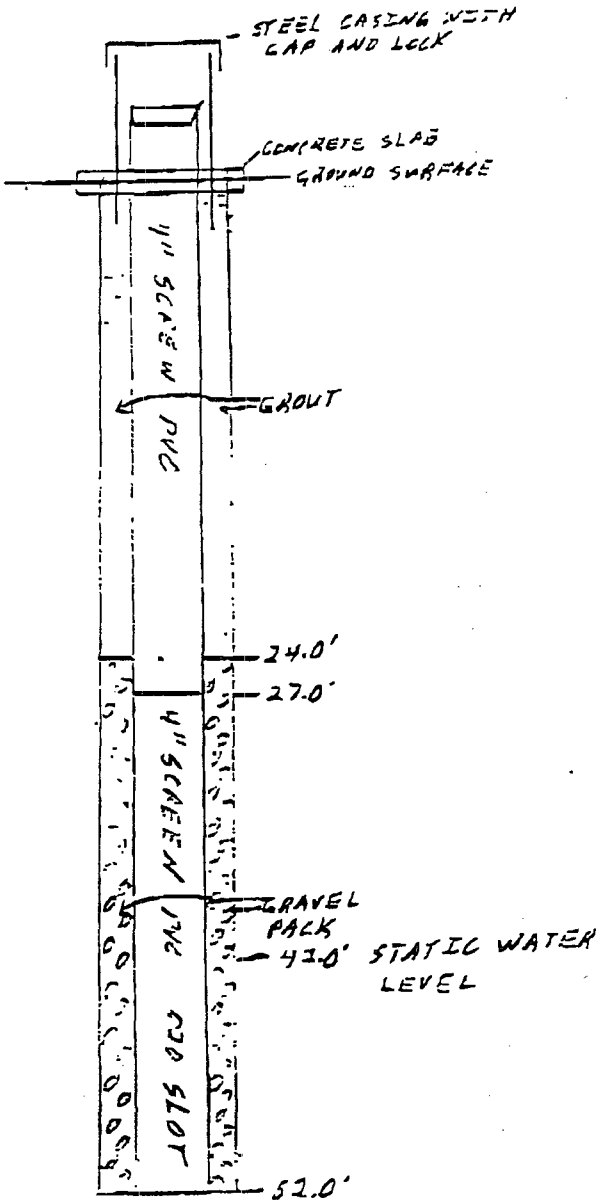
1) PULL GROUND SURFACE FINISH SET
2) SPLIT SCREEN/CASING BELOW EXISTING GROUT LINE
3) SET TREMMIE TO BOTTOM OF THE WELL
4) INJECT GROUT TO DISPLACE CONTENTS OF THE WELL TO THE SURFACE
5) CAPTURE WELL CONTENTS
6) SET PRESSURE PACKER ABOVE CASING SPLIT
7) INJECT GROUT UNDER PRESSURE TO A MINIMUM OF CALCUALTED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

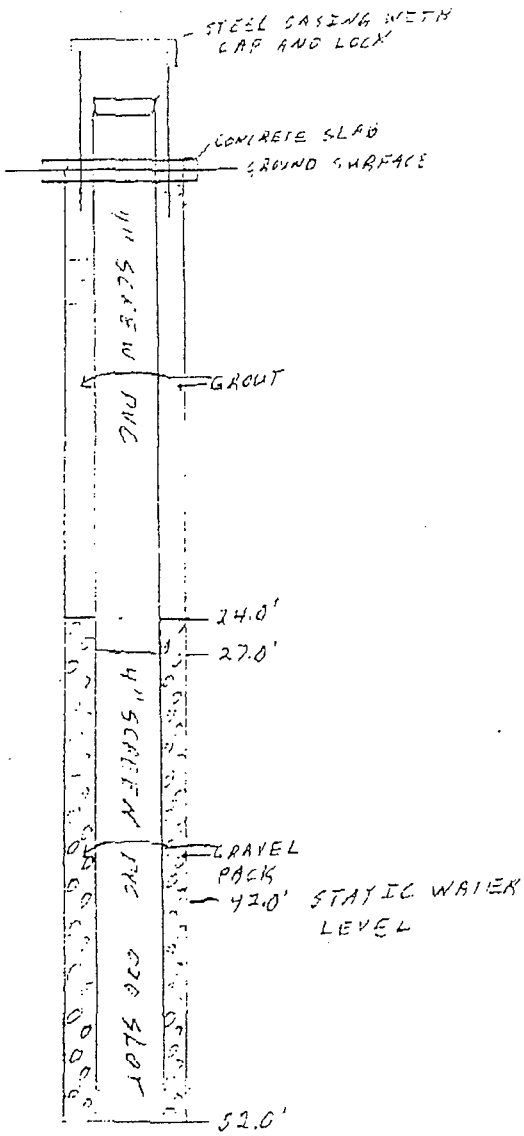
Depth(ft)	Formation
0-5	clay
5-19	Red sandy clay
19-42	Red clay w/ sand layers
42-52	Sand with thin clay layers

GREG
DRILLER
NOT
KNOWN

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

DRILLER NOT KNOWN

PRECISION ENGINEERING, INC.

PROJECT: CINIZA OW-20
Replacement 1 Continuous Sampling

LOG OF TEST BORINGS

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.

PROJECT: CINIZA OW-20
Replacement 2 Continuous Sampling

LOG OF TEST BORINGS

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

DEPTH	PLOT	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 dense, moist, red-brown.	No odor
	*********	5.0		
	*********	10	more dense	
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

PRECISION ENGINEERING, INC.

PROJECT: CINIZA OW-20
Replacement 2 Continuous Sampling

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	

LOGGED BY: WHK

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

File: GRC 1995 red

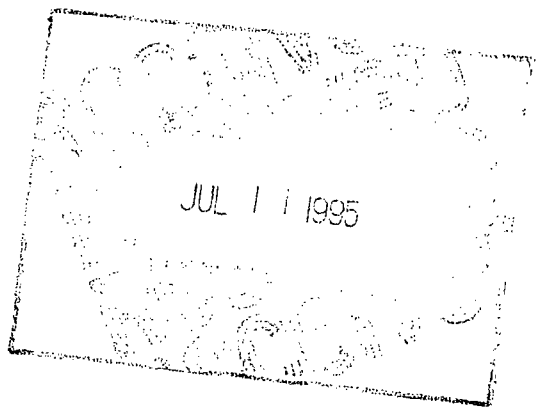
GIANT REFINING CO.

Route 3, Box 7
Gallup, New Mexico
87301

505
722-3833

July 6, 1995

VIII



Benito Garcia
Bureau Chief
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
525 Camino De Los Marquez
Santa Fe, New Mexico 87502

Re: **Annual Groundwater Notification**
Permit No. NMD000333211-2

Dear Mr. Garcia:

Pursuant to Attachment G: Groundwater Monitoring Plan, 2.G. and H. of the indicated permit, Giant Refining Company - Ciniza submits the enclosed analytical and statistical data from the annual groundwater sampling event.

There are several significant items that should be noted. This was the first sampling event with the new dedicated pump system. The system worked flawlessly and significantly reduces the chance of contamination of groundwater samples. This is particularly evident in the absence of any volatiles in any of the samples.

Also significant is the overall reduction in chromium in SMW-3, SMW-4, and SMW-5. Giant is not sure if this is the result of the surging/redevelopment of all the predetection and detection wells or if it is the result of the dedicated pumps, which ostensibly could result in lower chrome values due to less movement of sampling equipment into and out of the well bores.

SMW-6 continues to show high levels of all metals (excluding lead) and electrical conductivity, as well as a decrease in pH, and confirms Giant's belief that the stainless steel casing in that well has become damaged. The damage could be a result of corrosion or from mechanical damage. Nevertheless, the water samples retrieved from SMW-6 are more similar to the water in the evaporation lagoons than what is normally observed within the Ciniza Sands.

The change in the analytical characteristics of the samples retrieved

from SMW-6 was first noted after the Fall, 1993 semi-annual sampling event. Graphs showing the various constituents are attached to illustrate the increase (or decrease in the case of pH) of those constituents. These increases are concurrent with renovation of the evaporation lagoons, which are adjacent to SMW-6. Although probably coincidental, it is conceivable that the earth moving activities may have exposed a recharge route from the evaporation lagoons to the SMW-6 completion zone.

Giant proposes to drill an offset to SMW-6, approximately 20 feet northwest and into the same sand lens, and abandon SMW-6 by plugging with a cement/bentonite slurry. The new well will be called SMW-6A. The drilling will be performed by a truck mounted rotary rig, using augers and coring constantly to insure that the well is completed in the same sand interval. The casing will be schedule 40 PVC with flush screw-type joints. A diagram of the proposed well bore is included with this letter. Please note that it is imperative that the new well be screened only across the Ciniza Sand in order to retrieve representative samples from that zone.

The indicator parameters for the detection wells once again show a significant statistical increase (Cochran's Approximation of the Behrens-Fisher Student's-T Test). Giant believes that this is a false positive, an inherent shortcoming of this statistical analysis technique with this type of very consistent data, as discussed with NMED on numerous occasions in the past, and proposes that the compliance sampling program not be initiated.

In summation, Giant requests NMED approval for the abandonment of SMW-6 and the replacement of that well with a new well to be identified as SMW-6A. Giant does not consider this to be a permit modification as it is a replacement in kind. Furthermore, Giant will appreciate a timely approval in order to facilitate the drilling and completion process prior to the required semi-annual sampling event which will occur in September or October.

Thank you for your consideration in this matter. Should you require additional information, please contact me at (505) 722-0227.

Sincerely,

Lynn Shelton
Senior Environmental Coordinator
Giant Refining Company

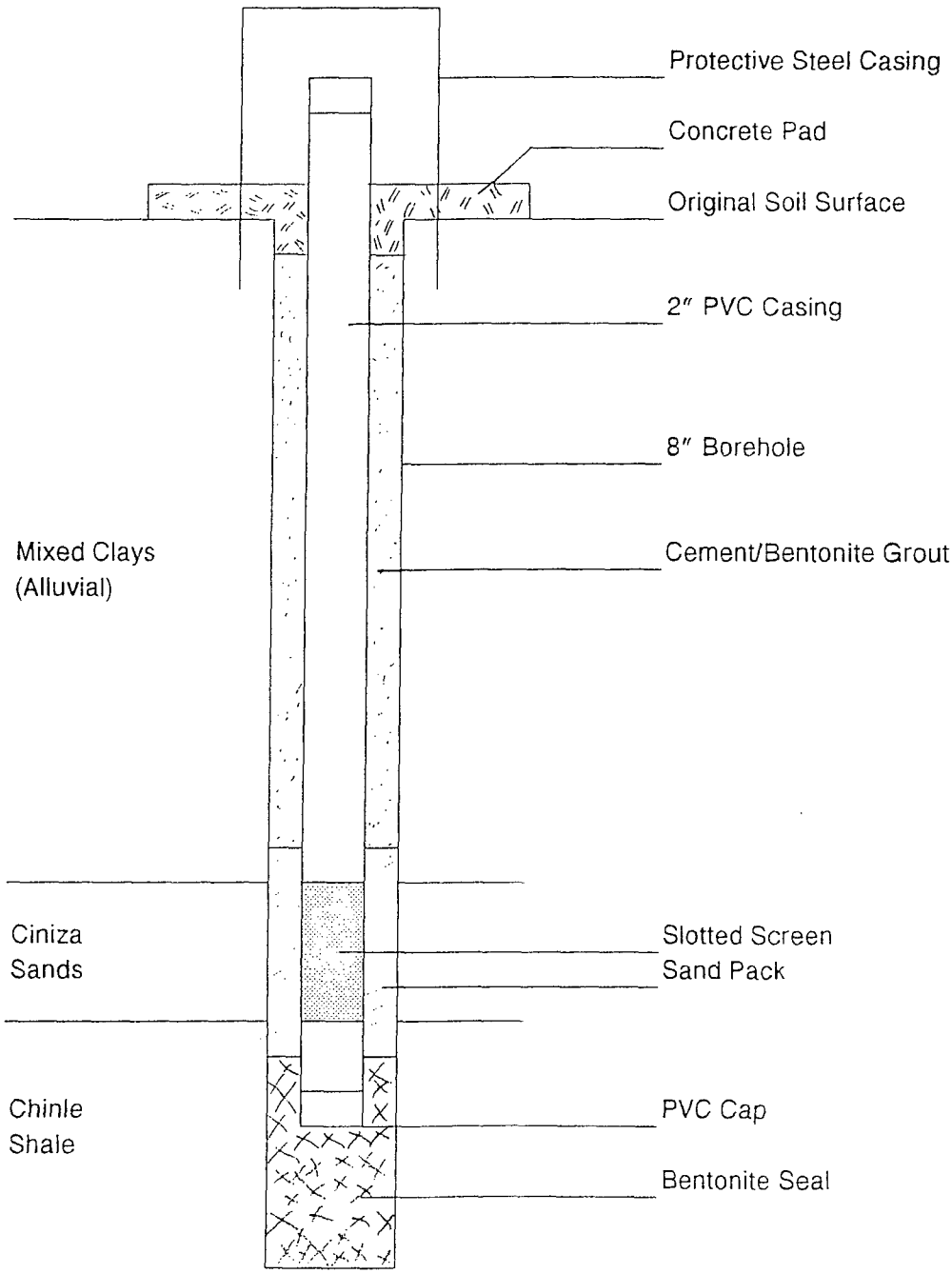
TLS:sp

cc: David C. Pavlich, HSE Manager, Giant Refining Company
Kim Bullerdick, Corporate Counsel, Giant Industries Arizona, Inc.
Roger Anderson, Oil Conservation Division, Santa Fe, NM

(SRP)[WPDOCS\TLS\NMED.706]

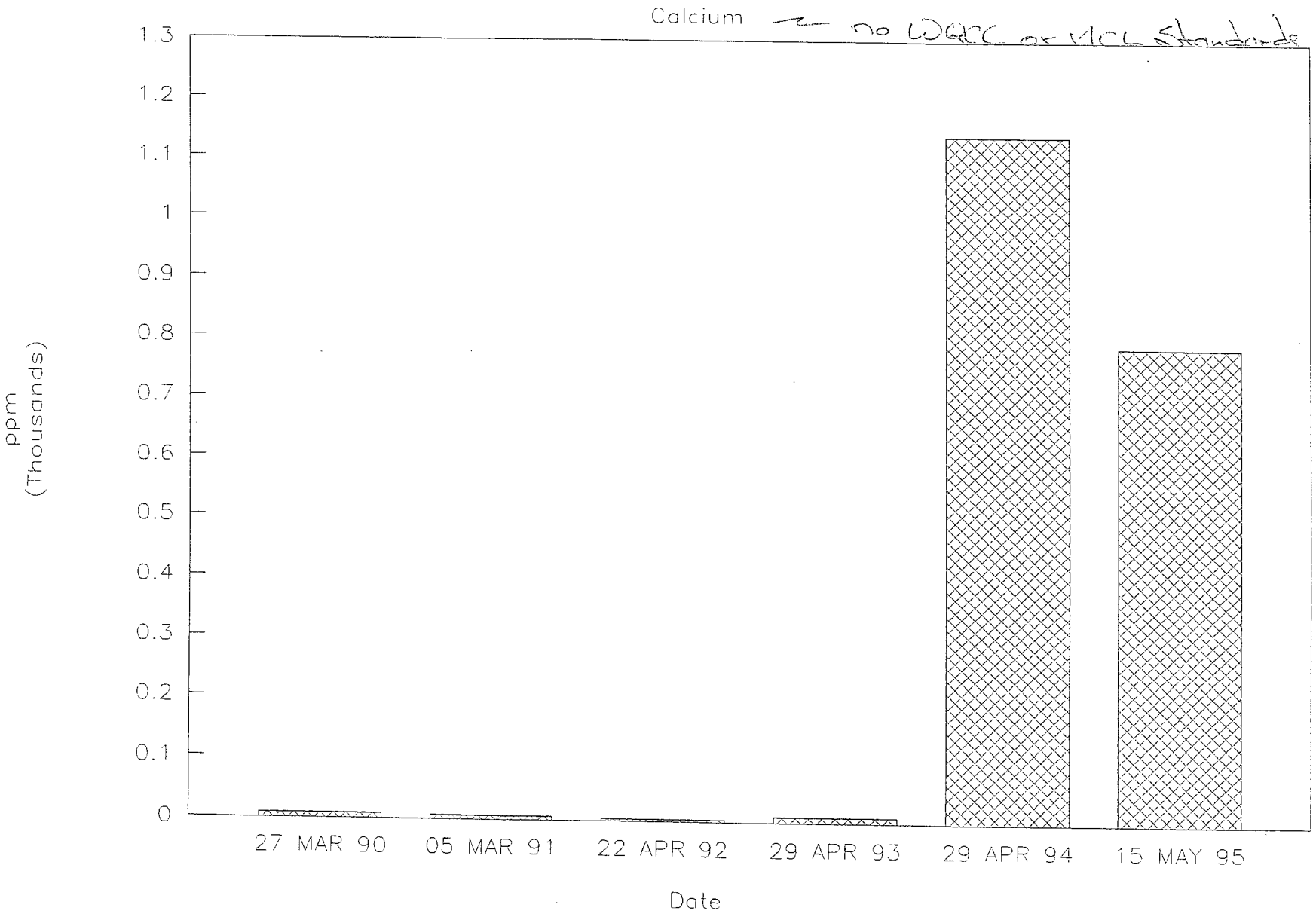
GIANT REFINING – CINIZA

PROPOSED SMW-6A WELL DIAGRAM

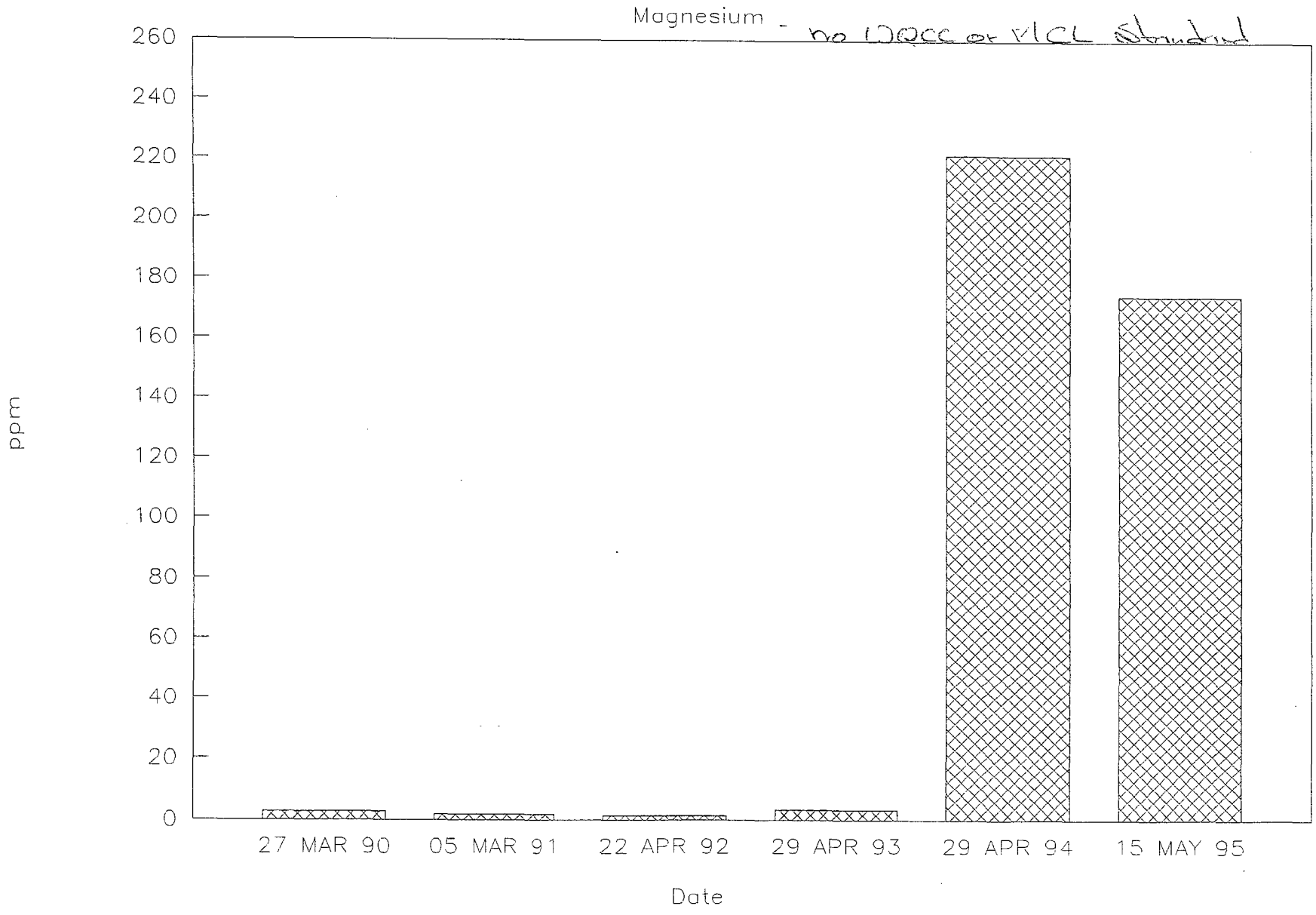


TLS/95

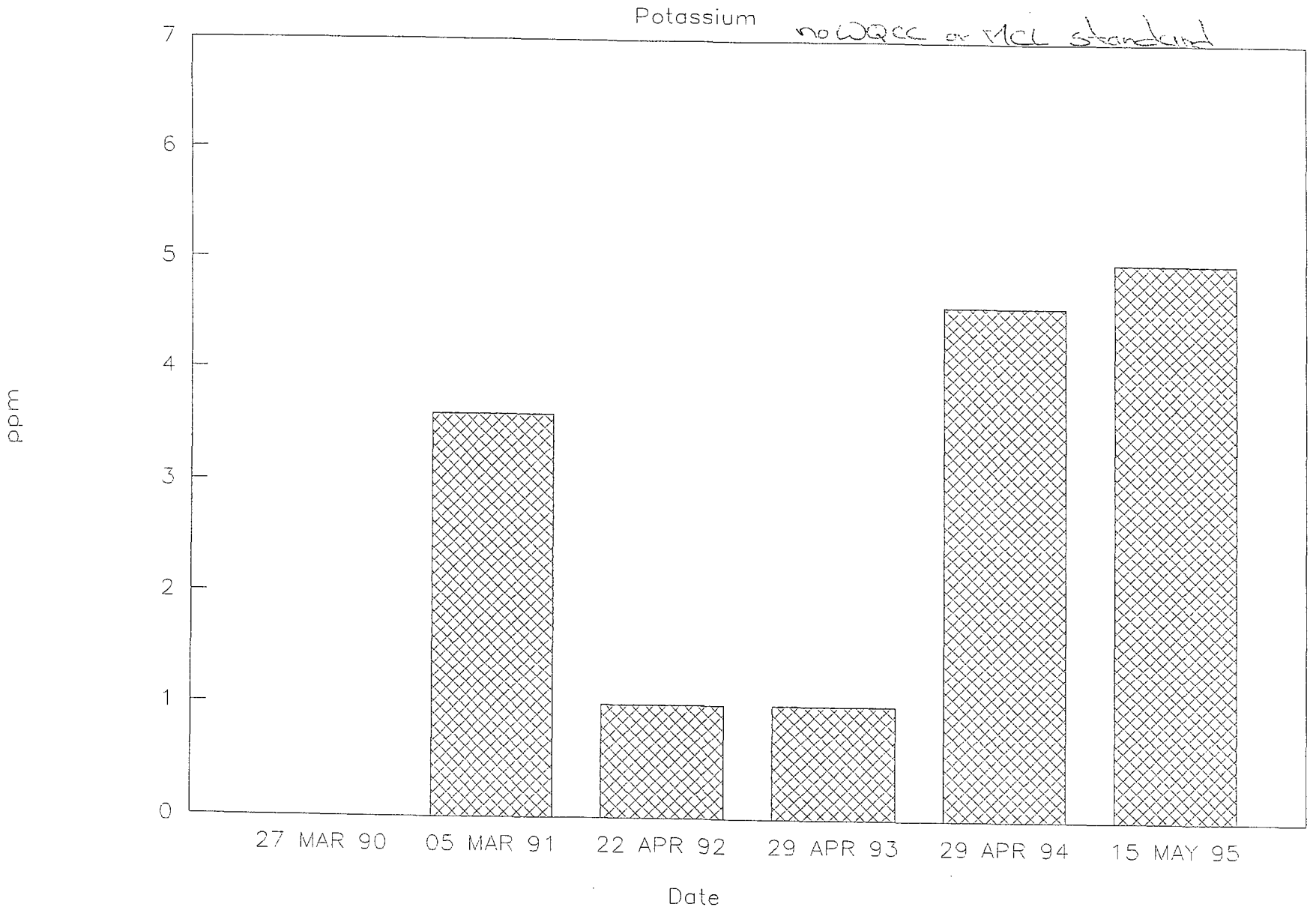
SMW 6


Calcium
no WQCC or MCL Standards
ppm
(Thousands)
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
27 MAR 90
05 MAR 91
22 APR 92
29 APR 93
29 APR 94
15 MAY 95
Date

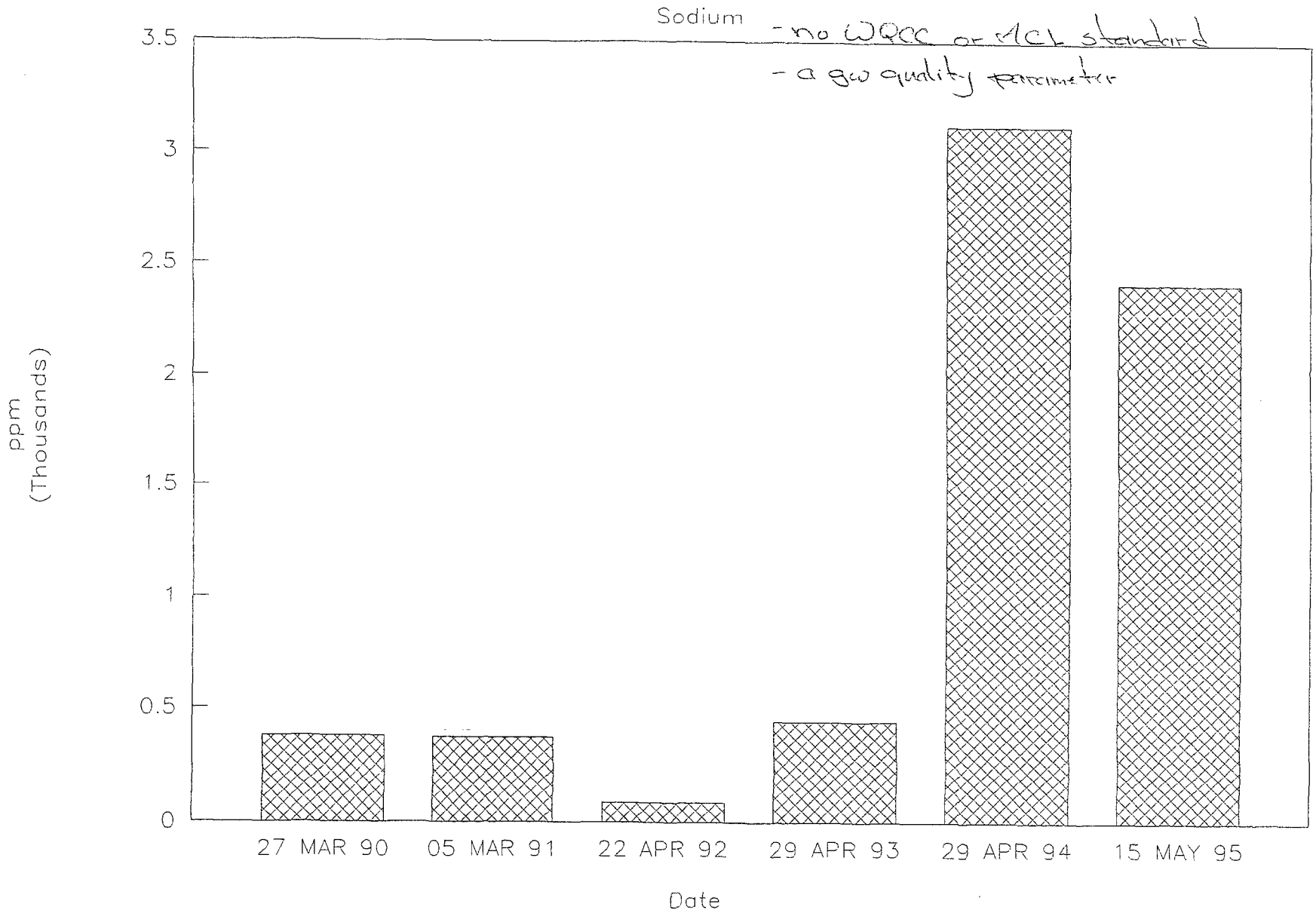
SMW 6


Magnesium - no DOCC or VCL Standard
260
240
220
200
180
160
140
120
100
80
60
40
20
0
ppm
27 MAR 90
05 MAR 91
22 APR 92
29 APR 93
29 APR 94
15 MAY 95
Date

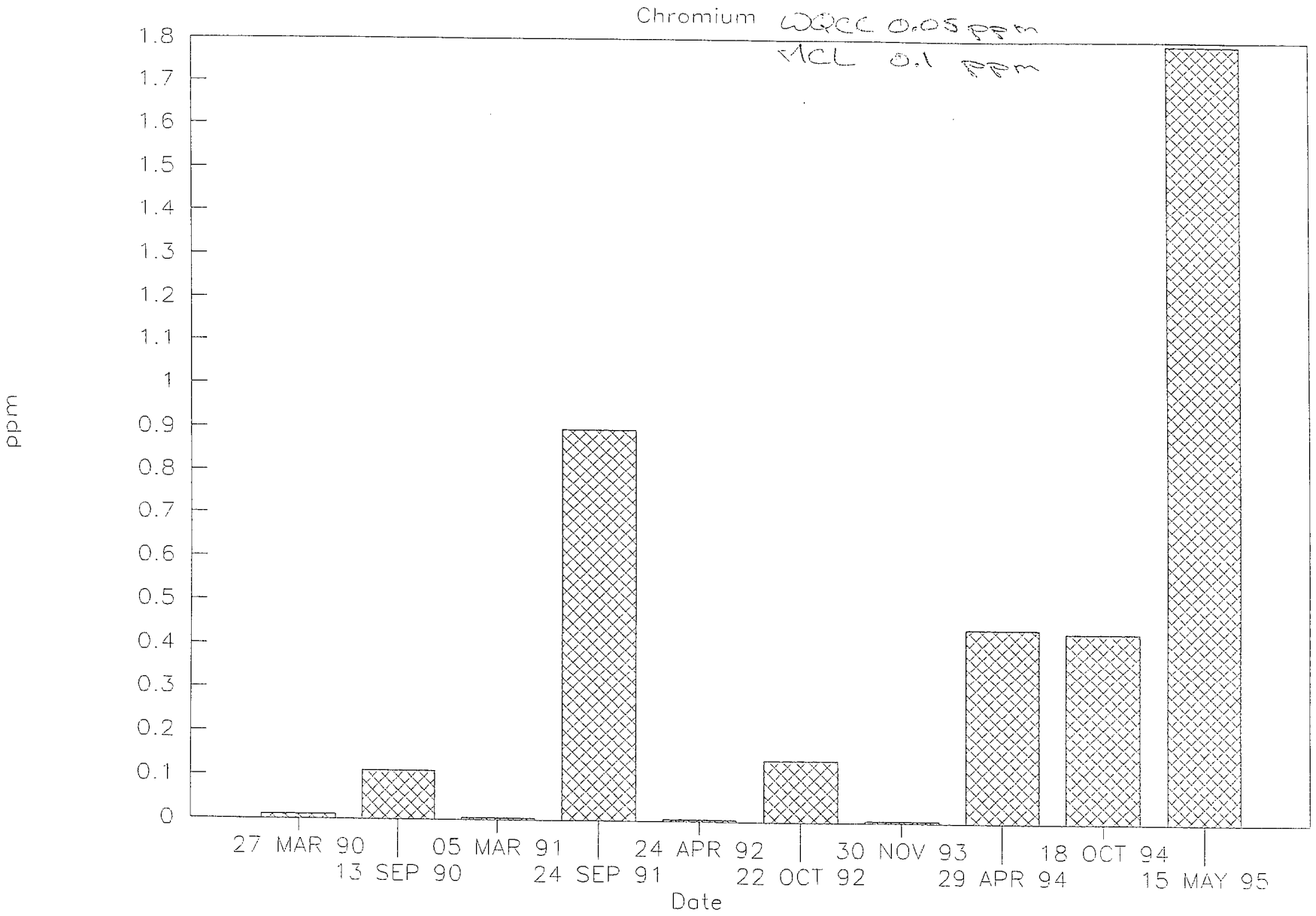
SMW 6


Potassium
no WQCC or MCL standard
ppm
7
6
5
4
3
2
1
0
27 MAR 90
05 MAR 91
22 APR 92
29 APR 93
29 APR 94
15 MAY 95
Date

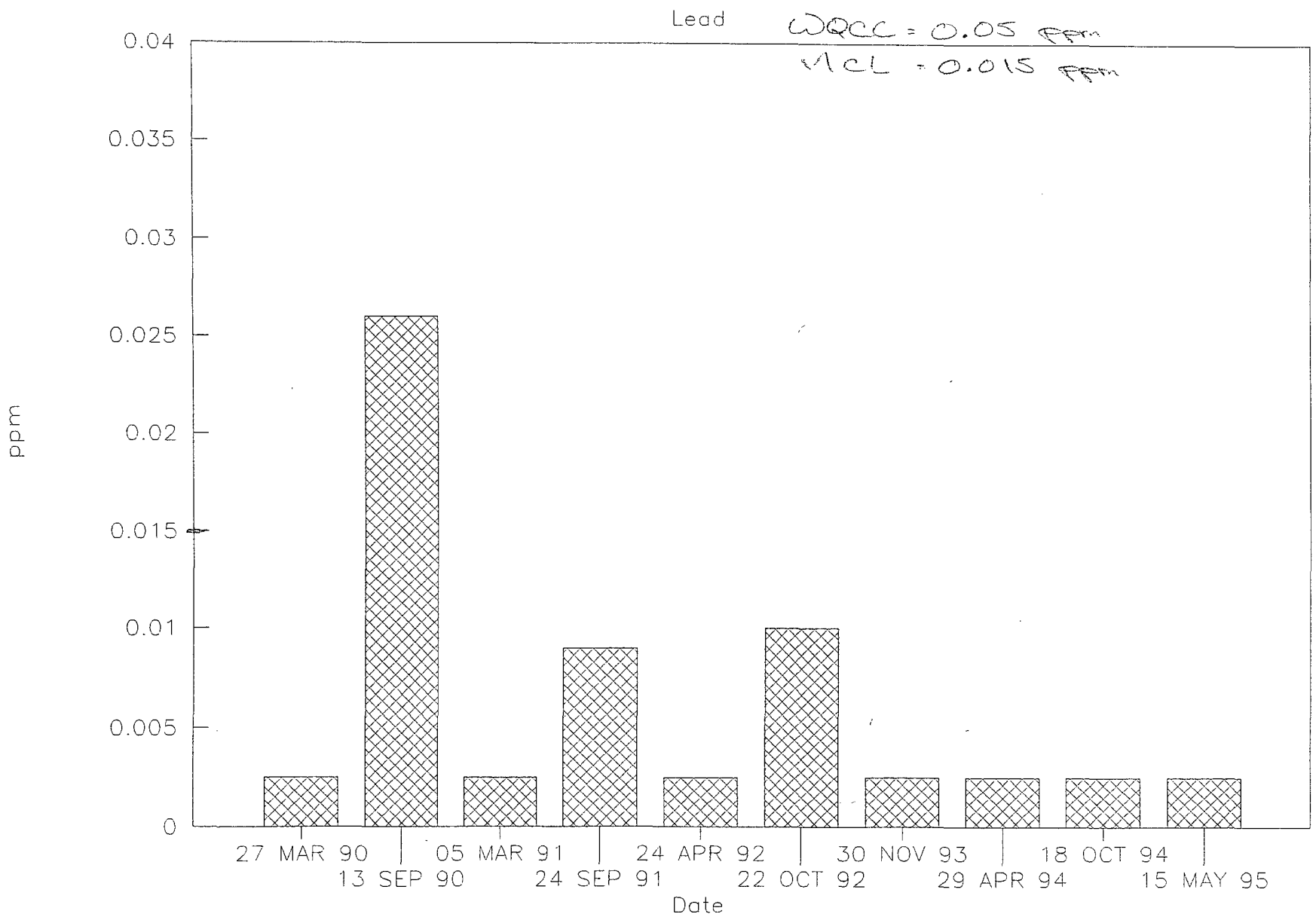
SMW 6


Sodium
- no WQCC or MCL standard
- a gw quality parameter
3.5
3
2.5
2
1.5
1
0.5
0
ppm
(Thousands)
27 MAR 90
05 MAR 91
22 APR 92
29 APR 93
29 APR 94
15 MAY 95
Date

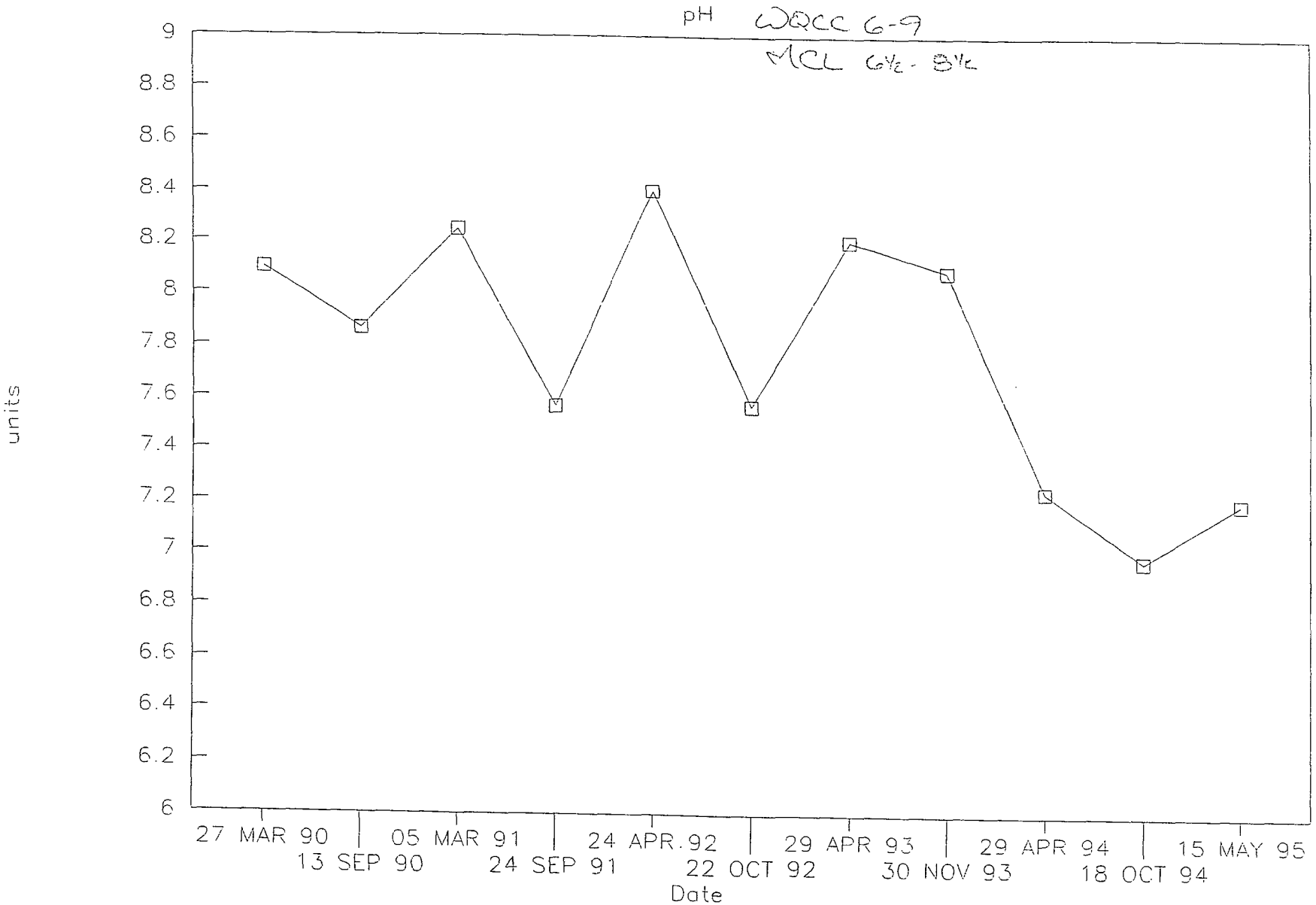
SMW 6


Chromium
WQCC 0.05 ppm
MCL 0.1 ppm
ppm
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
27 MAR 90
13 SEP 90
05 MAR 91
24 SEP 91
24 APR 92
22 OCT 92
30 NOV 93
29 APR 94
18 OCT 94
15 MAY 95
Date

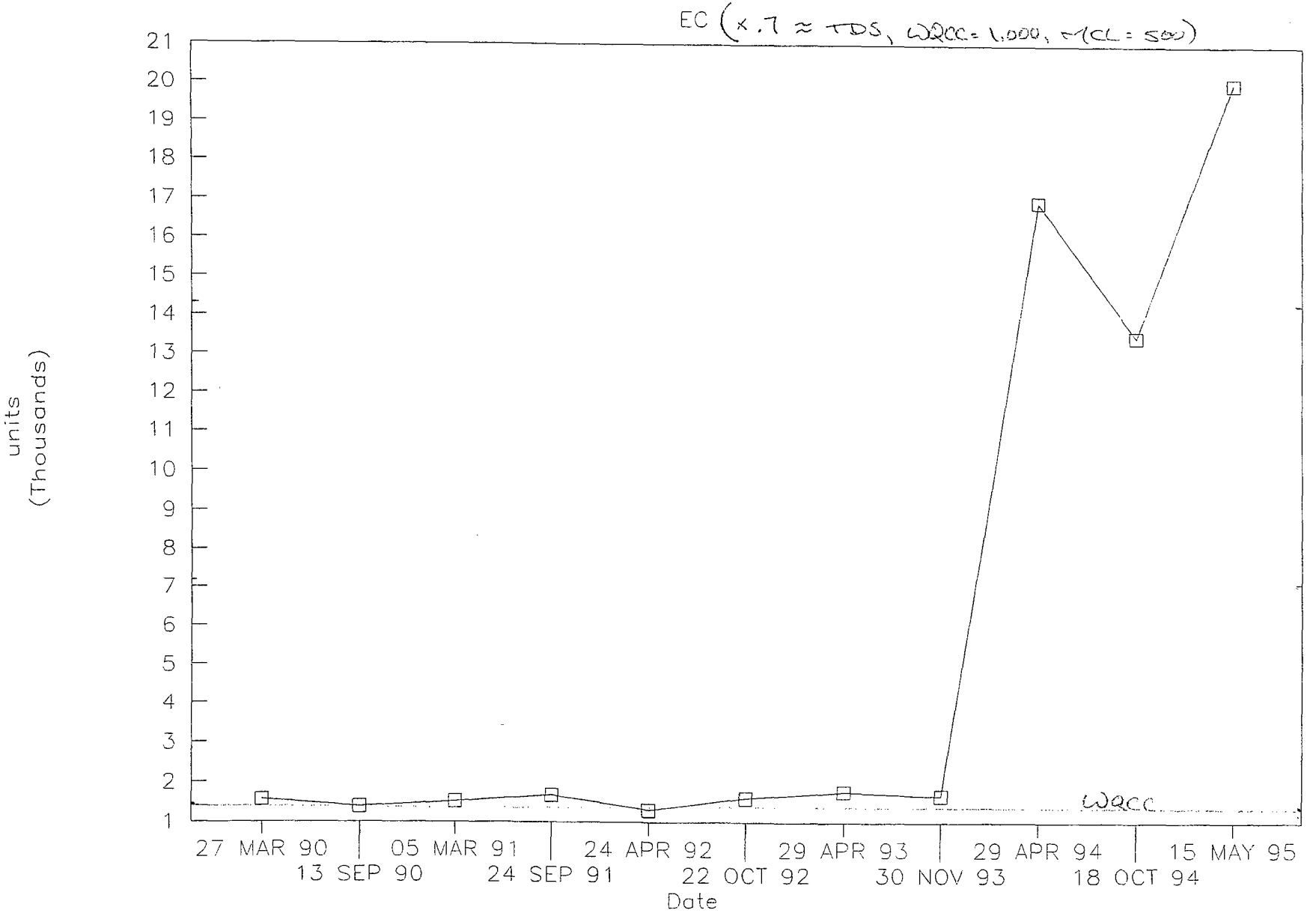
SMW 6


Lead
WQCC = 0.05 ppm
MCL = 0.015 ppm
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
ppm
27 MAR 90
13 SEP 90
05 MAR 91
24 SEP 91
24 APR 92
22 OCT 92
30 NOV 93
29 APR 94
18 OCT 94
15 MAY 95
Date

SMW 6


pH
WQCC 6-9
MCL 6½ - 8½
9
8.8
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
7
6.8
6.6
6.4
6.2
6
units
27 MAR 90
13 SEP 90
05 MAR 91
24 SEP 91
24 APR 92
22 OCT 92
29 APR 93
30 NOV 93
29 APR 94
18 OCT 94
15 MAY 95
Date

SMW 6


EC (x.7 ≈ TDS, WQCC = 1,000, Cl = 500)
units
(Thousands)
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
WQCC
27 MAR 90
13 SEP 90
05 MAR 91
24 SEP 91
24 APR 92
22 OCT 92
29 APR 93
30 NOV 93
29 APR 94
18 OCT 94
15 MAY 95
Date

File Red Fire '95

RAK X
Bob S.
File

GIANT
REFINING CO.

Route 3, Box 7
Gallup, New Mexico
87301

505
722-3833

July 28, 1995

Ronald A. Kern
RCRA Technical Compliance Program Manager
Hazardous & Radioactive Materials Bureau
New Mexico Environment Department
525 Camino De Los Marquez
Santa Fe, New Mexico 87502

Re: **SMW-6 Well Replacement**
Giant Refining Company - Ciniza
NMD000333211

Dear Mr. Kern:

Giant Refining Company - Ciniza (Giant) submits the following responses to the questions in the July 25, 1995 letter from your office.

Specifically, and in the order presented in your letter, those responses are:

1) *In the 4th paragraph of your letter you state GRC's belief that the stainless steel casing in SMW-6 is damaged and that water samples from this well are similar to the water in the evaporation lagoons. Has damaged casing provided a pathway for lagoon water to reach the Ciniza Sands? Can GRC provide an analysis of the evaporation lagoon water so that HRMB can compare it to the groundwater analyses?*

Giant's belief that the stainless steel casing in SMW-6 is damaged is based on observation of a separation at ~ seven feet, the occurrence of a clay/shale plug at ~ fifty feet, the ability to hear water flowing into the wellbore and the abrupt change in water analysis results. That the casing is damaged is certain. The nature of the damage and its effect on the groundwater characteristics are less clear.

Obviously, water entering the wellbore above the screened interval could potentially affect the water contained within the Ciniza Sands, assuming hydrostatic pressure is sufficient to recharge those sands. At the very least, water entering the wellbore will most certainly bias the sample and diminish the credibility of the analytical data obtained

from laboratory analysis. For that reason, Giant believes that the damaged casing could, in fact, create a pathway for water other than that produced by the Ciniza Sands to migrate into the Ciniza Sands.

The statement that the water samples obtained from SMW-6 were similar to the evaporation lagoon water is based on the fact that evaporation lagoon water is much higher in total dissolved solids and electro-conductivity and of lower pH than water samples obtained from the Ciniza Sands (see attached analytical data).

Please note that the levels of salts, TDS, and pH in a given sample will vary in direct proportion to the levels in the ponds (due to evaporation). For example, a sample taken near the end of the evaporation season when water levels are extremely low will be considerably higher in some constituents than a sample taken when ponds are full).

2) *In the 5th paragraph of your letter you suggest earth moving activities in the evaporation lagoons adjacent to SMW-6 may have exposed a route for lagoon water to migrate to the Ciniza Sands. Could you explain in greater detail what you have in mind?*

Giant assumes that in reconditioning the evaporation lagoons immediately adjacent to SMW-6 that a sand stringer or similar porous formation may have been exposed. In that the depth increase in the pond was minimal, the possibility of exposing a pathway to the Ciniza Sands is remote. Nevertheless, in trying to imagine all of the potential reasons for the change in the characteristics of water from SMW-6, this was considered a possibility.

It is also conceivable that the well casing may have been physically damaged by some of the earthmoving equipment, either by striking the steel protective well casing or the concrete pad the surrounds it.

3) *In the 6th paragraph you propose drilling an offset monitoring well prior to plugging and abandoning SMW-6. Unless SMW-6 is providing a conduit for contaminants to reach groundwater, HRMB sees no reason to plug it. The new monitoring well, if approved, will need to be designed and constructed similar to the existing SMW-6 (with the obvious difference in casing materials). The U.S. Environmental Protection Agency's RCRA GROUNDWATER MONITORING: DRAFT TECHNICAL GUIDANCE, November 1992 contains the guidelines for design, construction and development of a monitoring well.*

Giant is committed to plugging and abandoning SMW-6, before drilling

SMW-6A. As SMW-6 will serve no purpose, Giant is reluctant to leave an open pathway, from either the surface or the subsurface, to a zone that is used to monitor the potential migration of hazardous constituents from the Land Treatment Area.

The design of the new well, SMW-6A, is an improvement on the well design and construction of SMW-6, primarily because it will have a sand pack around the screened interval as opposed to a gravel pack. The well design for SMW-6A that was submitted to HRMB in the July 6, 1995 letter is consistent with the requirements of the New Mexico Oil Conservation Division and, again, exceeds the design/construction specifications of SMW-6. A more detailed list of construction features is included in the following response.

4) *In the 8th paragraph you state GRC does not consider the abandonment of SMW-6 and its replacement with SMW-6A to be permit modifications. Because the proposed well, SMW-6A, will replace a monitoring well which may be damaged and/or will have a different design than the existing well, SMW-6, a permit modification may be required. Please submit a more* ***detailed*** *diagram (e.g. where the centralizers will be placed, slot size, thickness and location of bentonite plug above the slotted screen, height of top of casing above ground level, radius of concrete pad, etc.) than the well diagram sent with your July 6 letter.*

Giant still does not believe that the replacement of SMW-6 with SMW-6A should be a permit modification. Although technically the design of SMW-6A is an improvement on the design of SMW-6, the function of the well within the permit is exactly the same. The same constituents, sampling interval (Spring/Fall), geologic formation, and reporting requirements of SMW-6A are identical to those of SMW-6. Only the physical location of the wellbore will change very slightly.

A list of construction details of SMW-6A are listed below:

Total depth	72' to 75'
Casing size and type	2" PVC (flush screw joints)
Sand packing	16 - 40 sand
Screened casing	.010" slots
Bentonite seal-bottom	≥ 3' bentonite pellets
Bentonite seal-top	3' bentonite pellets (immediately above sand pack)
Height of casing	36" above ground level
Steel protective casing	2' into grout
Cement pad	36" x 36" x 6"
Screened interval	Ciniza Sand formation only

Centralizers	Stainless steel - bottom of pipe, top of screen, and every 20' to surface

The cement pad will be 3' x 3' x 6" and sloped away from the protective casing. The protective casing will be installed 2' into the grout. A locking cap will be installed on the protective casing. A centralizer will be installed at the bottom of the casing, at the top of the slotted screen casing and at ≥ 20' intervals to the surface.

After installation of the well is complete, the formation will be surged and developed. After development activities are complete, the dedicated pump (presently in SMW-6) will be decontaminated and installed in SMW-6A. Water samples for analysis are expected to be taken in conjunction with the semi-annual groundwater sampling event in late September or October provided that HRMB approval for this replacement is received in time to complete the project prior to the Fall sampling event.

Giant hopes that the responses contained in this letter adequately answer your inquiries. If you need additional information, please contact me at (505) 722-0277.

Sincerely,

Lynn Shelton
Senior Environmental Coordinator
Giant Refining Company

cc: David Pavlich, HSE Manger, Giant Refining Company
Kim Bullerdick, Corporate Counsel, Giant Industries Arizona, Inc.
Roger Anderson, NMOCD

[SRP\WPDOCS\TLS\RCRA.728]

PROPOSED SMW - 6A WELL DIAGRAM