Monzeglio, Hope, NMENV

ENTERED

From: Rajen, Gaurav [Gaurav.Rajen@wnr.com]
Sent: Tuesday, August 18, 2009 9:30 AM
To: Monzeglio, Hope, NMENV; Chavez, Carl J, EMNRD
Cc: Riege, Ed
Subject: Well drilling logs at Gallup Refinery
Attachments: BW-3C.pdf; BW-1A.pdf; BW-1B.pdf; BW-1C.pdf; BW-2A.pdf; BW-2B.pdf; BW-2C.pdf; BW-3A.pdf; BW-3B.pdf

Dear Hope:

Many thanks for your patience and understanding. I have been attempting to gather all our well logs. It is just a matter of going through some old files. Personnel changes and a lack of response from our previous drilling and engineering company have made this a bit difficult.

Although not complete, I am sending you several logs for a number of our wells. I hope to send you the remainder shortly. I will be sending the logs in several separate e-mails, so as to keep the attachment size small enough for transfer.

Best regards,

Raj

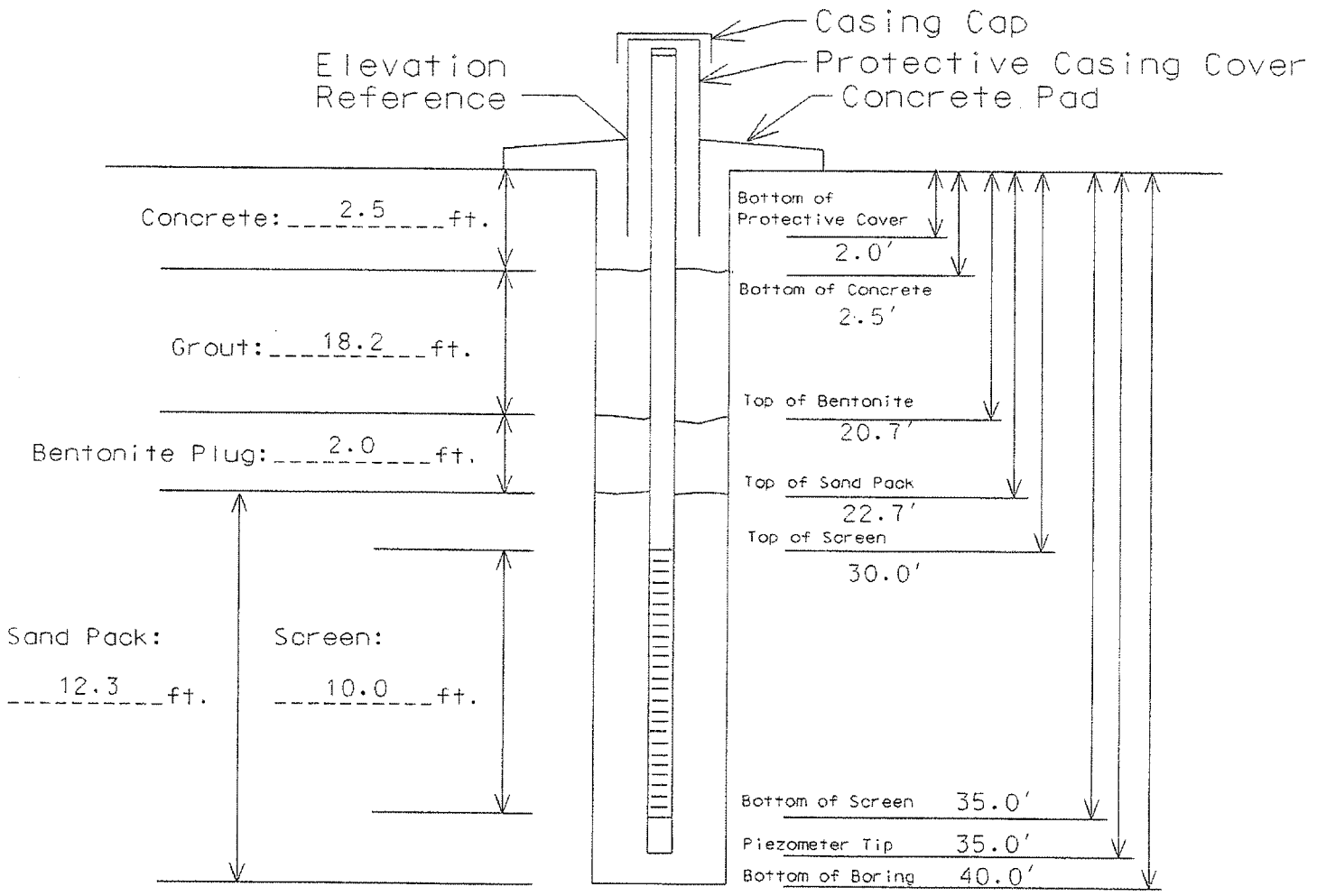
This inbound email has been scanned by the MessageLabs Email Security System.

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. BW-1A



Boring Diameter: 8 5/8"

Sand Type: 20-40 Silica

Bollards, Type/Size: 3" Dia. Steel, Conc. Filled

Bentonite: 3/8" Chips

Screen Type/Size: 2" PVC Sch. 40, 0.010" Slotted

Cement/Grout: 6% Bentonite

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: TBS

Other: Backfilled w/ Bentonite 35'-37' Clay 37'-40'

Bottom Cap Used? Yes

Site Easting: TBS

Project #: 03-118

Project Name: Ciniza Refinery - Boundry Wells

Elevation: TBS

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

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.: 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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW1A.xls]Sheet1

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

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.: 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

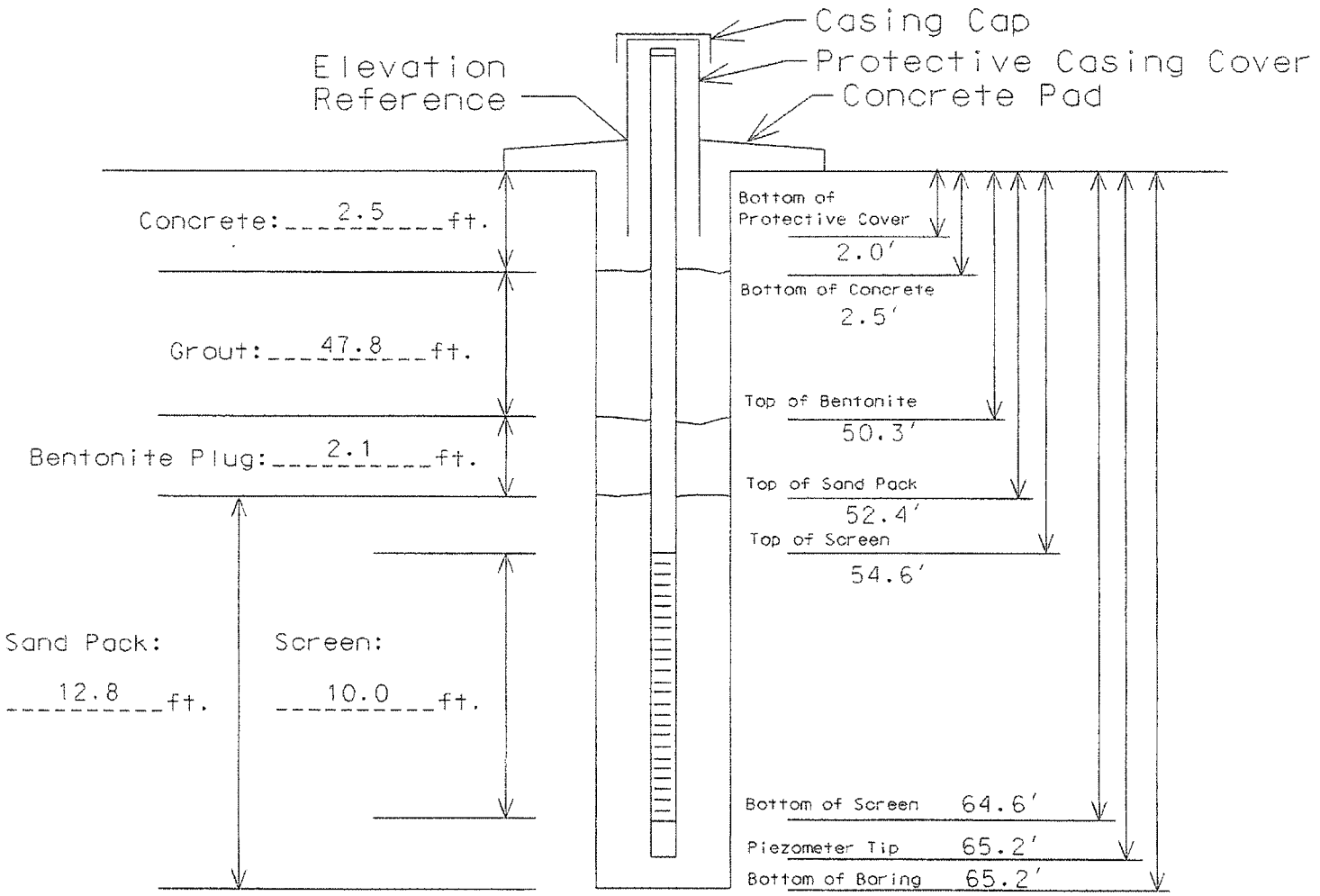
C:\Documents and Settings\eriege\Local Settings\Temp\[BW1A.xls]Sheet2

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. BW-1B



Boring Diameter: 8 5/8"

Sand Type: 20-40 Silica

Bollards, Type/Size: 3" Dia. Steel, Conc. Filled

Bentonite: 3/8" Chips

Screen Type/Size: 2" PVC Sch. 40, 0.010" Slotted

Cement/Grout: 6% Bentonite

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: TBS

Other: N/A

Bottom Cap Used? Yes

Site Easting: TBS

Project #: 03-118

Project Name: Ciniza Refinery - Boundry Wells

Elevation: TBS

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

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.: 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	//////////	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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW1B.xls]Sheet1

Sheet: 2 OF 3
Bore Point: Dike 7-8 intersection

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.: 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.
			////////// ////////// ////////// ////////// //////////	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				
	40.0-45.0		////////// ////////// ////////// ////////// ////////// //////////		**Same as above**, 1 sand laminae				

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW1B.xls]Sheet2

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

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.: 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 and sandstone				
			//**/						
	59.8-60.0								
				60.0	**Petrified Forest Formation of the Painted Desert Member. Clay**,(claystone), red, carbonate nodules, (white), hard, crumbly, damp-moist				
	60.0-65.0								
					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' interval				

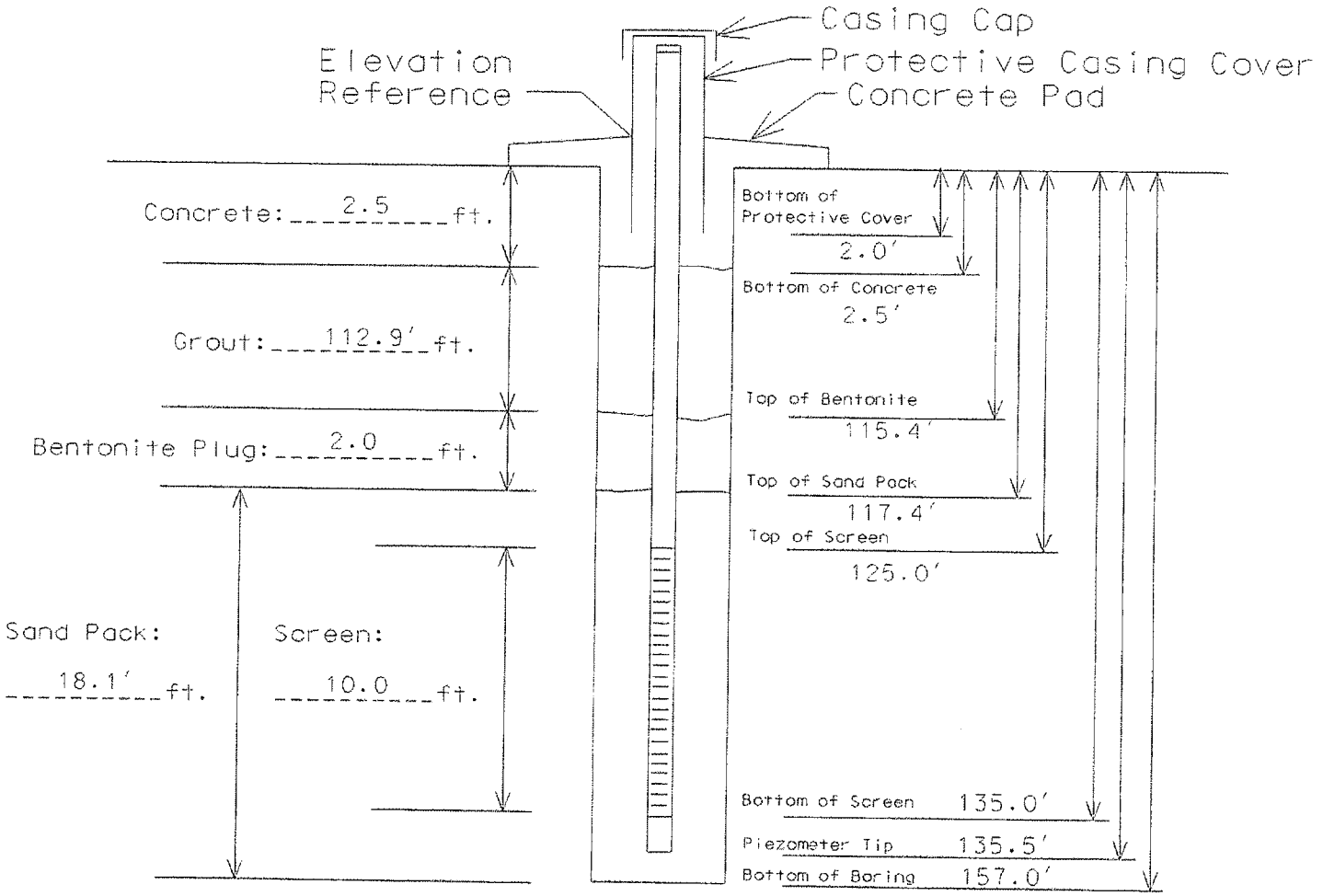
SIZE & TYPE OF BORING: 4-1/4" ID Hollow Stemmed Auger **LOGGED BY:** WHK

C:\Documents and Settings\eriege\Local Settings\Temp\[BW1B.xls]Sheet3

505-523-7674

Installation Diagram

Monitoring Well No. BW-1C



Boring Diameter: 8 5/8"

Sand Type: 20-40 Silica

Bollards, Type/Size: 3" Dia. Steel, Conc. Filled

Bentonite: 3/8" Chips

Screen Type/Size: 2" PVC Sch. 40, 0.010" Slotted

Cement/Grout: 6% Bentonite

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: TBS

Other: N/A

Bottom Cap Used? Yes

Site Easting: TBS

Project #: 03-118

Project Name: Ciniza Refinery - Boundry Wells

Elevation: TBS

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	//////////	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: 2 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				
			//*//*//*// //*//*//*//	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				
	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: 3 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 and sandstone				
			//**/						
	59.8-60.0								
				60.0	**Petrified Forest Formation of the Painted Desert Member. Clay**,(claystone), red, carbonate nodules, (white), hard, crumbly, damp-moist				
	60.0-65.0								
					Same as above, some grey mottling, fissile at 60.0'				
				65.0					

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			75.0 85.0 95.0 105.0 115.0	**Mudstone/Siltstone** interbedded, blocky, damp-dry, dense **Chinle Group, Petrified Forest Formation, Painted Desert Member**				
	119.0-131.0			125.0	**Petrified Forest Formation,** **Sandstone**, white, hard, some pebbles of quartzite, and mafic rock, interbedded claystone and silt-stone				
	131.0-134.5				**Sandstone**, very hard, clean, quartz, water bearing				
	134.5-145.0			135.0 145.0	**Mudstone**, grey, moist, firm				
	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			155.0	**Sandstone**, white-light grey, hard, silty				
	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

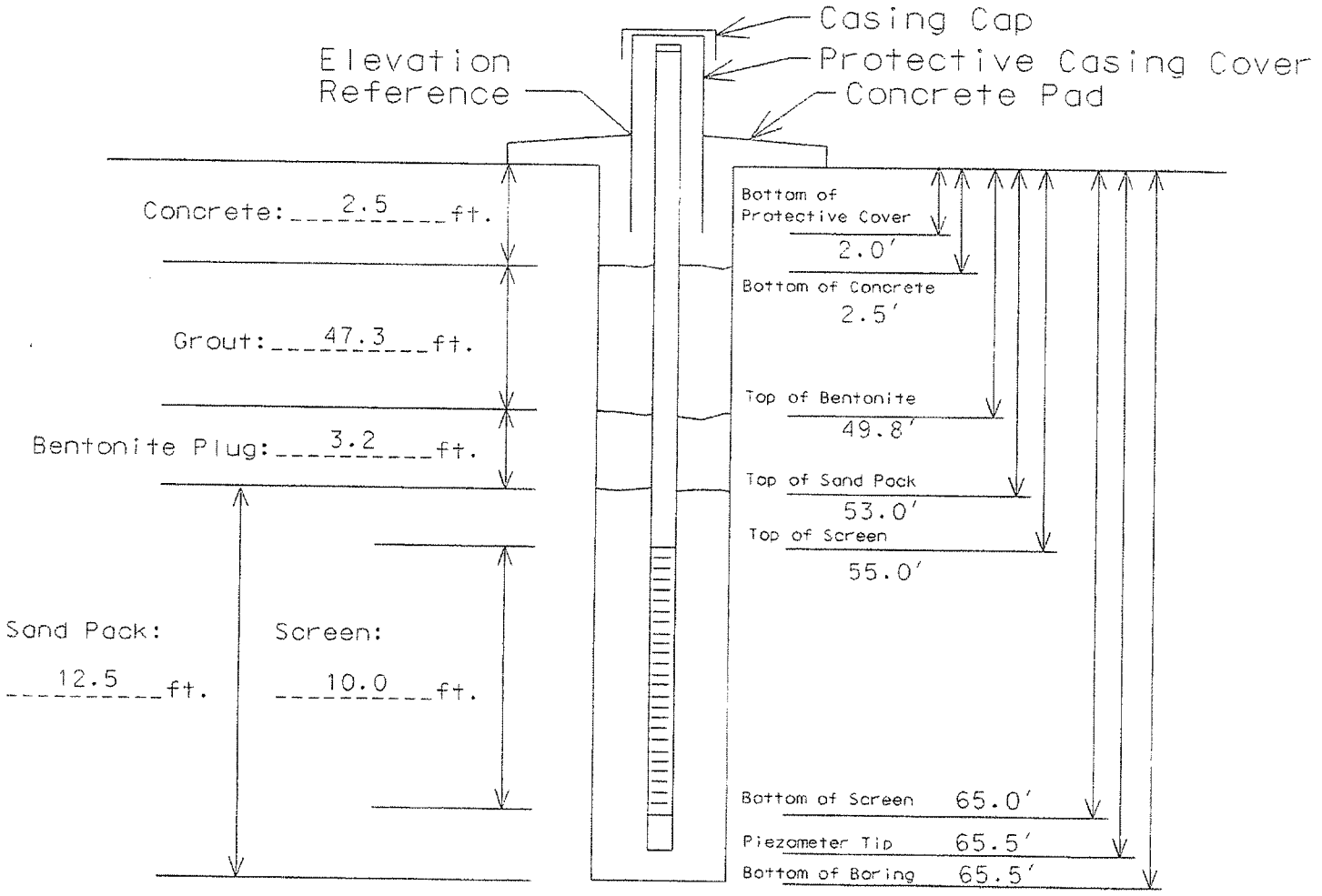
C:\Documents and Settings\eriege\Local Settings\Temporary Internet Files\(

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. BW-2A



Boring Diameter: 8 5/8"

Sand Type: 10-20 Silica

Bollards, Type/Size: 3" Dia. Steel, Conc. Filled

Bentonite: 3/8" Chips

Screen Type/Size: 2" PVC Sch. 40, 0.010" Slotted

Cement/Grout: 6% Bentonite

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: TBS

Bottom Cap Used? Yes

Site Easting: TBS

Other: N/A

Project #: 03-118

Project Name: Ciniza Refinery - Boundry Wells

Elevation: TBS

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW2A.xls]Sheet1

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 mottling, wet				
	26.2-26.7		//////////						
	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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW2A.xls]Sheet2

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

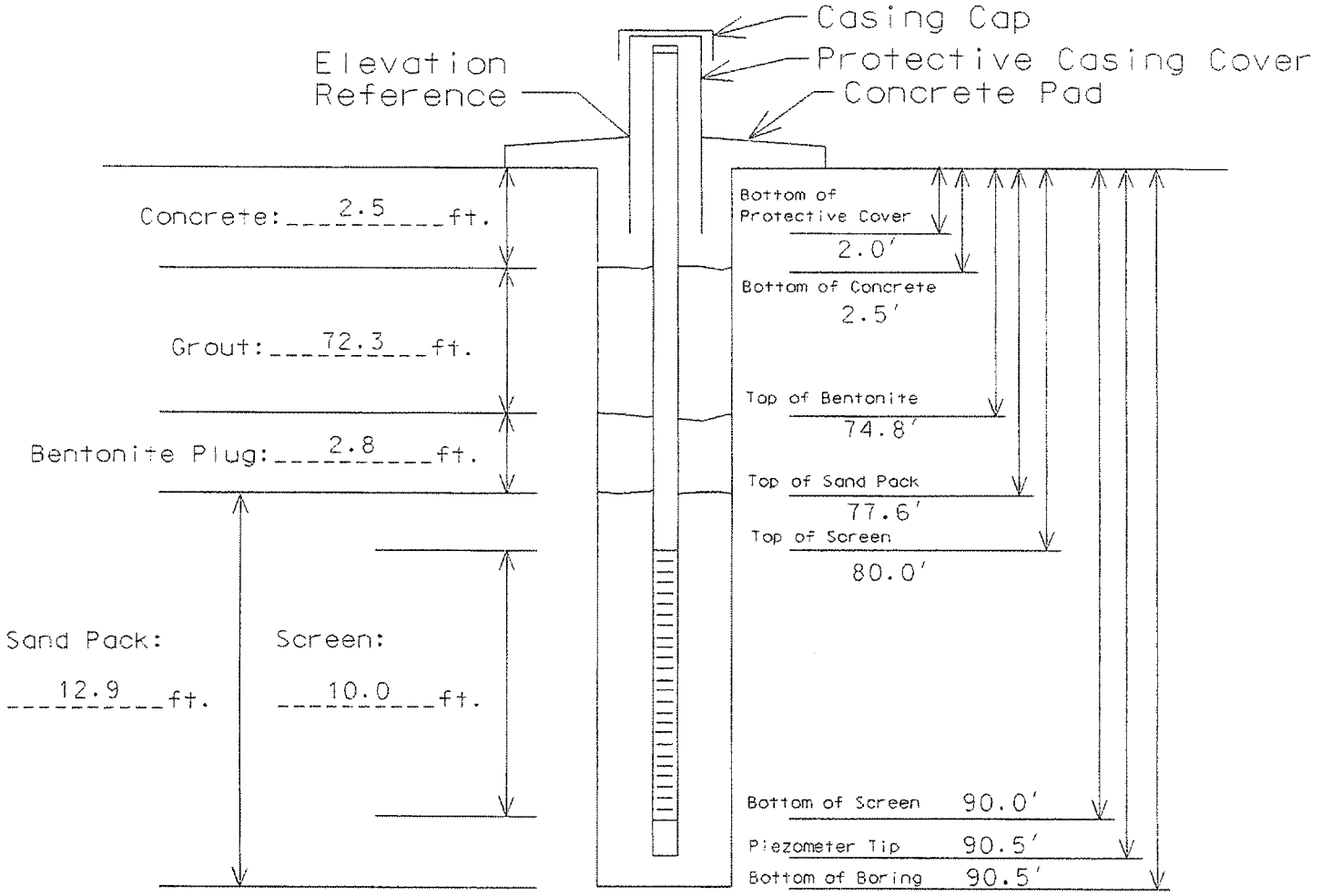
C:\Documents and Settings\eriege\Local Settings\Temp\[BW2A.xls]Sheet3

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. BW-2B



Boring Diameter: 8 5/8"

Sand Type: 20-40 Silica

Bentonite: 3/8" Stabilized Pellets (TR-30)

Bollards, Type/Size: 3" Dia. Steel, Conc. Filled

Screen Type/Size: 2" PVC Sch. 40, 0.010" Slotted

Cement/Grout: 6% Bentonite

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: TBS

Bottom Cap Used? Yes

Site Easting: TBS

Other: N/A

Project #: 03-118

Project Name: Ciniza Refinery - Boundry Wells

Elevation: TBS

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	//////////		**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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW2B.xls]Sheet1

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 mottling, wet				
	26.2-26.7		//////////						
	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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW2B.xls]Sheet2

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW2B.xls]Sheet3

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**				
			//////////	85.0	**Mudstone**, weathered, red-brown, grey-green reduction spots, hard, moist-wet, blocky/crumbly				
			//////////						
			//////////						

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW2B.xls]Sheet4

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 90.0	**Mudstone**, weathered, red-brown, grey-green reduction spots, hard, moist-wet, blocky/crumbly, mottled, thin bedded to laminar, more laminar > 86'				
	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

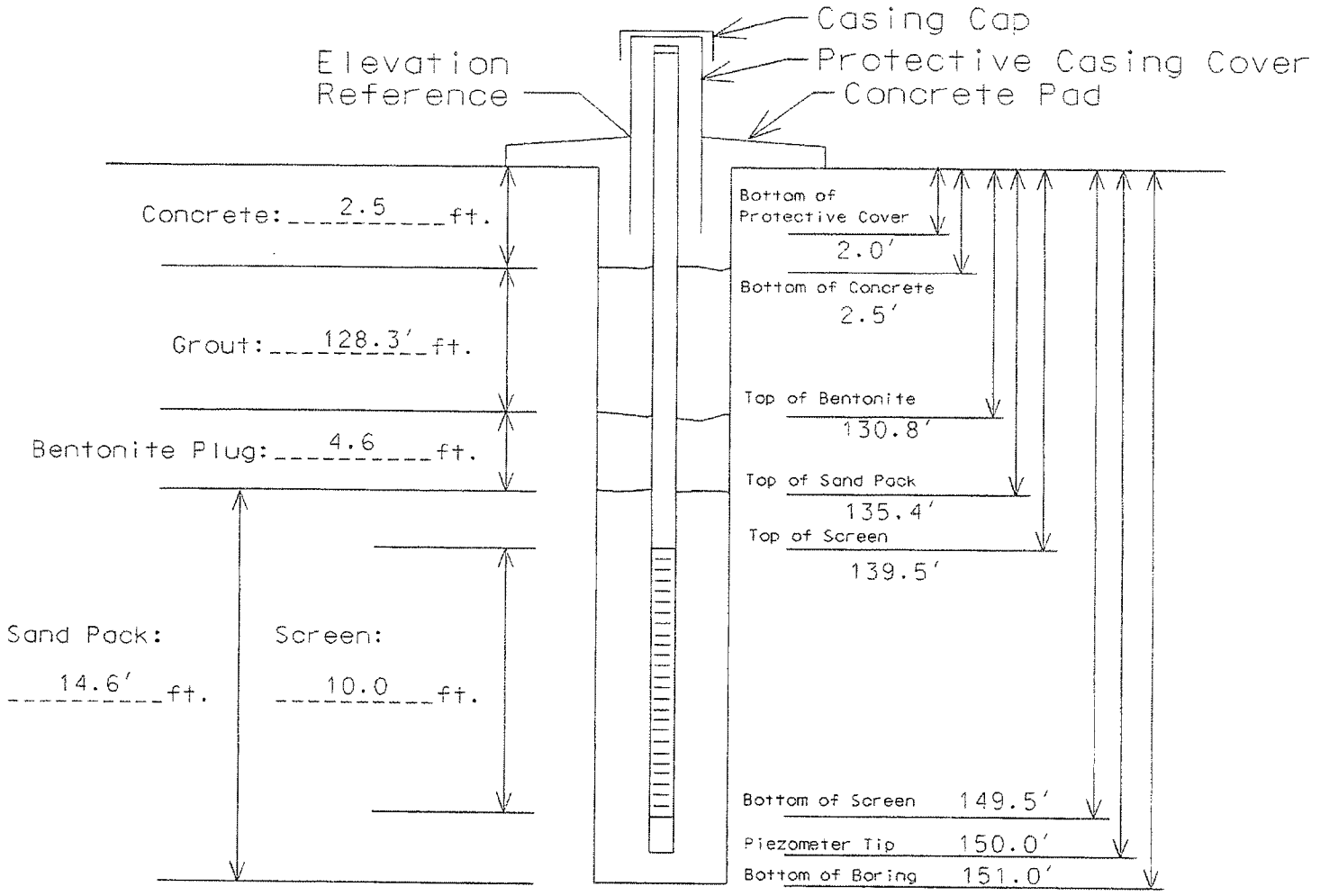
C:\Documents and Settings\eriege\Local Settings\Temp\[BW2B.xls]Sheet5

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. BW-2C



Boring Diameter: 8 5/8"

Sand Type: 20-40 Silica

Bollards, Type/Size: 3" Dia. Steel, Conc. Filled

Bentonite: 3/8" Chips

Screen Type/Size: 2" PVC Sch. 40, 0.010" Slotted

Cement/Grout: 6% Bentonite

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: TBS

Other: N/A

Bottom Cap Used? Yes

Site Easting: TBS

Project #: 03-118

Project Name: Cinizo Refinery - Boundry Wells

Elevation: TBS

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	//////////	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: 6-1/4" OD Air Rotary **LOGGED BY:** WHK

C:\Documents and Settings\eriege\Local Settings\Temp\[BW2C.xls]Sheet1

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				
			////////// //////////	30.0	**Silt**, pinkish-brown, mottled, damp 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: 6-1/4" OD Air Rotary **LOGGED BY:** WHK

C:\Documents and Settings\eriege\Local Settings\Temp\[BW2C.xls]Sheet2

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

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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**				
			//////////	85.0	**Mudstone**, weathered, red-brown, grey-green reduction spots, hard, moist-wet, blocky/crumbly				
			//////////						
			//////////						

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

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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.
	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

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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.
				110.0					
				115.0					
				120.0					
				125.0					

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

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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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW2C.xls]Sheet7

Sheet: 8 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

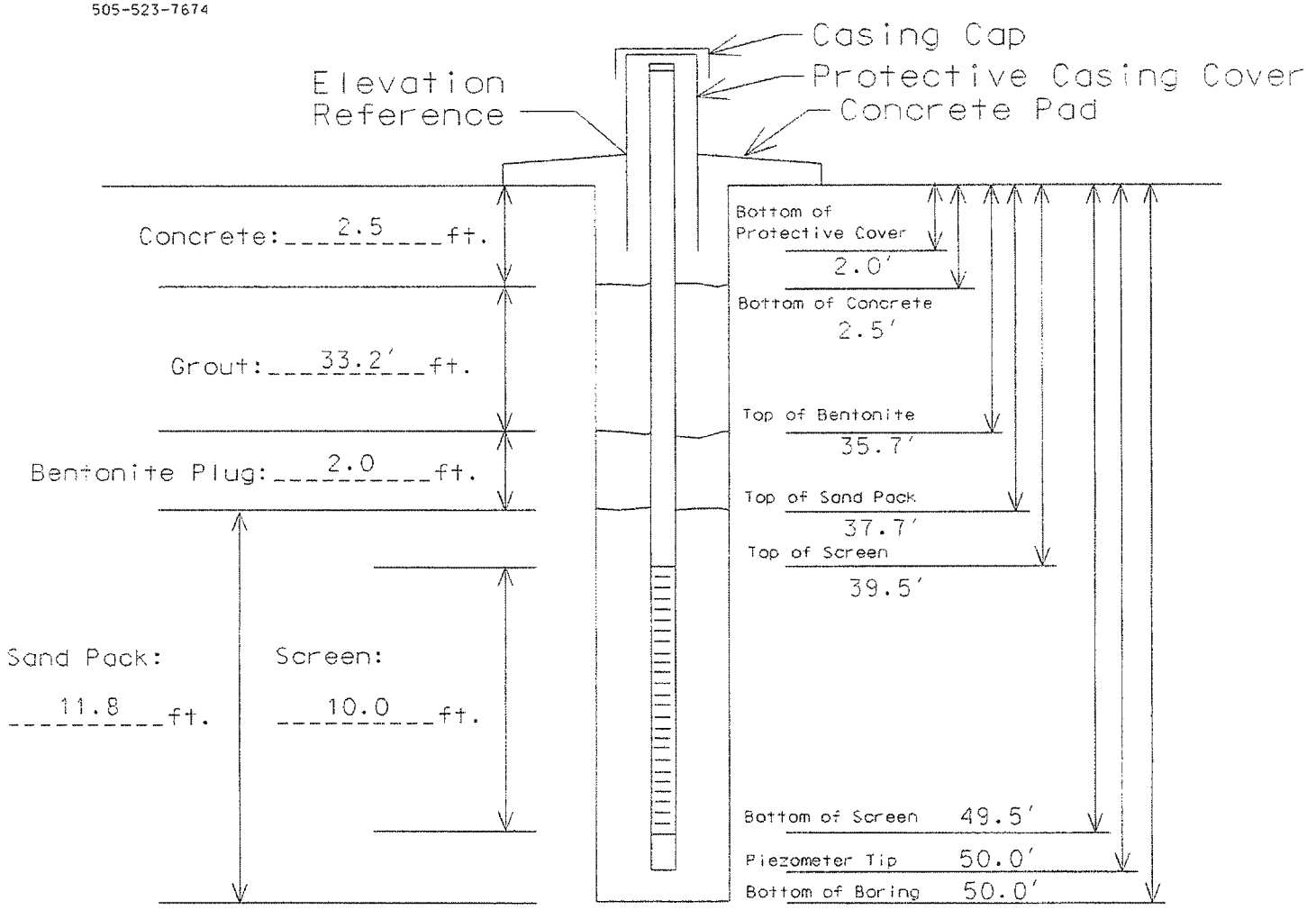
C:\Documents and Settings\eriege\Local Settings\Temp\[BW2C.xls]Sheet8

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. BW-3A



Boring Diameter: 8 5/8"

Sand Type: 20-40 Silica

Bollards, Type/Size: 3" Dia. Steel, Conc. Filled

Bentonite: 3/8" Chips

Screen Type/Size: 2" PVC Sch. 40, 0.010" Slotted

Cement/Grout: 6% Bentonite

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: TBS

Bottom Cap Used? Yes

Site Easting: TBS

Project #: 03-118

Project Name: Ciniza Refinery - Boundry Wells

Elevation: TBS

Sheet: 1 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		//////////	10.0	**Clay**, dark brown to red-brown, firm, blocky, moist				
	12.0-12.2		-----		**Silt**, clayey, light brown, crumbly, damp-dry				
	12.2-15.0		//////////	15.0	**Clay**, red-brown, firm, blocky, damp-moist				
	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		*******	20.0	**Sand**, very fine, reddish-brown, loose, dry				
	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		- - - - - - - - - - - -	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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3A.xls]Sheet2

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

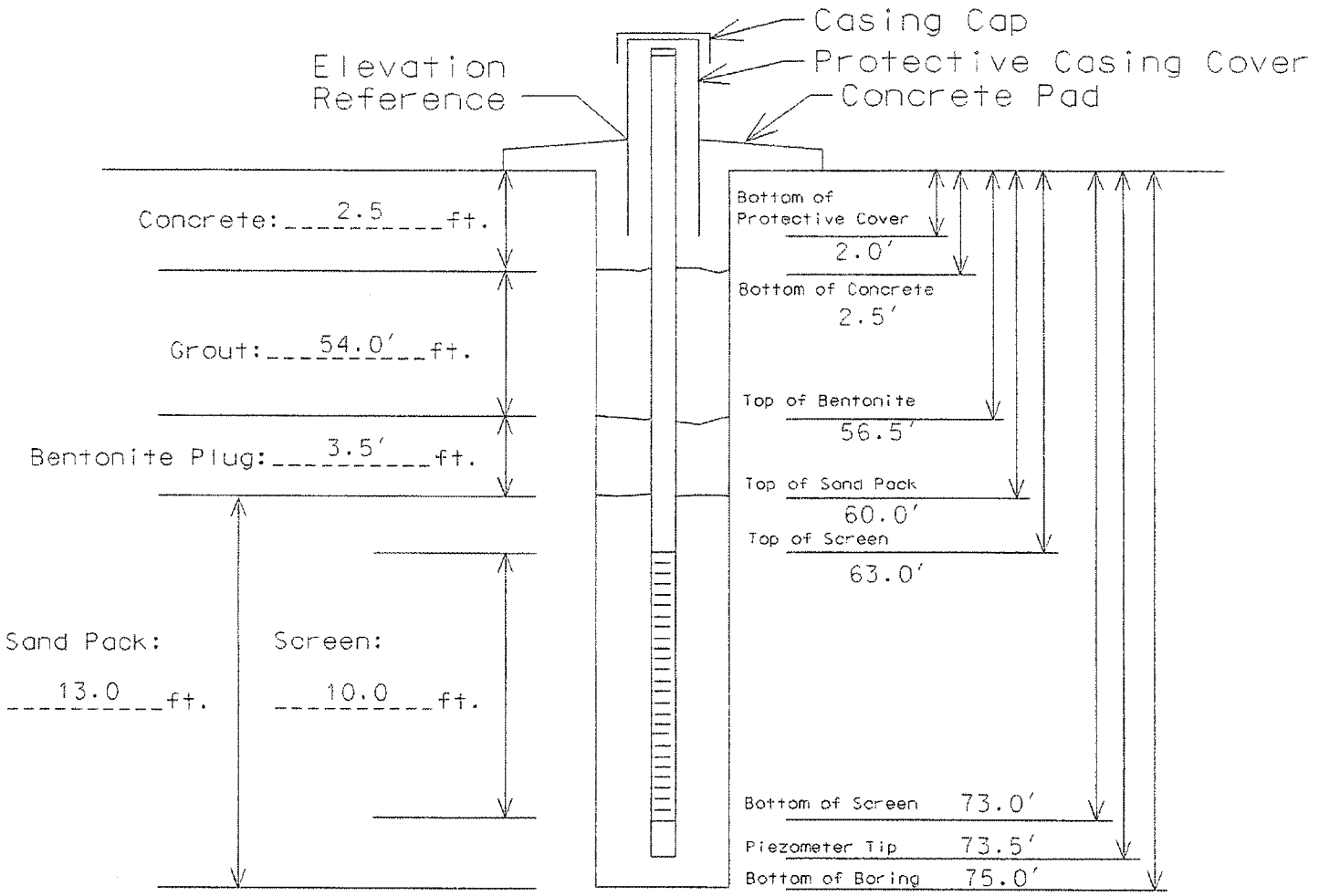
C:\Documents and Settings\eriege\Local Settings\Temp\[BW3A.xls]Sheet3

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. BW-3B



Boring Diameter: 8 5/8"

Sand Type: 20-40 Silica

Bollards, Type/Size: 3" Dia. Steel, Conc. Filled

Bentonite: 3/8" Chips

Screen Type/Size: 2" PVC Sch. 40, 0.010" Slotted

Cement/Grout: 6% Bentonite

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: TBS

Backfill with 3/8" Bentonite Chips to 73.0'

Other:

Bottom Cap Used? Yes

Site Easting: TBS

Project #: 03-118

Project Name: Ciniza Refinery - Boundry Wells

Elevation: TBS

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3B.xls]Sheet1

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3B.xls]Sheet2

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3B.xls]Sheet3

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

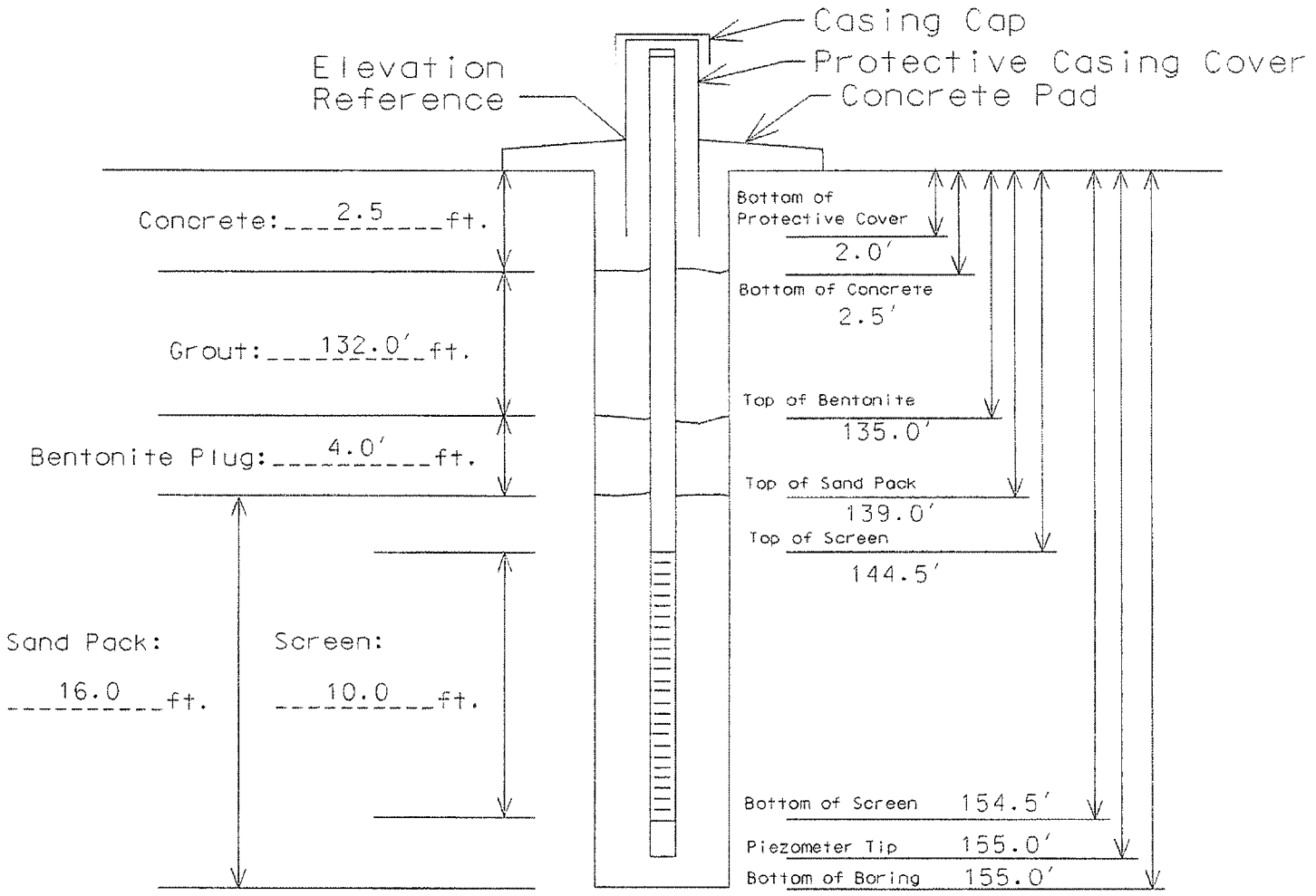
C:\Documents and Settings\eriege\Local Settings\Temp\[BW3B.xls]Sheet4

PRECISION ENGINEERING, INC.

505-523-7674

Installation Diagram

Monitoring Well No. BW-3C



Boring Diameter: 8 5/8"

Sand Type: 20-40 Silica

Bollards, Type/Size: N/A

Bentonite: 3/8" Chips

Screen Type/Size: 2" PVC Sch. 40, 0.010" Slotted

Cement/Grout: 6% Bentonite

Riser Type/Size: 2" PVC Sch. 40

Water: Potable

Locking Expandable Casing Plug? Yes

Site Northing: TBS

Other: N/A

Bottom Cap Used? Yes

Site Easting: TBS

Project #: 03-118

Project Name: Ciniza Refinery - Boundry Wells

Elevation: TBS

Sheet: 1 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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3C.xls]Sheet1

Sheet: 2 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				

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3C.xls]Sheet2

Sheet: 3 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.
	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:** WHK

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3C.xls]Sheet3

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		//////////	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				
	74.0-92.0		//////////		**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				
			//////////	80.0					
			//////////	85.0					

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3C.xls]Sheet4

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					
			//////////						
			//////////						
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			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////						
			//////////	105.0					
	105-110.0		**/**/*/**		**Sandstone**, mudstone, silt, interbedded, dense, dry				
			//*/**						
			//*/**						
			//*/**						
			//*/**						
			//*/**						

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3C.xls]Sheet5

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3C.xls]Sheet6

Sheet: 7 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.
			//////////	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					
			/-/-*/-						
			/-/-*/-						

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3C.xls]Sheet7

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

C:\Documents and Settings\eriege\Local Settings\Temp\[BW3C.xls]Sheet8

MONITORING WELL IDENTIFICATION REPORT

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

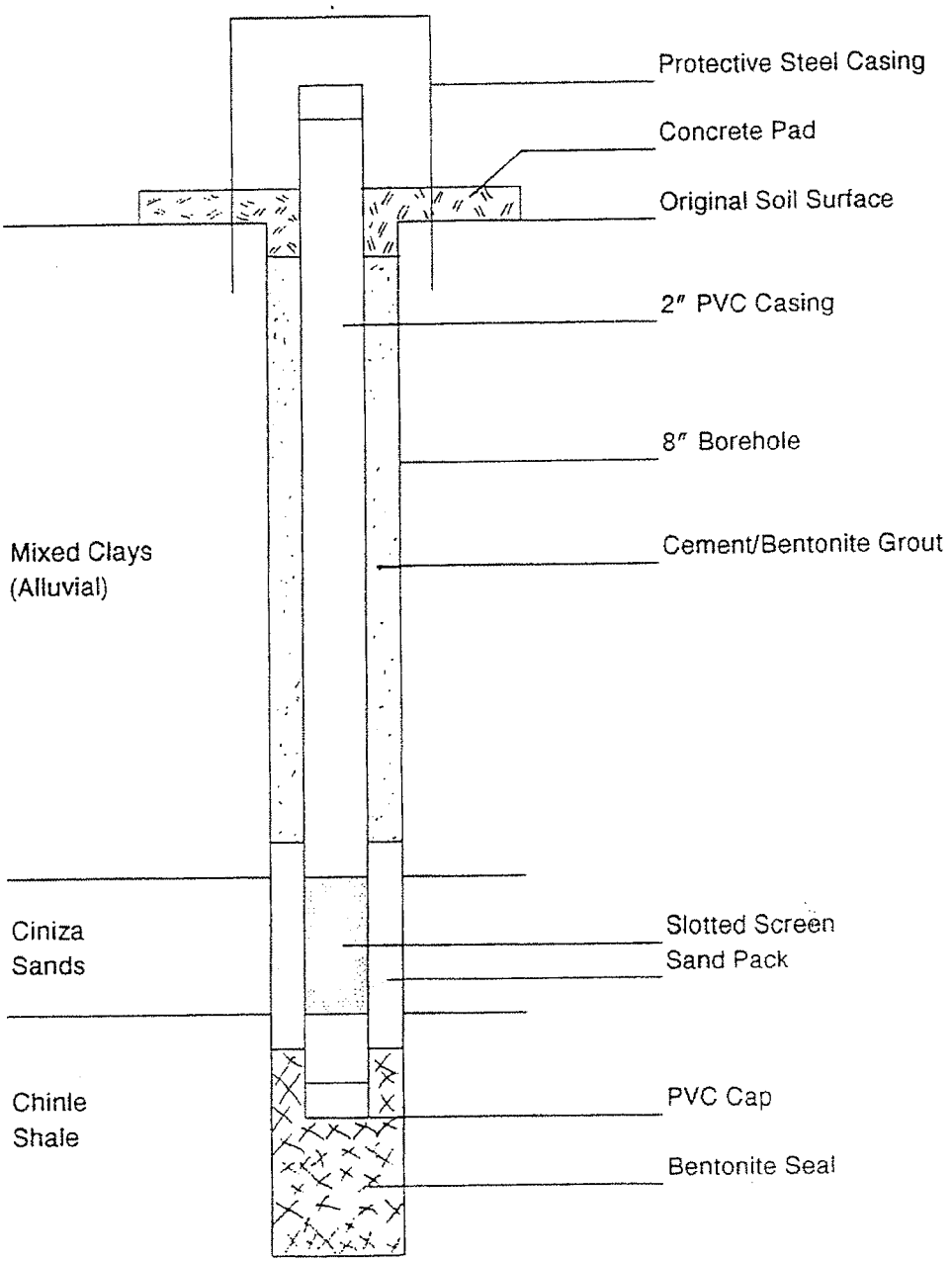
FACILITY NAME	Giant Refining Co. - Ciniza
EPA I.D. NUMBER	NMD000333211-2
COUNTY	McKinley
WELL NUMBER	SMW-6
WELL LOCATION (LONGITUDE)	108 26' 02"
WELL LOCATION (LATITUDE)	35 29' 38"
NEW MEXICO STATE PLANE	(X) 320,839.52 (Y) 1,635,867.66
AQUIFER NAME	Ciniza Sand
AQUIFER CONFINED? xx	UNCONFINED?
WELL INSTALLATION DATE	10-3-85
DRILLING METHOD	HLWAG
INNER CASING DIAMETER	2.0"
BOREHOLE DIAMETER	6.5"
CASING MATERIAL	SS304
METHOD OF DEVELOPMENT	Compr
ELEV. BOTTOM OF BOREHOLE	6806.35
ELEV. BOTTOM OF WELL CASING	6807.55
ELEV. BOTTOM OF SCREENED INT.	6810.55
ELEVATION OF SCREENED INTERVAL	6830.55
SURVEYED ELEVATION OF CASING TOP	6880.71

DATE OF REPORT 2-2-96

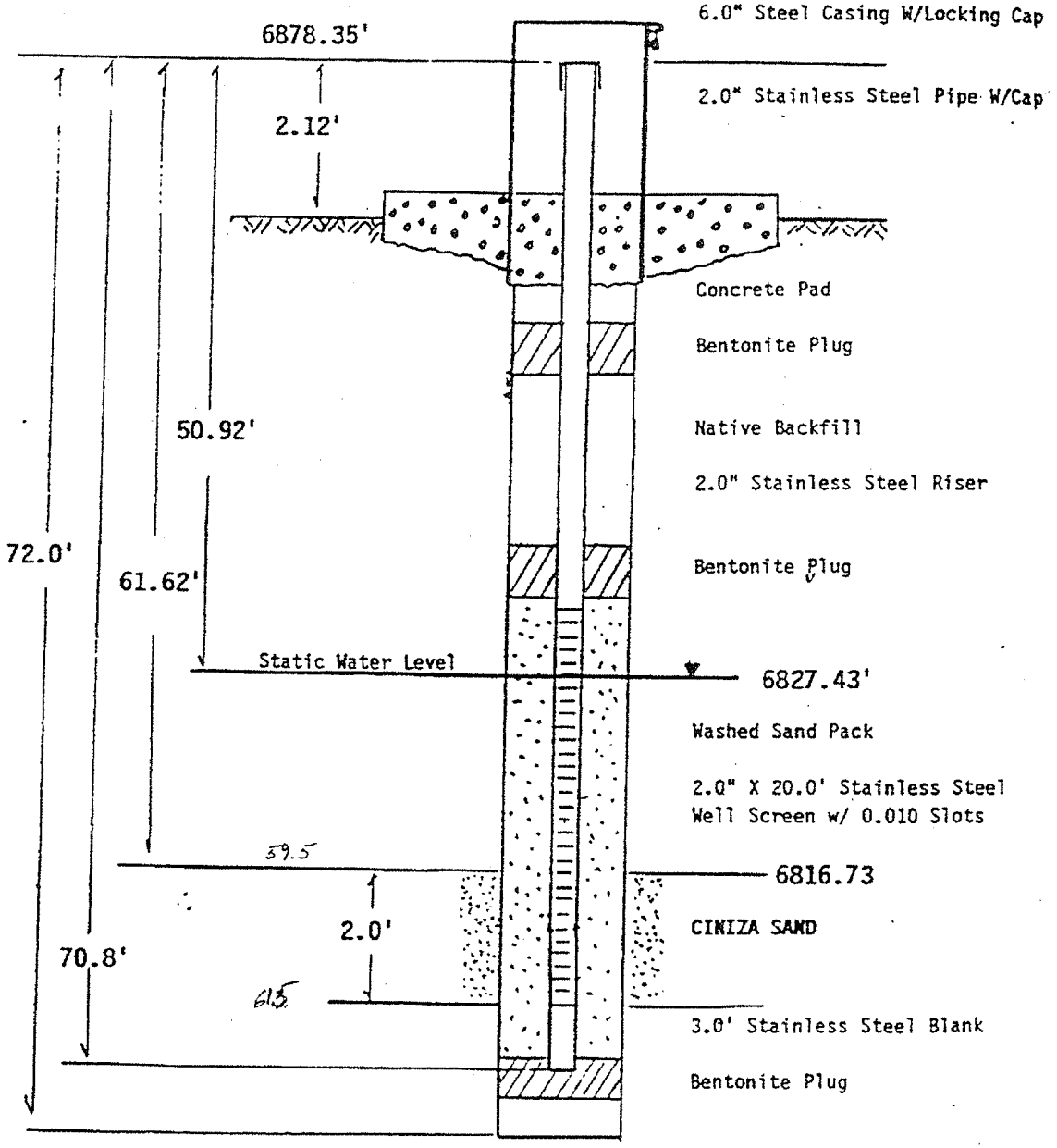
SIGNATURE Dorinda Mancini
NAME (TYPED) Dorinda Mancini

GIANT REFINING – CINIZA

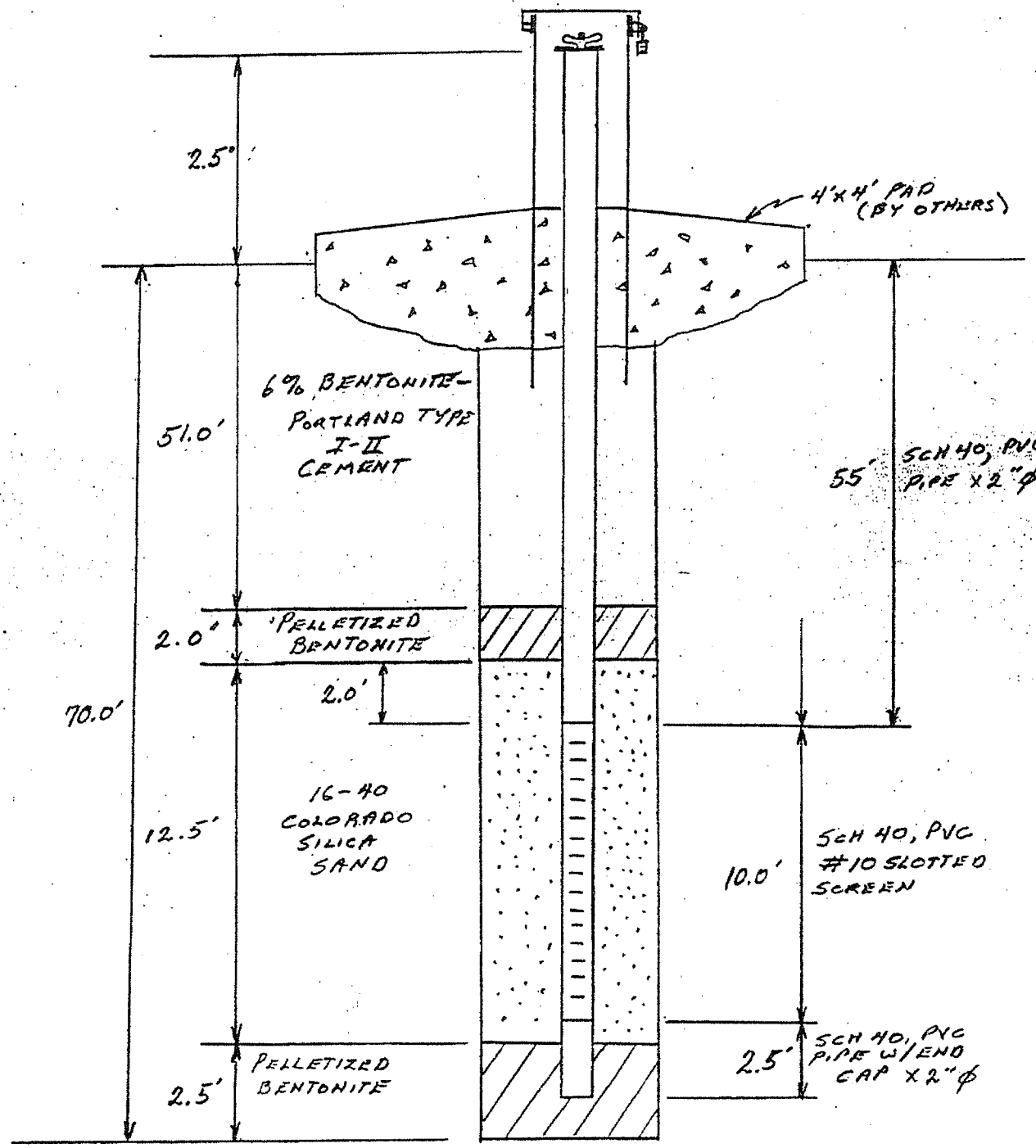
PROPOSED SMW-6A WELL DIAGRAM



TLS/95



COMPLETION DIAGRAM FOR WELL SMW-6



SMW-6
REPLACEMENT
DRILLED 10-2-95

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:15' South of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.:SMW-6C

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	%M	L	PI	CLASS
	0-9.8	Continuous Sampling	//--//			Clay, silty, wet, red-brown, firm, substantial roots and vegetative debris 0-3.0'.				
			//--//	2.5						
			//--//	5.0						
			//--//	7.5						
	9.8		//--//							
	9.8-10.3		//:://	10		Clay, very sandy, firm, red-brown, moist				
	10.3		//:://							
	10.3-12.5		:://::			Sand, very clayey, moist to wet, brown, loose				
	12.5		:://::	12.5						
	12.5-14.4		::::::			Sand, fine, damp, loose, light brown				
	14.4		::::::							
	14.4-15.5		------	15		Silt, clay interbeds, laminar, moist, firm, light brown, some root matter				
	15.5-19.0		//--//			Clay, silty, blocky, moist - wet, stiff, brown				
			//--//	17.5						
	19.0		//--//							
	19.0-20.0		--//--	20		Silt, clayey, laminar bedded, charcoal @ 19.2. stiff, moist, light brown				
	20.0		--//--							
	20.4-22.3		::--::			Sand, silty, some silt interbedding <3 cm, dry loose, light brown, silt is laminar bedded.				
	22.3		::--::	22.3						

Continued.....

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:15' South of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.:SMW-6C Continued

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	22.3-24.3	Continuous Sampling				Clay, stiff, some carbonate nodules (rare), brown, moist to wet, massive				
	24.3									
	24.3-25.7			25		Clay, sandy, blocky, laminar bedded, moist, stiff, brown.				
	25.7									
	25.7-27.2					Clay/Silt, interbedded, stiff, laminar, moist, light brown, charcoal in pieces < 1cm.				
	27.2									
	27.2-28.4			27.5		Sand, fine, silty, loose, damp, orange				
	28.4									
	28.4-29.2					Clay, stiff, moist to wet, laminar, brown				
	29.2-30.8			30		Clay, very sandy, stiff, lt. brown to orange, moist, grades sandier downward.				
	30.8									
	30.8-33.0					Silt, clayey, laminar, light brown, stiff, moist to damp.				
	33.0			32.5						
	33.0-34.4					Sand, fine, silty, laminar banded, loose, dry to damp, light brown.				
	34.4									
	34.4-35.0			35		Silt, sandy, loose, dry, lt.brown to orange				
	35.0-44.2					Clay, stiff, slightly blocky, some fine root matter, brown red, wet-moist, rare carbonate nodules				
				37.5						
				40						
				42.5						
	44.2									
				45		Continued.....				

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:15' South of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.:SMW-6C Continued

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	44.2-49.1		//--//			Clay, silty, laminar bedded, moist to wet,				
			//--//			stiff, red-brown, some green/grey reduction				
			//--//			filaments (likely root decomposition).				
			//--//							
			//--//	47.5						
			//--//							
			//--//							
	49.1		//--//							
	49.1-49.7		:://::			Sand, med., clayey, red-brown,med. dense,moist				
	49.7-51.3		//--//	50		Clay, silty, some lamination, wet/moist, stiff				
			//--//			sl. fissured, sand in vertical lines from				
	51.3		//--//			above (mud crack infilling ?)				
	51.3-60.9		//////			Clay, red-brown, blocky, wet to moist, stiff,				
			//////			green/grey reduction filaments;				
			//////	52.5						
			//////							
			//////							
			//////							
			//////							
			//////	55		massive, few reduction filaments below 55.0				
			//////							
			//////							
			//////							
			//////							
			//////	57.5						
			//////							
			//////							
			//////							
			//////							
			//////	60.5						
	60.9		//////							
	60.9-61.3		:://::			Sand, fine, clayey, saturated-v.weakly water				
	61.3-63.8		//////			bearing, loose, light brown.				
			//////			Clay. Brown, firm, wet, some green/grey				
			//////	62.5		reduction filaments.				
			//////							
			//////							
	63.8		//////							
	63.8-65.0	Chinle	======			Shale, weathered, blocky, green/grey reduction				
	65.0	boundary	======	65		layers <6cm, slightly sandy in reduction zones				
	T.D.					otherwise red bn, some carbonate deposition,				
						laminar to subblocky.				
						No water accumulation after 24 hours. Boring				
						grouted closed with a 6% bentonite/cement				
				67.5		slurry to the surface.				

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:15' South of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.:SMW-6C

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	0-9.8	Continuous Sampling	//--//			Clay, silty, wet, red-brown, firm, substantial roots and vegetative debris 0-3.0'.				
			//--//	2.5						
			//--//	5.0						
			//--//	7.5						
	9.8		//--//							
	9.8-10.3		//:://	10		Clay, very sandy, firm, red-brown, moist				
	10.3		//:://							
	10.3-12.5		:://			Sand, very clayey, moist to wet, brown, loose				
	12.5		:://	12.5						
	12.5-14.4		::::::			Sand, fine, damp, loose, light brown				
	14.4		::::::							
	14.4-15.5		------	15		Silt, clay interbeds, laminar, moist, firm, light brown, some root matter				
	15.5-19.0		//--//			Clay, silty, blocky, moist - wet, stiff, brown				
			//--//	17.5						
	19.0		//--//							
	19.0-20.0		--//--			Silt, clayey, laminar bedded, charcoal @ 19.2.				
			--//--	20		stiff, moist, light brown				
	20.0		--//--							
	20.4-22.3		::--::			Sand, silty, some silt interbedding <3 cm, dry loose, light brown, silt is laminar bedded.				
	22.3		::--::	22.3						

Continued.....

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

Logged By: whk

Sheet: 2 of 3

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:15' South of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.:SMW-6C Continued

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	22.3-24.3	Continuous Sampling				Clay, stiff, some carbonate nodules (rare), brown, moist to wet, massive				
	24.3									
	24.3-25.7			25		Clay, sandy, blocky, laminar bedded, moist, stiff, brown.				
	25.7									
	25.7-27.2					Clay/Silt, interbedded, stiff, laminar, moist, light brown, charcoal in pieces < 1cm.				
	27.2									
	27.2-28.4			27.5		Sand, fine, silty, loose, damp, orange				
	28.4									
	28.4-29.2					Clay, stiff, moist to wet, laminar, brown				
	29.2-30.8			30		Clay, very sandy, stiff, lt. brown to orange, moist, grades sandier downward.				
	30.8									
	30.8-33.0			32.5		Silt, clayey, laminar, light brown, stiff, moist to damp.				
	33.0									
	33.0-34.4					Sand, fine, silty, laminar banded, loose, dry to damp, light brown.				
	34.4									
	34.4-35.0			35		Silt, sandy, loose, dry, lt.brown to orange				
	35.0-44.2			37.5		Clay, stiff, slightly blocky, some fine root matter, brown red, wet-moist, rare carbonate nodules				
				40						
				42.5						
	44.2									
				45		Continued.....				

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:15' South of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.:SMW-6C Continued

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS
	44.2-49.1		//--//			Clay, silty, laminar bedded, moist to wet,				
			//--//			stiff, red-brown, some green/grey reduction				
			//--//			filaments (likely root decomposition).				
			//--//							
			//--//	47.5						
			//--//							
			//--//							
	49.1		//--//							
	49.1-49.7		::// ::			Sand, med., clayey, red-brown,med. dense,moist				
	49.7-51.3		//--//	50		Clay, silty, some lamination, wet/moist, stiff				
			//--//			sl. fissured, sand in vertical lines from				
	51.3		//--//			above (mud crack infilling ?)				
	51.3-60.9		//////			Clay, red-brown, blocky, wet to moist, stiff,				
			//////			green/grey reduction filaments;				
			//////	52.5						
			//////							
			//////							
			//////							
			//////							
			//////	55		massive, few reduction filaments below 55.0				
			//////							
			//////							
			//////							
			//////							
			//////	57.5						
			//////							
			//////							
			//////							
			//////							
			//////	60.5						
	60.9		//////							
	60.9-61.3		::// ::			Sand, fine, clayey, saturated-v.weakly water				
	61.3-63.8		//////			bearing, loose, light brown.				
			//////			Clay, Brown, firm, wet, some green/grey				
			//////	62.5		reduction filaments.				
			//////							
			//////							
	63.8		//////							
	63.8-65.0	Chinle	======			Shale, weathered, blocky, green/grey reduction				
	65.0	boundary	======	65		layers <6cm, slightly sandy in reduction zones				
	T.D.					otherwise red bn, some carbonate deposition,				
						laminar to subblocky.				
						No water accumulation after 24 hours. Boring				
						grouted closed with a 6% bentonite/cement				
				67.5		slurry to the surface.				

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:30' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery.
Giant Industries

Water Elev: none

Elevation:

Boring No.: SMW-6B

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	0-9.7	Continuous Sampling	//--//			Clay, slightly silty, very slightly sandy, wet				
			//--//			firm, red-brown.				
			//--//							
			//--//							
			//--//	2.5						
			//--//							
			//--//							
			//--//							
			//--//							
			//--//	5.0		some silty laminae with charcoal pieces below				
			//--//			5' (rare).				
			//--//			drier than above				
			//--//							
			//--//							
			//--//	7.5						
			//--//							
			//--//							
			//--//							
	9.7		//--//							
	9.7-12.5		:://	10		Sand, very clayey, grades more sandy below 10				
			:://			feet, scattered pebbles <1 cm subrounded,				
			:://			moist, medium dense, red-brown				
			:://							
			:://							
	12.5		:://	12.5						
	12.5-12.9		//://			Clay, sandy, silty, red-brown, firm, moist				
	12.9-15.6		::::			Sand, fine, damp-moist, loose, lt. red-brown				
			::::							
			::::							
			::::	15						
	15.6		::::							
	15.6-20.2		//--//			Clay, silty with clayey silt interbeds <3 cm,				
			//--//			moist, very stiff to hard, lt brown to brown,				
			//--//			beds distinguishable but contacts gradational.				
			//--//	17.5						
			//--//							
			//--//							
			//--//							
			//--//							
	20.2		//--//	20.2						
	20.2-21.4		::--::			Sand, fine, silty, light brown, loose, dry				
			::--::							
	21.4		::--::							
	21.4-23.5		//--//			Clay, silty, laminar bedding, damp, stiff,				
			//--//	22.5		brown to red-brown.				
						CONTINUED.....				

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:30' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.:SMW-6B Continued

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	Continued	Continuous Sampling	//--//			Clay, silty, laminar bedding, damp, stiff, brown to red-brown. Continued				
	23.5		//--//							
	23.5-25.7		::--::			Sand, silty, sl. clayey, some scattered charcoal, laminar silt bedding, brown, damp, medium to fine, moderately dense				
			::--::	25						
	25.7		::--::							
	25.7-25.9		::::::			Sand, sl. silty, loose, dry, orange				
	25.9-27.3		//--//			Clay, silty, silt laminar bedded dry to damp, brown, fissle structure.				
	27.3		//--//							
	27.3-28.8		::--::	27.5		Sand, fine, silty, orange, loose, dry, medium dense.				
			::--::							
	28.8		::--::							
	28.8-29.0		//--//			Clay, silty, hard, moist, brown				
	29.0-31.0		::--::	30		Sand, fine, silty, orange, loose, dry, loose				
	31.0		::--::							
	31.0-32.8		--::--			Silt, fine sandy, orange, dry, loose				
			--::--	32.5						
	32.8		--::--							
	32.8-34.3		::--::			Sand, fine, silty, light brown, dry, loose				
	34.3		::--::							
	34.3-34.9		------	34.9		Silt, laminar, charcoal, dry, loose, orange-bn				
	34.9-47.7		//////			Clay, red-brown, slight blocky structure, moist to wet, stiff to hard, rarely carbonate nodules, some green grey reduction filaments likely root remnants, some scattered silty				
			//////	37.5		partings 44.2-45.4 (orange).				
			//////	40						
			//////	42.5						
			//--//	45						

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:30' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.:SMW-6B Continued

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	Continued	Continuous Sampling				Clay, red-brown, slight blocky structure, moist to wet, stiff to hard, rarely carbonate nodules, some green grey reduction filaments likely root remnants, some scattered silty				
	47.7			47.7		partings 44.2-45.4 (orange).				
	47.7-48.0					Sand, sl. silty, fine, moist, moderately dense				
	48.0-60.8					Clay, red-brown, slight blocky structure, slickensided where broken when sampled, some reduction filaments but fewer than above, wet				
				50		to moist.				
						no reduction filiments below 50.0.				
				52.5						
				55						
				57.5						
				60.0						
	60.8									
	60.8-61.1					Sand, v. silty,weak water bearing,loose, brown				
	61.1-62.0					Clay, silty, moist to wet, firm, red-brown				
	62.0-64.5			62.5		Shale, weathered, green/grey mottled, dense, moist, contact with the Chinle Formation				
	64.5									
	64.5-65.0			65		Shale, unweathered, green/grey, v. sandy to sandstone, hard, moist to damp				
	T.D.					T.D.				
						Notes: No water accumulation after 24 hr.				
				67.5		Grouted to the surface w/ 6% bentonite/cement slurry				

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:30' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.: SMW-6B

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	0-9.7	Continuous Sampling	//--//			Clay, slightly silty, very slightly sandy, wet firm, red-brown.				
			//--//	2.5						
			//--//	5.0		some silty laminae with charcoal pieces below 5' (rare). drier than above				
			//--//	7.5						
	9.7		//--//							
	9.7-12.5		:://	10		Sand, very clayey, grades more sandy below 10 feet, scattered pebbles <1 cm subrounded. moist, medium dense, red-brown				
	12.5		:://	12.5						
	12.5-12.9		//			Clay, sandy, silty, red-brown, firm, moist				
	12.9-15.6		::	15		Sand, fine, damp-moist, loose, lt. red-brown				
	15.6		::							
	15.6-20.2		//--//	17.5		Clay, silty with clayey silt interbeds <3 cm, moist, very stiff to hard, lt brown to brown, beds distinguishable but contacts gradational.				
	20.2		//--//	20.2						
	20.2-21.4		::--			Sand, fine, silty, light brown, loose, dry				
	21.4		::--							
	21.4-23.5		//--//	22.5		Clay, silty, laminar bedding, damp, stiff, brown to red-brown.				
						CONTINUED.....				

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:30' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.:SMW-6B Continued

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	Continued	Continuous Sampling	//--//			Clay, silty, laminar bedding, damp, stiff, brown to red-brown. Continued				
	23.5		//--//							
	23.5-25.7		::--::			Sand, silty, sl. clayey, some scattered charcoal, laminar silt bedding, brown, damp, medium to fine, moderately dense				
			::--::	25						
	25.7		::--::							
	25.7-25.9		::::::			Sand, sl. silty, loose, dry, orange				
	25.9-27.3		//--//			Clay, silty, silt laminar bedded dry to damp, brown, fissle structure.				
	27.3		//--//							
	27.3-28.8		::--::	27.5		Sand, fine, silty, orange, loose, dry, medium dense.				
	28.8		::--::							
	28.8-29.0		//--//			Clay, silty, hard, moist, brown				
	29.0-31.0		::--::	30		Sand, fine, silty, orange, loose, dry, loose				
	31.0		::--::							
	31.0-32.8		--::--			Silt, fine sandy, orange, dry, loose				
			--::--	32.5						
	32.8		--::--							
	32.8-34.3		::--::			Sand, fine, silty, light brown, dry, loose				
	34.3		::--::							
	34.3-34.9		------	34.9		Silt, laminar, charcoal, dry, loose, orange-bn				
	34.9-47.7		//////			Clay, red-brown, slight blocky structure, moist to wet, stiff to hard, rarely carbonate nodules, some green grey reduction filaments likely root remnants, some scattered silty				
			//////	37.5		partings 44.2-45.4 (orange).				
			//////	40						
			//////	42.5						
			//--//	45						

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:30' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: none

Elevation:

Boring No.:SMW-6B Continued

Date:10/12/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	Continued	Continuous Sampling				Clay, red-brown, slight blocky structure, moist to wet, stiff to hard, rarely carbonate nodules, some green grey reduction filaments likely root remnants, some scattered silty				
	47.7			47.7		partings 44.2-45.4 (orange).				
	47.7-48.0					Sand, sl. silty, fine, moist, moderately dense				
	48.0-60.8					Clay, red-brown, slight blocky structure, slickensided where broken when sampled, some reduction filaments but fewer than above, wet to moist.				
				50						
						no reduction filiments below 50.0.				
				52.5						
				55						
				57.5						
				60.0						
	60.8									
	60.8-61.1					Sand, v. silty,weak water bearing,loose, brown				
	61.1-62.0					Clay, silty, moist to wet, firm, red-brown				
	62.0-64.5			62.5		Shale, weathered, green/grey mottled, dense, moist, contact with the Chinle Formation				
	64.5									
	64.5-65.0			65		Shale, unweathered, green/grey, v. sandy to sandstone, hard, moist to damp				
	T.D.					T.D.				
						Notes: No water accumulation after 24 hr.				
				67.5		Grouted to the surface w/ 6% bentonite/cement slurry				

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

Logged By: whk

Sheet: 1 of 4

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:20' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: 69.81

Elevation:

Boring No.:SMW-6A

Date:10/2/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	0-9.5	continuous sampling	//--//			Clay, silty, wet, stiff, red/brown, root filaments				
			//--//							
			//--//							
			//--//							
			//--//	2.5						
			//--//							
			//--//							
			//--//							
			//--//							
			//--//							
			//--//	5.0						
			//--//							
			//--//							
			//--//							
			//--//							
			//--//							
			//--//	7.5						
			//--//							
			//--//							
			//--//							
	9.5		//--//							
	9.5-12.5		//:://	10		Clay, slightly sandy, wet, firm, red/brown, root filaments				
			//:://							
			//:://							
			//:://							
			//:://							
	12.5		//:://							
	12.5-15.1		:://::			Sand, fine, clayey (laminar banding), coarsens downward, rounded to subrounded, moist				
			:://::							
			:://::							
			:://::							
	15.1		:://::	15						
	15.1-17.6		//////			Clay, slightly silty, moist to wet, hard, dark brown, blocky, slickensided where compressed during sampling				
			//////							
			//////							
			//////							
	17.6		//////							
	17.6-20.6		--//--			Silt, clayey, laminar bedding, slightly blocky light brown, hard, moist to wet				
			--//--							
			--//--							
			--//--							
			--//--	20						
	20.6		--//--							
	20.6-21.5		::--::			Sand, fine, silty, dry, loose, light brown, grades to silt below				
			::--::							
	21.5-22.0		--::--			Silt, fn sandy, laminar, dry,loose,grades clay				
						CONTINUED.....				

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:20' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: 69.81

Elevation:

Boring No.:SMW-6A Continued

Date:10/2/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS
	22.0-23.5	continuous sampling	//--//			Clay, silty, hard, moist, brown				
	23.5		//--//							
	23.5-24.5		:://			Sand, fine, clayey, laminar, moist, brown				
	24.8		::--	24.8		clay replaced by silt 24.5-24.8, dry				
	24.8-25.5		--//			Silt, clayey, laminar, dry, firm, charcoal				
	25.5-26.5		::::::			Sand, fine, orange, dry, loose, subrounded,				
	26.5		::::::			frosted				
	26.5-27.2		--//			Silt, clayey, damp, brown, firm, charcoal				
	27.2-30.5		::::::	27.5		Sand, fine,dry to damp,moderately dense,orange				
			::::::			subrounded, frosted				
			::::::							
			::::::							
			::::::							
			::::::	30						
	30.5		::::::							
	30.5-32.4		--::--			Silt, fine sandy, light brown, laminar banded,				
			--::--			fissile, firm, very slightly clayey				
			--::--							
	32.4		--::--	32.4						
	32.4-34.2		::::::			Sand, fine, damp, orange-brown, laminar banded				
			::::::			loose to moderately dense				
	34.2		::::::							
	34.2-44.4		//////			Clay, stiff to hard, moist to wet, slightly				
			//////	35		blocky above 40'. Fractures during sampling				
			//////			slickensided. Some green-grey reduction				
			//////			filaments likely from root decomposition.				
			//////							
			//////							
			//////	37.5						
			//////							
			//////							
			//////							
			//////							
			//////	40						
			//////							
			//////							
			//////							
			//////							
			//////	42.5						
			//////							
			//////							
			//////							
	44.4		//////	44.4						
	44.4-45.0		::::::	45		Sand, med, rd-orange,dense,damp,frosted,subrnd				

CONTINUED.....

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:20' North Of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: 69.81

Elevation:

Boring No.:SMW-6A Continued

Date:10/2/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	45.0-60.2	continuous sampling				Clay, hard, slightly blocky above 54', massive below, red-brown, moist to wet, some very fine green-grey reduction filaments likely root decomposition, some root matter and charcoal pieces below 52'.				
				47.5						
				50						
				52.5						
				55						
				57.5						
	60.2			60.2						
	60.2-60.8					Sand, fine, very silty, brown, loose, water bearing, very weakly water producing				
	60.8-62.5					Clay, shaley, weathered shale, moist not water bearing, stiff grading downward to hard, top of Chinle Formation				
	62.5			62.5						
	62.5-64.2					Shale, red-brown, damp to moist, fine blocky, dense, appears unweathered				
	64.2									
	64.2-65.0					Sandstone, weak, friable, shaley, mottled grey green and rd brown, damp				
	65.0			65						
	65.0-70.0					Shale, very sandy, green-grey, hard, dry, fissle.				
				67.5						

CONTINUED.....

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:20' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery.
Giant Industries

Water Elev: 69.81

Elevation:

Boring No.:SMW-6A Continued

Date:10/2/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	continued	continuous sampling				continued				
				70						
	T.D.					T.D.				
						Water elevation measured (24 hours) = 68.91'				
						Notes: Boring abandoned and plugged with grout				
				72.5		consisting of 6% montmorillonite clay				
						(bentonite) and Portland Type I-II cement				
						tremied to the bottom of the boring and				
						grouted to the surface.				
				75						
				77.5						
				80						
				82.5						
				85						
				87.5						
				90						

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:20' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: 69.81

Elevation:

Boring No.:SMW-6A

Date:10/2/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS
	0-9.5	continuous sampling	//--//			Clay, silty, wet, stiff, red/brown, root filaments				
			//--//							
			//--//							
			//--//							
			//--//	2.5						
			//--//							
			//--//							
			//--//							
			//--//							
			//--//							
			//--//	5.0						
			//--//							
			//--//							
			//--//							
			//--//							
			//--//							
			//--//	7.5						
			//--//							
			//--//							
			//--//							
	9.5		//--//							
	9.5-12.5		//:://	10		Clay, slightly sandy, wet, firm, red/brown, root filaments				
			//:://							
			//:://							
			//:://							
			//:://							
	12.5		//:://							
	12.5-15.1		:://::			Sand, fine, clayey (laminar banding), coarsens downward, rounded to subrounded, moist				
			:://::							
			:://::							
			:://::							
	15.1		:://::	15						
	15.1-17.6		//////			Clay, slightly silty, moist to wet, hard, dark brown, blocky, slickensided where compressed during sampling				
			//////							
			//////							
			//////							
	17.6		//////							
	17.6-20.6		--//--			Silt, clayey, laminar bedding, slightly blocky light brown, hard, moist to wet				
			--//--							
			--//--							
			--//--							
			--//--	20						
	20.6		--//--							
	20.6-21.5		::--::			Sand, fine, silty, dry, loose, light brown, grades to silt below				
			::--::							
	21.5-22.0		--::--			Silt, fn sandy, laminar, dry,loose,grades clay				
						CONTINUED.....				

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:20' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: 69.81

Elevation:

Boring No.:SMW-6A Continued

Date:10/2/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	22.0-23.5	continuous sampling	//--//			Clay, silty, hard, moist, brown				
	23.5		//--//							
	23.5-24.5		:://::			Sand, fine, clayey, laminar, moist, brown				
	24.8		::--::	24.8		clay replaced by silt 24.5-24.8, dry				
	24.8-25.5		--//--			Silt, clayey, laminar, dry, firm, charcoal				
	25.5-26.5		::::::			Sand, fine, orange, dry, loose, subrounded,				
	26.5		::::::			frosted				
	26.5-27.2		--//--			Silt, clayey, damp, brown, firm, charcoal				
	27.2-30.5		::::::	27.5		Sand, fine,dry to damp,moderately dense,orange				
			::::::			subrounded, frosted				
			::::::							
			::::::							
			::::::							
			::::::	30						
	30.5		::::::							
	30.5-32.4		--::--			Silt, fine sandy, light brown, laminar banded,				
			--::--			fissile, firm, very slightly clayey				
			--::--							
	32.4		--::--	32.4						
	32.4-34.2		::::::			Sand, fine, damp, orange-brown, laminar banded				
			::::::			loose to moderately dense				
	34.2		::::::							
	34.2-44.4		//////			Clay, stiff to hard, moist to wet, slightly				
			//////	35		blocky above 40'. Fractures during sampling				
			//////			slickensided. Some green-grey reduction				
			//////			filaments likely from root decomposition.				
			//////							
			//////							
			//////	37.5						
			//////							
			//////							
			//////							
			//////							
			//////	40						
			//////							
			//////							
			//////							
			//////							
			//////	42.5						
			//////							
			//////							
			//////							
	44.4		//////	44.4						
	44.4-45.0		::::::	45		Sand, med, rd-orange,dense,damp,frosted,subrnd				

CONTINUED.....

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:20' North Of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: 69.81

Elevation:

Boring No.:SMW-6A Continued

Date:10/2/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE,CONDITION,COLOR,GRAINSIZE,ETC.)	%M	L	PI	CLASS.
	45.0-60.2	continuous sampling				Clay, hard, slightly blocky above 54', massive below, red-brown, moist to wet, some very fine green-grey reduction filaments likely root decomposition, some root matter and charcoal pieces below 52'.				
				47.5						
				50						
				52.5						
				55						
				57.5						
	60.2			60.2						
	60.2-60.8					Sand, fine, very silty, brown, loose, water bearing, very weakly water producing				
	60.8-62.5					Clay, shaley, weathered shale, moist not water bearing, stiff grading downward to hard, top of Chinle Formation				
	62.5			62.5						
	62.5-64.2					Shale, red-brown, damp to moist, fine blocky, dense, appears unweathered				
	64.2									
	64.2-65.0					Sandstone, weak, friable, shaley, mottled grey green and rd brown, damp				
	65.0			65						
	65.0-70.0					Shale, very sandy, green-grey, hard, dry, fissle.				
				67.5						

CONTINUED.....

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

Logged By: whk

PRECISION ENGINEERING, INC.

File #:95-111

Bore Point:20' North of Well SMW-6

LOG OF TEST BORINGS

Site:Ciniza Refinery, Giant Industries

Water Elev: 69.81

Elevation:

Boring No.:SMW-6A Continued

Date:10/2/95

LAB #	DEPTH	BLOW COUNT	PLOT	SCALE	SAMPLE	MATERIAL CHARACTERISTICS (MOISTURE, CONDITION, COLOR, GRAINSIZE, ETC.)	%M	L	PI	CLASS.
	continued	continuous sampling				continued				
				70						
	T.D.					T.D.				
						Water elevation measured (24 hours) = 68.91'				
						Notes: Boring abandoned and plugged with grout				
				72.5		consisting of 6% montmorillonite clay				
						(bentonite) and Portland Type I-II cement				
						tremied to the bottom of the boring and				
						grouted to the surface.				
				75						
				77.5						
				80						
				82.5						
				85						
				87.5						
				90						

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

Logged By: whk

Geoscience Consultants, Ltd.

WELL LOGGING FORM

SMW-6

Page 1 of

Client GIANT REFINING COMPANY Well Number SMW-6

___ ¼ ___ ¼ ___ ¼ ___ ¼ S ___ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 10/3/85 Completion Date

Logs Run Lith from Cores Logged By J.C. Hunter

Elevation 6879.45 Spud In (Fm.) Chinle

Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well COMPLETED AS SMW-

Depth | Litho. Recov.

RUN	From	To	Sample#/Ft	Lith/Remarks
1	0	5.	0815/4'	0-3' SOIL; gry rd (5R4/2) cly loam, Roots
2	5	10	0820/10'	3-10' CLAY; dk rd brn (10R3/4), ≤5% silt
3	10	15	0825/15'	10-14 SANDY CLAY; gry rd (10R4/2), cly w/ 10-20%
4	15	20	0830/20'	vfg sd & silt
5	20	25	0835/25'	14-15 SAND; pale rd (10R6/2) - gry rd (10R4/2),
6	25	30	0840/30'	fg-mg, mod sort, subrnd, Q+F+Lu
7	30	35	0845/35'	15-28 SANDY CLAY; gry rd (10R4/2), cly w/ 10-15
8	35	40	1015/40	vfg sd & silt; irreg lam bdg 0-2°/core
9	40	45	1025/45	28-36 SAND; gry rd (10R4/2) - mod rd brn (10R
10	45	50	1030/50	vfg-fg, mod sort, subrnd, Q+F+Lu, bcm
11	50	55	1035/55	thin cly interbeds
12	55	60	1045/60	
13	60	65	1101/62.5	Wet sand @62.5
14	65	70	No Sample	36-61 CLAY; dk rd brn (10R3/4); ≤5% vfg
				sd & silt.
				61-63 SAND, WET; mod rd brn (10R4/6) fg, vfg, poor sort, ≥15% cla
				matrix, some lost recovery, free H_2O, clayey
				@ base
				63-70 clayey SANDSTONE; grn gry (5GY6/1) -
				gry rd (10R4/2), vfg sd & silt, clay
				interbeds (laminae), dry, reduction
				spots
				Completed w/ 72' [illegible] @ [illegible]

Samples labeled SMW-5 → ~~SMW-5~~ = SMX-6

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Page ____ of ____

Client GIANT REFINING COMPANY Well Number SMX-6

___ ¼ ___ ¼ ___ ¼ ___ ¼ S ___ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 10/1/85 Completion Date 10/1/85

Logs Run Lith from Cores Logged By J.C. Hunter

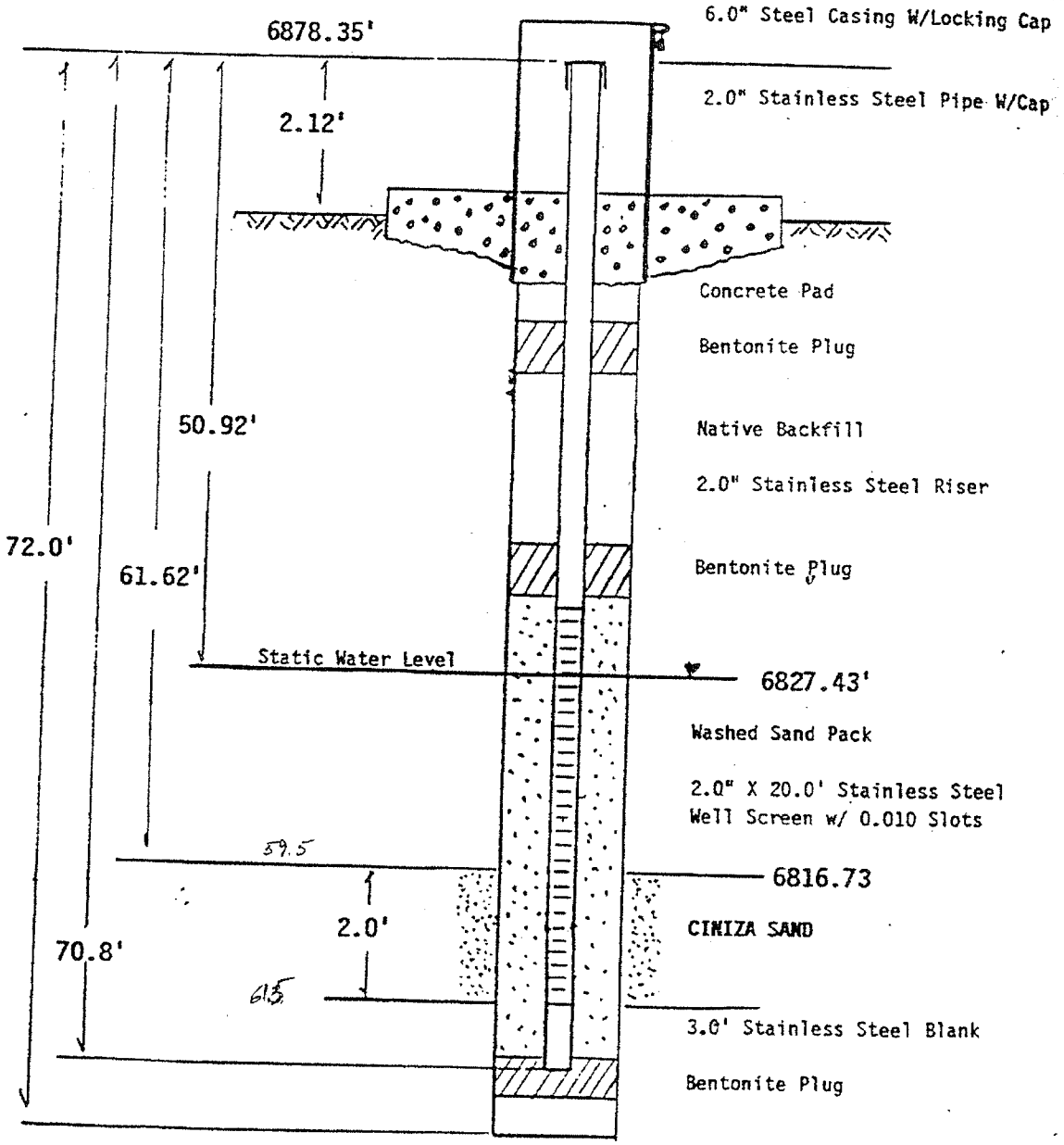
Elevation ____ Spud In (Fm.) Chinle

Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

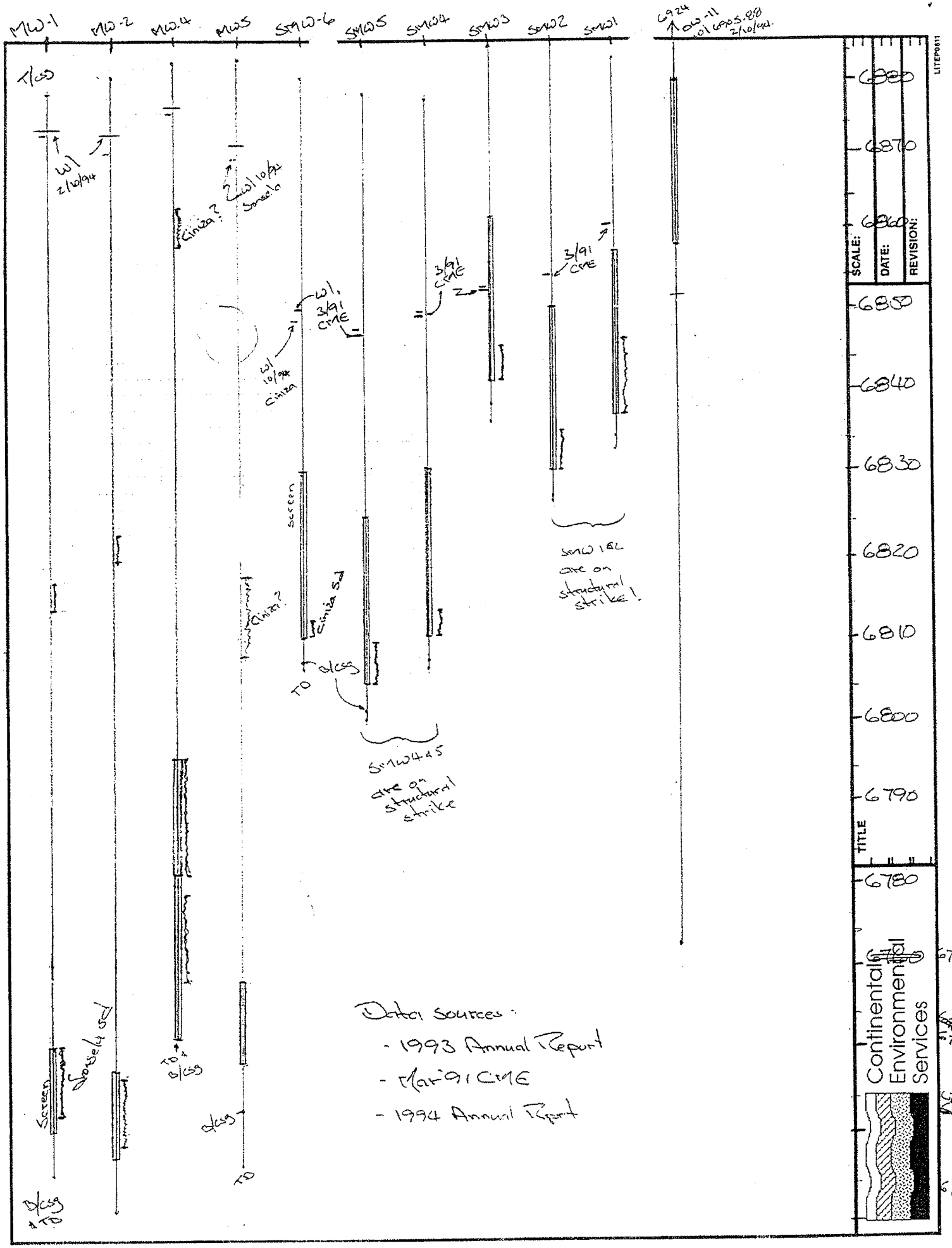
Depth | Litho. | Recov.

RUN	From	To	Sample#/Ft	Lith/Remarks
				Renumbered SMX-6; open borehole, not completed
			051001:	
1	0	5	1118/4.0	0-4.0' SOIL; gry rd (10R 4/2); clayey loam w/ roots
2	5	10	1114/10.0	4.0-12.5' CLAY; dk rd brn (10R/3/4); v soft + plastic; ≤ 5% silt
3	10	15	1120/15.0	
4	15	20	1124/20.0	12.5-20.0 SANDY CLAY; gry rd (5R 4/2); clay w/ 10-25% fg sand; faint wavy discon. lam bdd 0-3°/core
5	20	25	1128/25.0	
6	25	30	1135/30.0	
7	30	35	1140/35.0	20-22.0 SAND; gry rd (10R 4/2) cg-fg poor sort, qtz + vole RF + μ-spar + plag, subrnd
8	35	40	1148/40.0	
9	40	45	1159/45.0	22-33 SANDY CLAY; pale rd brn (10R 5/4); cly w/ 15-25% fg sand; faint wavy to discont lam bdd 0-2°/core
10	45	50	1255/50.0	
11	50	55	1306/55.0	
12	55	60	1325/60.0	33-36 SAND; gry rd (10R 4/2) - pale rd brn (10R 5/4) fg-vfg; poor sort, subangu - subrnd; qtz + feldspars
13	60	65	1345/65.0	
14	65	66	1357/68.0	
				36-57 CLAY; dk rd brn (10R 3/4); ≤ 2% silt; no reduction spots
				57-66 SANDY CLAY; gry rd (5R 4/2) - dsky rd (5R 3/4), locally mod brn (5YR 4/4); 10-20% vFg sd
				66-68 SANDSTONE; pale olive (10Y 6/2) - lt grn

Ref Auger @ 68' 1495



COMPLETION DIAGRAM FOR WELL SMW-6



Data sources:

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

MONITORING WELL MW-2

SURFACE ELEVATION: 6877 FEET
(Unsurveyed)

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)	BLOWS/FT SAMPLES
0										
10										
20										
30										
40										
50										
60										
70										
80										
90										
100										
110										
120										
130										
140										
150										
160										

SYMBOLS	DESCRIPTION
CL	REDDISH-BROWN SILTY CLAY, TRACE MEDIUM TO COARSE SAND AS LOOSE TO FIRM BLEBS
	WATER LEVEL 9.1 FEET B.G. 10/18/81
SC	PINKISH-PURPLE, SLIGHTLY SANDY (FINE) CLAY
SH	VARIEGATED REDDISH-BROWN, GREEN AND LIGHT PURPLE, SANDY TO SILTY SHALE
CL	REDDISH-BROWN SILTY CLAY, FIRM
LS/SH	LIGHT GREEN TO DARK RED LIMESTONE INTERBEDDED WITH SHALE
LS	LIGHT GREEN LIMESTONE, HARD
SS	WHITE TO LIGHT-GRAY, FINE TO MEDIUM SAND; SOME CLAY; GRADES GREENISH GRAY TO PINK, COARSE TO MEDIUM SAND
SH	DEEP PURPLE SHALE, FIRM

BORING COMPLETED AT 138.0 FEET ON 10/15/81

SCREENED INTERVAL

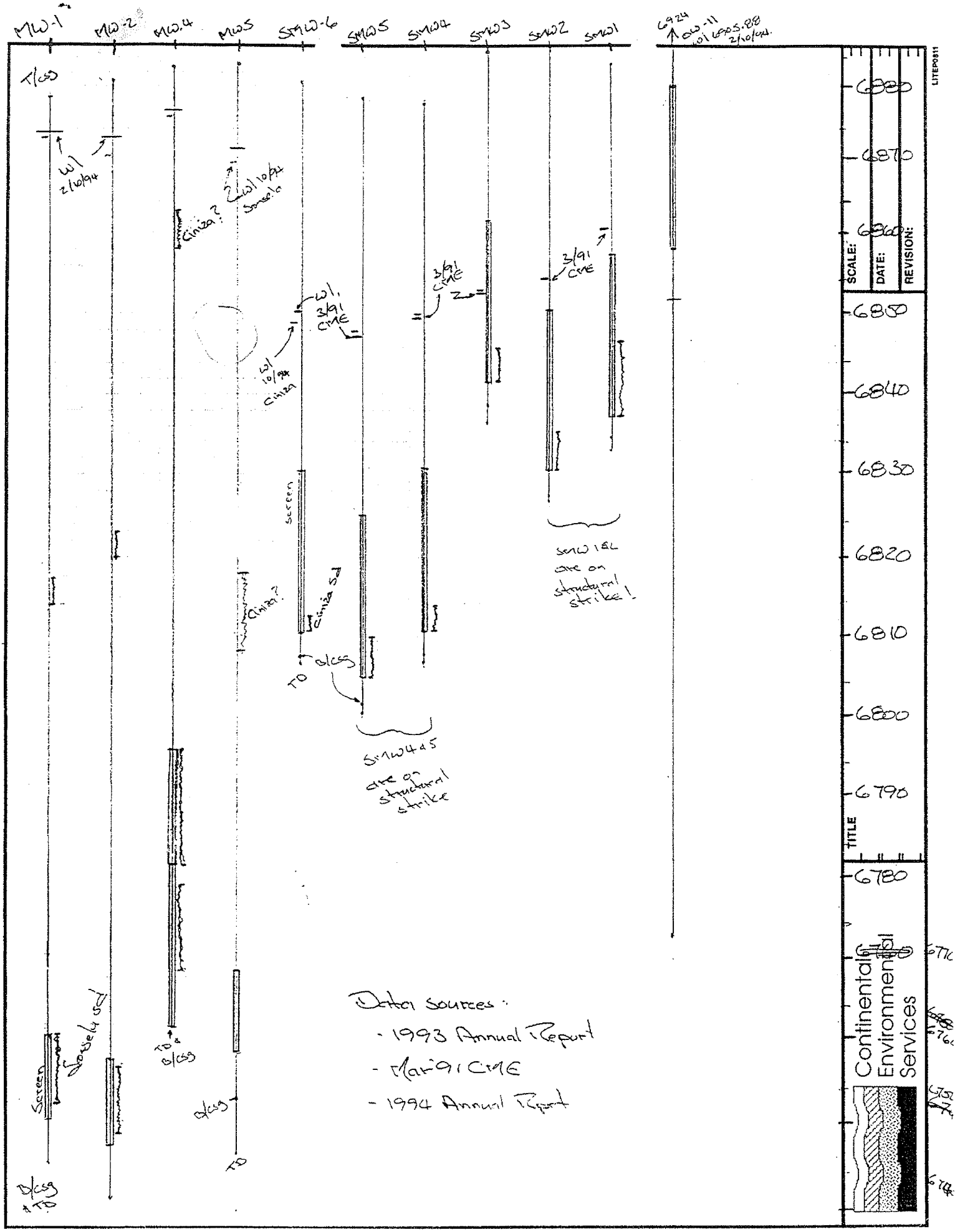
MONITORING WELL IDENTIFICATION REPORT

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

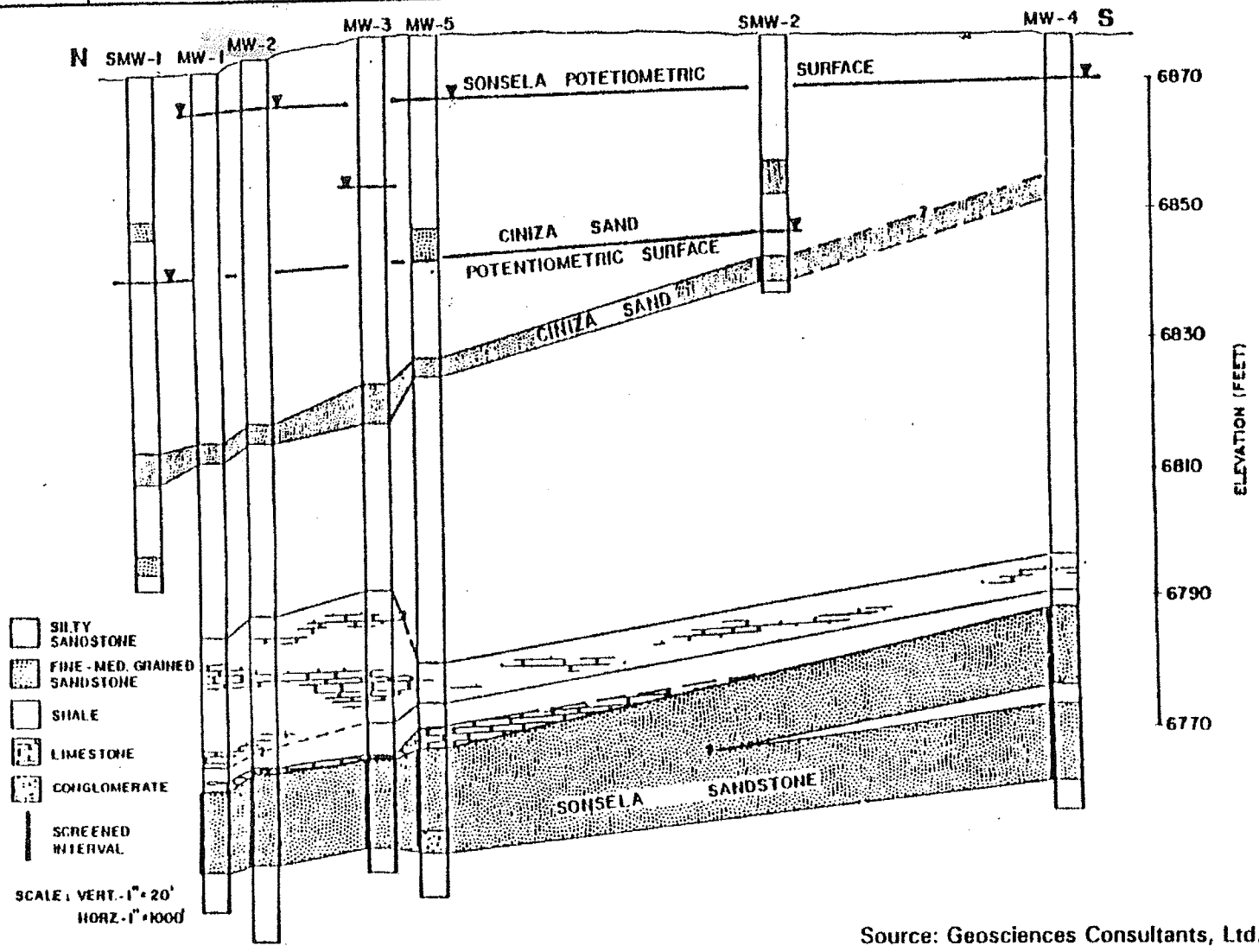
SIGNATURE Dorinda Mancini
NAME (TYPED) Dorinda Mancini



Data sources:

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

CHECKED BY | APPROVED BY | DRAWN BY EMH | DATE 12/22/92 | FILE NAME



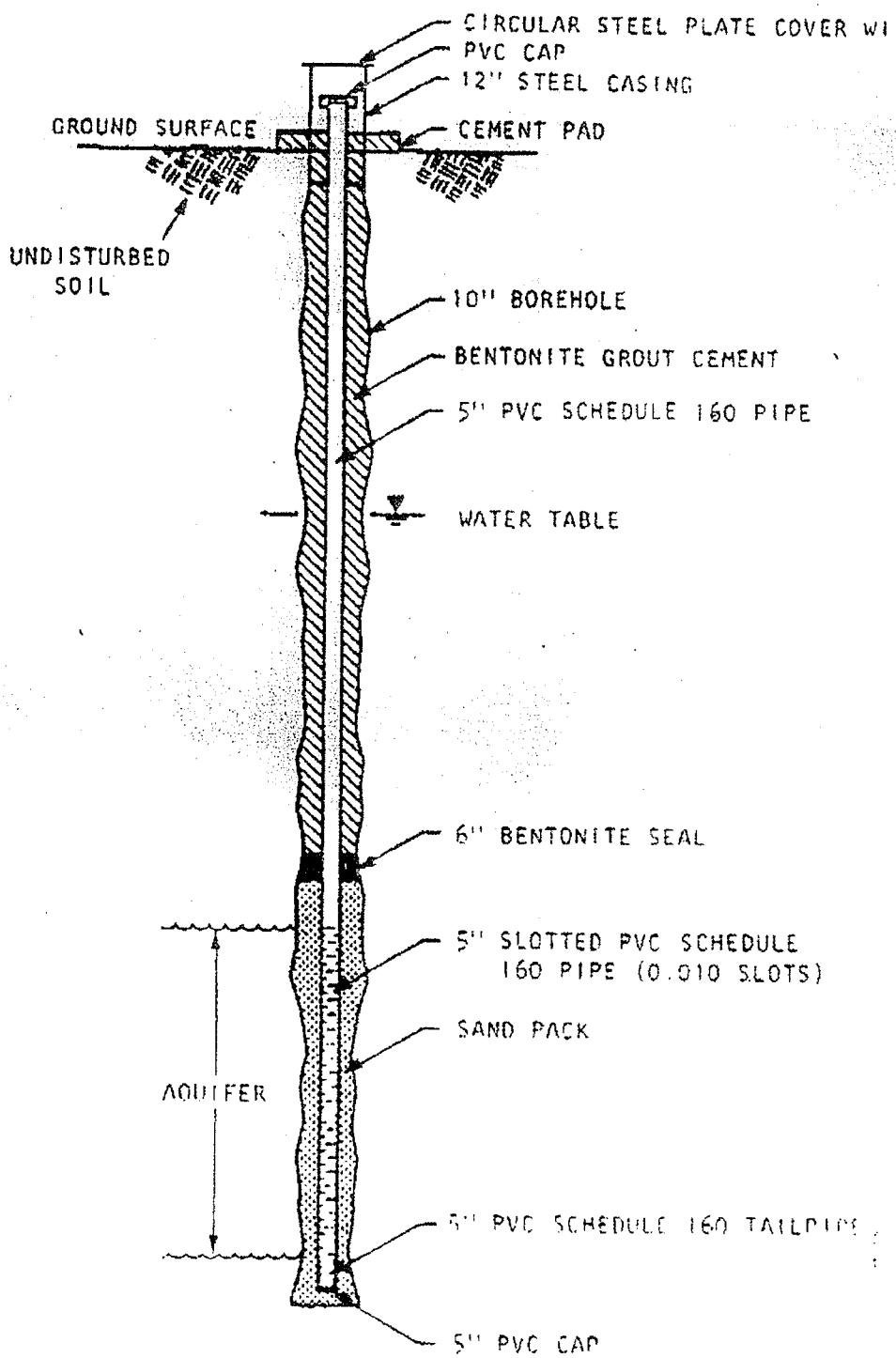
Source: Geosciences Consultants, Ltd. 1986

SEC DONOHUE
Environment & Infrastructure

FIGURE 3
GEOLOGIC CROSS SECTION

CINIZA REFINERY

GIANT REFINING COMPANY
GALLUP, NEW MEXICO



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.

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-4

SURFACE ELEVATION: 6883 FEET
(Unsurveyed)

LABORATORY TEST DATA

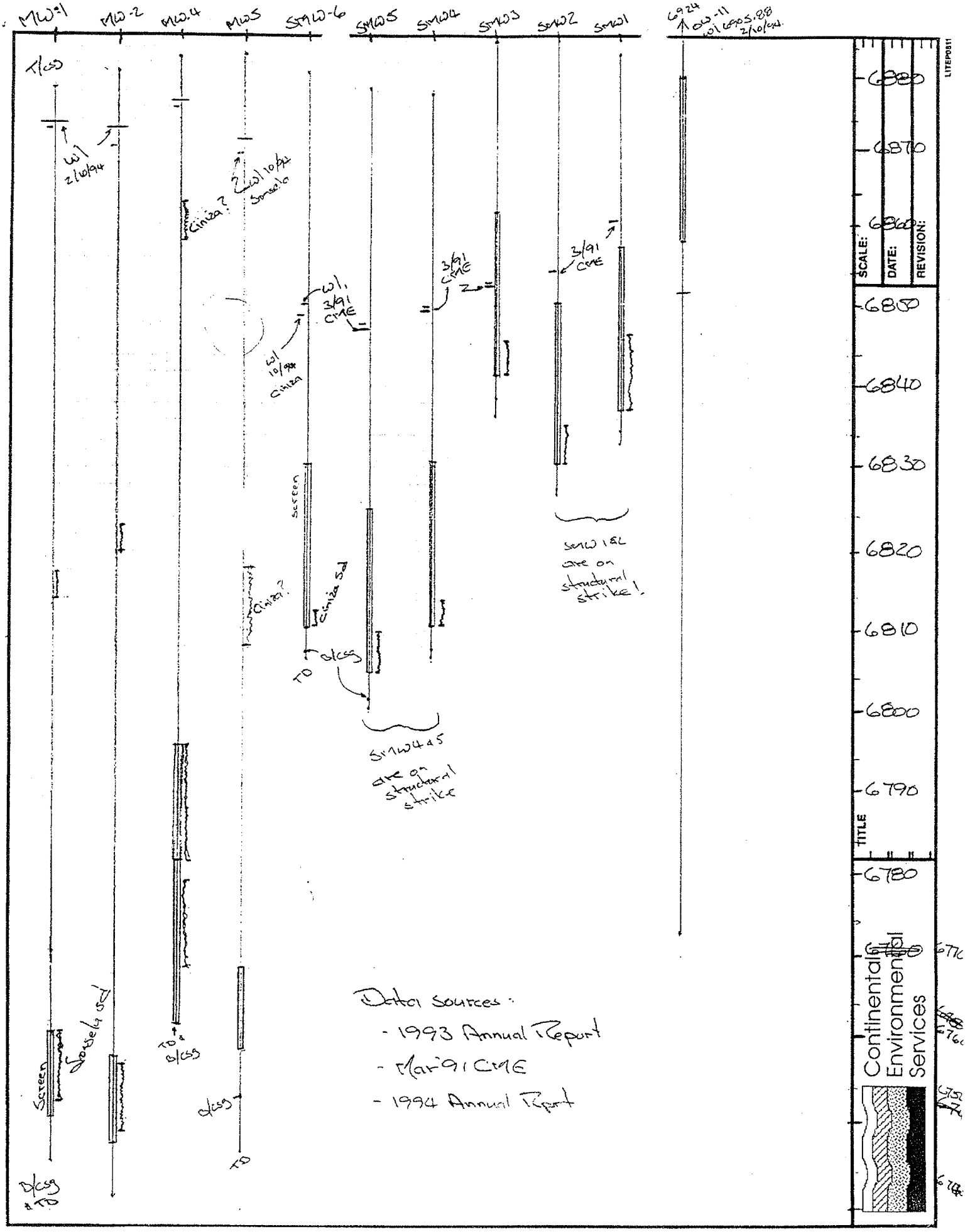
DEPTH IN FEET	TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	MOISTURE CONTENT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

SYMBOLS	DESCRIPTION
CL	REDDISH-BROWN SILTY CLAY, LOOSE
CL	REDDISH-BROWN CLAY, FIRM WATER LEVEL 8.7 FEET B.G. 10/18/81 GRADES SILTY AND SANDY (COARSE) 20-25 FEET
SH	VARIEGATED REDDISH-BROWN, GREEN AND LIGHT PURPLE SILTY SHALE GRADES REDDISH-BROWN TO RED-ORANGE, 65-70 FEET
SH/LS	VARIEGATED LIGHT GREEN TO DARK RED SHALE AND THIN LIMESTONE BED
SH	REDDISH-ORANGE, SLIGHTLY SANDY SHALE
SS	WHITE TO LIGHT GRAY, CLAYEY SANDSTONE
SH	PURPLE SANDY SHALE
SS	WHITE TO LIGHT GRAY SANDSTONE, HARD
SH	PURPLE SHALE WITH THIN LENSES OF CLAYEY SAND

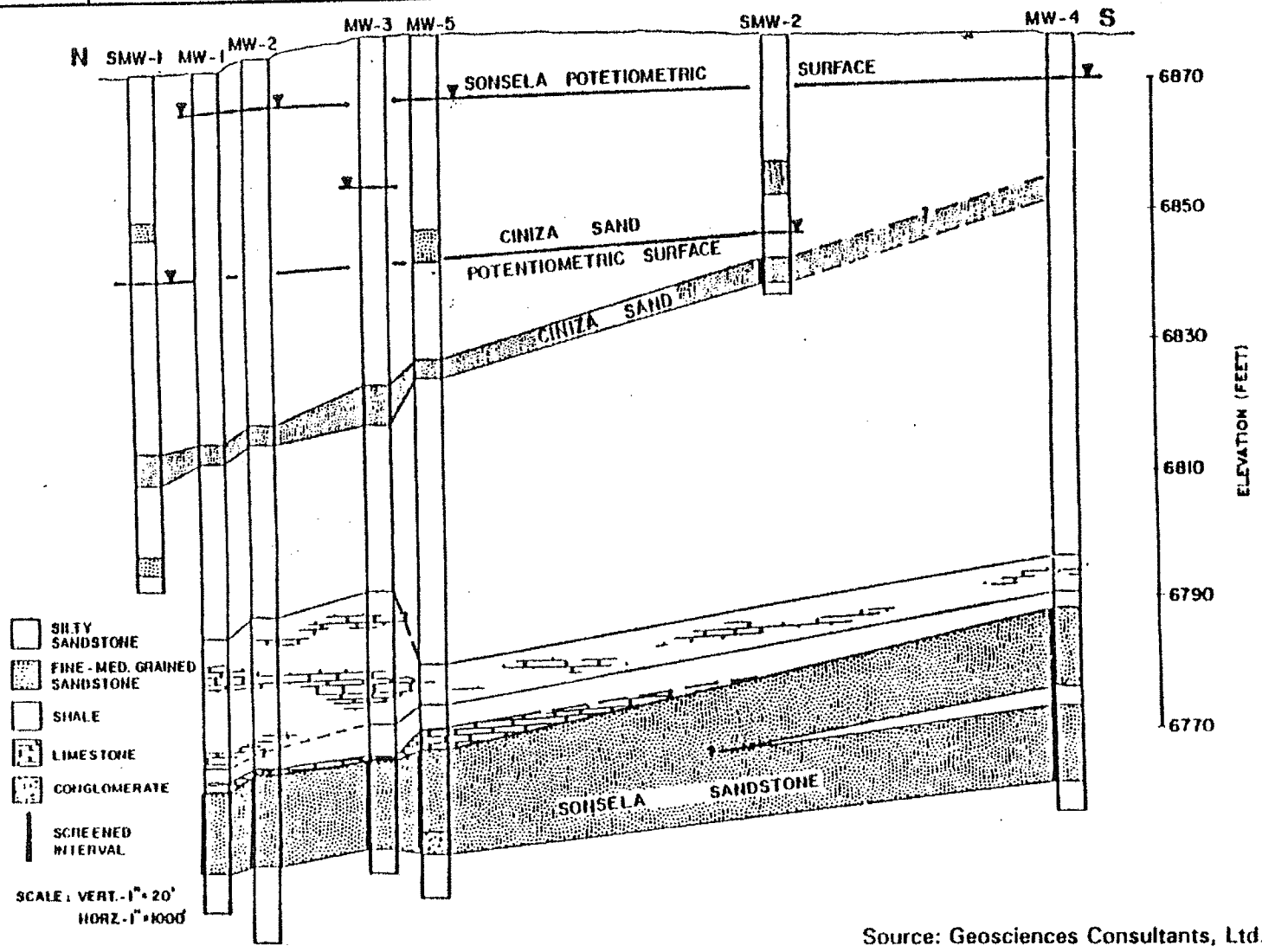
BORING COMPLETED AT 120.0 FEET ON 10/16/81.

SCREENED INTERVAL

DAMES & MOORE


MW-1
MW-2
MW-4
MW-5
SMW-6
SMW-5
SMW-4
SMW-3
SMW-2
SMW-1
6924
MW-11
w/ 6905.88
2/10/94
T/CSG
w/ 2/10/94
Cinza?
w/ 10/94 Sonsela
3/91 CME
w/ 3/91 CME
w/ 10/94 Cinza
Screen
Cinza sd
TD
B/CSG
SMW 1&2 are on structural strike!
SMW 4&5 are on structural strike
Sonsela sd
Screen
B/CSG
TD
Data Sources:
- 1993 Annual Report
- Mar 91 CME
- 1994 Annual Report
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
SCALE:
DATE:
REVISION:
TITLE
Continental Environmental Services
LITEP0811

CHECKED BY | APPROVED BY | DRAWN BY EMH | DATE 12/22/92 | FILE NAME



Source: Geosciences Consultants, Ltd. 1986

SEC DONOHUE
Environment & Infrastructure

FIGURE 3
GEOLOGIC CROSS SECTION

CINIZA REFINERY
GIANT REFINING COMPANY
GALLUP, NEW MEXICO

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.

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-5
WELL LOCATION (LONGITUDE)	108 25' 57"
WELL LOCATION (LATITUDE)	35 29' 43"
NEW MEXICO STATE PLANE	(X) 321,233.03 (Y) 1,636,212.58
AQUIFER NAME	Sonsela
AQUIFER CONFINED?	UNCONFINED?
WELL INSTALLATION DATE	7-21-86
DRILLING METHOD	HLWAG & AIRRT
INNER CASING DIAMETER	5.0"
BOREHOLE DIAMETER	10.0"
CASING MATERIAL	PVC
METHOD OF DEVELOPMENT	Compr
ELEV. BOTTOM OF BOREHOLE	6746.80
ELEV. BOTTOM OF WELL CASING	6753.30
ELEV. BOTTOM OF SCREENED INT.	6758.30
ELEVATION OF SCREENED INTERVAL	6768.80
SURVEYED ELEVATION OF CASING TOP	6883.32

DATE OF REPORT 2-26-96

SIGNATURE Dorinda Mancini
NAME (TYPED) Dorinda Mancini

GCL

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 6540.5 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	
30			7	28.5	30.0	30.0-31.5	
			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
40			12	36.0	37.5	37.5-39.0	
			13	37.5	40.0	40.0-41.5	
			14	40.0	42.5	42.5-44.0	
45							

GCL

WELL LOGGING R...

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 R

Client Giant — Well Number MW-5

___1/4___1/4___1/4___1/4 S___T___R___ State New Mexico

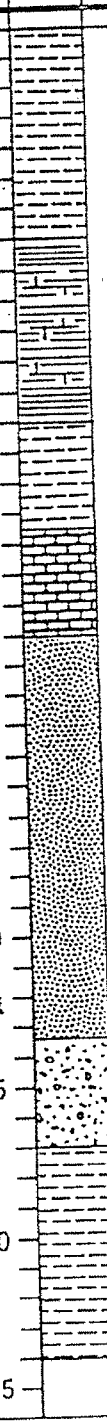
County ___ — Contractor Stewart Bros

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

Logs Run Lithology — Logged By Selke

Elevation 6887.8 — Spud In (Fm.) Chinle Formation

Remarks NOC

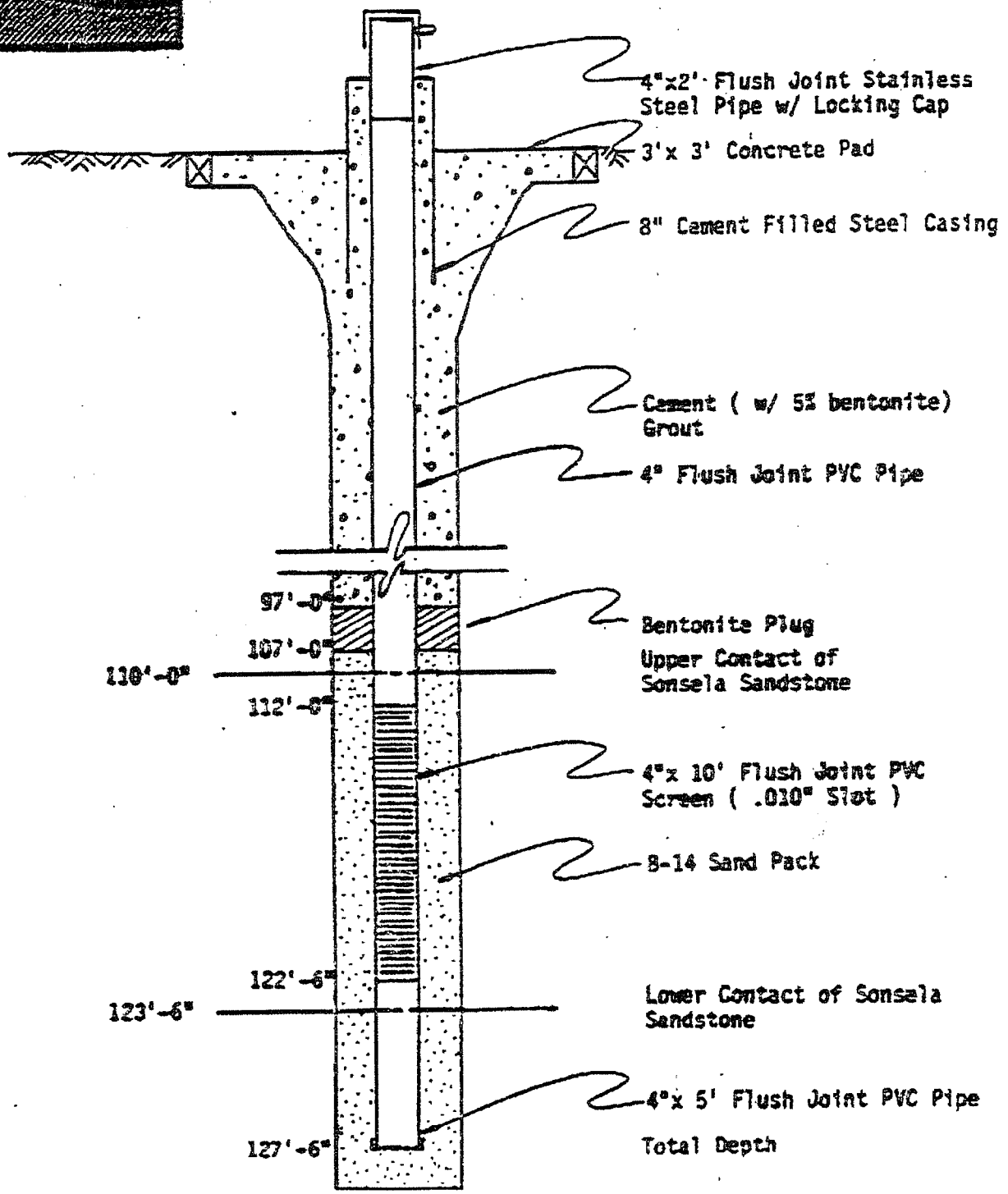


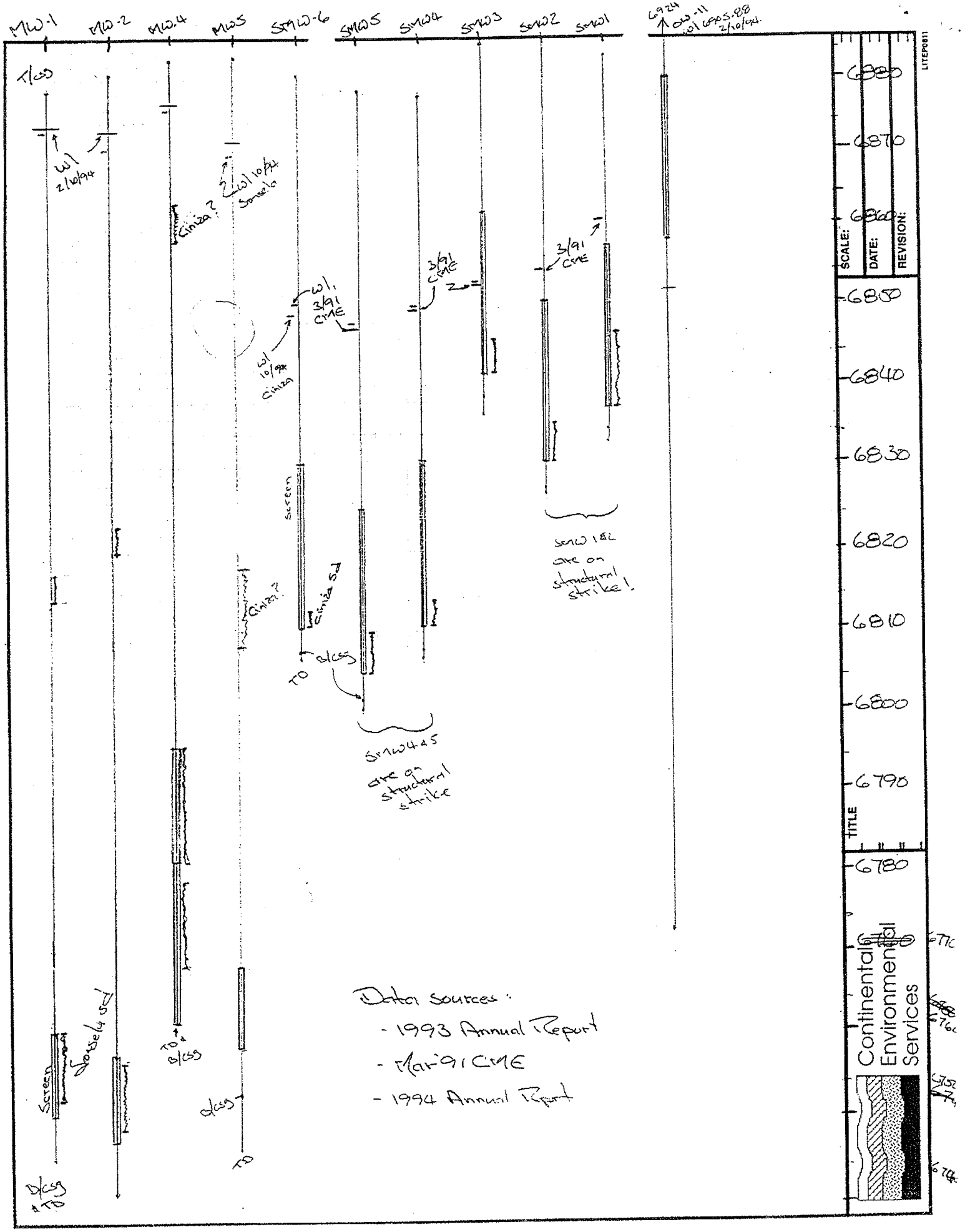
RUN	FROM	TO	SAMPLE DEPTH	REMARKS
25	97	107	97-107	97-103 Reddish shale w/limestone stringers
				103-106.5 red shale/clay
25	107	117	107-117	106.5-110 reddish colored limestone w/greenish white blebs
				110-123.5 grayish to reddish (?) colored, fine to medium grained, subrounded to rounded, moderately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

GCL

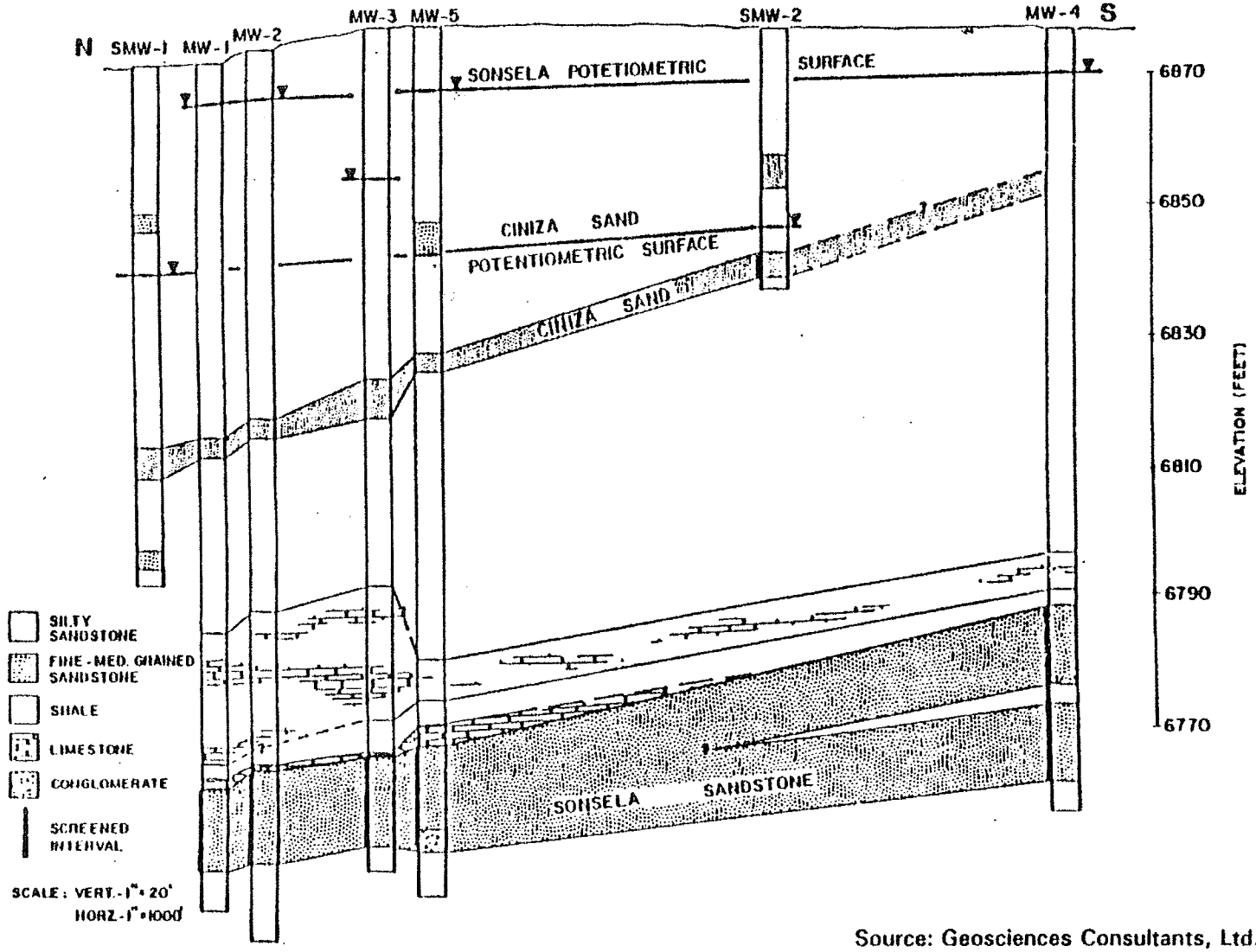
COMPLETION DIAGRAM

MW-5




MW-1
MW-2
MW-4
MW-5
SMW-6
SMW-5
SMW-4
SMW-3
SMW-2
SMW-1
6924
MW-11
6885.88
2/10/94
T/CSG
w/ 2/10/94
Cinza?
w/ 10/94 Sonsela
w/ 10/94 Cinza
w/ 3/91 CME
3/91 CME
Screen
Cinza Sd
B/CSG
TD
SMW 1&2 are on structural strike!
SMW 4&5 are on structural strike
Sonsela Sd
Data sources:
- 1993 Annual Report
- Mar 91 CME
- 1994 Annual Report
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
SCALE:
DATE:
REVISION:
TITLE
Continental Environmental Services
LITEP0811

CHECKED BY | APPROVED BY



Source: Geosciences Consultants, Ltd. 1986

SEC DONOHUE
Environment & Infrastructure

FIGURE 3
GEOLOGIC CROSS SECTION

CINIZA REFINERY

GIANT REFINING COMPANY
GALLUP, NEW MEXICO

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.

6

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-5
WELL LOCATION (LONGITUDE)	108 25' 57"
WELL LOCATION (LATITUDE)	35 29' 43"
NEW MEXICO STATE PLANE	(X) 321,233.03 (Y) 1,636,212.58
AQUIFER NAME	Sonsela
AQUIFER CONFINED?	UNCONFINED?
WELL INSTALLATION DATE	7-21-86
DRILLING METHOD	HLWAG & AIRRT
INNER CASING DIAMETER	5.0"
BOREHOLE DIAMETER	10.0"
CASING MATERIAL	PVC

7

METHOD OF DEVELOPMENT	Compr
ELEV. BOTTOM OF BOREHOLE	6746.80
ELEV. BOTTOM OF WELL CASING	6753.30
ELEV. BOTTOM OF SCREENED INT.	6758.30
ELEVATION OF SCREENED INTERVAL	6768.80
SURVEYED ELEVATION OF CASING TOP	6883.32

DATE OF REPORT 1-27-95

SIGNATURE
NAME (TYPED) Lynn Shelton

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

MONITORING WELL IDENTIFICATION REPORT

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Giant Refining Company

EPA I.D. NUMBER NMD000333211-2

COUNTY McKinley

WELL NUMBER SMW-2

WELL LOCATION (LONGITUDE) ° ' "

WELL LOCATION (LATITUDE) ° ' "

AQUIFER NAME Ciniza Sand

AQUIFER CONFINED X UNCONFINED

WELL INSTALLATION DATE 9-26-85

DRILLING METHOD HLWAG

INNER CASING DIAMETER 2.0"

BOREHOLE DIAMETER 6.5"

CASING MATERIAL SS304

METHOD OF DEVELOPMENT COMPR

ELEV BOTTOM OF BOREHOLE 6826.73

ELEV BOTTOM OF WELL CASING 6827.13

ELEV BOTTOM OF SCREENED INT 6830.13

ELEVATION OF SCREENED INT 6850.13

SURVEYED ELEV OF CASING TOP 6881.73

DATE OF REPORT Jan. 28, 1991 SIGNATURE Claud C. Rosendale

NAME (TYPED) Claud C. Rosendale

b:wellid/bas

MONITORING WELL IDENTIFICATION REPORT

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DRIVE/HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME GIANT REFINING COMPANY

EPA I.D. NUMBER NMD000333211-2

COUNTY McKinley

WELL NUMBER SMW-2

WELL LOCATION (LONGITUDE) _____

WELL LOCATION (LATITUDE) _____

NEW MEXICO STATE PLANE (X) 321,542.80

(Y) 1.635,592.65

AQUIFER NAME Ciniza Sand

AQUIFER CONFINED X UNCONFINED _____

WELL INSTALLATION DATE 9-26-85

DRILLING METHOD HLWAG

INNER CASING DIAMETER 2.0"

BOREHOLE DIAMETER 6.5"

CASING MATERIAL SS304

METHOD OF DEVELOPMENT COMPR

ELEV BOTTOM OF BOREHOLE 6826.73

ELEV BOTTOM OF WELL CASING 6827.13

ELEV BOTTOM OF SCREENED INT 6830.13

ELEVATION OF SCREENED INT 6850.13

SURVEYED ELEV OF CASING TOP 6884.44

DATE OF REPORT 11-1-91. SIGNATURE [illegible]

NAME (TYPED) [illegible]

Geoscience Consultants, Ltd

WELL LOGGING FORM

Page ____ of ____

Client GIANT REFINING COMPANY Well Number SMX-2

___ ¼ ___ ¼ ___ ¼ ___ ¼ S ___ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 9-26-85 Completion Date

Logs Run Lith from Cores Logged By J.C. Hunter

Elevation 6883 Spud In (Fm.) Chinle

Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

Depth | Litho | Recov

RUN	From	To	Sample#/Ft	Lith/Remarks
				~ 81' NLGE FROM MW-4
			850926	
1	0	5	1015/2.5 1016/5.0	0-2.5' soil light-brn silty
2	5	10	1018/7.5 1019/10.0	calcification ~100'c into silty clay
3	10	15	1023/12.5 1024/15.0	2.5'-9.0' clay red slightly moist very cohesive
4	15	20	1050/17.5 1051/20.0	9.0'-9.1 sand buff fine-med gr unconsolidated
5	20	25	1059/22.5 1100/25.0	dry 9.1 - ~17.0' CLAY; red, slightly moist, plastic
6	25	30	1112/27.5 1113/30.0	~17.0'-23.0' SAND (WET) fg-med gr
				23'-30' CLAY: red, slightly moist, plastic
				WATER LEVEL 15'-7" 1150

Sand ~17' [illegible] 17-23'

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Page ____ of ____

Client GIANT REFINING COMPANY Well Number SMW-2

___ ¼ ___ ¼ ___ ¼ ___ ¼ S ___ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

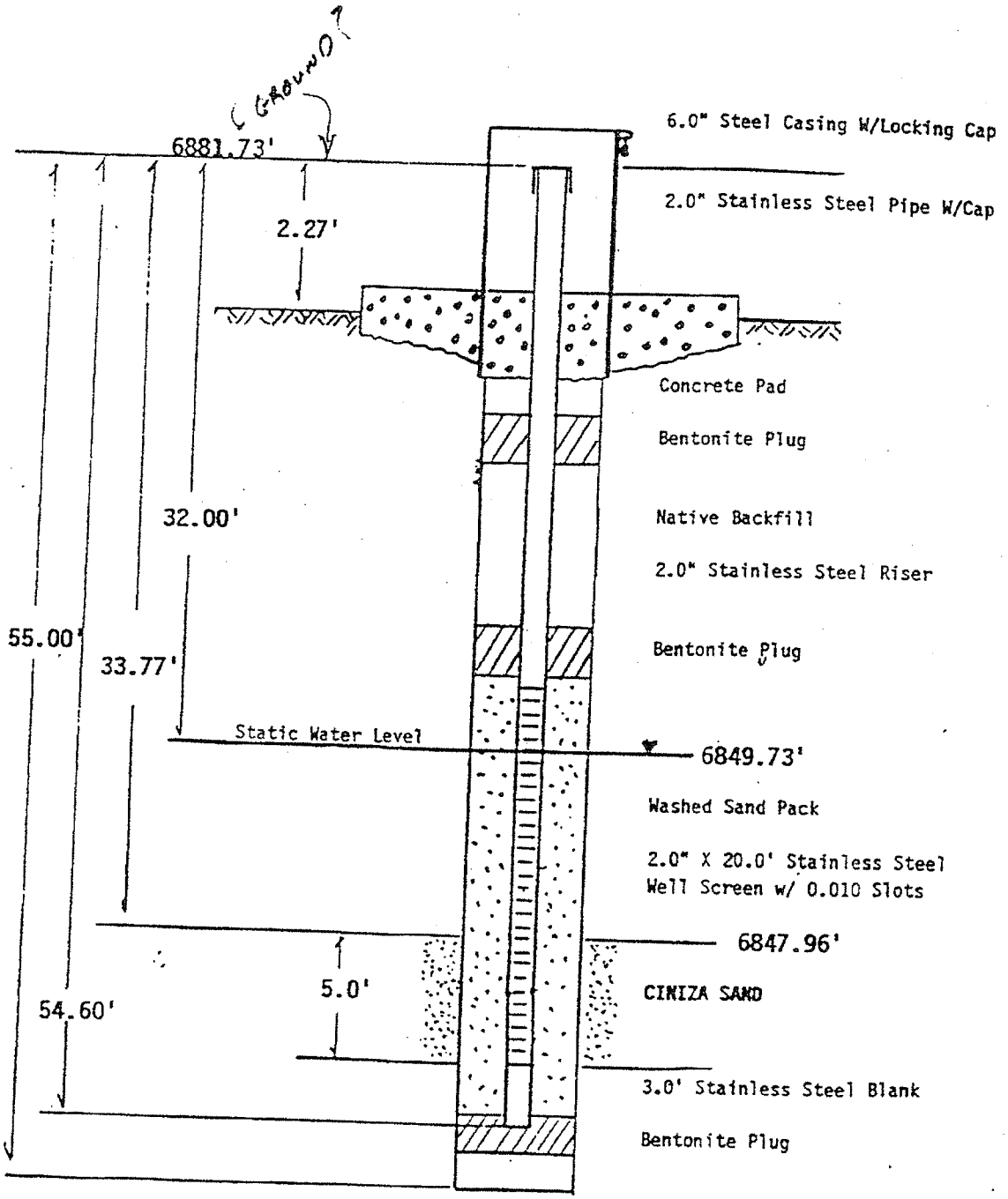
Spud Date 9/26/95 Completion Date

Logs Run Lith from Cores Logged By J.C. Hunter

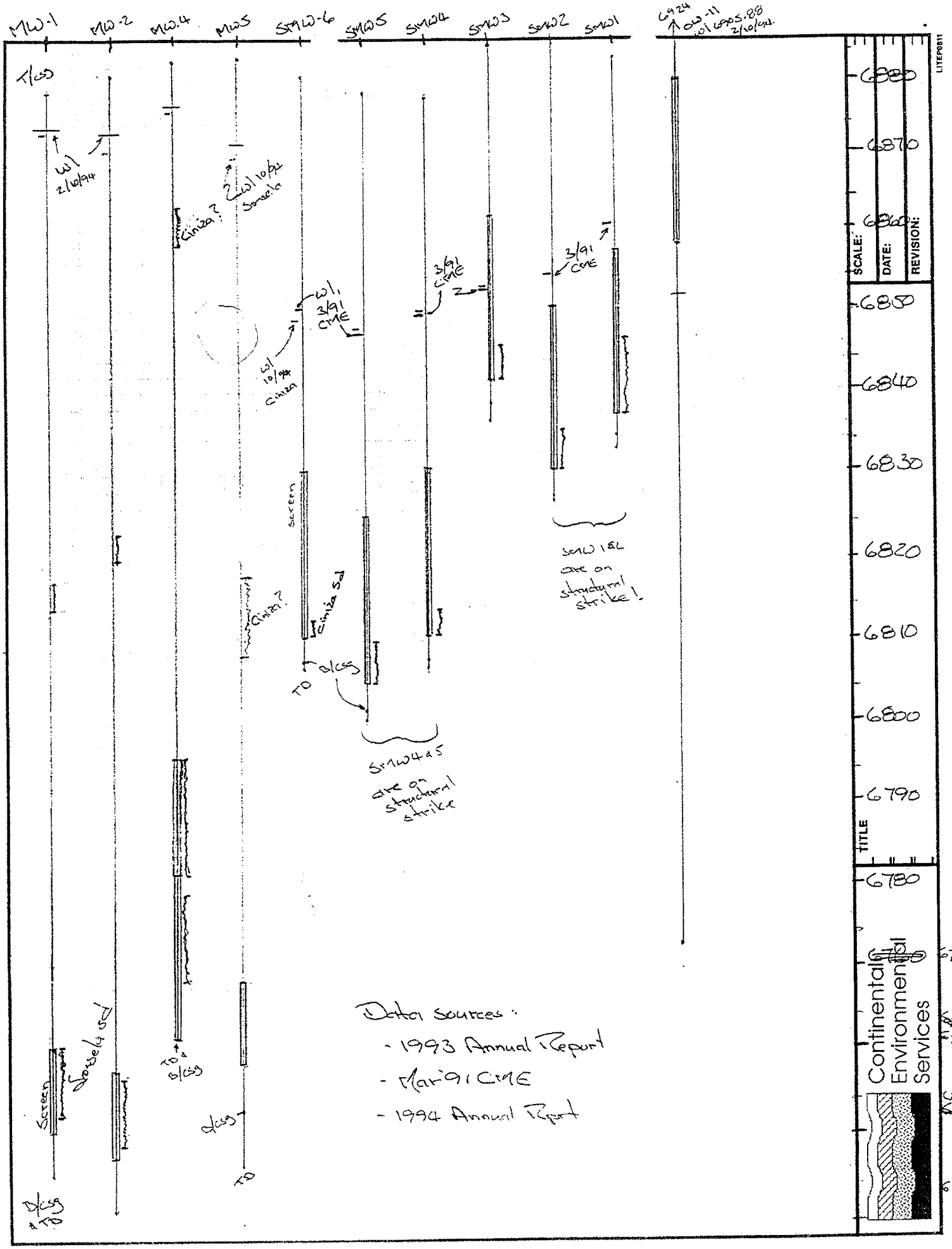
Elevation 6882.83 Spud In (Fm.) Chinle

Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

Depth	Litho	Recov	RUN	From	To	Sample#/Ft	Lith/Remarks
							SE corner of LTA Times should be 15xx, not 14xx etc
						850925	
0			ϕ	0	5	1415/4.0 SDY CLY	0-1.5 SOIL
5			2	5	10	1420/10.0 CLY SD	
10			3	10	15	1426/15' CLY	1.5-4.0 CLAY
15			4	15	20	1432/20' SD	
20			5	20	25	1438/25' CLY	4.0-19.0 SANDY CLAY
25			6	25	30	1445/27.5 SD; 1446/30.0 CLY SD	
30			7	30	35	1452/32.5 CLY; 1453 35.0 SD	19.0-24 SAND; gr rd (5R4/2); med gr, poor sort, qtz & lith cn frac
35			8	35	40	1458/37.5; 1459/40.0	
							24-25 CLAY
							25-28 SAND, as above
							28-32 CLAYEY SAND & CLAY
						5'	32-38 SAND (WET) mod rd brn (10R4/2) med gr, mod sort, qtz, rnd
							38-40 CLAY
							9/26/95 H_2O level 29'7" 9:40
							N 120° to SMW2
							pH 7.1 #850926 1445



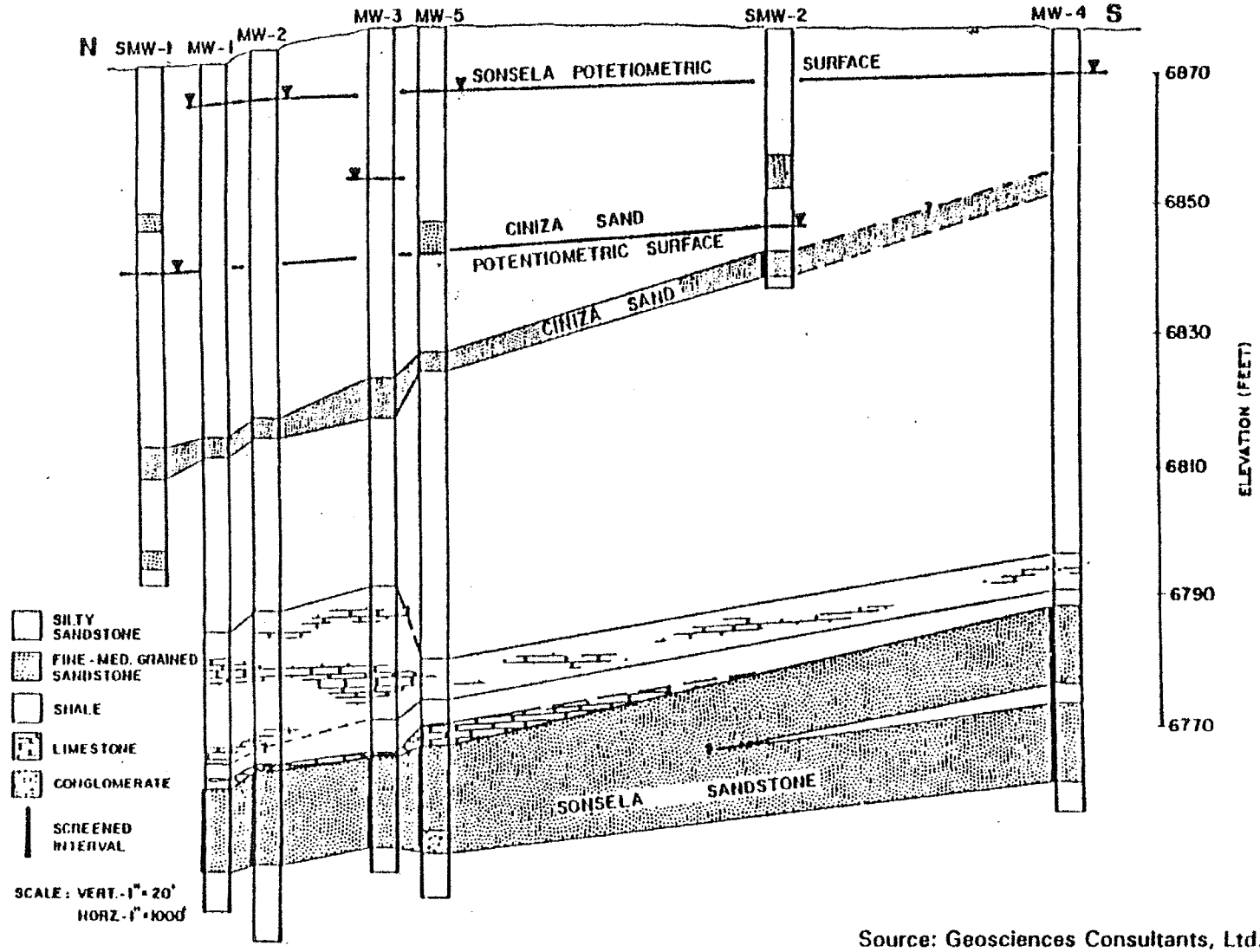
COMPLETION DIAGRAM FOR WELL SMW-2



Data sources:

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

CHECKED BY | APPROVED BY | DRAWN BY | DATE



Source: Geosciences Consultants, Ltd. 1986

SEC DONOHUE
Environment & Infrastructure

FIGURE 3
GEOLOGIC CROSS SECTION

CINIZA REFINERY

GIANT REFINING COMPANY
GALLUP, NEW MEXICO

MONITORING WELL IDENTIFICATIOI .EPORT

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DRIVE/HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME	GIANT REFINING COMPANY
EPA I.D. NUMBER	NMD000333211-2
COUNTY	McKinley
WELL NUMBER	SMW-3
WELL LOCATION (LONGITUDE)	108° 25' 56"
WELL LOCATION (LATITUDE)	35° 29' 40"
NEW MEXICO STATE PLANE (X)	321,397.90
(Y)	1,635,948.75
AQUIFER NAME	Ciniza Sand
AQUIFER CONFINED	X UNCONFINED
WELL INSTALLATION DATE	10-1-85
DRILLING METHOD	HLWAG
INNER CASING DIAMETER	2.0"
BOREHOLE DIAMETER	6.5"
CASING MATERIAL	SS304
METHOD OF DEVELOPMENT	COMPR
ELEV BOTTOM OF BOREHOLE	6836.15
ELEV BOTTOM OF WELL CASING	6838.65
ELEV BOTTOM OF SCREENED INT	6841.65
ELEVATION OF SCREENED INT	6861.65
SURVEYED ELEV OF CASING TOP	6884.56

DATE OF REPORT 11-1-91

SIGNATURE [illegible]

NAME (TYPED) [illegible]

MONITORING WELL IDENTIFICATION REPORT

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Giant Refning Company

EPA I.D. NUMBER NMD000333211-2

COUNTY McKinley

WELL NUMBER SMW-3

WELL LOCATION (LONGITUDE) 108° 25' 56"

WELL LOCATION (LATITUDE) 35° 29' 40"

AQUIFER NAME Ciniza Sand

AQUIFER CONFINED X UNCONFINED

WELL INSTALLATION DATE 10-1-85

DRILLING METHOD HLWAG

INNER CASING DIAMETER 2.0"

BOREHOLE DIAMETER 6.5"

CASING MATERIAL SS304

METHOD OF DEVELOPMENT COMPR

ELEV BOTTOM OF BOREHOLE 6836.15

ELEV BOTTOM OF WELL CASING 6838.65

ELEV BOTTOM OF SCREENED INT 6841.65

ELEVATION OF SCREENED INT 6861.65

SURVEYED ELEV OF CASING TOP 6882.15

DATE OF REPORT Jan. 28, 1991 SIGNATURE Claud C. Rosendale

NAME (TYPED) Claud C. Rosendale

b:wellid/bas

Geoscience Consultants, Ltd.

WELL LOGGING FORM

SMW-3

Page 1 of 1

Client GIANT REFINING COMPANY Well Number SMW-3

___ ¼ ___ ¼ ___ ¼ ___ ¼ S ___ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 10/1/85 Completion Date 10/1/85

Logs Run Lith from Cores Logged By J.C. Hunter

Elevation 6883.25 Spud In (Fm.) Chinle

Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

Depth | Litho | Recov

RUN	From	To	Sample#/Ft	Lith/Remarks
				Upgradient well, SE side of ATA
			851001:	Meas from top of auger (A.T.)
TIME 0850	0			
1	0	5	0855/4.0'	0-3 SOIL gry rd (10R 4/2) cly loam, roots
2	5	10	0845/10.0	
3	10	15	0852/15.0	3-11 CLAY dk rd brn (10R 3/4) plastic,
4	15	20	0859/20.0	≤5% silt
5	20	25	0906/25.0	11-17 SANDY CLAY gry rd (5R 4/2), 10-20%
6	25	30	0914/30.0	vfg sand & silt
7	30	35	0921/35.0 SS	wet sd @ 33 B.A.T.OP
8	35	40	0935/40.0	17-25 SAND; gry rd (5R 4/2); vc-vfg,
9				poor sort, subang, Q+F±Lv
10				25-27 CLAY; dk rd brn (10R 3/4); ≤2% silt
				27-30 SAND; pale rd brn; vfg, subrnd, mod sort
				Q+F±Lv
				23' Screen + 41' pipe = 44'
				dr to 42' for 2' stickup
				TD @ 42'
				Pipe in hole = 43½' below top of
				casing (2.6' stick up)
				Bottom screen @ 41'
				30-33 CLAY; pale rd brn (10R 5/4); ≤10% silt
			4'	31.5 33-37 SAND (wet); mod rd brn (10R 4/6) vfg, v sort,

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WELL LOGGING FORM

Page ____ of ____

Client GIANT REFINING COMPANY Well Number SMY-3

___ ¼ ___ ¼ ___ ¼ ___ ¼ S ___ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 9-26-85 Completion Date ____

Logs Run Lith from Cores Logged By J.C. Hunter

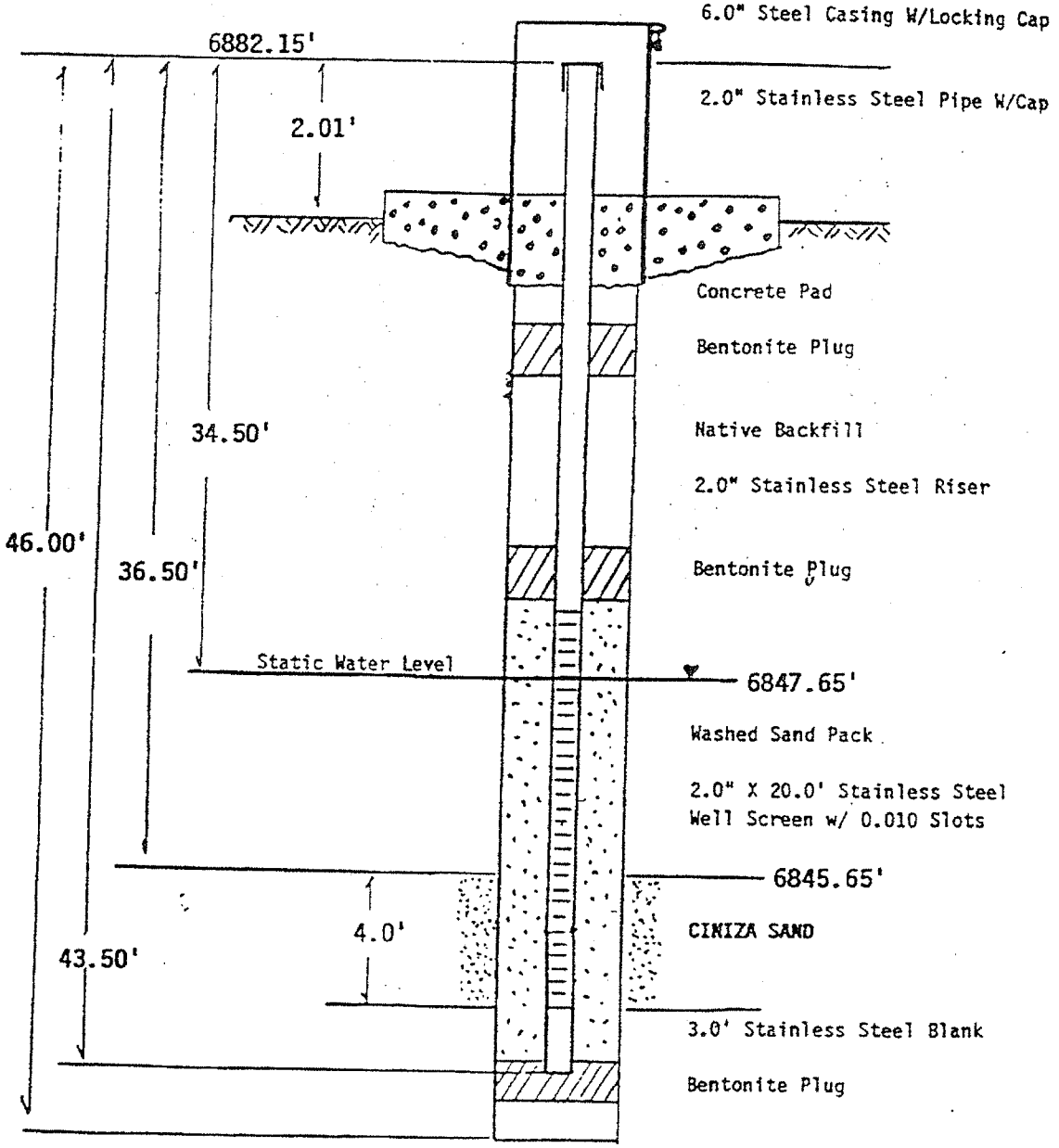
Elevation ____ Spud In (Fm.) Chinle

Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

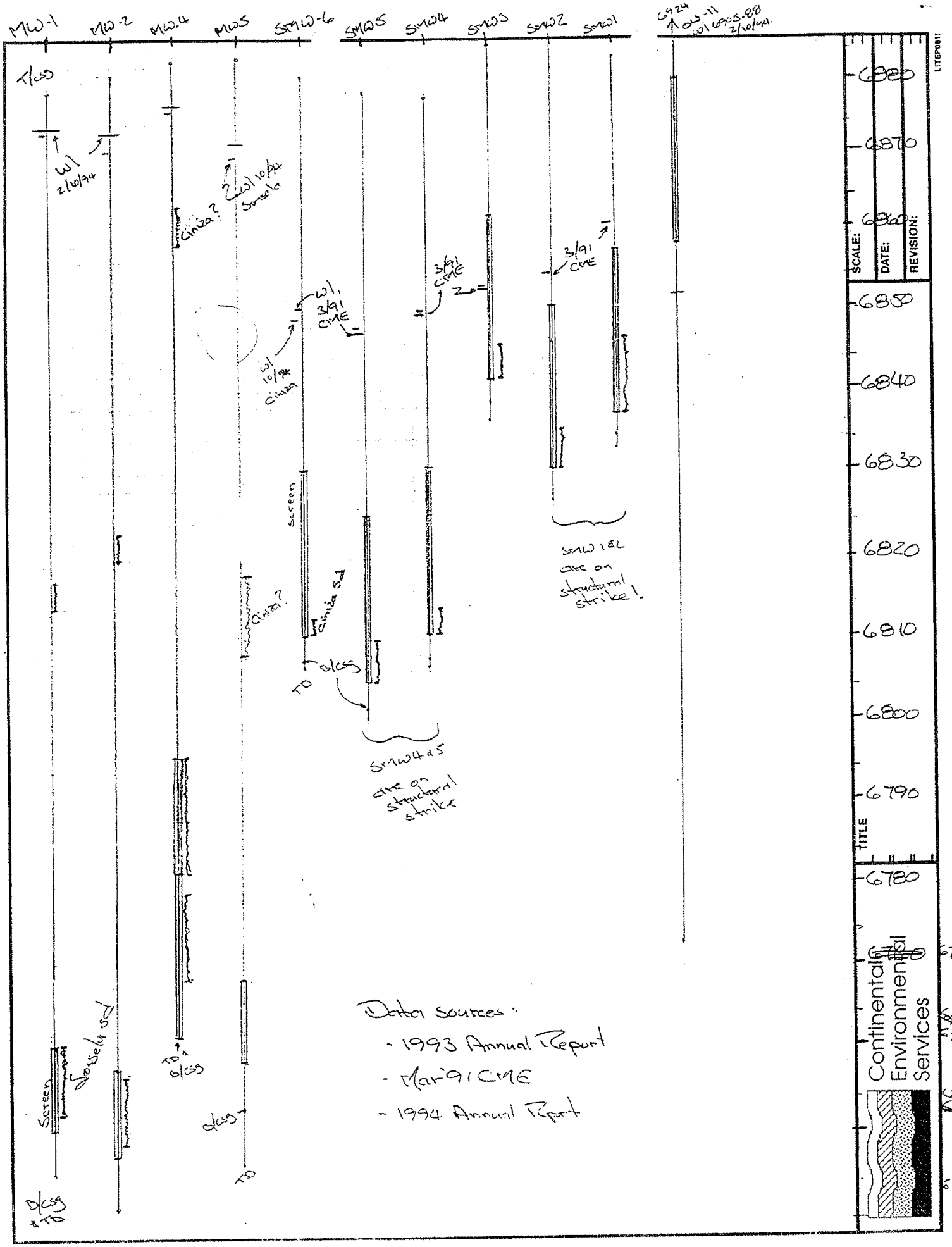
Depth | Litho | Recov

RUN	From	To	Sample#/Ft	Lith/Remarks
			850926 1214/0.0	
1	0	5	1215/2.5 1216/5.0	0-4.5' Soil; brn, clayey, sandy soil
2	5	10	1218/7.5 1219/10.0	4.5-~~30~~ 28.0 RED CLAY; s dry to slightly moist, local reduction nodules
3	10	15	1221/12.5 1222/15.0	
4	15	20	17.5 20.0	28.0-30+ RED SILTY CLAY, as above but ~~to~~ more dry
5	20	25	1234/22.5 1235/25.0	
6	25	30	27.5 30.0	

0 5 10 15 20 25 30



COMPLETION DIAGRAM FOR WELL SMW-3


MW-1
MW-2
MW-4
MW-5
SMW-6
SMW-5
SMW-4
SMW-3
SMW-2
SMW-1
6924
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
SCALE:
DATE:
REVISION:
TITLE
Continental Environmental Services
Data Sources:
- 1993 Annual Report
- Mar 91 CME
- 1994 Annual Report
SMW 1&2 are on structural strike!
SMW 4 & 5 are on structural strike
Screen
TD
d/cs

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-4
WELL LOCATION (LONGITUDE)	108 26' 01"
WELL LOCATION (LATITUDE)	35 29' 44"
NEW MEXICO STATE PLANE	(X) 321,397.90 (Y) 1,635,948.75
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	6806.74
ELEV. BOTTOM OF WELL CASING	6807.84
ELEV. BOTTOM OF SCREENED INT.	6810.84
ELEVATION OF SCREENED INTERVAL	6830.84
SURVEYED ELEVATION OF CASING TOP	6880.08

DATE OF REPORT 2-22-96

SIGNATURE Dorinda Mancini
NAME (TYPED) Dorinda Mancini

Consultants, Ltd.

Page SMW-4 of

Client GIANT REFINING COMPANY Well Number SMW-4

___ ¼ ___ ¼ ___ ¼ ___ ¼ S ___ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 9/25/85 Completion Date 9/25/85

Logs Run Lith from Cores Logged By J.C. Hunter

Elevation 6878.44 Spud In (Fm.) Chinle

Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

Depth | Litho | Recov

RUN	From	To	Sample#/Ft	Lith/Remarks
				Between MW1- & MW-2 Depths from top
				of auger, ~1.5' AGL (typical)
1	0	5	850925:a 0840/40	0-1.5' (1.5) SOIL; gry rd (10R 4/2); silty cly
2	5	10	0847 cl 110.8	w/ minor sd; roots & org matter
3	10	15	0852 cl 115'	1.5-9.0 (7.5') CLAY; gry rd (5R4/2) - dk rd
4	15	20	0859 cl 120'	brn (10R3/4); dense, plastic, 1-5% silt
5	20	25	0906 50 125'	9.0-16.0 (6.0') SANDY CLAY; gry rd (10R4/2)
6	25	30	0918/27.5 cl 0914/30.0 sat	- dsky rd (5R3/4); cly w/ 15-20% m
7	30	35	0917/32.5 cl 0920/35.0 cl	cly bolls @ 36') gr-cr gr sd, local f grvl, poor sort
8	35	40	0921/37.5 cl 0926/40.0 cl	
9	40	45	0936/42.5 cl 0937/45.0 cl	2nd cutting 44.5')
10	45	50	0960/47.5 sat cly 0951/50.0 cly	15.0-23.0 (7.0) CLAY; gry rd (5R4/2),
11	50	55	0954/52.5 sat cly 0955/55.0 cly	loc. sandy, 5-10% sd
12	55	60	850926:1215/57.5' cly 1214/60.0 sat	23.0-24.0 (1') SAND; pale rd brn (10R5/4) - m
14	60	65	1241/62.5 1242/65.0	rd brn (10R4/2); f g, mod srt, loose,
15	65	69	1250/67.5 1259/69.0	qtz ± K-spar
				24.0-33.0 (9.0) SILTY CLAY; mod rd (5R5/4)
				cly w/ 10-20% slt, loc f g sand
				33.0-~~55.0~~ 59 (26) CLAY; mod rd brn (10R4/
				loc silty-sandy
				57.5-59.5
				59-61 (2') Sand (wet) mod rd brn
				(10R4/6); f g, mod sort
				61-69 Silty Sandstone (dry) pale rd (10R6/2)
				loc [illegible]

TTR 0830

TD 1000

Move to 20

Continued 9/30/85 @ 1100

Geoscience Consultants, Ltd

WELL LOGGING FORM

Page ____ of ____

Client GIANT REFINING COMPANY Well Number SMY-4

___ ¼ ___ ¼ ___ ¼ ___ ¼ S ___ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 9-26-85 Completion Date

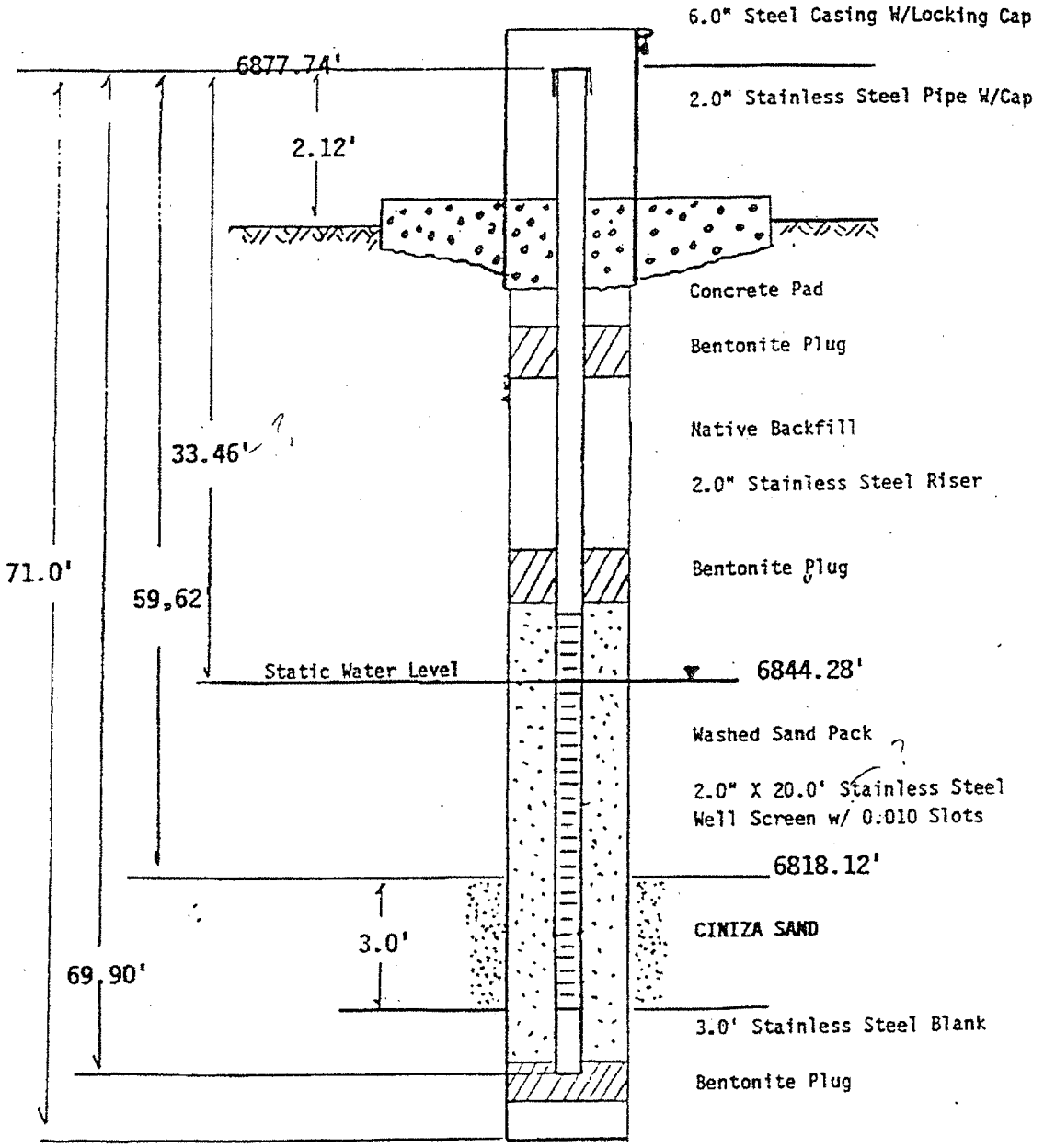
Logs Run Lith from Cores Logged By J.C. Hunter

Elevation ____ Spud In (Fm.) Chinle

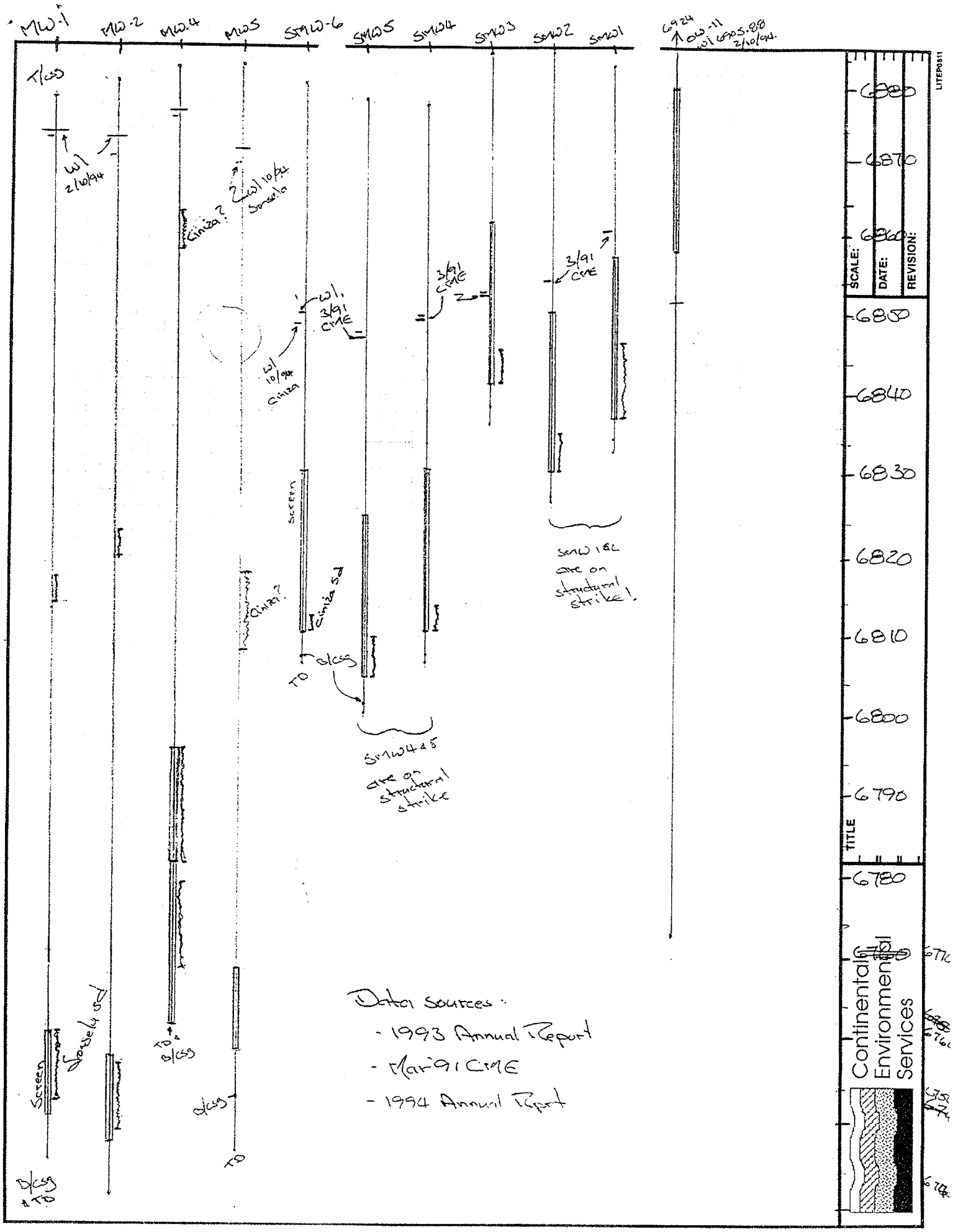
Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

Depth | Litho | Recov

RUN	From	To	Sample#/Ft	Lith/Remarks
			850926	
1	0	5	1325/0.0 1326/2.5 1327/5.0	0-10 shale/clay red slightly swint cohesive
2	5	10	1330/7.5 1331/10.0	
3	10	15	1335/12.5 1336/15.0	sand encountered at 10' dry coarse-fine gr low density 10-15
4	15	20	1345/17.5 1346/20.0	water level 15'5"
5	20	25	1354/22.5 1355/25.0	18-20 clayey sand (saturated) brn, fn-med gr w/ abundant clay
6	25	30	1402/27.5 1403/30.0	W.L. 26'-10 #850926 1+10
				20-24 sand; brn, fn gr (saturated) w/v. minor clay
				24-25 sandy clay; brn (saturated) w/ silt + fn sand
				25-27.5 sand; fn-med gr (saturated) v. minor clay
				27.5-29 sandy clay (moist) silt + fn sand
				29-30+ silty clay; (dry) reddish brn w/ greenish reduction nodules
				pH 7.4
				Conductance 4850



COMPLETION DIAGRAM FOR WELL SMW-4



Data sources:

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

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

Geoscience Consultants, Ltd.

WELL LOGGING FORM

Page ____ of ____

Client GIANT REFINING COMPANY Well Number SMX-5

___ ¼ ___ ¼ ___ ¼ ___ ¼ S ___ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 9-26-85 Completion Date ____

Logs Run Lith from Cores Logged By J.C. Hunter

Elevation ____ Spud In (Fm.) Chinle

Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

Depth | Litho | recov

RUN	From	To	Sample#/Ft	Lith/Remarks
1	0	5	1444/0.0 1445/2.5 1446/5.0	0-0.5 sand; lt brn, fx-med gr w/minor clay
2	5	10	1453/7.5 1454/10.0	0.5-20.0+ clay; reddish brn, slightly moist plastic clay w/ minor amount of reduction nodules increasing w/ depth
3	10	15	1500/12.5 1601/15.0	
4	15	20	1610/17.5 1611/20.0	

0 5 10 15 20 25 30

Geoscience Consultants, Ltd

WELL LOGGING FORM

Page SMW-5 of

Client GIANT REFINING COMPANY Well Number SMW-5

___ ¼ ___ ¼ ___ ¼ ___ ¼ S ___ T 15 N R 15 W State New Mexico

County McKinley Contractor Fox

Spud Date 9/25/85 Completion Date 9/25/85

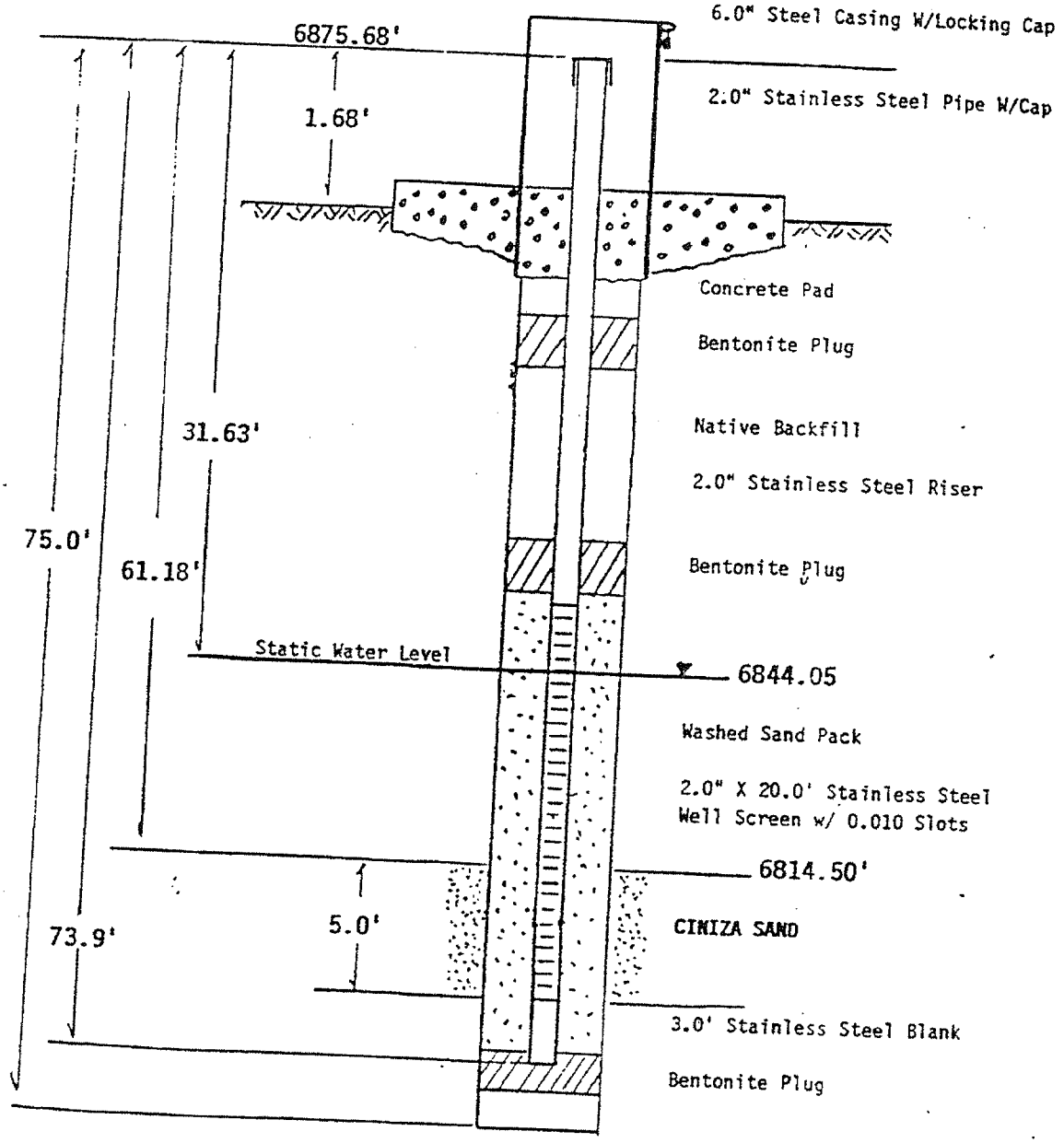
Logs Run Lith from Cores Logged By J.C. Hunter

Elevation 6876.78 Spud In (Fm.) Chinle

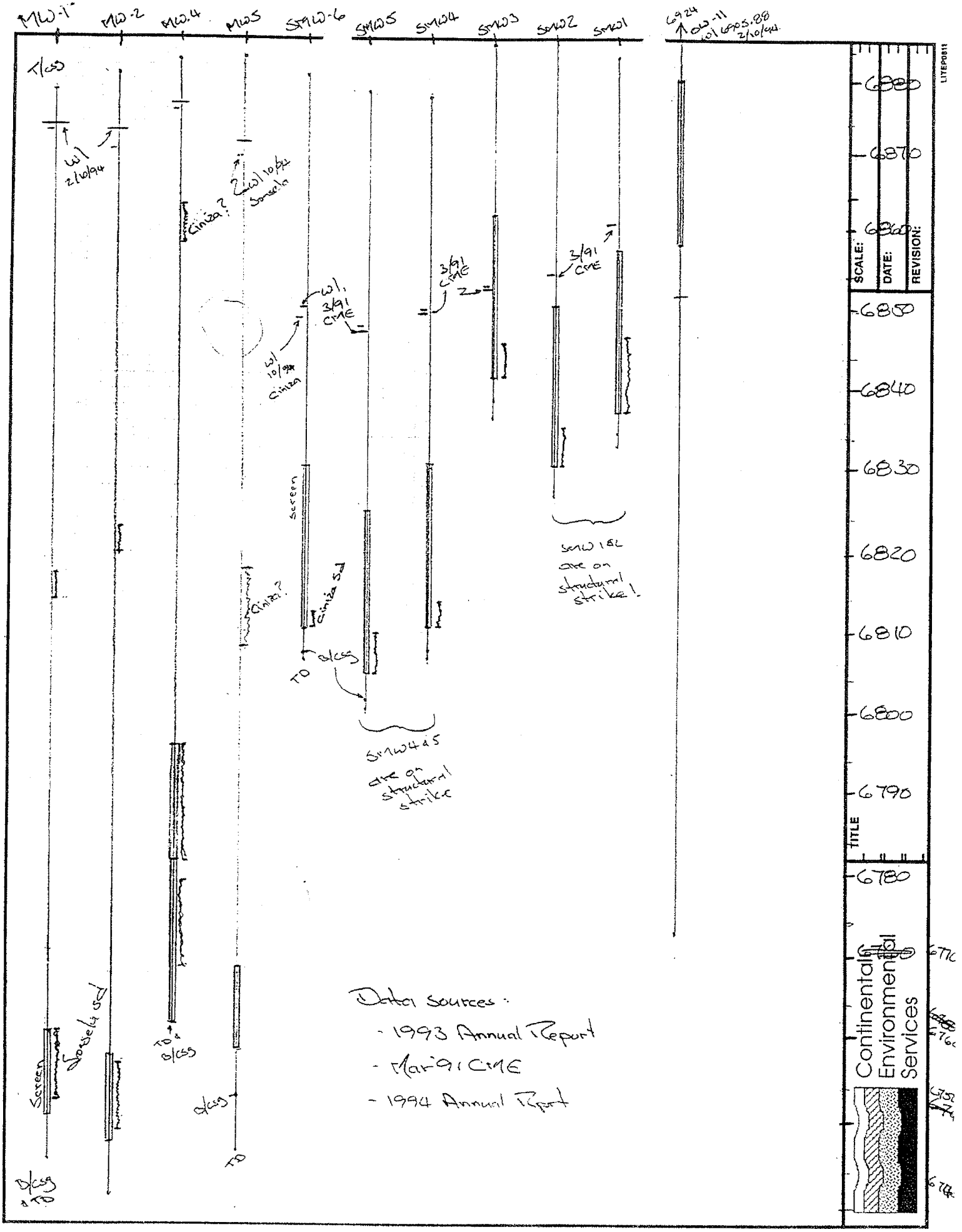
Remarks Drilled w/Hollow Stem Auger & Continuous Sampler. Collected samples @ 2.5 and 5.0' intervals for %H_2O. Comp. as SS monitor Well

Depth | Litho | Recov

RUN	From	To	Sample#/Ft	Lith/Remarks
			850925:	
1	0	5	1050/4.0	0-3.0 SOIL
2	5	10	1056/10.0	
3	10	15	1102/15	3.0-14.0 SILTY CLAY
4	15	20	1106/20	
5	20	25	1114/25	14.0-17.5 SAND
6	25	30	1126/30	
7	30	35	1141/32.5 1142/35.0	17.5-14 CLAY
8	35	40	1235/37.5 1236/40	
9	40	45	1254/42.5 1255/45.0	14-15 SAND
10	45	50	1310/47.5 1311/50.0	
11	50	55	1320/52.5 1321/55.0	15-24 SANDY CLAY
				24-25 SAND
				25-32 SANDY CLAY
				32-45 CLAY
				45-55 SANDY CLAY

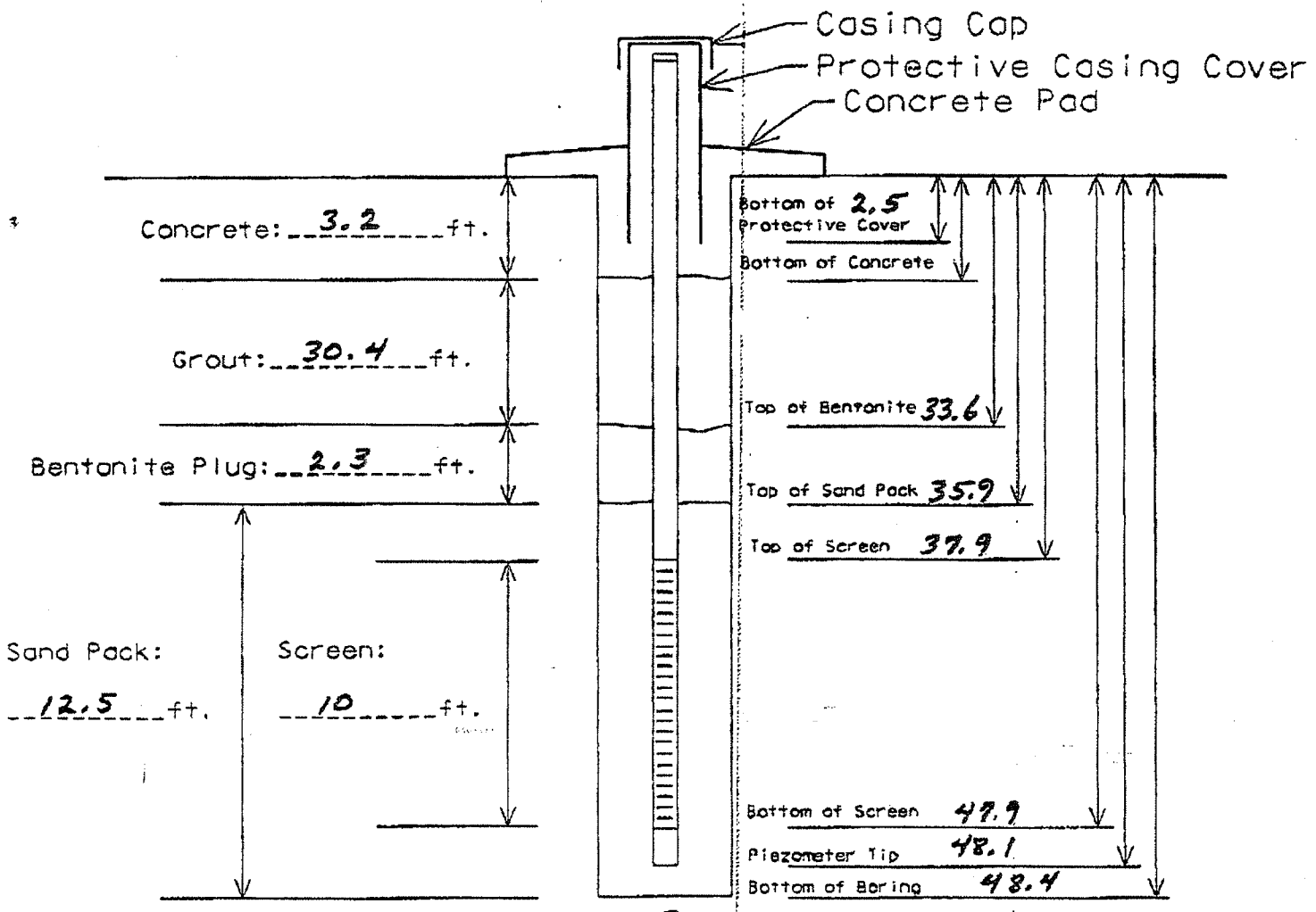


COMPLETION DIAGRAM FOR WELL SMW-5


MW-1
MW-2
MW-4
MW-5
SMW-6
SMW5
SMW4
SMW3
SMW2
SMW1
6924
MW-11
6905.88
2/10/94
6880
6870
6860
6850
6840
6830
6820
6810
6800
6790
6780
SCALE:
DATE:
REVISION:
TITLE
LITEP0811
Screen
TD
Continental Environmental Services
Data sources:
- 1993 Annual Report
- Mar 91 CME
- 1994 Annual Report

Installation Diagram

Monitoring Well No. OW-30



Boring Diameter: 8 5/8"

Sand Type: 20-40

Bollards, Type/Size: NONE

Bentonite: PELDLUL, 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: 4599.3

Other:

Bottom Cap Used? YES

Site Easting: 30.0

Project #: 96-134

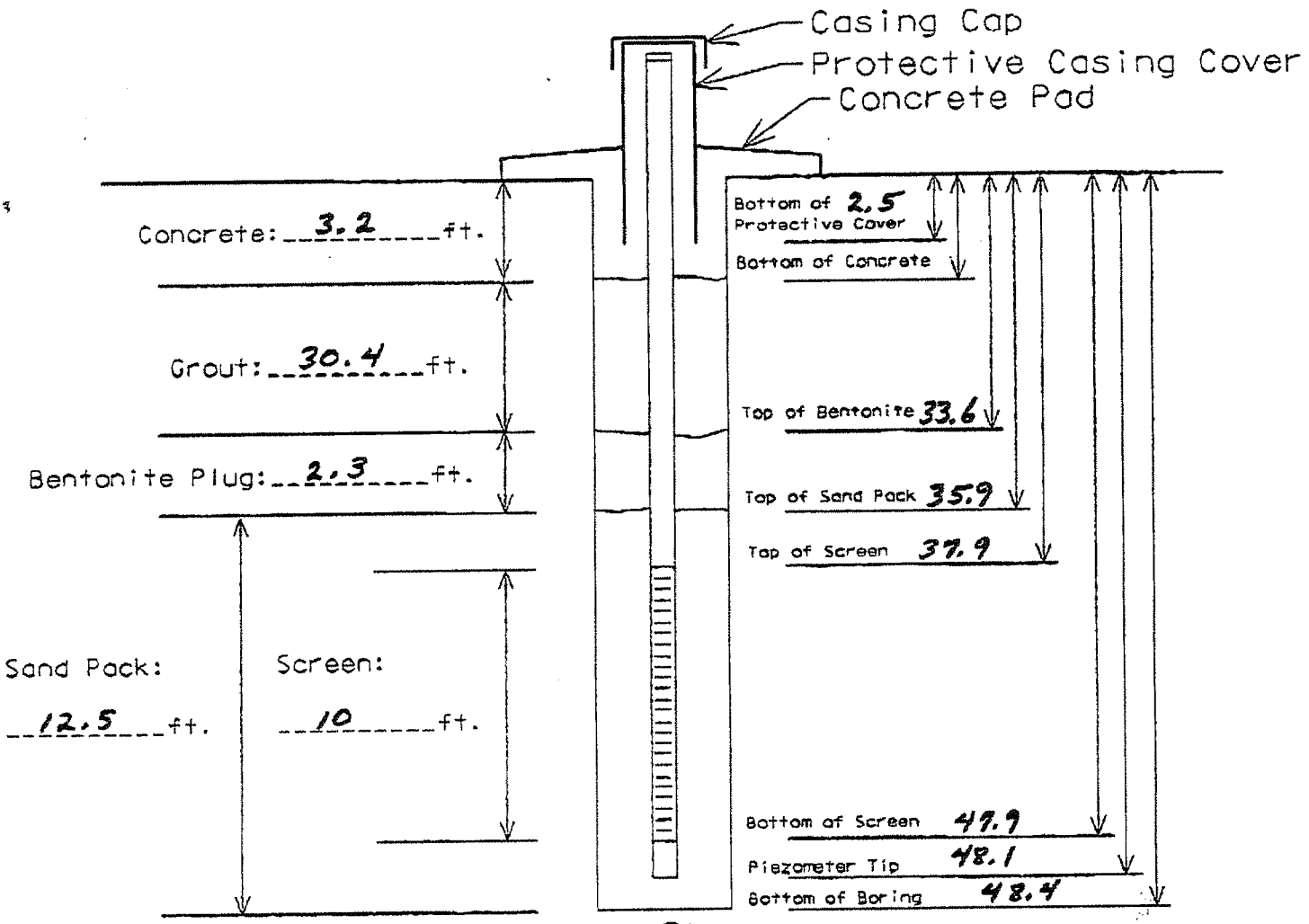
Project Name: CINIZA REFINERY INVESTIGATION

Elevation: 6921.6

PRECISION ENGINEERING, INC.
505-523-7674

Installation Diagram

Monitoring Well No. OW-30



Boring Diameter: 8 5/8"

Sand Type: 20-40

Bollards, Type/Size: NONE

Bentonite: PELPLUG, TR-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

PRECISION ENGINEERING INC.
505-523-7674

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

PROJECT: Giant Refinery
Ciniza

PRECISION ENGINEERING, INC.

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	

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

LOGGED BY: WHK

PROJECT: Giant Refinery
Ciniza

PRECISION ENGINEERING, INC.

LOG OF TEST BORINGS

FILE #: 96-133
ELEVATION: 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
23.8	***---***		C		ALL SAMPLES
23.8-24.3	///---///		C	**CLAY**, SILTY, BROWN, VERY STIFF, MOIST	
24.3-39.7	/////////	25	C	**CLAY**, BROWN, VERY STIFF, MOIST, SOME CARBONATE SPECKS > 28'	
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////		C		
	/////////	30	C		
	/////////		C		
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	/////////	35	C		
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	/////////		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

PROJECT: Giant Refinery
Ciniza

PRECISION ENGINEERING, INC.

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: 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				NOTE: STATIC WATER ELEVATION 33.5 @ .5 HOURS AND 24.4 @ 72 HOURS	
		50			
		55			
		60			
		65			

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

LOGGED BY: WHK

BORING OW-1

SURFACE ELEVATION: 6868 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									
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150									
160									

LABORATORY TEST DATA

PENETRATION RATE MINUTES/FOOT

PENETRATION RATE (MINUTES/FOOT)	SYMBOLS	DESCRIPTION
6.0, 5.0, 4.0, 4.2	CL	TRIASSIC PERIOD CHINLE FORMATION RED TO REDDISH BROWN CLAY WITH TRACE TO SOME SILT, CALCAREOUS, HIGHLY WEATHERED
3.8, 4.1, 5.6, 5.0, 4.2, 4.6, 5.4, 4.2, 3.6, 4.0, 5.4, 8.0	SHALE	27 FEET: SHALE, REDDISH BROWN, SILTY, CALCAREOUS, SOFT, FRESH GRADES HARD FROM 33 FEET GRADES WITH OCCASIONAL THIN LIMESTONE INTERBEDS FROM 40 TO 50 FEET GRADES WITH THIN SANDSTONE INTERBEDS FROM 45 TO 50 FEET GRADES SOFT FROM 65 FEET GRADES WITH THIN SANDSTONE AND LIMESTONE INTERBEDS FROM 75 FEET, HARD
5.2, 4.2, 3.6	SS	86 FEET: SANDSTONE, VARIEGATED BROWN TO LIGHT GRAY, FINE GRAINED, SILTY, SOFT, WITH ROUNDED TO SUBROUNDED, CLEAR TO FROSTED QUARTZ GRAINS, MICACEOUS, FRESH
		SHALE 98 FEET: SHALE, REDDISH BROWN, SILTY, SOFT, FRESH

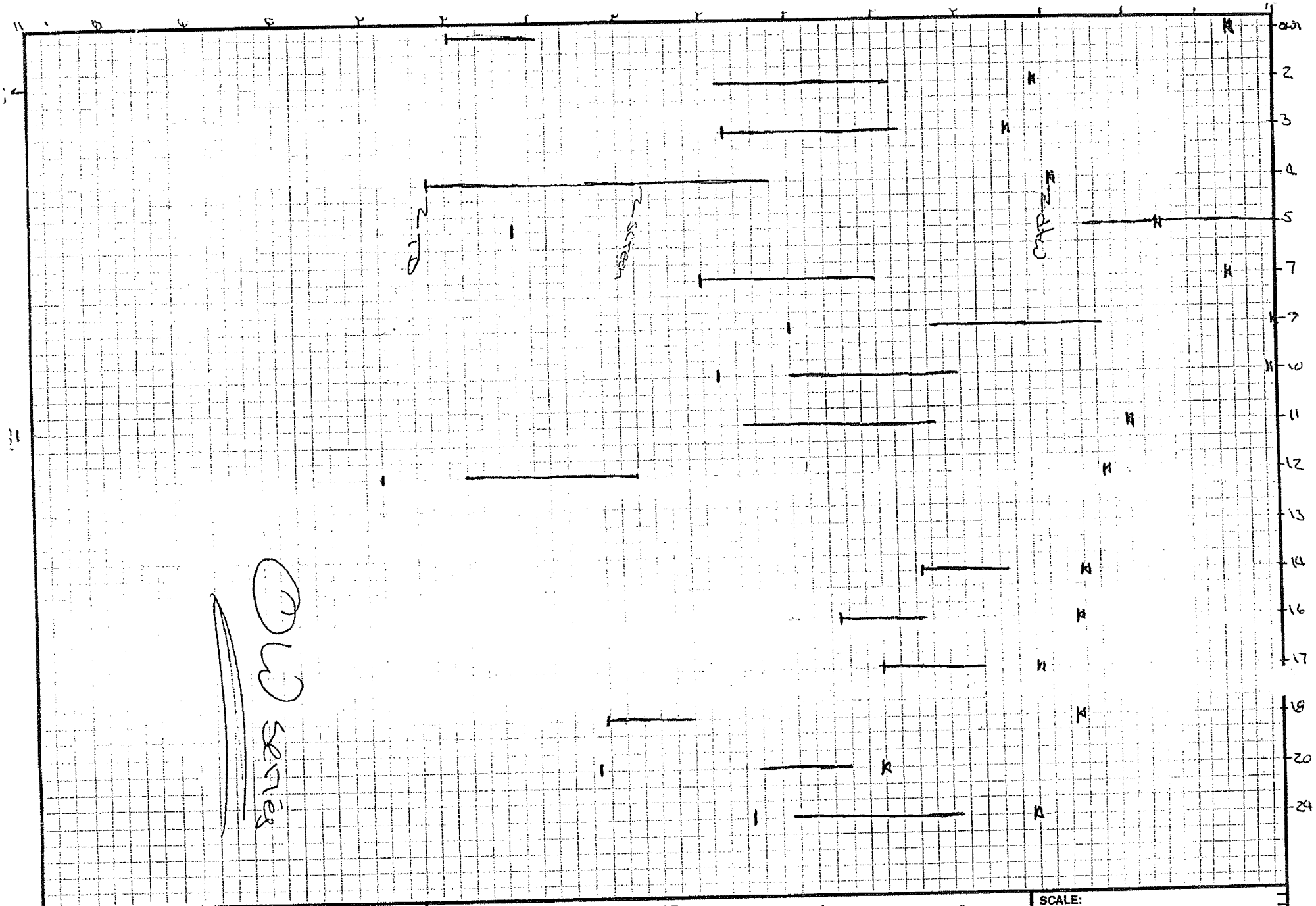
BORING COMPLETED AT 99.3 FEET ON 11/10/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 89.0 TO 99.3 FEET.
GRAVEL PLACED FROM 88.0 TO 99.3 FEET AND SEALED WITH CEMENT AND BENTONITE TO SURFACE.
GROUND WATER LEVEL MEASURED AT 6.4 FEET BELOW GROUND ON 1/5/81.

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



Continental Environmental Services

TITLE From GTRF 06E
Geoscience Consultants Y86
Table 3-1

| screen
= dtw
— TD
OW series

SCALE:
DATE:
REVISION:

LITEP0811

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									
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120									
130									
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150									
160									

PENETRATION RATE MINUTES/FOOT

	SYMBOLS	DESCRIPTION
	ML	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY CLAY, SOFT, HIGHLY WEATHERED
1.8, 2.0, 3.0		7-6-84
4.0, 2.4, 3.3	SHALE	34 FEET: SHALE, REDDISH BROWN, SILTY, CALCAREOUS, SOFT, FRESH
1.9		GRADES BROWN FROM 50 FEET
2.0, 1.4		GRADES WITH SOME FINE SAND FROM 58 FEET
2.0, 1.4		SILT AND FINE SAND GRADES OUT FROM 70 FEET
1.0		GRADES DARK GRAY FROM 75 FEET
2.3		GRADES WITH TRACE TO SOME SILT FROM 80 FEET
2.5, 10.0	SHALE	83 FEET: SHALE, DARK BROWN TO BLACK, WITH SOME SAND AND GRAVEL-SIZED FRAGMENTS OF PETRIFIED WOOD, HARD
7.8		GRADES GRAY FROM 88 FEET
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, 4.0, 3.6, 4.4, 5.0	SS	143 FEET: SANDSTONE, BROWN, FINE-GRAINED, SUBANGULAR, CALCAREOUS, WELL SORTED, SOFT SHALE 162.5 FEET: SHALE, PURPLE TO REDDISH BROWN, WITH SOME SILT, HARD 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

DAMES & MOORE

Bill Crumpler

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

TABLE 2
SUMMARY OF WELL DATA

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				

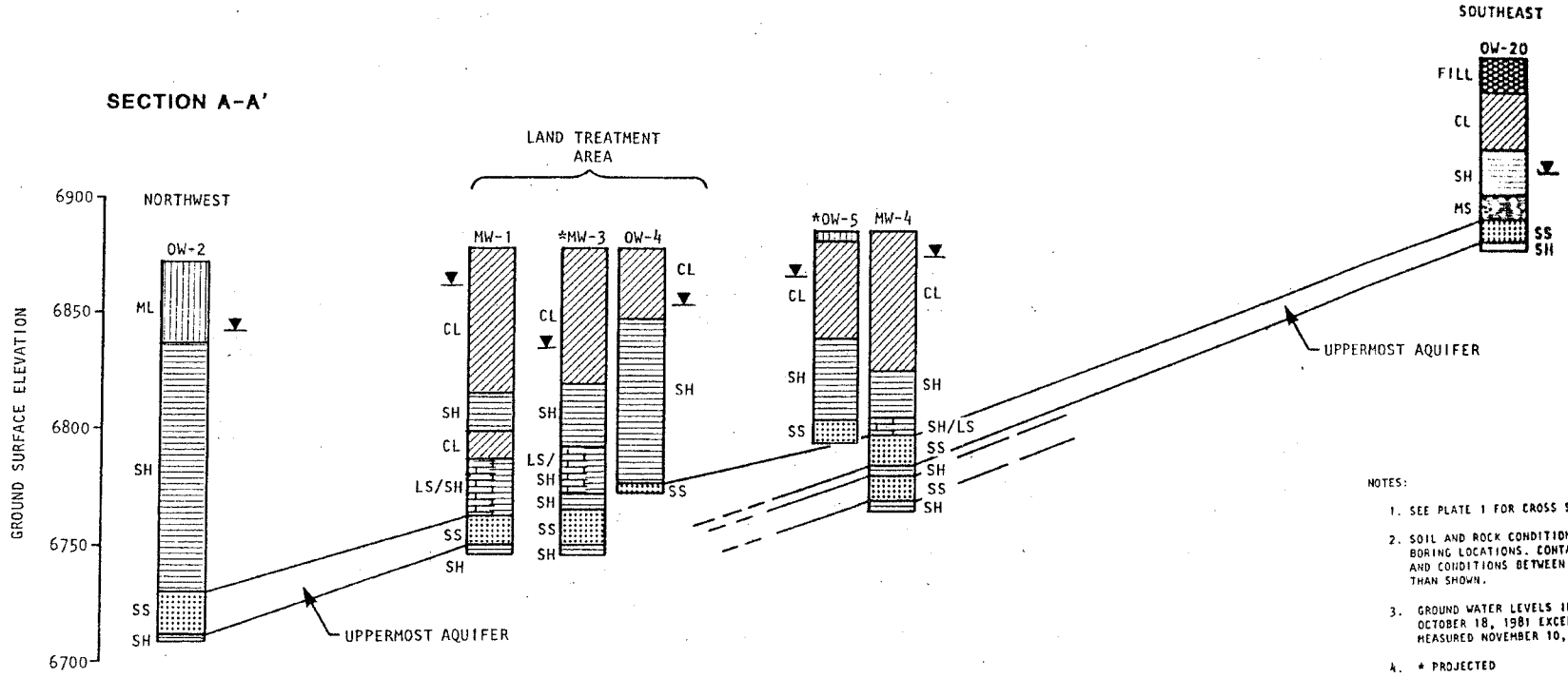
[1] Estimated - survey required

[3] Depth underlined is maximum depth of well

[4] Does not include zones of sandy shale below water table

Jun 5 1981

SECTION A-A'



NOTES:

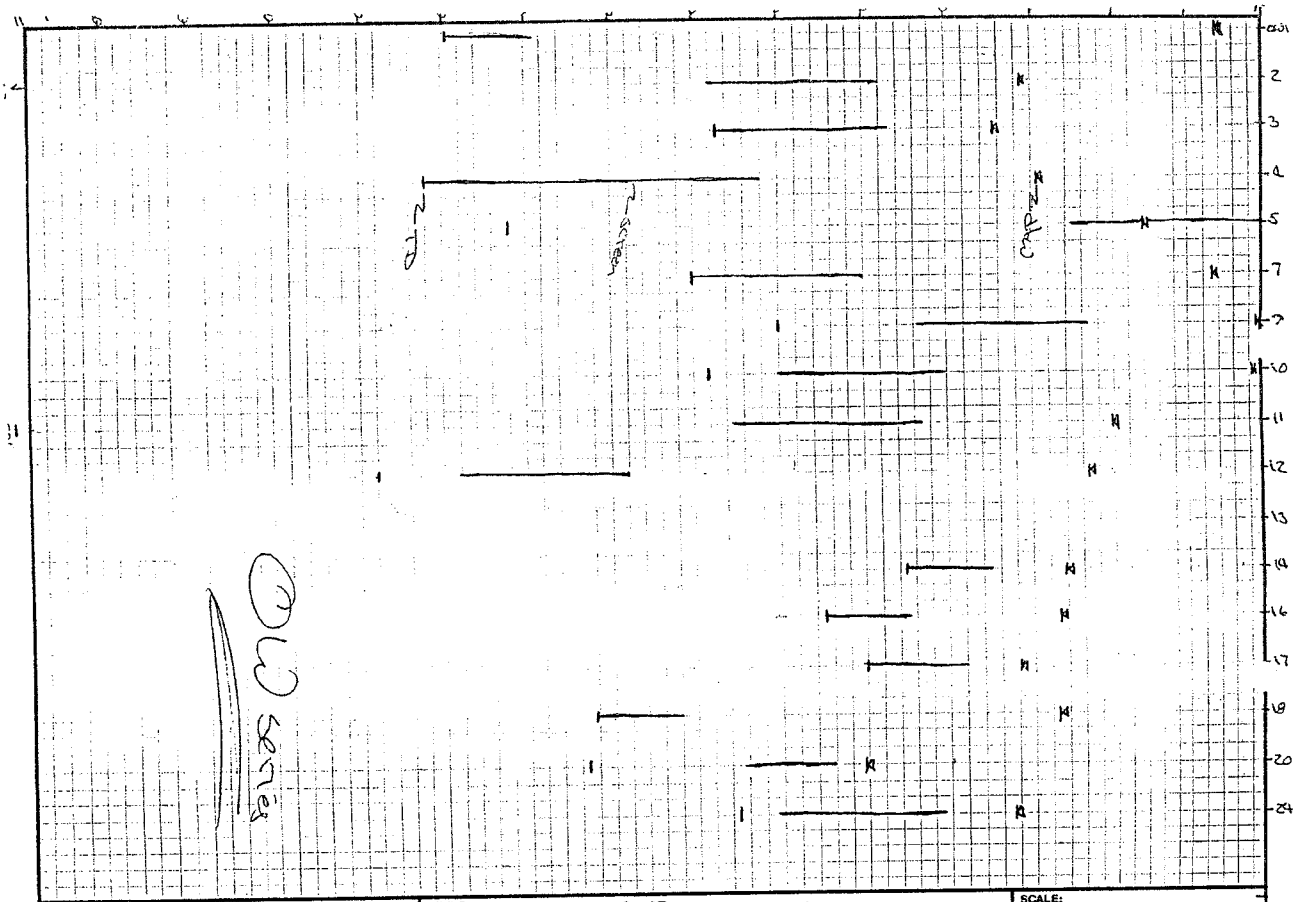
1. SEE PLATE 1 FOR CROSS SECTION LOCATION.
2. SOIL AND ROCK CONDITIONS SHOWN EXIST ONLY AT BORING LOCATIONS. CONTACTS ARE INTERPOLATED, AND CONDITIONS BETWEEN BORINGS MAY BE DIFFERENT THAN SHOWN.
3. GROUND WATER LEVELS INDICATED BY ▼, MEASURED OCTOBER 18, 1981 EXCEPT FOR MW-3 WHICH WAS MEASURED NOVEMBER 10, 1981.
4. * PROJECTED

SCALE
0 250 500
FEET
VERTICAL EXAGGERATION: 10X

PREPARED FOR **Shell Oil Co.**

CROSS SECTION
A - A'

BY **Dames & Moore** Plate 2



Continental Environmental Services

TITLE From GTRF OGE Geoscience Consultants Y86 Table 3-1

1 screen
= sites
— TD

OW series

SCALE:

DATE:

REVISION:

LITEP0811

BORING OW-3

SURFACE ELEVATION: 6876 FEET
34
6842

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

PENETRATION RATE MINUTES/FOOT	SYMBOLS	DESCRIPTION
1.2	CL	TRIASSIC PERIOD
1.8		CHINLE FORMATION
2.2		REDDISH BROWN CLAY WITH SOME FINE SAND, SOFT, HIGHLY WEATHERED
1.6		GRADES WITH SILT FROM 15 FEET
2.0		76-84
3.2	SHALE	FINE SAND GRADES OUT FROM 25 FEET
5.0		28 FEET: SHALE, RED TO REDDISH BROWN, SILTY, CALCAREOUS, HARD, FRESH
4.0		GRADES SOFT FROM 35 FEET
4.4		
4.0		
2.6		GRADES WITH SOME FINE SAND FROM 50 FEET
1.4		
1.0		
2.5		

BORING COMPLETED AT 67.0 FEET ON 11/4/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 47.0 TO 67.0 FEET.
GRAVEL PLACED FROM 36.0 TO 67.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 34.4 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

Continental Environmental Services

TITLE from GTRF 06E Geoscience Consultants Y86 Table 3-1

1 screen
= dtw
— TD

Old series

SCALE:

DATE:

REVISION:

LITEP0811

BORING OW-4

SURFACE ELEVATION: 6881 FEET

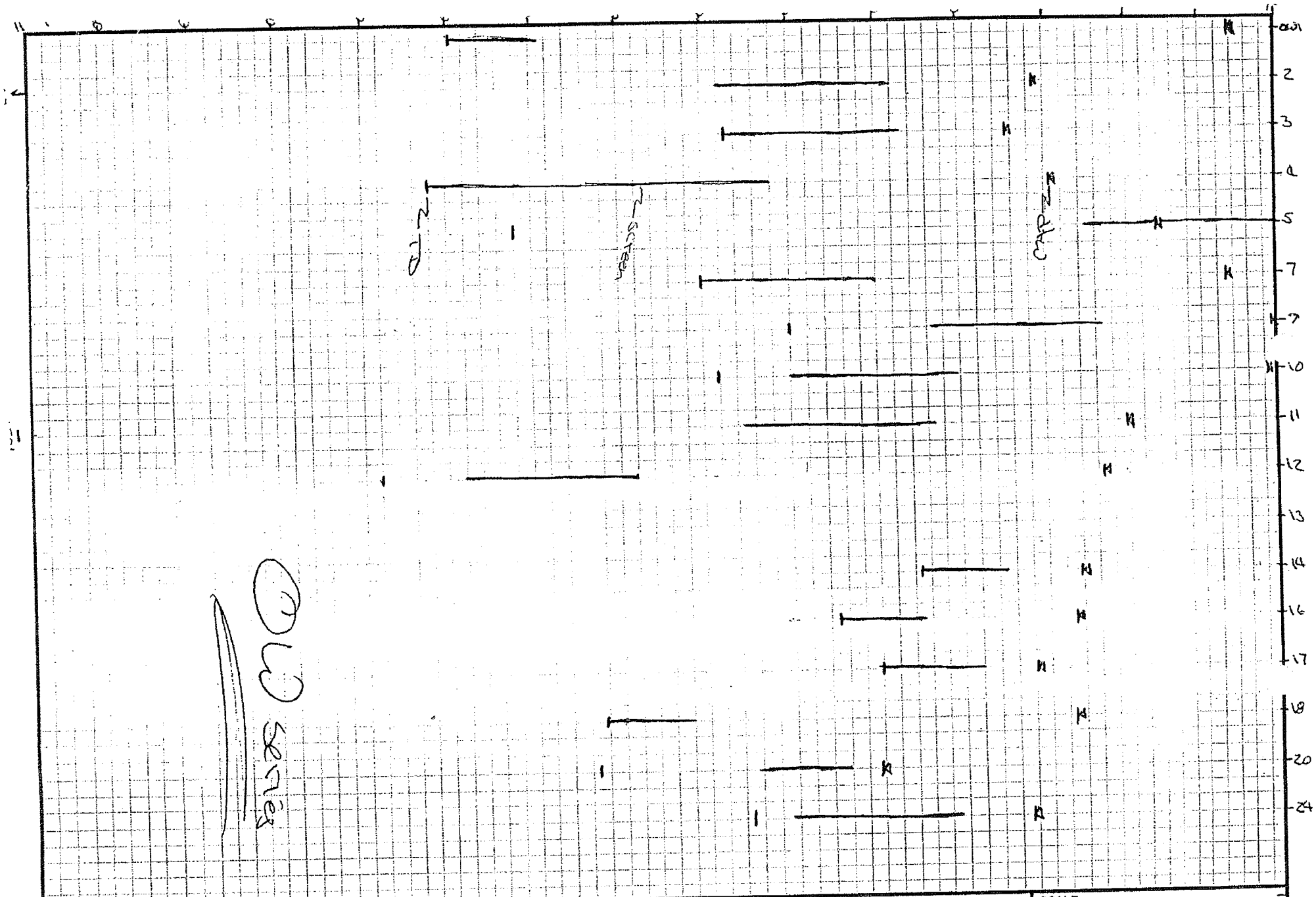
DEPTH IN FEET	LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	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	CL	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY CLAY, SOFT, HIGHLY WEATHERED
2.4		
3.0		GRADES WITH SOME FINE SAND FROM 15 FEET
2.8		
3.4		
4.0	SHALE	28 FEET: SHALE, REDDISH BROWN, SILTY, WITH SOME FINE-GRAINED SAND, CALCAREOUS, HARD, FRESH
5.0		
4.4		
5.0		
5.4		
5.0		
12.2		GRADES GRAY FROM 60 FEET
7.0		
8.0		
5.0		
6.0		
6.4		GRADES WITH THIN LIMESTONE INTERBEDS FROM 85 TO 100 FEET
5.4		
5.0		
4.4		
17.5	SS	100 FEET: SANDSTONE, LIGHT TO DARK BROWN, FINE-GRAINED, HARD, FRESH

BORING COMPLETED AT 102.0 FEET ON 11/7/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 62.0 TO 102.0 FEET.
GRAVEL PLACED FROM 62.0 TO 102.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 29.2 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

DAMES & MOORE



Continental Environmental Services

TITLE From GTRF 06E
Geoscience Consultants Y86
Table 3-1

1 screen OW series
2 dtw
— TD

SCALE:

DATE:

REVISION:

LITEP0811

BORING OW-5

SURFACE ELEVATION: 6882 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
0.8	ML	TRIASSIC PERIOD
		CHINLE FORMATION
3.4	CL	BROWN TO REDDISH BROWN FINE SAND WITH SOME SILT AND CLAY, SOFT, HIGHLY WEATHERED
3.0		3.5 FEET: REDDISH BROWN SILTY CLAY, SOFT, HIGHLY WEATHERED
1.6		GRADES WITH GRAVEL-SIZED FRAGMENTS OF SANDSTONE AND LIMESTONE FROM 15 TO 25 FEET
1.4		
2.0		
2.3		
4.0		
2.5		
3.3	SHALE	48 FEET: SHALE, REDDISH BROWN, SILTY, WITH SOME SAND, SOFT, FRESH
3.2		GRADES WITH OCCASIONAL THIN INTERBEDS OF SANDSTONE AND LIMESTONE FROM 55 FEET
4.5		
3.8		
3.6		
4.0		
4.0		
5.0	SS	82 FEET: SANDSTONE, REDDISH BROWN, VERY FINE-GRAINED, INTERBEDS OF WHITE TO GRAY FINE GRAINED SANDSTONE, SOME MICA, SOFT, FRESH
4.2		

BORING COMPLETED AT 92.0 FEET ON 11/12/80.
BORING CAVED FROM 25.3 TO 92.0 FEET.
~~4 INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 20 TO 25.3 FEET. GRAVEL PLACED FROM 17.4 TO 25.3 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE. GROUND WATER LEVEL MEASURED AT 16.2 FEET BELOW GROUND ON 1/5/81.~~

?

LOG OF BORINGS

DAMES & MOORE

Continental Environmental Services

TITLE From GTRF 06E
Geoscience Consultants Y86
Table 3-1

screen
dtw
TD

OW setting

SCALE:
DATE:
REVISION:

LITEP0811

APPENDIX A

WELL CLOSEOUT RECOMMENDATIONS - CINIZA REFINERY

WELL I.D.	(YES/NO)	RATIONALE
OW-1	NO	Well monitors the Sonsela at the western edge of the property. Well is artesian flowing. Recommend adding pressure cap.
OW-2	YES	Well drilled to the Sonsela (143'), backfilled with cuttings, gravel packed and screened from 43'-68'. Potential for communication between upper water bearing zone and Sonsela considered high. Log questionable; location of upper water bearing zone not known.
OW-3	YES	Suspect poor logging. Location of water bearing zone not known. Well screened and gravel packed from 36'-67'. Believe water bearing interval is a very thin zone at approximately 67' based on recent data. This zone may add water to otherwise dry sandy zones above.
OW-4	YES	Located in the center of the land treatment unit. Logs indicate that the well is screened in the Sonsela and likely is gravel packed across other water bearing units above, creating the potential for cross contamination. Logging questionable.
OW-5	CLOSED	This well was closed in 1996 after it was observed screen used in construction of the well was exposed at the ground surface.
OW-7	YES	Water producing zone is not known. Screen and gravel pack extends 25'. It is believed that the well produces from zone on Chinle plus sands above - 2 distinct zones. Zones should not be allowed to intermix. Located in a low water area and floods during rainy season.
OW-9	YES	This well is located in the Sonsela. Gravel extends into the alluvial material above the sandstone. Potentially cross contamination can occur between Sonsela water and water in the alluvial materials above. The well is also located in a standing water area and is subject to flooding.
OW-10	YES	Well appears to be sound but is located in area subject to surface flooding.
OW-11	YES	Used as the up gradient well for monitoring water coming into the facility. The location of the well is not truly up gradient of the facility. Recommend replacing this well with a well that is up gradient of the facility. Well is screened below the producing zone. Well was originally drilled to 150+feet, backfilled with cuttings then screened. Water producing zone can be cross contaminated with material below the actual production zone.

Continue

BORING OW-7

SURFACE ELEVATION: 6872-FEET

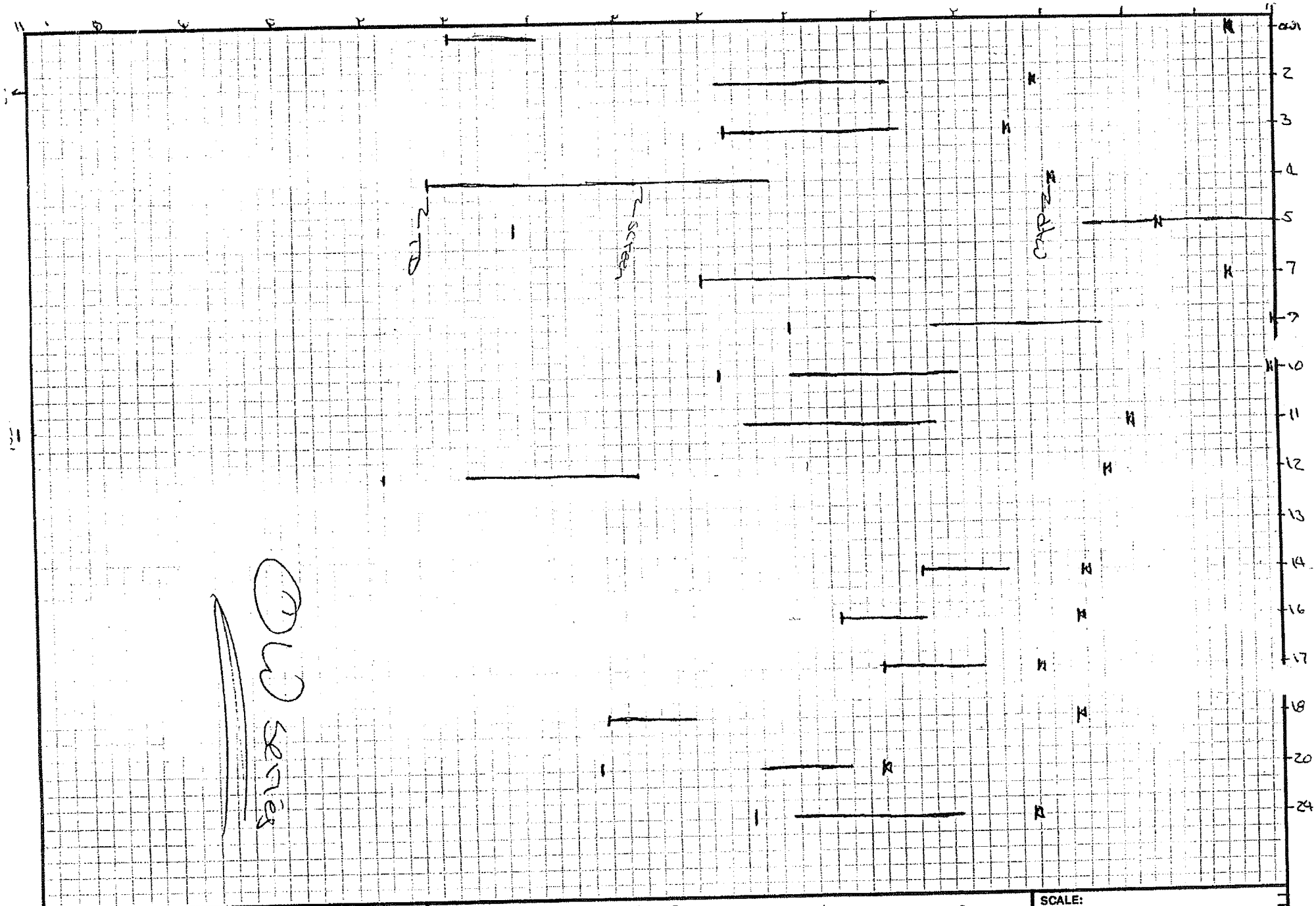
DEPTH IN FEET	LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	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
3.2	ML	TRAISSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY CLAY WITH SOME FINE SAND, SOFT, HIGHLY WEATHERED
3.6		
4.4		GRADES HARD FROM 15 TO 30 FEET
4.8		
4.8		
4.6		GRADES WITH TRACE COARSE SAND FROM 30 TO 40 FEET
3.8		
5.0		GRADES HARD FROM 35 FEET
4.4		
5.6	SHALE	44 FEET: SHALE, RED, WITH SOME SAND AND SILT, HARD, FRESH
6.0		
7.0		GRADES WITH OCCASIONAL THIN LIMESTONE INTERBEDS FROM 55 FEET
6.2		
6.6		

BORING COMPLETED AT 70.0 FEET ON 11/18/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 50.0 TO 70.0 FEET.
GRAVEL PLACED FROM 45.0 TO 70.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 6.7 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

DAMES & MOORE



Continental Environmental Services

TITLE From GTRF 06E
Geoscience Consultants Y86
Table 3-1

screen	Old series
dtw	
TD	

SCALE:

DATE:

REVISION:

LITEP0611

BORING OW-9

SURFACE ELEVATION: 6873 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)
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10									
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60									
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90									
100									
110									
120									
130									
140									
150									
160									

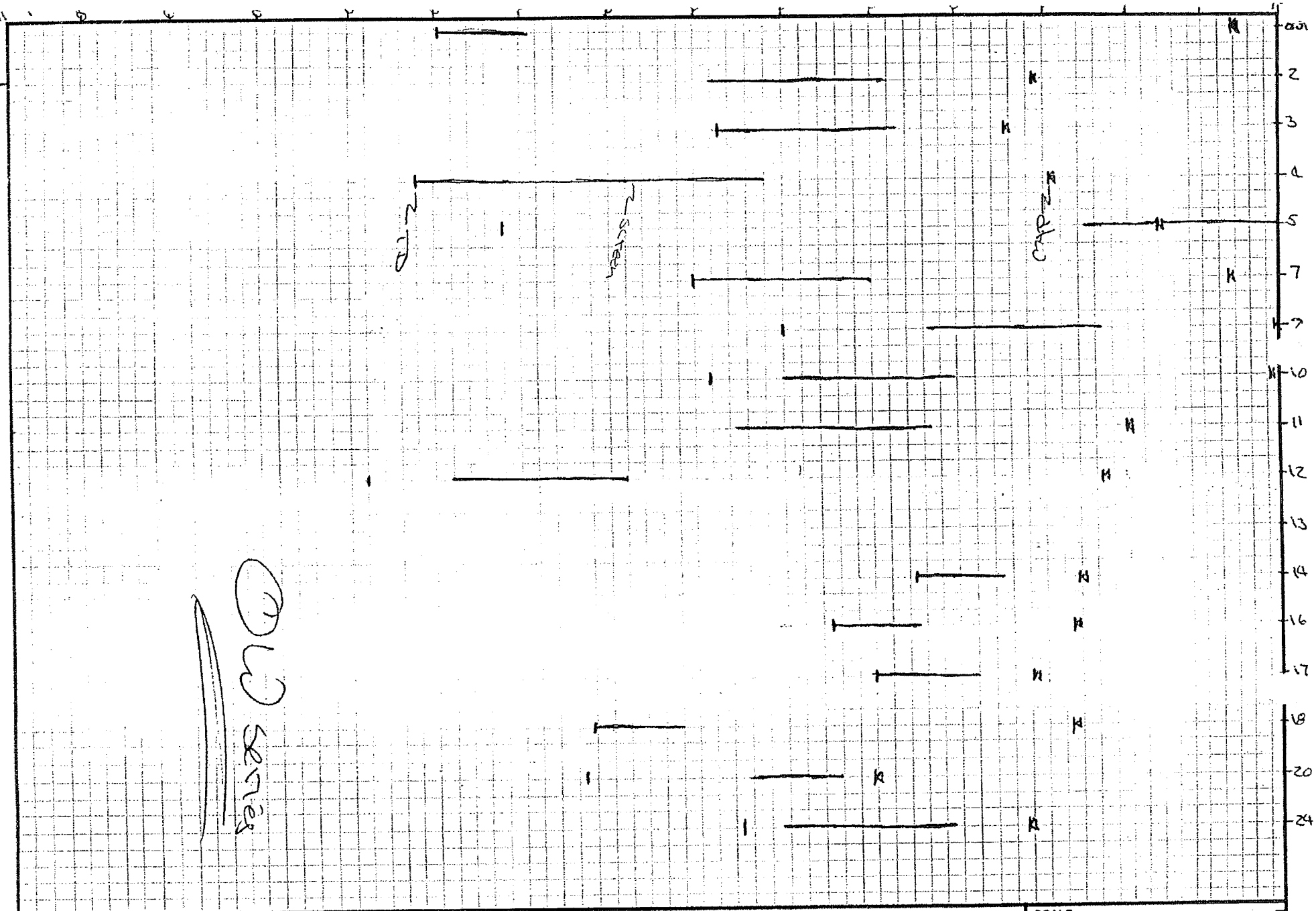
PENETRATION RATE MINUTES/FOOT

PENETRATION RATE (MINUTES/FOOT)	SYMBOLS	DESCRIPTION
1.6, 1.2, 1.0, 3.2, 3.3	CL	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY CLAY, SOFT, HIGHLY WEATHERED GRADES GRAY FROM 6 FEET
6.7, 8.5, 3.2, 4.2, 4.0	SS	23 FEET: SANDSTONE, BROWN, FINE-TO COARSE-GRAINED, WITH GRAVEL-SIZED FRAGMENTS OF LIMESTONE AND CHERT, CLEAR TO FROSTED QUARTZ GRAINS, HARD, FRESH GRADES SOFT FROM 30 FEET GRADES GRAYISH BROWN FROM 40 FEET
4.0, 3.2	SHALE	46 FEET: SHALE, GRAY, SANDY (FINE-GRAINED) WITH OCCASIONAL THIN INTERBEDS OF LIMESTONE, SOFT, FRESH
3.5	SS	58 FEET: SANDSTONE, REDDISH BROWN, FINE-GRAINED, THIN LAYERED, SOFT, FRESH

BORING COMPLETED AT 60.0 FEET ON 11/21/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 23.0 TO 43.0 FEET.
GRAVEL PLACED FROM 19.0 TO 60.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 0.6 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

DAMES & MOORE



Continental Environmental Services

TITLE From GTRF OGE
Geoscience Consultants Y86
Table 3-1

1 screen
2 dtw
— TD

OW series

SCALE:

DATE:

REVISION:

LITEP0811

BORING OW-10

SURFACE ELEVATION: 6872 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									
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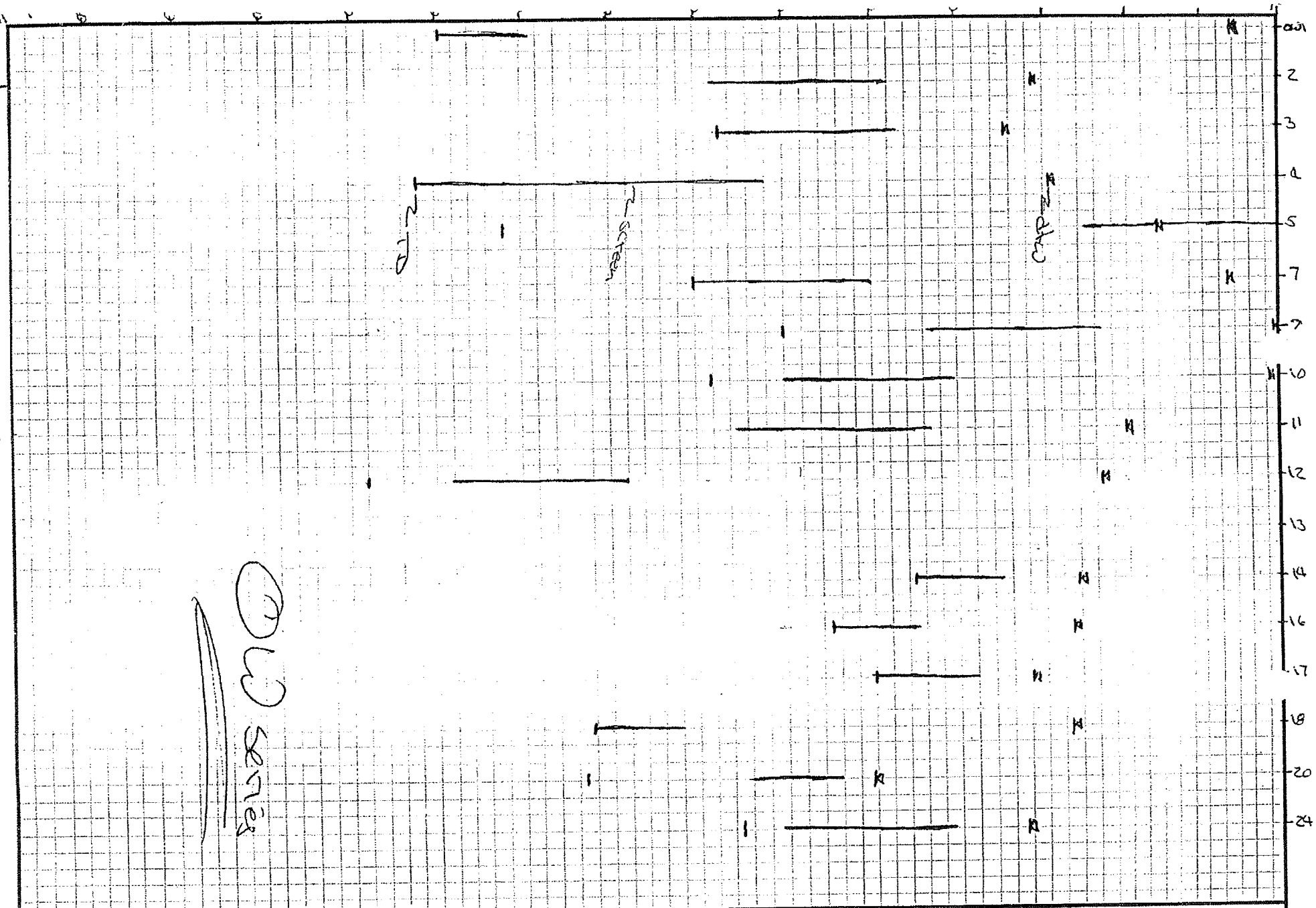
70									
80									
90									
100									
110									
120									
130									
140									
150									
160									

PENETRATION RATE MINUTES/FOOT	SYMBOLS	DESCRIPTION
1.0	CL	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY CLAY, SOFT, HIGHLY WEATHERED
1.4		GRADES WITH TRACE TO SOME MEDIUM TO FINE-GRAINED SAND-SIZED PARTICLES OF CHERT, PETRIFIED WOOD, AND LIMESTONE FROM 5 FEET
1.4	ML	
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
2.0		
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

DAMES & MOORE



Continental Environmental Services

TITLE from GTRF 06E
Geoscience Consultants Y86
Table 3-1

screen	Old series
= dtw	
— TD	

SCALE:

DATE:

REVISION:

LITEP0811

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-11

SURFACE ELEVATION: 6923 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 (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: 1.6, 1.4, 2.4, 3.0, 6.5, 2.4, 12.5, 4.4, 5.5, 4.0, 3.1, 4.3, 5.0, 8.0, 2.5, 3.3, 4.0, 2.3, 3.6, 2.3, 4.3, 4.5, 2.7, 3.0, 3.5, 4.0, 4.3, 2.5, 3.3, 4.5, 2.7, 4.5, 2.0, 6.5, 5.0, 2.3, 2.3, 2.7, 3.0, 2.2, 2.3, 2.2, 2.7, 3.3, 2.7, 2.2

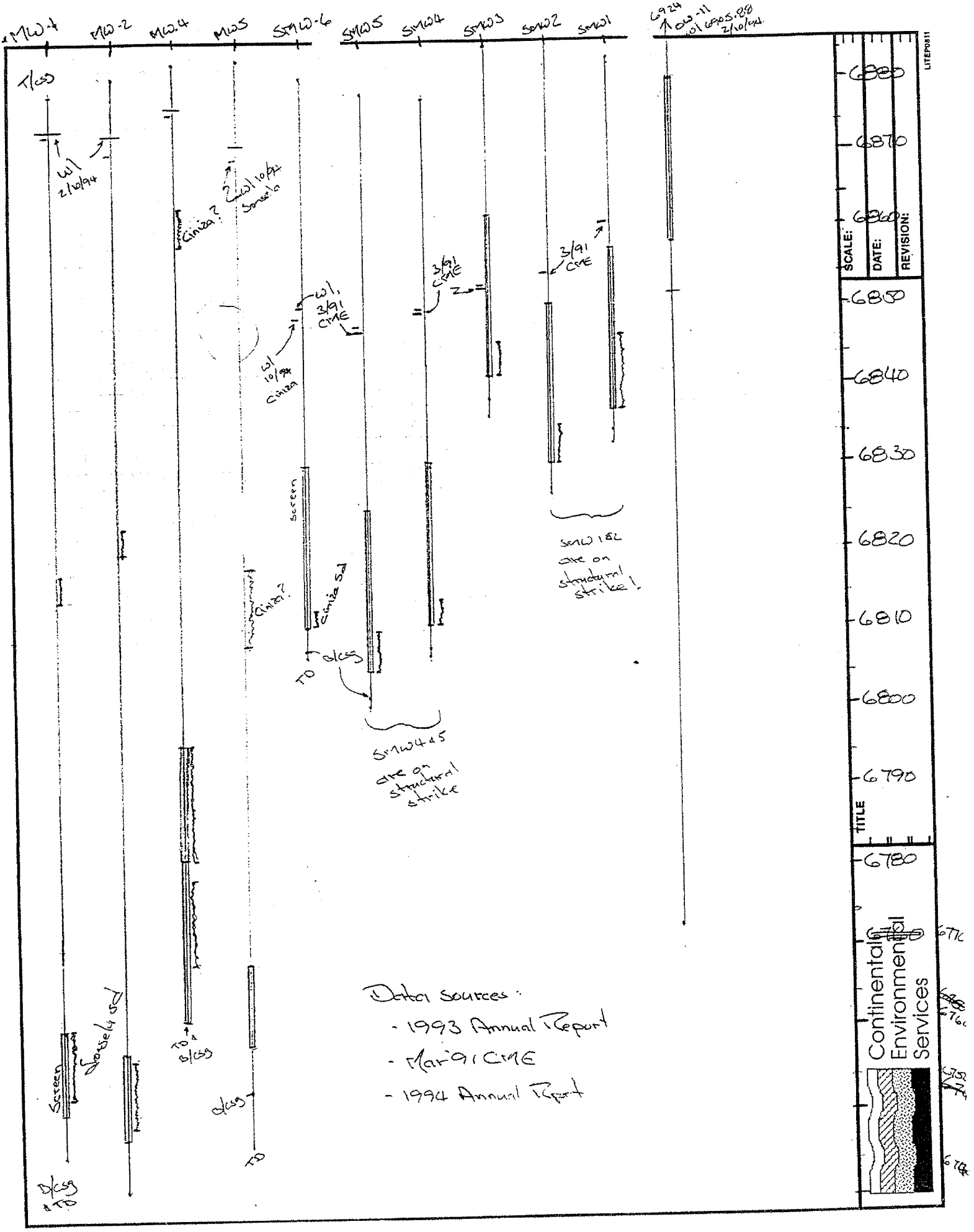
GRAVEL

SYMBOLS	DESCRIPTION
	TRIASSIC PERIOD
SM	CHINLE FORMATION REDDISH BROWN SILTY FINE SAND, SOFT, HIGHLY WEATHERED
	GRADES WITH GRAVEL-SIZED FRAGMENTS OF FINE SANDSTONE AND LIMESTONE FROM 7 FEET
SHALE	13 FEET: SHALE, GRAY, SILTY, WITH OCCASIONAL THIN INTERBEDS OF WHITE SANDSTONE, SOFT, FRESH
	GRADES WITH REDDISH BROWN SANDSTONE INTERBEDS FROM 20 FEET
	GRADES WITH LAYER OF WHITE, FINE-GRAINED SANDSTONE FROM 23 TO 24 FEET
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
SHALE	40 FEET: SHALE, GRAY TO PURPLE, SILTY AND SANDY, SOFT, FRESH
	GRADES WITH SOME SAND FROM 47 FEET GRADES GRAY AND HARD FROM 50 TO 55 FEET
	GRADES WHITE TO LIGHT GRAY FROM 55 FEET, SOFT
	GRADES PURPLE FROM 68 FEET
	GRADES GRAY FROM 78 FEET
	GRADES WITH OCCASIONAL THIN INTERBEDS OF LIMESTONE AND GRAVEL-SIZED FRAGMENTS OF CHERT FROM 92 FEET
	GRADES REDDISH BROWN FROM 103 FEET
	GRADES GRAY AND HARD FROM 110 FEET
	GRADES SOFT WITH NO INTERBEDS FROM 114 FEET
	GRADES PURPLISH GRAY FROM 117 FEET
	GRADES GRAY FROM 140 FEET

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'

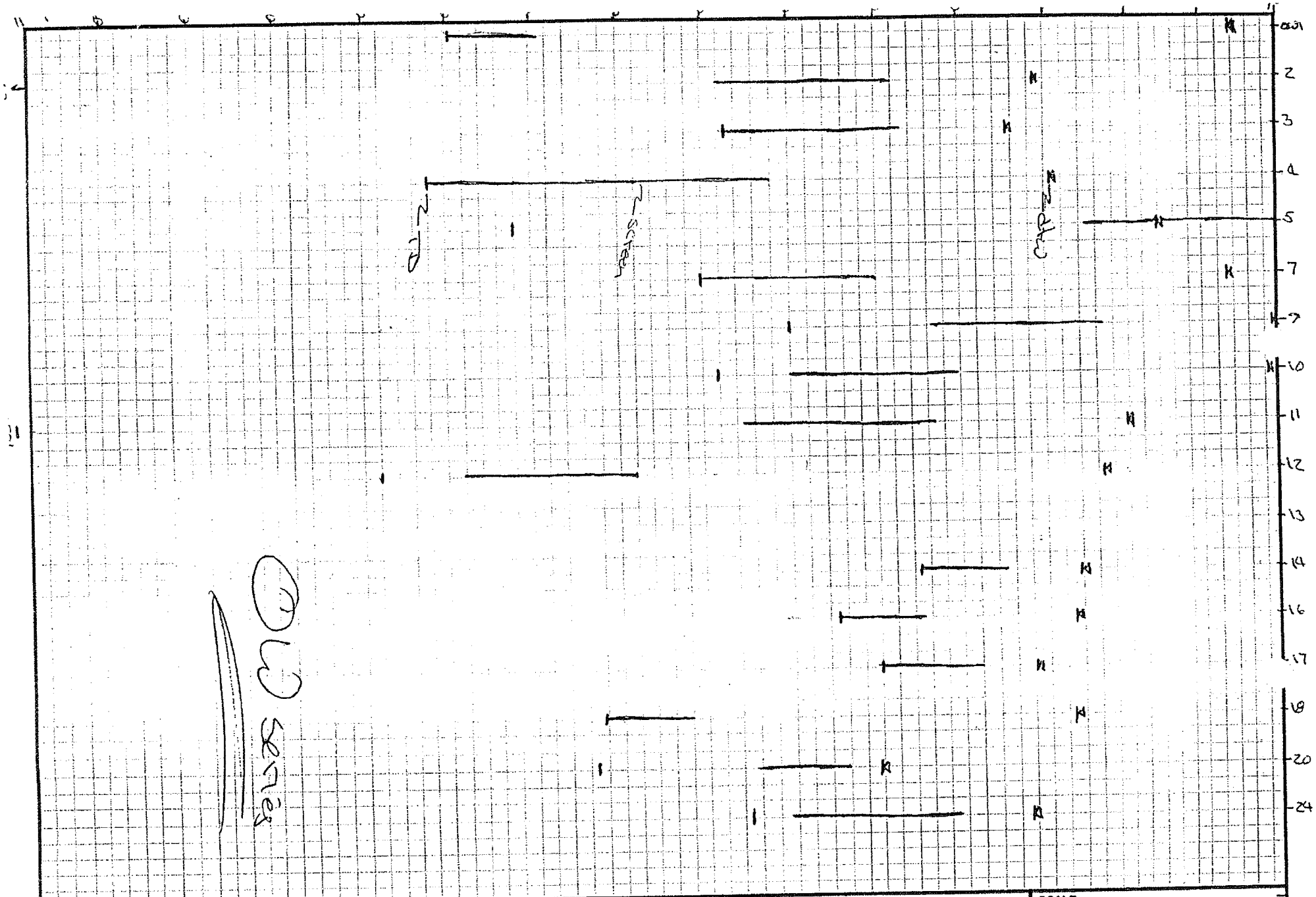
LOG OF BORINGS

DAMES & MOORE



Data sources:

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



Continental Environmental Services

TITLE from GTRF 06E
Geoscience Consultants Y86
Table 3-1

1 screen
2 dtw
— TD

OW series

SCALE:

DATE:

REVISION:

LITEP0811

BORING OW-12

SURFACE ELEVATION: 6030 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 (PSI)	STRENGTH TEST DATA: SHEAR STRENGTH (PSI)	STRENGTH TEST DATA: DEVIATOR STRESS (PSI)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)
0									
10									
20									
30									
40									
50									
60									
70									
80									
90									
100									
110									
120									
130									
140									
150									
160									

SCREEN

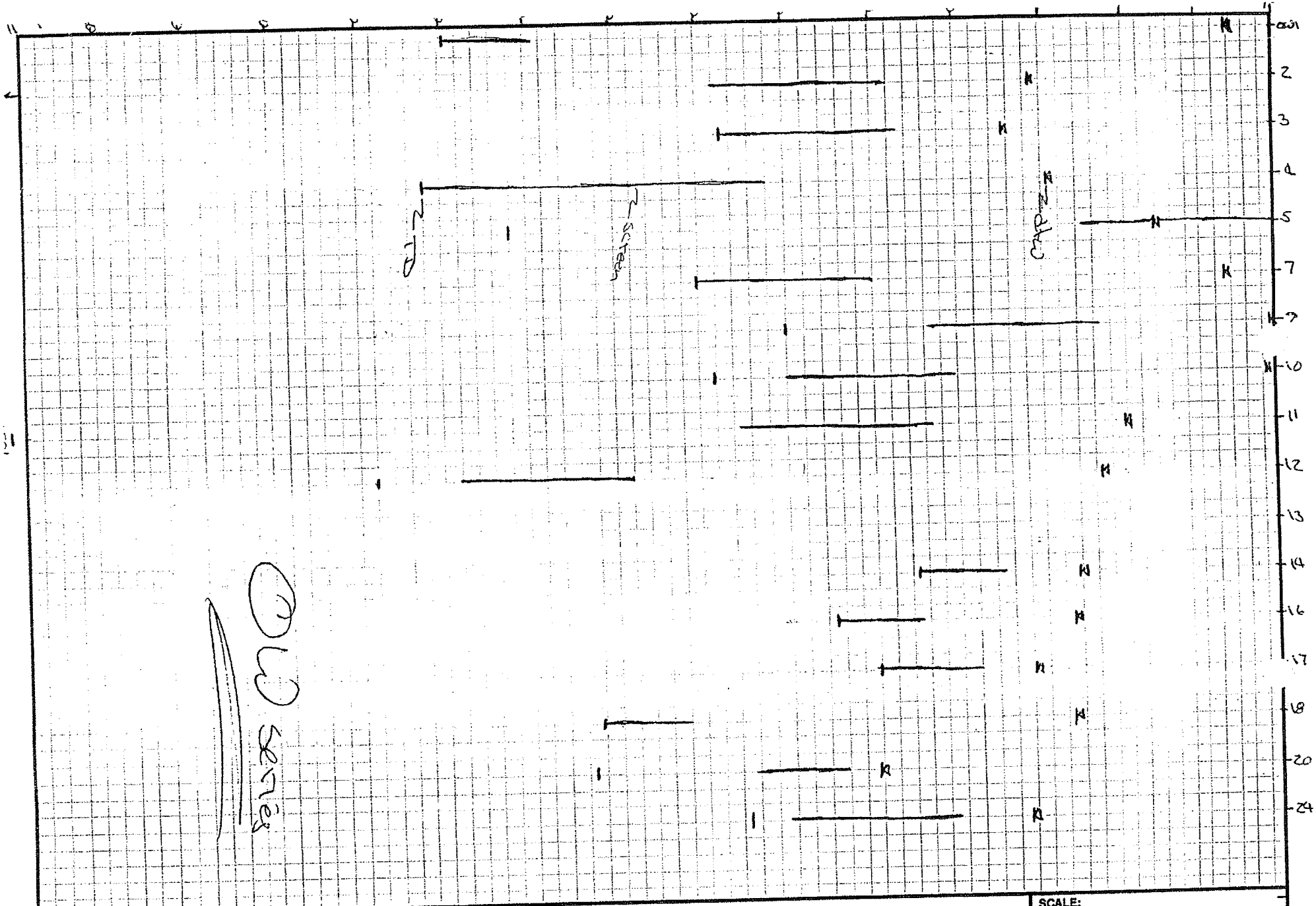
PENETRATION RATE MINUTES/6 INCHES

PENETRATION RATE (MIN/6 IN)	SYMBOLS	DESCRIPTION
3.3	GW	TRIASSIC PERIOD
6.4	SS	CHINLE FORMATION LIGHT BROWN FINE SAND WITH GRAVEL-SIZED FRAGMENTS OF CHERT, LIMESTONE, AND PETRIFIED WOOD, SOFT, HIGHLY WEATHERED
6.4		3 FEET: SANDSTONE, LIGHT BROWN, FINE-GRAINED WITH SOME MEDIUM TO COARSE GRAINS, COMPOSED OF QUARTZ WITH MINOR CHERT AND LIMESTONE, HARD, FRESH
4.0		GRADES SOFT FROM 17 FEET
15.0 / 3.5		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		GRADES HARD FROM 29 FEET
6.7		
5.0		GRADES SOFT FROM 40 FEET
3.0		
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
3.5	SHALE	64 FEET: SHALE, GRAY, SILTY, SANDY, SOFT, FRESH
3.3		
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 GRADES BROWN FROM 112 FEET
5.6		
4.8		
4.0		
5.0		
4.3		
5.0		
8.3		
5.0	SHALE	143 FEET: SHALE, GRAY, SILTY, SANDY, HARD, FRESH

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



Continental Environmental Services

TITLE From GTRF 06E
Geoscience Consultants Y86
Table 3-1

1 screen OW series
2 dtw
— TD

SCALE:

DATE:

REVISION:

LITEP0811

WELL I.D.	(YES/NO)	RATIONALE
OW-12	NO	Appa ly well constructed. Well screened in the Son down gradient of the facility. Recommend keep as an intermediate monitoring point.
OW-13	NO	Apparently well constructed. Well screened in the Sonsela down gradient of the facility. Recommend keep as an intermediate monitoring backup well.
OW-14	NO	Well is known to be contaminated. Used to track contaminant migrating on top of the Chinle shale in Area 1 (see plume sheet).
OW-16	YES	Sonsela well within the tank farm berms. Well provides a direct pathway to the Sonsela if a tank is compromised.
OW-17(RW-4)	YES	This well connects the Sonsela and the zone on top of the Chinle shale directly. The zone on the Chinle shale is contaminated. Cross contamination is imminent if this well is not closed. Sonsela does not appear to be impacted as yet because of its artesian potential. This well should be closed immediately.
OW-18	CLOSED	This well was destroyed during construction activities.
OW-20	YES	Well drilled into the Sonsela but screened above in a "mudstone" zone. Unknown how the well was backfilled to the screened interval. Suspect cross contamination may occur with water on top of the Chinle Formation. This well has been damaged twice and repaired because of site construction. Well up gradient from tank farm, but, down gradient of the facility. Water producing zone cannot be clearly identified from the logs.
OW-24	YES	Well was gravel packed from 28'-61'. The zone lying on top of the Chinle Formation is in direct contact with the sandy stringers above allowing immediate communication between the zones. The potential for cross contamination, should one or the other of the zones become contaminated, is high.
OW-25(RW-3)	YES	The well is screened in an upper part of the Sonsela and the zone lying on top of the Chinle shale. The zone on the shale is contaminated and cross contamination will occur. Sonsela appears to not have been impacted, as yet. Sonsela has likely not been impacted because of its artesian properties. Closure of this well should be a priority or cross contamination will occur.
OW-26	YES	This well is screened in the Sonsela. It is located within a tank farm berm area. Loss of integrity of the tanks will inject product directly into the Sonsela. Recommend priority closure.
BG4(OW-27)(RW1)	NO	Currently a recovery well in Area 1 plume. Well is screened in the zone on top of the Chinle shale.
B-1(OW-28)(RW-2)	YES	Originally converted from a boring to a well because of the discovery of product on the water surface of the zone lying on top of the Chinle shale. No product has been observed in the well since the original discovery. Recommend Closure since this well is inside a tank berm area and can potentially inject product to the top of the Chinle if tank integrity is lost.
OW-29	NO	Screened across the zone on top of the Chinle shale. Currently used to monitor for contaminant constituents for the Area 1 plume.
OW-30	NO	Screened across the zone on top of the Chinle shale. Currently used to monitor for contaminant constituents for the Area 1 plume.

Continue

BORING OW-13

SURFACE ELEVATION: 6914 FEET

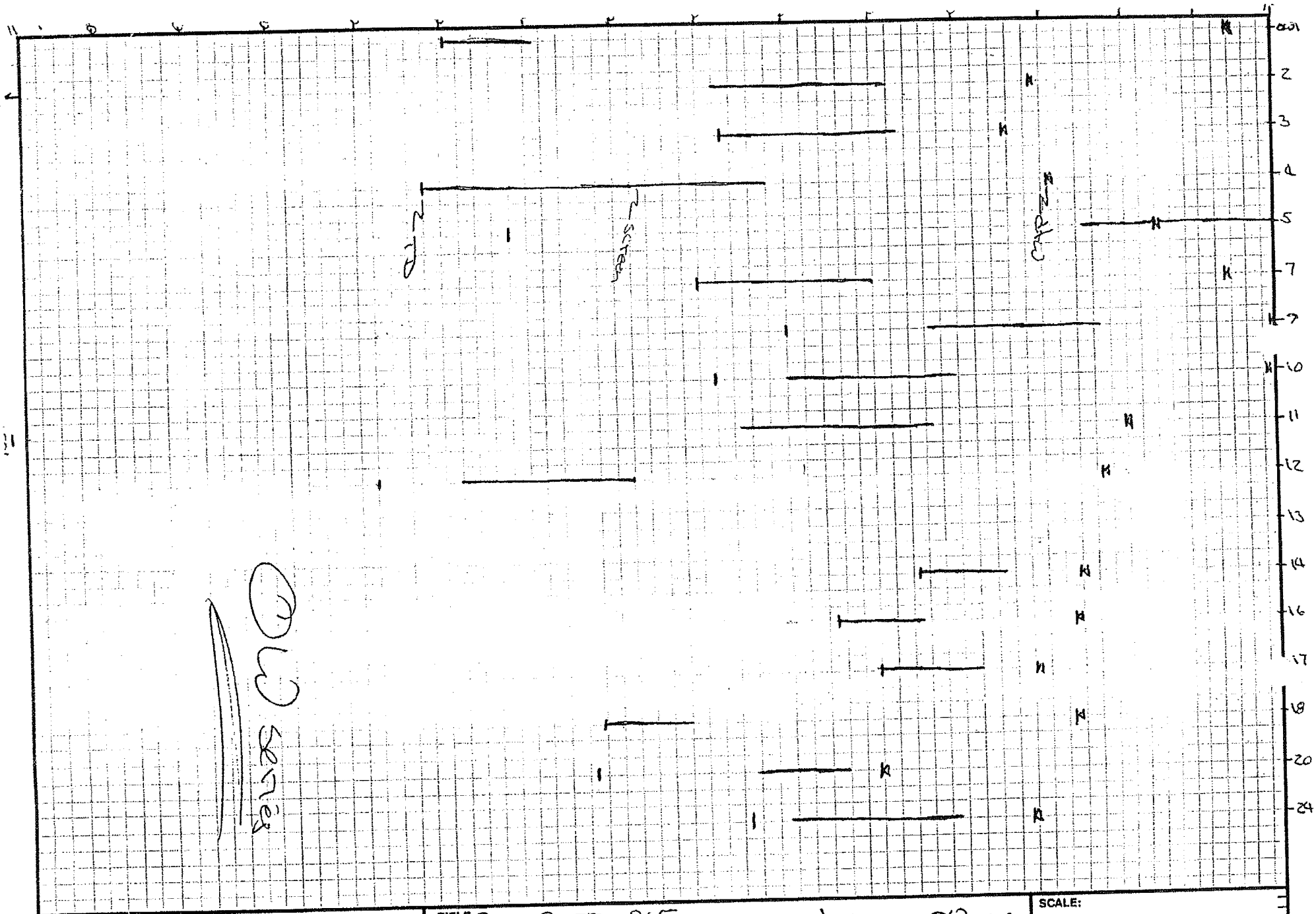
DEPTH IN FEET	LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	STRENGTH TEST DATA: TYPE OF TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF)	STRENGTH TEST DATA: SHEAR STRENGTH (PSF)	STRENGTH TEST DATA: DEVIATOR STRESS (PSF)	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
1.4	CL	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY FINE SANDY CLAY, SOFT, HIGHLY WEATHERED
2.6	SHALE	GRADES WITH GRAVEL FROM 3 TO 6 FEET 8 FEET: SHALE, REDDISH BROWN, SILTY WITH SOME FINE SAND, SOFT, FRESH
3.6		
4.0		
3.0		
3.0		GRADES WITH THIN LIMESTONE INTERBEDS FROM 26 TO 32 FEET
3.3		
4.4		GRADES GRAY AND HARD FROM 40 FEET
4.8		
4.6		GRADES REDDISH BROWN FROM 55 FEET
4.0		
4.3		
7.5		
6.7		
5.0		
6.5	SS/MS	70 FEET: SANDSTONE, WHITE TO GRAY, FINE-GRAINED, INTERBEDDED WITH REDDISH BROWN SANDY MUDSTONE, THIN BEDDED, HARD, FRESH
6.7		
6.0		
5.0	SS	79 FEET: SANDSTONE, LIGHT BROWN, FINE-GRAINED WITH SOME MEDIUM TO COARSE GRAINS, SLIGHTLY CALCAREOUS, COMPOSED OF QUARTZ WITH MINOR LIMESTONE, HARD, FRESH
6.0		
6.7		
10.0		
8.0		
6.4	SHALE	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



Continental Environmental Services

TITLE from GTRF 06E
Geoscience Consultants Y86
Table 3-1

1 screen old series
2 ditto
— TD

SCALE:

DATE:

REVISION:

LITEP0811

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									

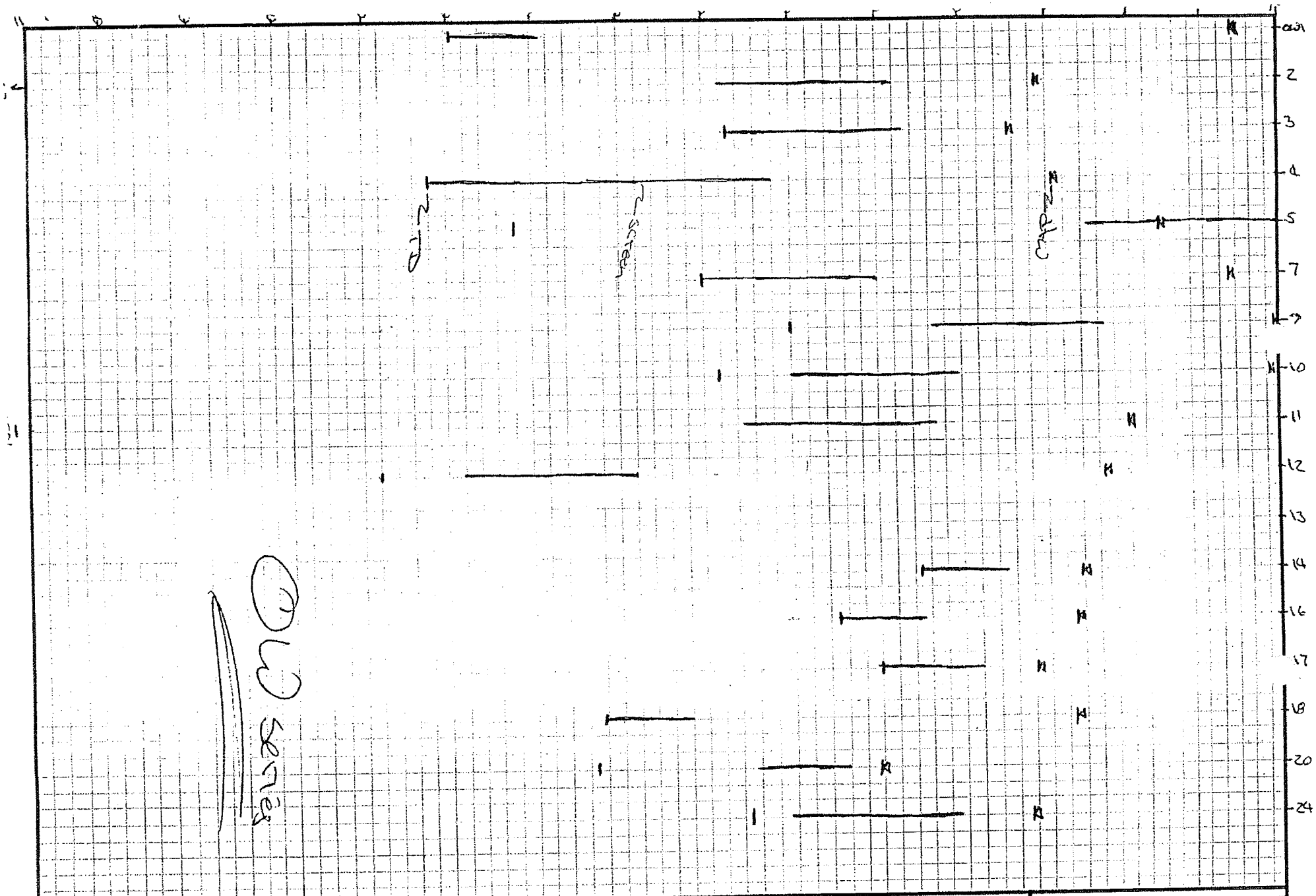
PENETRATION RATE MINUTES/FOOT	SYMBOLS	DESCRIPTION
2.0, 1.7, 1.6, 1.7, 2.6	CL	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY, FINE SANDY CLAY, CALCAREOUS, SOFT, HIGHLY WEATHERED
2.2, 2.6, 2.4	SM	24 FEET: REDDISH BROWN SILTY, VERY FINE SAND, SOFT, HIGHLY WEATHERED
5.0, 4.0	SS	39 FEET: SANDSTONE, 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.

BAD LOG

LOG OF BORINGS

DAMES & MOORE



Continental Environmental Services

TITLE from GTRF 06E
Geoscience Consultants Y86
Table 3-1

screen	Old series
≈ dtw	
— TD	

SCALE:

DATE:

REVISION:

LITEP0811

BORING OW-18

SURFACE ELEVATION: 6932 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
0.7, 1.0, 1.2, 1.7	SH	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN SILTY FINE SAND, SOFT, HIGHLY WEATHERED
3.0, 3.2, 6.0, 3.0, 4.8, 4.0, 4.0	SHALE	17 FEET: SHALE, REDDISH BROWN, SANDY, WITH SOME GRAVEL-SIZED FRAGMENTS OF CHERT AND PETRIFIED WOOD, OCCASIONAL THIN INTERBEDS OF LIMESTONE AND SANDSTONE, SOFT, FRESH GRADES HARD FROM 30 TO 32 FEET GRADES GRAY FROM 32 FEET GRADES HARD FROM 37 TO 41 FEET
3.0, 2.9	SS	0.5 FOOT LAYER OF FINE-GRAINED, BROWN, CALCAREOUS SANDSTONE FROM 49 FEET
6.3, 3.0, 2.8, 3.6	SS	61 FEET: SANDSTONE, BROWN, FINE-GRAINED, THIN BEDDED WITH OCCASIONAL THIN INTERBEDS OF BLUISH GRAY MUDSTONE, NONCALCAREOUS, HARD, FRESH MUDSTONE INTERBEDS GRADE OUT FROM 65 FEET, GRADES SOFT

BORING COMPLETED AT 82.0 FEET ON 12/4/80.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 72.0 TO 82.0 FEET.
GRAVEL PLACED FROM 67.0 TO 82.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 27.0 FEET BELOW GROUND ON 12/5/80.

LOG OF BORINGS

DAMES & MOORE

PLATE A2-18

Continental Environmental Services

TITLE From GTRF 06E
Geoscience Consultants Y86
Table 3-1

1 screen
2 dtw
— TD

Old series

SCALE:

DATE:

REVISION:

LITEP0811

BORING OW-24

SURFACE ELEVATION: 6878 FEET

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

PENETRATION RATE MINUTES/FOOT

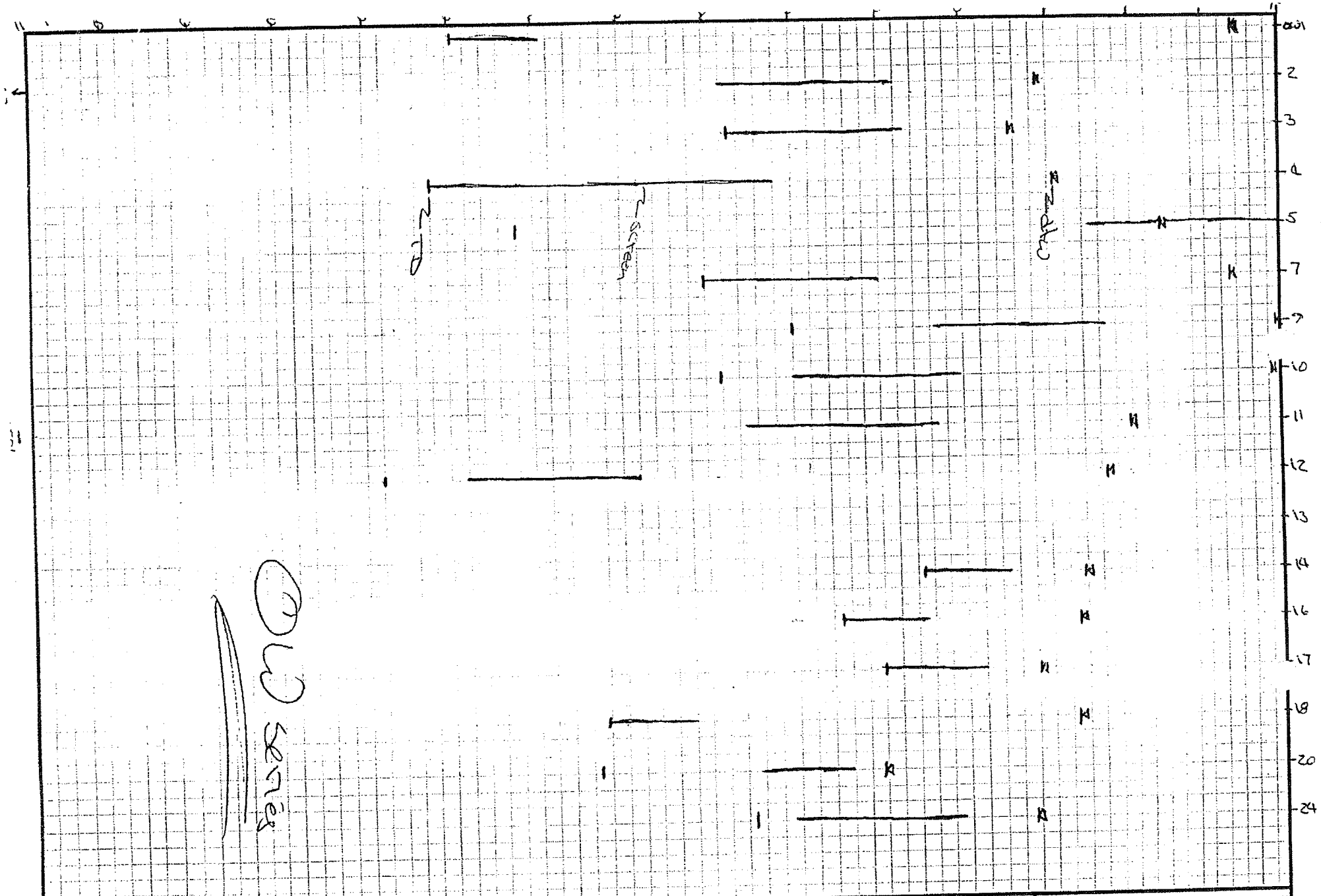
2.4, 2.0, 2.0, 1.6, 2.0, 1.8, 2.3, 1.8, 2.3, 3.5, 3.3, 4.0, 3.7, 4.0, 2.0, 3.0, 2.3, 2.4

SYMBOLS	DESCRIPTION
CL	TRIASSIC PERIOD CHINLE FORMATION REDDISH BROWN, VERY FINE SANDY CLAY, SOFT, HIGHLY WEATHERED
SHALE	30 FEET: SHALE, REDDISH BROWN, SANDY, SOFT, FRESH

BORING COMPLETED AT 65.0 FEET ON 1/2/81.
4-INCH PVC PIEZOMETER INSTALLED WITH PERFORATIONS FROM 41.0 TO 61.0 FEET.
GRAVEL PLACED FROM 28.0 TO 61.0 FEET AND BORING SEALED WITH BENTONITE AND CEMENT TO SURFACE.
GROUND WATER LEVEL MEASURED AT 32.5 FEET BELOW GROUND ON 1/5/81.

LOG OF BORINGS

DAMES & MOORE



Continental Environmental Services

TITLE From GTRF 06E
Geoscience Consultants Y86
Table 3-1

screen	OW series
± dtw	
– TD	

SCALE:

DATE:

REVISION:

LITEP0811

WELL CLOSURE RECORD

WELL IDENTIFICATION: OW-26

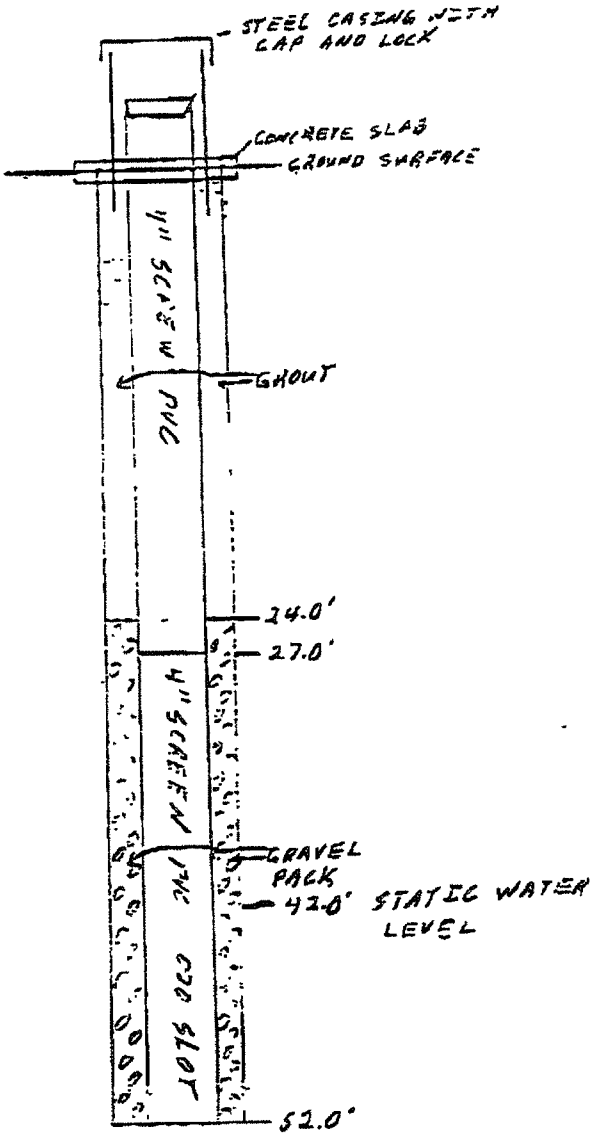
LOCATION	
STATE:	NEW MEXICO
COUNTY:	McKINLEY
LOCAL COORDINATES OR TOWNSHIP AND RANGE:	PLANT LOCALS: N3730.74, W1188.93
OWNER:	GIANT REFINING COMPANY, 505-722-3833
CONTACT:	DORINDA MANCINI, ENVIRONMENTAL DEPARTM
CLOSURE COMPANY:	PRECISION ENGINEERING, INC., 505-523-7674
CONTACT:	WILLIAM H. KINGSLEY
CLOSURE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

DETAIL OF CLOSURE PROCEDURE:

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

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

CINIZA REFINERY
OW-26
DRILLED: JUNE 29, 1990



FORMATION LOG

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

GREG
DRILLER
NOT
KNOWN