CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
3550 N. Central Ave, 2nd floor
Phoenix, AZ, 85012
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

The following file is part of the Walter E. Heinrichs, Jr. Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

Welenco

WELLEX INCORPORATED

ELECTRIC LOG

COMPANY

WELL NO.

FIELD

COUNTY

STATE

LOCATION

SEC. TWP. RGE.

Other Services

Permanent Datum

Elev.: K.B.

D.F.

G.L.

Log Measured From

Ft. Above Perm. Datum

Drilling Measured From

Date

Run No.

Depth-Driller

Depth-Logger

Bottom Logged Interval

Top Logged Interval

Type Fluid in Hole

Salinity, PPM Cl

Density

Viscosity

pH

Fluid Loss

Source of Sample

Rm @ Meas. Temp.

Rmf @ Meas. Temp.

Rmc @ Meas. Temp.

Source: Rmf — Rmc

Rm @ BHT

Rmf @ BHT

Rmc @ BHT

Time Circ. Stopped

Time Logger on Bottom

Max. Rec. Temp. Deg. F

Equipment No.

Location

Recorded By

Witnessed By

Run No.	Bit From	Bit To	Size	Type Fluid in Hole	Density	Viscosity	pH	Fluid Loss	Source of Sample	Rm @ Meas. Temp.	Rmf @ Meas. Temp.	Rmc @ Meas. Temp.	Source: Rmf — Rmc	Rm @ BHT	Rmf @ BHT	Rmc @ BHT	Time Circ. Stopped	Time Logger on Bottom	Max. Rec. Temp. Deg. F	Equipment No.	Location	Recorded By	Witnessed By

Field Area

This Reading and Log Conforms To API RP 31 - ⊕

REMARKS

Changes in Mud Type or Additional Samples

Type	Sample No.	Depth	Date	Time

Type Log

Depth

Scale Change

Scale Ft. Per Min.

Scale Down Hole

Type Log	Depth	Scale Ft. Per Min.	Scale Down Hole

Equipment Data

Run No.	Tool Type	Tool Type	Tool Position	Other

SPONTANEOUS POTENTIAL millivolts

RESISTIVITY ohms, ar/m

SHORT NORMAL 16 Inch

LONG NORMAL 64 Inch

RESISTANCE Detail Curve

Depth

100

200

300

400

500

600

700

800

900

1000

1050

950

1000

Short Normal — AM 16"

Long Normal — AM 64"

SP Curve

Short Normal — AM 16"

Long Normal — AM 64"

SP Curve

Caliper 10" Inch

0

50

0

200

welenco

WELL ENGINEERING SURVEYS

Caliper Density

COMPANY	STEWART DRILLING
WELL	E-19
FIELD	ESSCO
STATE	ARIZONA COUNTY MARICOPA
LOCATION: SEC. TWP. RGE.	OTHER SERVICES: 16-64 E-LOG GAMMA NEUTRON
PERMANENT DATUM	C.L. ELEV. 1045.25' ELEV. C.L.
LOG MEASURED FROM	C.L. FT. ABOVE PERM. DATUM
DRILLING MEASURED FROM	C.L.

DATE	11/5/82	11/5/82	
RUN NO.	ONE	ONE	
TYPE LOG	CALIPER	DENSITY	
DEPTH-DRILLER	1003'	1003'	
DEPTH-LOGGER	1005'	1005'	
BOTTOM LOGGED INTERVAL	1003'	1003'	
TOP LOGGED INTERVAL	0'	0'	
TYPE FLUID IN HOLE	GEOTONITE	GEOTONITE	
MAX. REC. TEMP. DEG. F.	N/A	N/A	
RECORDED BY	P. AMORITOS	P. AMORITOS	
WITNESSED BY	P. MEDRICK	P. MEDRICK	

RUN NO.	BIT	BORE-HOLE RECORD FROM	TO	SIZE	CASING RECORD WGT.	FROM	TO
1	6.5"	SURFACE	1003'				

Remarks

Field Rate

DEPTHS

CALIPER IN INCHES

DEPTH IN FEET

welenco

WELL ENGINEERING SERVICES

Gamma-Ray, Neutron Log

Company	
Well	
Field	
County	
State	
Location	
Other Services	
Permanent Datum	
Log Measured From	
Drilling Measured From	
Elev. K.B.	
Elev. D.F.	
Elev. G.L.	
Date	
Run No.	
Depth-Driller	
Depth-Logger	
Bottom Logged Interval	
Top Logged Interval	
Type Fluid in Hole	
Salinity, PPM Cl	
Density	
Level	
Max. Rec. Temp. Deg. F	
Operating Rig Time	
Recorded By	
Witnessed By	

EQUIPMENT DATA

Gamma Ray		Neutron	
Run No.	1	Run No.	1
Tool Model No.	MGT375-1-1724	Log Type	CNL
Inspector	J. Little	Tool Model No.	MGT375-1-1376
Detector Model No.	1	Inspector	J. Little
Type	GR	Detector Model No.	1-1121A
Length	18'	Type	N/A
Distance to N. Source	14'	Length	6'6"
		Source Model No.	171
Ground		Serial No.	1A
Motor Truck No.		Strength	1.5
Instrument Truck No.		Type	NPW-251
Tool Serial No.		Strength	30

LOGGING DATA

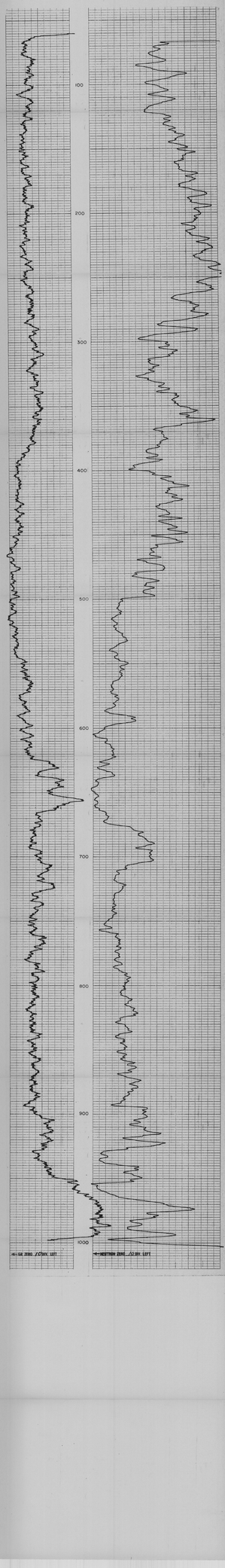
Gamma Ray						Neutron					
Run No.	Depth Driller	Depth Logger	T.C. Sec.	Bore Settings	Gain Dial Div. L or R	API G.R. Units per Log Div.	T.C. Sec.	Bore Settings	Gain Dial Div. L or R	API N. Units per Log Div.	
1	1000'	1000'	1 sec	12"	1.5	10	1	7 7/8 inch	10R	10	

Reference Literature:

Remarks:

Fold Here

GAMMA RAY	DEPTH	NEUTRON
API GAMMA-RAY UNITS		API NEUTRON UNITS
0		1000



welenco

WELL ENGINEERING SURVEYS

ELECTRIC LOG

Serial No. 73823

COMPANY: ESSO PRODUCING INC.

WELL: No. 1

FIELD: ESSO

STATE: ARKANSAS — COUNTY: JOHNSON

LOCATION: SEC 1 T 13 N R 21 W

Other Services: SONIC, CONTINUOUS DIPMETER, CONTINUOUS VELOCITY SURVEY

Permanent Datum: GL — Elev. 1,135 ft

Log Measured From: KB — 12 ft above Perm. Datum

Drilling Measured From: KB

Date: 6-8-82

Run No.: ONE

Type Log: DUAL INDUCTION LATEROLOG

Depth—Driller: 6,515

Depth—Logger: 6,515

Bottom Logged Interval: 6,515

Top Logged Interval: 1,137

Type Fluid in Hole: SALT WATER GEL

Salinity, PPM Cl: 4,000

Density: 9.2

Level: FULL

Max. Rec. Temp. Deg. F: 140

Equipment No. and Location: 3823 LAFAYETTE

Recorded By: D. BOWLES

Witnessed By: MR. MOSS

Run No.	Bit From	Bit To	Size	Type Fluid in Hole	Density	Viscosity	pH	Fluid Loss	Source of Sample	Rm @ Meas. Temp.	Rmf @ Meas. Temp.	Rmc @ Meas. Temp.	Source: Rmf / Rmc	Rm @ BHT	Rmf @ BHT	Rmc @ BHT	Time Since Circ.	Max. Rec. Temp. Deg. F.	Equip. Location	Recorded By	Witnessed By
ONE	1,137	6,515	7 7/8"	SALT WATER GEL	9.2	40			MUD PIT	@ °F	@ °F	@ °F		@ °F	@ °F	@ °F	24 HRS	140	3823 LAFAYETTE	D. BOWLES	MR. MOSS

Field Hrs: This Heading and Log Conforms To API RP 31

REMARKS

Changes in Mud Type or Additional Samples

Date / Sample No.	Depth—Driller	Type Fluid in Hole

Scale Changes

Type Log	Depth	Scale Up Hole	Scale Down Hole

Data	Run	Tool Type	Pad Type	Pad Position	Other
Rm @ Meas. Temp.					
Rmf @ Meas. Temp.	ONE	10-in. S-LOG	PADS		
Rmc @ Meas. Temp.					
Source: Rmf / Rmc					
Rm @ BHT					
Rmf @ BHT					
Rmc @ BHT					

Equipment Data

NOTE: CIRCULATION WAS RECOVERED BY ACAK FILLING A PORTION OF THE HOLE WITH PEA GRAVEL AND USING OF LOSING QUANTITIES OF GEL. HENCE, A L.I.P. OF WIDTH AUND, IT WAS FOUND THAT A SMALL VOLTAGE POTENTIAL EXISTS ON THE RIG, THE LINE THAT SHOWS MUDS INSULATED, THE LARGER TRUCK WAS ALSO THOROUGHLY GROUNDED.

SPONTANEOUS POTENTIAL millivolts

Depths

RESISTIVITY, ohms_m²/m

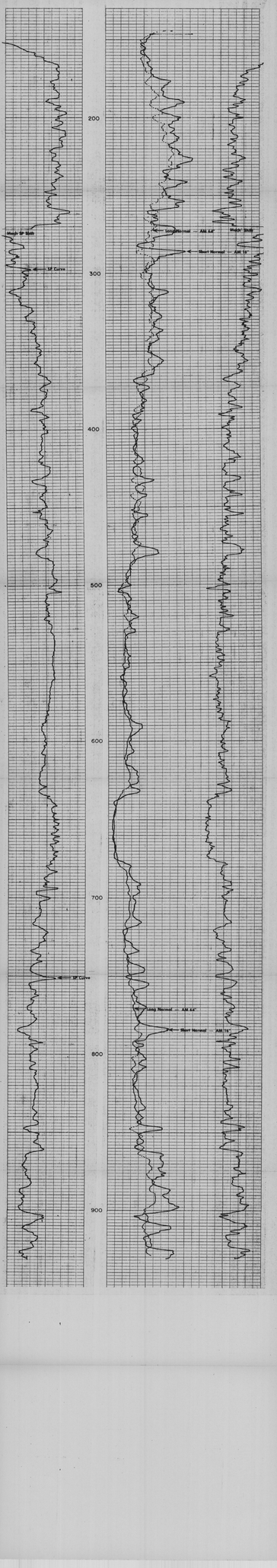
SHORT NORMAL 16 inch

0 — 50

LONG NORMAL 64 inch

0 — 50

RESISTANCE Detail Curve



welenco

WELL ENGINEERING SURVEYS

SONIC/VARIABLE DENSITY WAVEFORM

COMPANY: [illegible]

WELL: [illegible]

FIELD: [illegible] COUNTY: [illegible]

STATE: [illegible]

LOCATION: [illegible]

Other Services: [illegible]

Permanent Datum: [illegible] Elev.: [illegible]

Log Measured From: [illegible] [illegible] Above Perm. Datum

Drilling Measured From: [illegible]

Date: [illegible]

Run No.: [illegible]

Depth-Driller: [illegible]

Depth-Logger: [illegible]

Bottom Logged Interval: [illegible]

Top Logged Interval: [illegible]

Type Fluid in Hole: [illegible]

Salinity, PPM Cl: [illegible]

Density: [illegible] Viscosity: [illegible]

Max. Rec. Temp. °F: [illegible]

Operating Rig Time: [illegible]

Recorded By: [illegible]

Witnessed By: [illegible]

BOW SPRING CENTRALIZERS	No.	Hours	Miles
Mud Type:	[illegible]	[illegible]	[illegible]
Density:	[illegible]	[illegible]	[illegible]
Viscosity:	[illegible]	[illegible]	[illegible]
PH:	[illegible]	[illegible]	[illegible]
Fluid Loss:	[illegible]	[illegible]	[illegible]
Source of Sample:	[illegible]	[illegible]	[illegible]
Rm @ Meas. Temp.	[illegible]	[illegible]	[illegible]
Rmf @ Meas. Temp.	[illegible]	[illegible]	[illegible]
Rmc @ Meas. Temp.	[illegible]	[illegible]	[illegible]
Source: Rmf / Rmc	[illegible]	[illegible]	[illegible]
Rm @ BHT	[illegible]	[illegible]	[illegible]
Time Since Circ.	[illegible]	[illegible]	[illegible]
Max. Rec. Temp. °F	[illegible]	[illegible]	[illegible]
Equip. Location	[illegible]	[illegible]	[illegible]
Recorded By	[illegible]	[illegible]	[illegible]
Witnessed By	[illegible]	[illegible]	[illegible]

RUN	BIT	CASING	SHOE
No.	[illegible]	[illegible]	[illegible]
Type	[illegible]	[illegible]	[illegible]
Size	[illegible]	[illegible]	[illegible]
From	[illegible]	[illegible]	[illegible]
To	[illegible]	[illegible]	[illegible]

BOREHOLE RECORD	No.	BIT	CASING RECORD	No.
Run No.	[illegible]	[illegible]	Size	[illegible]
Bit From	[illegible]	[illegible]	Wgt.	[illegible]
To	[illegible]	[illegible]	From	[illegible]

Remarks:

VDL PHOTOGRAPHED ON SCALE (3 FT.) RECEIVED.

Field Here

DEPTHS

INTEGRATED TRAVEL TIME

200 1200

VDL (usec)

0 msec/ft 90

100

200

300

400

500

600

700

800

900

INTEGRATED TRAVEL TIME

welenco

WELL ENGINEERING SURVEYS

Gamma-Ray Neutron Log

COMPANY	[illegible]
WELL	[illegible]
FIELD	[illegible]
COUNTY	[illegible]
STATE	[illegible]
API NO.	[illegible]
OTHER SERVICES	[illegible]
SEC.	[illegible]
TWP.	[illegible]
RGE.	[illegible]
PERMANENT DATUM	[illegible]
ELEV.	[illegible]
LOG MEASURED FROM	[illegible]
DRILLING MEASURED FROM	[illegible]
DATE	[illegible]
RUN NO.	[illegible]
DEPTH-DRILLER	[illegible]
DEPTH-LOGGER	[illegible]
BTM. LOG INTERVAL	[illegible]
TOP LOG INTERVAL	[illegible]
CASING-DRILLER	[illegible]
CASING-LOGGER	[illegible]
BIT SIZE	[illegible]
TYPE FLUID IN HOLE	[illegible]
DENS.	[illegible]
VISC.	[illegible]
PH	[illegible]
FLUID LOSS	[illegible]
SOURCE OF SAMPLE	[illegible]
RM @ MEAS. TEMP.	[illegible]
RMF @ MEAS. TEMP.	[illegible]
RMC @ MEAS. TEMP.	[illegible]
SOURCE: RMF / RMC	[illegible]
RM @ BHT	[illegible]
TIME SINCE CIRC.	[illegible]
MAX. REC. TEMP.	[illegible]
EQUIP. LOCATION	[illegible]
RECORDED BY	[illegible]
WITNESSED BY	[illegible]

RUN NO.	BORE-HOLE RECORD				CASING RECORD			
	BIT SIZE	FROM	TO	WEIGHT	SIZE	WEIGHT	FROM	TO
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EQUIPMENT DATA

Gamma Ray				Neutron			
Run No.	005			Run No.	005		
Tool Model No.	GCS/7315A/7A			Log Type	S-S		
Diameter	1 11/16"			Tool Model No.	GCS/7315A/7A		
Detector Model No.	-			Diameter	1 11/16"		
Type	GM			Detector Model No.	-		
Length	18"			Type	He3		
Distance to N. Source	6'			Length	6"		
				Source Model No.	7C-1		
General				Serial No.	119		
Hoist Truck No.				Spacing	12"		
Instrument Truck No.				Type	Delta 241		
Tool Serial No.				Strength	3C		

LOGGING DATA

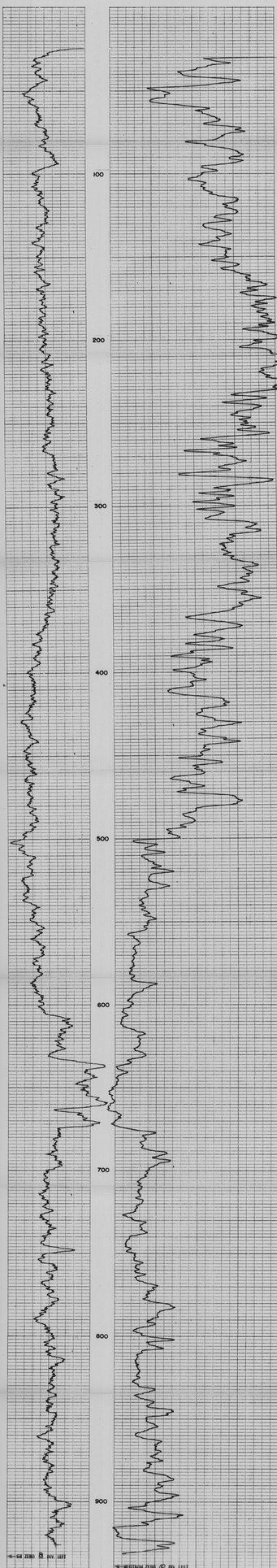
General						Gamma Ray			Neutron		
Run No.	Depths From	Depths To	Speed Ft/Min.	T.C. Sec.	Sens. Settings	Zero Div. L or R	API G.R. Units per Log Div.	T.C. Sec.	Sens. Settings	Zero Div. L or R	API N. Units per Log Div.
1	331'	75'	20	1	100/1/2B	82	20	1	500/22	105	60

Reference Literature:

Remarks:

Fold Here

GAMMA RAY	DEPTHS	NEUTRON
API GAMMA-RAY UNITS		API NEUTRON UNITS
160 360		400 1200



welenco

WELL ENGINEERING SURVEYS

ELECTRIC LOG

Company	PETROLEUM DEVELOPMENT CORP.
Well	FEDERAL WAYNE MILLER #1-1
Field	WILDCAT
County	SWEETWATER
State	WYOMING
Other Services	NONE
Permanent Datum	GROUND LEVEL
Elevation	6417 KB
Log Measured From	10 FT. ABOVE PERM. DATUM
Drilling Measured From	KB

Date	10-11-87	10-11-87	
Run Number	ONE	TWO	
Depth Driller	10,000	10,000	
Depth Logger	10,000	10,000	
Bottom Log Interval	10,000	10,000	
Top Log Interval	2,000	2,000	
Casing Driller	10-3/4" @ 2,000	10-3/4" @ 2,000	
Casing Logger	2,000	2,000	
Bit Size	9-7/8"	9-7/8"	
Type Fluid in Hole	LIGNOSULFONATE	LIGNOSULFONATE	
Dens. / Visc.	9.4 / 45	9.4 / 45	
pH / Fluid Loss	10.5 / 4.0	10.5 / 4.0	
Source of Sample	FLOWLINE	FLOWLINE	
Rm @ Meas. Temp.	.09 @ 70°F	.09 @ 70°F	
Rmf @ Meas. Temp.	.07 @ 70°F	.07 @ 70°F	
Rmc @ Meas. Temp.	.12 @ 70°F	.12 @ 70°F	
Source: Rmf / Rmc	MEASURED / CALCULATED	MEASURED / CALCULATED	
Rm @ BHT	.09 @ 170°F	.09 @ 170°F	
Rmf @ BHT	.07 @ 170°F	.07 @ 170°F	
Rmc @ BHT	.12 @ 170°F	.12 @ 170°F	

Time Circ.	6 HRS.	6 HRS.	
Max. Rec. Temp.	170°F	170°F	
Equipment Number	1-5-X	1-5-X	
Location	1-5-X	1-5-X	
Recorded By	GARY WILSON	GARY WILSON	
Witnessed By	MR. RAY	MR. RAY	

Field Rices | This Reading and Log Conform To API RP 31 ☑

REMARKS:

Changes in Mud Type or Additional Sampling

Date	Depth	Type Log	Depth	Scale Up Hole	Scale Down Hole
10-11-87	2,000	DIPM	9500	9500 - 10,000	2,000 - 9500

Scale Changes

Date	Depth	Scale Up Hole	Scale Down Hole

Sample - Driller

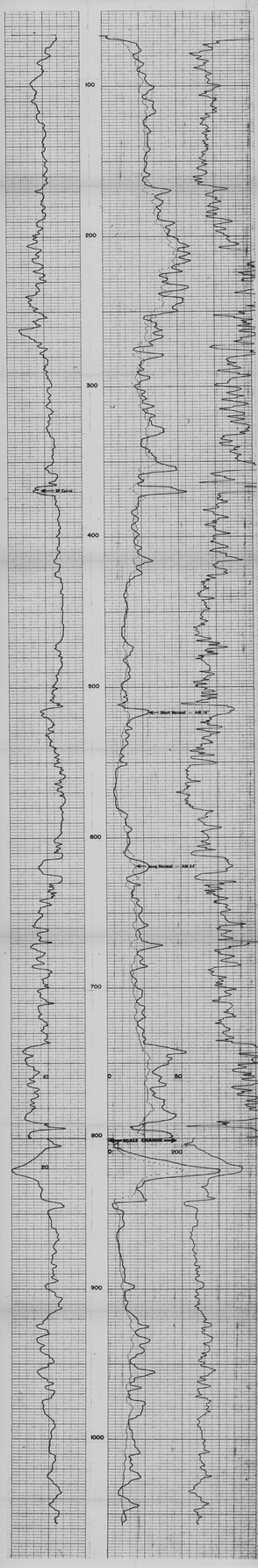
Type Fluid in Hole

Dens. / Visc.			
pH / Fluid Loss	nil		
Source of Sample			
Rm @ Meas. Temp.	@ °F	@ °F	
Rmf @ Meas. Temp.	@ °F	@ °F	
Rmc @ Meas. Temp.	@ °F	@ °F	
Source: Rmf / Rmc			
Rm @ BHT	@ °F	@ °F	
Rmf @ BHT	@ °F	@ °F	
Rmc @ BHT	@ °F	@ °F	

Equipment Data

Bow No.	Tool Type	Pad Type	Pad Position	Other
1-5-X	E-DOC	FIXED	FIXED	

SPONTANEOUS POTENTIAL millivolts	Deflection	RESISTIVITY ohms, m²/m	RESISTIVITY ohms, m²/m
10 / 0 / 120		SHORT NORMAL 16 INCH 0 – 50	
		LONG NORMAL 64 INCH 0 – 200	RESISTANCE Detail Curve



welenco

WELL ENGINEERING SURVEYS

Density

COMPANY	ROB JONES DRILLING
WELL	1
FIELD	ENSCO
COUNTY	MARLOWE
LOCATION	
SECTION	
TWP	
RGE	
OTHER SERVICES	
PERMANENT DATUM	G.L.
ELEV.	0
LOG MEASURED FROM	G.L.
DRILLING MEASURED FROM	G.L.
DATE	11/17/82
RUN NO.	ONE
DEPTH-DRILLER	1000'
DEPTH-LOGGER	1000'
BTM. LOG INTERVAL	1000'
TOP LOG INTERVAL	0'
CASING-DRILLER	13 3/8" @ 0'
CASING-LOGGER	13 3/8" @ 0'
BIT SIZE	8 1/2"
TYPE FLUID IN HOLE	WATER
DENSITY	8.4
VISCOSITY	28
PH	10
FLUID LOSS	NO
SOURCE OF SAMPLE	FLOWLINE
RM @ MEASURED TEMP.	1.5 @ 80
RMF @ MEASURED TEMP.	1.5 @ 80
RMC @ MEASURED TEMP.	1.5 @ 80
SOURCE: RMF / RMC	M / M
RM @ BHT	1.5 @ 100
TIME SINCE CIRC.	8 HRS
TIME ON BOTTOM	1 HR
MAX. REC. TEMP.	100
EQUIPMENT NO.	1
LOCATION	1
RECORDED BY	R. ALCORN
WITNESSED BY	

CORRECTED DENSITY CURVE ONLY INDICATES CORRECTION FOR BOREHOLE SIZE, MUD WEIGHT, TEMPERATURE AND PRESSURE

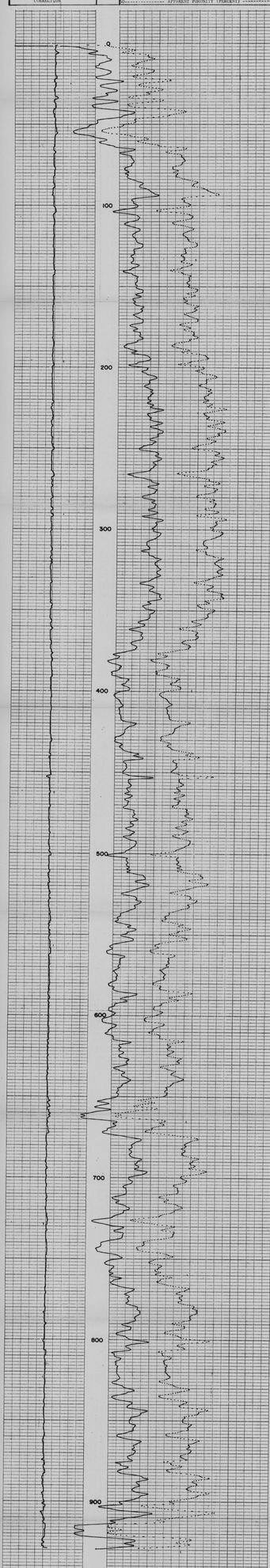
Reference Literature:

Remarks:

NOTE: CORRECTION CURVE ONLY INDICATES IF CORRECTION OF DENSITY AND POROSITY CURVES IS REQUIRED. DENSITY AND POROSITY ARE NOT AUTOMATICALLY CORRECTED.

Field Store

	DEPTHS	
CORRECTION		2 APPARENT DENSITY (GM/CC) 3
		50 APPARENT POROSITY (PERCENT) 10



Gamma-Ray Neutron Log

Welenco
WELL ENGINEERING SURVEYS

Company	ETERNAL ENERGY, LLC
Well	#1
Field	SOUTH - DEVILS SLIDE
County	MORGAN
State	UTAH
Other Services	
Location	1,980' FSL & 1,980' FEL
Sec.	24
Twp.	3N
Rge.	1W
Permanent Datum	GROUND LEVEL
Elevation	5,300'
Log Measured From	KB 10' A.G.L.
Drilling Measured From	KB
Elev.: K.B.	5,310'
D.F.	
G.L.	5,300'
Date	10-Jul-14
Run No.	ONE
Depth-Driller	1,200'
Depth-Logger	1,200'
Bottom Logged Interval	1,200'
Top Logged Interval	SURFACE
Type Fluid in Hole	WATER
Salinity, PPM Cl	
Density / Viscosity	
Max. Rec. Temp. Deg. F.	
Estimated Cement Top	SURFACE
Time Well Ready	
Time Logger on Bottom	
Equipment No. & Location	
Recorded By	
Witnessed By	

EQUIPMENT DATA

Gamma Ray		Neutron	
Run No.	ONE	Run No.	ONE
Tool Model No.	GCS/7.5D.1.5/4	Log Type	In-3
Diameter	1 11/16"	Tool Model No.	GCS/7.5A.1.5/2-1
Detector Model No.	-	Diameter	1 11/16"
Type	GM	Detector Model No.	-
Tension	Lbs.	Type	He-3
Distance to N. Source	11'	Length	6"
		Source Model No.	72-1
General		Serial No.	113
Rent Truck No.		Spacing	13"
Instrument Truck No.		Type	Am-Be .25 Ci
Tool Serial No.		Strength	261

LOGGING DATA

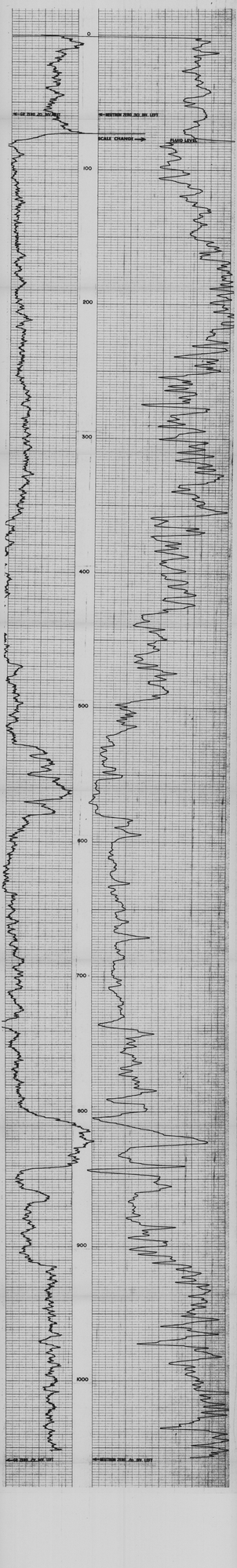
Ground Data					Gamma Ray			Neutron		
Run No.	Depths	Speed FPM	T.C. Sec.	Bore Settings	API G.R. Units Div. S or B	T.C. Sec.	Bore Settings	API N. Units Div. L or R		
1	From: 0'	To: 1,200'	20'	5	100/128	1sec	20	3	100/222	105	60
	2.5"	5"	20	5	100/128	20sec	20	3	100/111	205	80

References Literature:

Remarks:

Field Sheet

GAMMA RAY		DEPTHS	NEUTRON	
000	600	1600		6000
API GAMMA-RAY UNITS			API NEUTRON UNITS	
180	480	1200		1200



welenco

WELL ENGINEERING SURVEYS

Caliper Density

COMPANY	TIDWART DRILLING
WELL	B-11
FIELD	DUNDON MOBILE VALLEY
STATE	ARIZONA COUNTY MARICOPA
LOCATION:	
SEC.	TWP.	RGE.
OTHER SERVICES:	16-44 E-LOG CANNA SECTION
PERMANENT DATUM	Gals.	ELEV.	
LOG MEASURED FROM	Gals.	AT ABOVE PERM. DATUM	
DRILLING MEASURED FROM	Gals.		
DATE	12/22/82		
RUN NO.	ONE		
TYPE LOG	CALIPER DENSITY		
DEPTH-DRILLER	1032' 1032'		
DEPTH-LOGGER	1032' 1032'		
BOTTOM LOGGED INTERVAL	1028' 1028'		
TOP LOGGED INTERVAL	0' 0'		
TYPE FLUID IN HOLE	GLUCOMIX		
MAX. REC. TEMP. DEG. F	N/A		
ENGINEER AT	E. MAGNUSON		
WITNESSED BY	R. GUNTHEY		

BOTH	BOTH HOLE RECORD			CASING RECORD			
SIZE	WT.	FROM	TO	SIZE	WT.	FROM	TO
1	5.8	SURFACE	1032'				

Field Rev.

Sample No.

CALIPER
HOLE DIAMETER IN INCHES

DEPTHS

APPARENT DENSITY (GRAMS/CC)

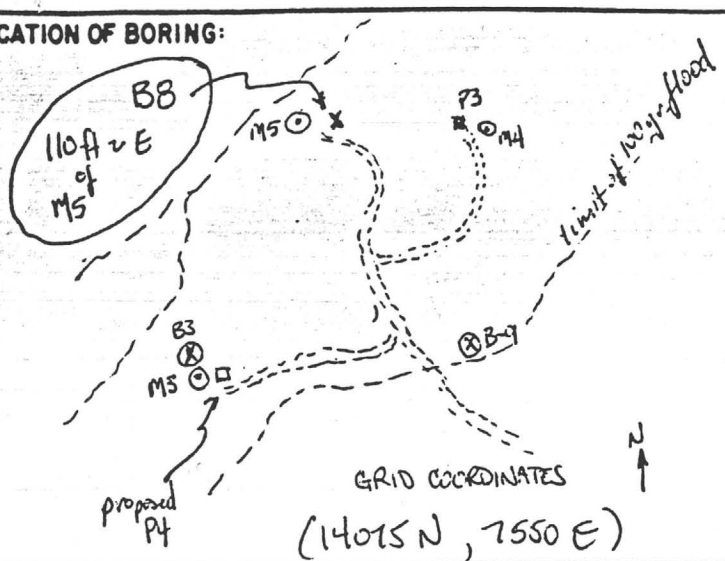
Original: 4.5.1.2
Copy: EOR, MEC, KBO, DSW, DLK, Locker, EOR

PRELIMINARY DRAFT

FIELD LOG OF BORING

SHEET 1 OF 52

LOCATION OF BORING:



PROJECT: ENSCO	BORING NO. B8
	TOTAL DEPTH: 101.3'
JOB NO.: 18396.004, 014	LOGGED BY: KPR
PROJ. MGR.: Carol Serlin	EDITED BY: HAV
DRILLING CONTRACTOR: Bob James Drilling	
DRILL RIG TYPE: Garner Denver 2000 - Mud Rotary, wireline core	
DRILLERS NAME: Patch Karr, Larry Marcus - Supervisors	
SAMPLING METHODS: Grab every 5', Core at contacts	
HAMMER WT.: —	DROP: —
STARTED, TIME: 0:35	DATE: 11/23/87
COMPLETED, TIME:	DATE:
BORING DEPTH (ft.)	used 8 drill collars
CASING DEPTH (ft.)	— 6½" bit
WATER DEPTH (ft.)	
TIME:	
DATE:	
BACKFILLED, TIME:	DATE: BY:
SURFACE ELEV.: 1408	DATUM: Mean Sea Level
CONDITIONS: Alluvial Fan, Creosote-Saguaro desert	

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE CONDITION (MUD EC)	DRILLING RATE (min/ft)	MUD Vis	MUD wt	MUD pH	DEPTH IN FEET	GRAPHIC LOG
		mud engineer →			/		52	1.436	9	1	SM
										2	
						50 ft / hr				3	
										4	
										5	
										6	
										7	
										8	
										9	
										10	

Light yellow-brown SILTY SAND (SM)
loose to coherent (sand and "balled" silt+sand), subangular, fine to medium grained sand, 20?% silt + clay
quartz-rich fragments, feldspar, biotite (?color may be reddish)
dry fine to coarse-grained subangular to subrounded
SM gravel coarse-grained sand mostly quartz
with few cobbles

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED) · SHEET 2 OF ____

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	EC COND	D.RATE	VIS	WT	PLT

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH | GRAPHIC LOG

11 — 4W BRN SILTY SAND (SM)

2 — SP — BROWN SAND (SP)

loose, dry, medium to coarse-grained, subangular, ~~moderately poorly graded~~ to subrounded (may be close to SW) very little (<5%) clay or silt with gravel, fine-grained sand size quartz-rich (granitic) fragments, feldspar, silt, calcite coatings

3

4

15

6

7 — Occasional calcite grain-coatings

8 — submounded

9 — biotite schist quartz-rich feldspar fragments well sorted (uniform grain size)

20

1

2

3

4

25 — (reddish brown color (?))

6

7

8 — increasing percentage gravel and coarse sand

9

30

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED). SHEET 3 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND EC	D.RATE	Vis	wt	pH	DEPTH	GRAPHIC LOG
										31	
										2	
										3	
										4	
										35	
						ft/hr				6	
										7	
										8	
										9	
										40	
										1	
										2	
										3	
										4	
					—	..	37	—	9.5	45	
										6	
										7	
										8	
										9	
										50	

BROWN SAND (SP)

percentage feldspar slowly increasing, although quartz still a more common.

Coarser grained w/ some gravels
<2% fragments are 1/4 IN

(qtz-rich fragment - probably veins in granite or gneiss.)

More medium to coarse grained
no gravels,
fragments either crystals of quartz or feldspar or mono-mineralic rocks (predominatatly quartz)

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 4 OF ____

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

BROWN SAND (SP)

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	VIS	WT	PH	DEPTH	GRAPHIC LOG	
										51	SP	
					2200		42	8.5	9.5			
										2		
										3		
										4		
										55		
										6		Coarse grained sand w/ gravels (1%?)
										7		more rock (biotite gneiss, biotite granite) fragments calcite coating on some fragments common silt and clay coatings (especially 60-65 ft)
										8		occasional calcite coatings increasing percentage rock fragments (granite and metamorphics)
										9		
										60		Medium to coarse sand
										1		slight decrease in percent gravel
										2		
										3		
										4		
										65		
										6		– some angular chip (breaking of larger fragments? gravels?)
										7		– slightly higher silt and clay (some coherent agglomerates of sand grains held together by clays and silts)
										8		
										9		
										70		

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED) SHEET 5 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND. EC	D.RATE	VIS	WT	PH	DEPTH	GRAPHIC LOG
										71	SP
										2	
										3	
										4	
										75	
										6	
										7	
										8	
										9	
										80	
										1	
										2	
										3	
										4	
										85	
										6	
										7	
										8	
										9	
										90	

BROWN SAND (SP)

slight increase in percent gravel

coarser grained sand w/ some small gravel (chatter) (these coarser grained samples may represent presence of gravels – especially when chatter occurs)

biotite gneiss, biotite granite fragments

slight increase in percent clay and silt

–slightly higher clay chatter

BROWN SILTY SAND (SM) medium to coarse grained subrounded to subangular silt gravel and clay

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 6 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	VIS	WT	pH	DEPTH	GRAPHIC LOG	
												BROWN SAND (SP)
										91	SP	
												– higher clay and silt (forming sand grain agglomerates)
										2		
										3		
												chatter
										4		
										95		
										6		still BRN SAND (SP)
												– higher clay and silt (as above)
												medium – coarse grained sand
										7		chatter
										8		
										9		continued increase in silt and clay
										100		
										1		still slightly higher silt & clay
										2		chatter
										3		
										4	SP	[illegible]
					1800		46	8.7	95	105		[illegible]
												[illegible] GRAVELLY SAND (SP) [illegible]
										6		back to lower silt and clay content
										7		[illegible] chatter
												[illegible]
										8		
										9		
										110		

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 7 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	~~COND~~ EC	D.RATE	Vis	wt	pH	DEPTH	GRAPHIC LOG	BROWN SAND (SP)
										111	SP	
												increasing clay and silt grain coatings
										2		coarse grained sands (Probably GRAVELLY SAND) continuous chatter
										3		
										4		
										115		
										6		coarse grained angular, broken fragments (Probably GRAVELLY SAND)
										7		
										8		
										9		
										120		decreasing gravel
										1		medium to coarse sand sporadic chatter
										2		medium to coarse grained sand with gravel
										3		
										4		
										125		
										6		occasional chatter
										7		
										8		
										9		
										130		

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 8 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	~~COND.~~ EL	D.RATE	vis	wt	pH	DEPTH	GRAPHIC LOG	BROWN SAND (SP)
										131	SP	
												medium to coarse grained — occasional chatter
										2		
										3		
										4		
										135		
										6		
										7		Calcite coating on fragments. — chatter
										8		
										9		
										140		
										1		
										2		(fast penetration) — occasional chatter
										3		
										4		
										145		
										6		
										7		(fast penetration) — chatter
										8		
										9		
										150		

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED) SHEET 9 OF

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND. EC	D.RATE	vis	wt	pH	DEPTH	GRAPHIC LOG
										151	
										2	
										3	
										4	
										155	
										6	
										7	
										8	
										9	
										160	
										1	
										2	
										3	
										4	
										165	
										6	
										7	
										8	
										9	
										170	

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

BROWN SAND (SP)

medium-coarse sand

(much the same through 180')

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 10 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	~~COND.~~ EL	D.RATE	Vis	wt	pH	DEPTH	GRAPHIC LOG	BROWN SAND (SP)
										171		medium to coarse grained
										2		(fast drilling)
										3		
										4		
										175		slight [illegible]
						50 ft/hr				6		(fast drilling)
										7		
										8		
										9		
										180		[illegible] percent gravel
										1		Coarse-grained chatter
										2		w/ <2% gravels
										3		
					1800		45	8.3		4		
										185		
										6		Coarse grained chatter
										7		
										8		
										9		
										190		

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED) SHEET 11 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	CORED	D.RATE	VIS	WT	pH	DEPTH	GRAPHIC LOG
										191	SP
										2	
										3	
										4	
										195	
										6	
										7	
										8	
										9	
										200	
										1	
										2	
										3	
										4	
										205	
										6	
										7	
										8	
										9	
										210	

BROWN SAND (SP)

Coarse-grained w/gravels

occasional chatter

Medium – coarse grained

FF8

HARDING-LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED) PRELIMINARY DRAFT SHEET 12 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	~~COND~~ EL	D.RATE	Vis	wt	pH	DEPTH	GRAPHIC LOG	
												BROWN SAND (SP)
										211	SP	
										2		medium-coarse sand very loose occasional chatter
										3		
										4		
										215		
										6		coarse sand
						50 ft/hr				7		
										8		abrupt increase in gravel
										9		
										220		gravelly coarse-grained sand BRN GRAVELLY SAND (SP) (almost a sandy gravel) ~1/4" gravel and coarse sand very loose
										1		
										2		
										3		
										4		rig chatter
										225		Light Brown 5YR 5/6 Gravelly Sand (SP)/Sand w/gravel
										6		medium to coarse grained, round to subangular, gap graded, granitic quartz, feldspar
										7		30% med. 50% coarse sand 20% gravel
										8		coarse-grained sand with gravel (225 to 230)
										9		
										230		

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY (DRAFT)

FIELD LOG OF BORING (CONTINUED)

SHEET 13 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	~~COND.~~ EC	D.RATE	VIS	WT	PH	DEPTH	GRAPHIC LOG	
										231		Same
										2		chatter
										3		(230 to 235)
										4		
										235	X	Same, gravel content decreasing.
						55 ft/hr				6		Sand w/gravel. mostly medium to coarse grained
										7		w/some fine sand
										8		5 to 10% fine, 40% med 40% coarse 10% gravel
										9		← medium to coarse grained (235 to 240) with silt and fine grained sand
										240	X	chatter
										1		Same, more gravel not much fines
										2		
										3		with [illegible] gravel (240 to 245)
										4		
										245	X	[illegible] some angular grains/fragments (wonder chips?)
										6		[illegible] chatter
										7		[illegible] any or [illegible]
										8		[illegible] to the wash [illegible] out? [illegible] silt and clay [illegible]
										9		
										250	X	

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 14 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	Vis	Wt	pH	DEPTH	GRAPHIC LOG	
										251		Light Brown 5YR 5/6 Sand w/gravel
												medium to coarse grained
										2		round to angular, gap graded,
												same lithology as above.
										3		chatter
										4		
												(250 to 255)
										255		
												same, Sand w/gravel
										6		
										7		continuing increase in silt clay
										8		
												(255 to 260)
										9		
												chatter
										260		
												same gravelly sand
										1		abundant chips
										2		
										3		(260 to 265)
												increasing gravel
										4		
										265		
												same, same sample intervals
										6		appear Moderate reddish brown 10R 4/6
												gravelly sand
										7		[illegible] sand with
										8		(265 - 270) chatter
												gravel silt and clay
										9		
										270		

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 15 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	VIS	WT	pH	DEPTH	GRAPHIC LOG	
										271		Light Brown & Med reddish brown gravelly sand and sand w/gravel
										2		Sand w/gravel
										3		med to coarse sand, subround to angular (chips)
										4		90% sand 10% gravel (270 to 275)
										275		[illegible] silt and clay chatter
												Same sand w/gravel [illegible]
										6		[illegible] TO RED-BROWN CLAYEY SAND
										7	SC	(275 to 290)
						55 ft/hr						(SC) medium to coarse-grained [illegible] to [illegible] with gravel and silt
										8		
										9		
										280		Same sand w/gravel
										1		chatter
										2		
										3		(280 to 285)
										4		
										285		percentage [illegible]
												Same sand w/gravel
										6		Same fine grained sand quartz, feldspar, cobble chips
										7		[illegible]
										8		(285 to 290)
										9		
										290		

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 16 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	vis	wt	pH	DEPTH	GRAPHIC LOG	
										291		
												Same chatter
										2		
										3		
										4		(290 to 295)
										295	X	
												Same decrease in gravel content
										6		
										7		
										8		(295-300) chatter
										9		
										300	X	not much chatter
												Light Brown 5YR 6/4 Sand
										1		[illegible] occasional [illegible] gravel, [illegible]
										2		[illegible]
										3		
										4		slight decrease [illegible] chatter
										305	X	
												Same Sand w/ gravel
										6		[illegible]
										7		(305 to 310)
										8		
										9		
										310	X	

FF8

HARDING-LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 17 OF ____

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

Same drilling.

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	vis	wt	pH	DEPTH	GRAPHIC LOG
										311	
										2	
										3	
										4	
										315	X
										6	
						5 ft/hr				7	
										8	
										9	
										320	X
					1900		42	8.7	9.5	1	
										2	
										3	
										4	
										325	X
										6	
										7	
										8	
										9	
										330	X

Light Brown Sand (SP)
fine to coarse grained, subround
to subangular, moderately well graded
quartz, feldspar, trace gravel.

(310 to 315)

Same,
(315 to 320)

Light Brown 5YR 5/6 Gravelly Sand
w/clay or Sand w/gravel & clay
fine to coarse grained sand
subround to angular (chips)
10 to 15% gravel 80% sand 5 to 10% clay/silt

(320 to 325)

Same,

(325 to 330)

FF8

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 18 OF

PROJECT: ENSCO | NO 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	V/S	Wt	pH	DEPTH	GRAPHIC LOG	
										331		chatter
												Light Brown 5YR 5/6 Sand (SP)
										2		minor gravel and very minor clay.
												subround to angular (chips)
										3		moderately graded,
												granitic, quartz, feldspar . . . . .
										4		10% gravel 85% sand 5% silt/clay minor
												(330 to 335) chatter
										335		
												same, no clay maybe some minor silt
										6		gravel content decreasing.
										7		(335 to 340)
										8		
										9		
										340		same, minor gravel & clay
												10% gravel 90% sand 10% silt/clay.
										1		
										2		(340 to 345) minor chatter
										3		
										4		
										345		
												same
										6		(345 to 350)
										7		
										8		
										9		
										350		

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 19 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	Vis	Wt	pH	DEPTH	GRAPHIC LOG	
										351		
												Same, minor
										2		chatter
												(350 to 355)
										3		
										4		
										355		
												Same
						55 ft				6		(355 to 360)
										7		
						hr						
										8		
										9		
										360		
												Same,
										1		(360 to 365)
										2		
										3		
										4		
										365		
												Same,
										6		(365 to 370)
										7		
										8		
										9		
										370		

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED) SHEET 20 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	CONDITION	D.RATE	Vis	Wt	Plt	DEPTH	GRAPHIC LOG	
										371		Sand,
										2		(370 ± 375)
										3		
										4		
										375		Sand, [illegible]
										6		(375 ± 390)
										7		
										8		
										9		[illegible]
										380		Sand, slight increase in clay content w/gravel
										1		
										2		(380 ± 385)
										3		
										4		
										385		Sand with some gravel
										6		
										7		(385 ± 390)
										8		
										9		
										390		slight [illegible]

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED) SHEET 4 OF

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	CONE	D.RATE	VIS	WT	pH	DEPTH	GRAPHIC LOG
										39.1	
										2	
										3	
										4	
										39.5	
										6	
										7	
										8	
										9	
										40.0	
										1	
										2	
										3	
										4	
										40.5	
										6	
										7	
										8	
										9	
										41.0	

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

Sand, decrease in clay/silt content color change to Dark Yellowish Brown 10YR 4/2

(3.0 to 3.5)

Sand, Dark clay/silt

(3.5 to 4.0)

Sand,

(4.0 to 4.5)

Sand, clay content increasing w/gravel.

(4.5 to 4.10)

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 22 OF ____

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	vis	wt	pH	DEPTH	GRAPHIC LOG	
										411		
												same,
										2		(410 to 415)
										3		
										4		
										415	X	same color gravelly clayey sand
												15% gravel 20% clay/silt 65% sand.
										6		
											SC	clay
										7		(415 to 420)
										8		LIGHT BROWN VERY CLAYY SAND (SC) fine to medium-grained subangular to subrounded with silt, coarse sand and rare gravel
										9		
										420	X	same, clay increases, gravel decreases.
												rejoice a clayey sand w/ gravel
										1		10 to 15% gravel 25% clay/silt 60 to 65% sand.
										2		(420 to 425)
										3		
										4		
										425	X	same, clayey sand w/ gravel
										6		10% gravel 55 to 60% sand 30 to 35% clay/silt
					1900		42	8.6	9.5	7		(425 to 430)
										8		
										9		
										430	X	

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 23 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	VIS	WT	PH	DEPTH	GRAPHIC LOG	
										431		Pale Yellowish Brown 10YR 6/2 Clayey Sand w/gravel
										2		fine to coarse grained sand subround to subangular, gap graded
										3		quartz, biotite, feldspar, apatite 15% gravel 55% sand 40% silt/clay
										4		(430 to 435)
										435		
										6		Same, gravel content increased. sand & gravel in a clay matrix. gravelly clayey sand/clayey gravelly sand.
						55 ft/hr				7		cobble chips (angular) 20% gravel 60% sand 20% silt/clay (435 to 440)
										8		
										9		minor occasional chatter
										440		
												same.
										1		
										2		(440 to 445)
										3		
										4		
										445		10YR 6/2 clayey sand / sandy clay w/gravel occasional
										6		fine to medium sand, gravel composed mostly of angular cobble chips, sand is subround to subangular, poorly graded
										7		quartz, biotite, feldspar.
										8		5 to 10% gravel 45% sand 45 to 50% silt/clay.
										9		gravel is mostly quartz
										450		(445 to 450)

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 24 OF ____

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND. E	D.RATE	VIS	WT	pH	DEPTH	GRAPHIC LOG
										45	
										2	
										3	
										4	
										455	
										6	
										7	
										8	
										9	
										460	
										1	
										2	
										3	
										4	
										465	
										6	
										7	
										8	
										9	
										470	

Sand, gravel content down slightly.

(450 ± 455)

Sand, sandy clay / clayey sand.

(455 ± 460)

Sand, sandy clay

460 ± sand wet. silt/clay

(460 ± 465)

Sand, sandy clay

(465 ± 470)

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 25 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. 138

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND.~~ EC	D.RATE	vis	wt	pH	DEPTH	GRAPHIC LOG	
										471		Same, clayey sand
										2		60% sand 40% silt/clay
										3		
										4		(470 to 475)
												slight [illegible]
										475		Same, clayey sand, some gravel
										6		<5% gravel 60% sand 35% silt/clay
										7		
										8		
						55 ft/hr				9		(475 to 490)
										480		
												Same,
										1		
										2		
										3		(490 to 495)
										4		
										485		
												Same,
										6		5% gravel 70% sand 30% silt/clay
												granitic gravel, quartz, [illegible], feldspar
										7		hornblende.
										8		
										9		
										490		

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 76 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COMB	D.RATE	VIS	WT	PH	DEPTH	GRAPHIC LOG
										491	
										2	
										3	
										4	
										495	
										6	
										7	
										8	
										9	
										500	
										1	
										2	
										3	
										4	
										505	
										6	
										7	
										8	
										9	
										510	

Sand, gravel content increases w/gravel clayey sand

fine to med sand w/some coarse sand subround to subangular, poorly graded quartz, biotite, feldspar granitic fragments

10% gravel 60% sand 30% silt/clay

(490 to 495)

Sand, gravel (55% fine sd) (40% silt/clay)

10-15% gravel 60% sand 25 to 30% silt/clay

(495 to 500)

Same color, sandy clay, no gravel

fine to med sand, subround to subangular, poorly sorted

increased clay content, some gravel

35 to 45% sand 55 to 65% clay/silt

(500 to 505)

Same clayey sand/sandy clay

quartz, biotite, feldspar, opaque, granitic fragments

(505 to 510)

FF8

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 27 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ FC	D.RATE	VIS	wt	pH	DEPTH	GRAPHIC LOG	
										511		Sore, clayey sand w/gravel
										2		5% gravel 50% sand 45% silt/clay
										3		
										4		(S10 to S15)
										515	X	
												Sore
					55 ft/hr					6		
										7		
										8		(S15 to S20)
										9		with uncommon red-brown clay and silt aggregates
					1900		42	8.6		520	X	Sore, sandy clay w/gravel
												granitic, fc to red sand w/sore coarse
										1		
										2		
										3		(S20 to S25)
										4		
										525	X	Sore, CL or SC, gravel content decreasing.
										6		
										7		[illegible] clay and silt
										8		(S25 to S30)
										9		
										530	X	

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 28 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	VIS	wt	pH	DEPTH	GRAPHIC LOG	
										531		Same, (SC)
												fine to coarse sand
										2		60% sand 40% silt/clay
										3		interbedded sandy clay and clayey sand.
										4		(530 to 535)
										535	X	Same (CL) sandy clay
										6		
										7		(535 to 540)
										8		
										9		
										540	X	Same occasional gravel
												mostly fine and medium sand w/some
										1		coarse grain
										2		
										3		(540 to 545)
										4		
										545	X	Same, Sandy CL or SC
										6		
										7		(545 to 550)
										8		
										9		
										550	X	

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 29 OF

PROJECT: ENSCO | NO 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	EC	D.RATE	VIS	WT	pH	DEPTH	GRAPHIC LOG
										551	
										2	
										3	
										4	
										555	
										6	
										7	
										8	
										9	
										560	
										1	
										2	
										3	
										4	
										565	
										6	
										7	
										8	
										9	
										570	

Sand, sandy clay or SC

Sat. sand 5or. silt/clay.

(550 ± 555)

Sand, clayey sand (SC)
fine to medium sand

65 ± 70% sand 35 ± 30% silt/clay.

(555 ± 560)

Sand, (SC)
fine to coarse sand
Var. sand 40% clay

(560 ± 565)

Sand (SC)

(565 ± 570)

FF8

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED).

SHEET 30 OF ____

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~GRND~~ GC	D.RATE	Vis	Wt	pH	DEPTH	GRAPHIC LOG
										571	
										2	
										3	
										4	
										575	
										6	
										7	
										8	
										9	
										580	
										1	
										2	
										3	
										4	
										585	
										6	
										7	
										8	
										9	
										590	

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

Same, (SC)
70% sand 30% silt/clay.

(570 ± 575)

Same, sandy CL/SC
fine to medium grained

(575 ± 580)

Same, some coarse sand and gravel
to sandy clay.

(580 ± 585)

SAME
fine to coarse sand with gravel
quartz, biotite, feldspar,
granitic fragments

(585 ± 590)

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 31 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~CONDC~~ EC	D.RATE	vis	wt	pH	DEPTH	GRAPHIC LOG	
										591		Same (SC)
										2		
										3		
										4		(590 to 595)
										595		Same, sandy CL or SC
										6		some gravel
												0 to 5% gravel 47.5% sand
										7		47.5% silt/clay.
										8		(595 to 600)
						55 ft/hr				9		to Dusky Yellow 5Y 6/4
										600		Dale Olive 10Y 4/2 Clay w/sand.
												or sandy clay (CL) maybe even silty clay.
										1		fine to medium sand w/occasional
												coarse sand and minor gravel
										2		quartz, biotite
										3		(600 to 605)
										4		
										605		Same.
										6		(605 to 610)
										7		
										8		
										9		
										610		

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 32 OF

PROJECT: EUSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	VIS	WT	pH	DEPTH	GRAPHIC LOG	
										611		Dusty Yellow 5YR 6/4 Clayey Sandy Silt or Clayey Silty Sand.
										2		fine to med sand, occasional gravel subround to sub angular, poorly graded, quartz, biotites
										3		50% clay/silt 50% sand.
										4		(610 to 615)
										615	X	
												same,
										6		gradual increase in silt and clay
										7		(615 to 620)
										8		
										9		
										620	X	
												Same trace gravel
										1		(620 to 625)
										2		
										3		with CLAY (ML-W/
										4	ML	LIGHT BROWN SANDY SILT [illegible] to medium-grained sand with abundant clay
										625	X	Dusty Yellow Sandy Silty Clay or Silty Sandy Clay.
											CL	fine to medium sand, minor coarse sand, sand in a silt/clay matrix
										6		
										7		~~50%~~ silt/clay ~~50%~~ sand
												GAV [illegible]: 50% 50% (50% fine 20% med.)
										8		
										9		
										630	X	

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 33 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	~~COND~~ EC	D.RATE	vis	wt	pH	DEPTH	GRAPHIC LOG
										630	
										2	
										3	
										4	
										635	
						FEET				6	
						hr				7	
										8	
										9	
										640	
										1	
										2	
										3	
										4	
										645	
										6	
										7	
										8	
										9	
										650	

CORE TO FEET

642 ↓ ↓ 648

6 5'11"

Same

gradual color change from light brown to light red-brown.

(630 to 635)

Same

(635 to 640)

PLD -

642-643' and 644-647 LIGHT BROWN SANDY SILT and SILT with CLAY (ML with CL) fine grained, finely bedded (<0.25 inch), calcareous, with thin gray (gypsiferous?) wavy laminae.

Shale (642' - 647.2')

Very thinly bedded (wavy lineation), bedding planes infilled with calcite. Moderate brown (5YR 4/4). Hard. Slightly moist. Lightly weathered.

643-644' and 647-648' LIGHT BROWN CLAY SAND (SC) fine to medium grained, more massive

Sandy Shale (647.2' - 647.9') bedded with silt very thinly bedded (wavy lineation), [illegible] bedding planes infilled with calcite. grained Moderate yellowish brown (10YR 5/4). Very hard. Slightly moist. Lightly weathered. 25% sand: fine to coarse grained. Max size: 4mm. Composed of quartz and biotite sand and shale pebbles.

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 34 OF

PROJECT: GUSCO | NO 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COMB. EC	D.RATE	VIS	wt	pH	DEPTH	GRAPHIC LOG
										650	
										1	
										2	
										3	
										4	
										655	
										6	
										7	
										8	
										9	
					1800		47	8.7	9.0	660	
										1	
										2	
										3	
										4	
										665	
										6	
										7	
										8	
										9	
										670	

Clay with sand.
Moderate yellowish brown (10YR 5/4), low plastic clay with 5-10% (low) sand. Sand is fine to medium grained, sub angular, composed of primarily quartz with biotite and amphiboles.
(650'-655')

same as above
(655'-660')

Same as above
(660'-665')

Same as above
(665'-670')

FF8

HARDING LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED)

SHEET 35 OF ____

PROJECT: GNSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	CORE	D.RATE	VIS	wt	pH	DEPTH	GRAPHIC LOG
										670	
										675	
										680	
										685	
										690	

Same as above (670'-675')

Same as above (675-680')

Same as above (680'-685')

Sandy clay, (CL) Mottled yellowish brown (10YR 5/4), low plastic clay with 15-20% fine to coarse-grained sand. Sand is predominately coarse-grained with max diameter of 45 mm. Subangular to subrounded grains. (685'-690')

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 36 OF

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	CORE %	D.RATE	VIS	WT	PH

PROJECT: FMSCO | NO. 18396 | BORING NO. 88

DEPTH | GRAPHIC LOG

690

increasing sand content to 25-30%

(690'-695')

695

same as above

(695-700')

700

Coarse Sand.

fine-to coarse-grained sand - predominantly coarse grained. Subangular qtz grains.

SM

finer sand composed of biotite, qtz.

(700'-705')

705

same as above

(705-710')

710

FF8

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 37 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. 38

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	VIS	wt	pH	DEPTH	GRAPHIC LOG	
										711		
										2		same as above
										3		(710'-715')
										4		
										715		
						50 ft/hr				6		same as above
										7		(715-770')
										8		[illegible] silt and clay decreasing coarse gr w/d sand
										9		
										720		Clayey sand,
										1		moderate yellowish brown
												Clay, sand same as above
										2		(720'-725')
										3		
										4		
										725		Sandy clay.
										6		Moderate yellowish brown.
										7		25% fine to coarse grained sand
												subangular to subrounded
												(725-730)
										8		
										9	ML w/ CL	LIGHT BROWN TO LIGHT [illegible] BROWN SANDY
												SILT WITH CLAY (ML W/ CL)
										730		

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 38 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	VIS	~~WT~~ wt	pH	DEPTH	GRAPHIC LOG	
										73+		
										2		Same as above
												15% sand
										3		(730'-735')
										4		
										735		
										6		same as above
										7		(735'-740')
										8		
										9		
										740		
										1		Same as above
										2		(740'-745')
										3		
										4		
										745		
										6		same as above
										7		(745'-750')
										8		
										9		
										750		

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 39 OF

PROJECT: ENSCO | NO. 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	vis	wt	pH	DEPTH	GRAPHIC LOG	
										751		Sandier – same as above (750-755)
										2		
										3		
										4		
										755		siltier same as above (755'-760')
										6		
						50 ft/hr				7		
										8		
										759		
										760		
										1		same as above (760'-765')
										2		
										3		
										4		
										765		
										6		same as above (765-770')
										7		
										8		
										9		
										770		

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 40 OF

PROJECT: ENSCO | NO 18396 | BORING NO. B8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	~~COND~~ EC	D.RATE	vis	wt	pH	DEPTH	GRAPHIC LOG	
										770		LIGHT BROWN TO [illegible] RED BROWN CLAYEY
										2	SC	same as above
												SAND (SC) [illegible]
										3		(770'-775')
												[illegible] silt [illegible]
										4		[illegible]
												[illegible] less [illegible]
										775		[illegible]
										6	CL	[illegible] BROWN TO [illegible] RED BROWN
												same as above
										7		SANDY CLAY (CL) with silt
												(775'-780')
										8		~50% sand (fine-med grained) + 50% clay/[illegible]
										9		
					1400		45	8.8		780		
										1		same as above
												(780'-785')
										2		
										3		
										4		
										785		
										6		same as above
										7		(785'-790')
										8		
										9		
										790		

FF8

HARDING LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED) PRELIMINARY DRAFT

SHEET 41 OF

PROJECT: Ensic | NO. 18396 | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG	
										791		same as above
										2		(790-795)
										3		
										4		
										795	SC	LIGHT BROWN CLAYEY SAND (SC) [illegible] Sandy Clay with clay [illegible] coarse-grained Moderate yellowish brown. and rare gravel 40% fine to coarse-grained sand. Sand is subangular to subrounded amphibole and qtz.
										6		
										7		
										8		(795-800)
										9		
										800		Clayey Sand with gravel Moderate yellowish brown. 50% fine to coarse-grained sand. 10% gravel (6mm max size). Increasing clay and silt (800-805)
										1		
										2		
										3		
										4		
										805	CL	LIGHT BROWN SANDY CLAY (CL) with silt
										6		same as above
										7		(805-810')
										8		
										9		
										810		

50 ft / hr

FFB

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 42 OF

PROJECT: ENSCO | NO. 18346 | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG
										810	
										1	
										2	
										3	
										4	
										815	X
										6	
										7	
										8	
										9	
										820	X
										1	
										2	
										3	
										4	
										825	X
										6	
										7	
										8	
										9	
										830	X

Same as above

(810' - 815')

Same as above

(815' - 820')

Same as above

(820' - 825')

Same as above

(825' - 830')

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 43 OF

PROJECT: EMSCO | NO 18396 | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG	
										831		Same as above
										2		(830'-835')
										3		
										4		
										835		
										6		
										7		Same as above
						50 ft/hr				8		(835'-840')
										9		
										840		
										1		Same as above
										2		(840'-845')
										3		
										4		
										845		
										6		same as above
										7		(845'-850')
										8		
										9		
										850		

FFS

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 44 OF ____

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG
										851	
										2	
										3	SC
										4	
										855	
										6	
										7	
										8	
										9	
										860	
										1	
										2	
										3	
										4	
										865	
										6	
										7	
										8	
										9	
										870	

PROJECT: ENSCO | NO. 18396 | BORING NO. B-5

same as above

(850' - 855')

light brown clayey sand (SC) fine to medium-grained angular to subrounded with silt and rare gravel

same as above

(855' - 860')

Coarse sand with gravel (SP)
Medium to coarse grained sand.
Subangular to subrounded grains.
Composed of feldspar, quartz, epidote, and hornblende. 10% fine gravel, 10 mm max size.

(860' - 865')

same as above

(865' - 870')

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 45 OF

PROJECT: ENSCO | NO. 18346 | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG
										871	
										2	
										3	
										4	
										875	
										6	
						50 ft/hr				7	
										8	
										9	
				1800			45	8.8		880	
										1	
										2	
										3	
										4	
										885	
										6	
										7	
										8	
										9	
										890	

Same as above

(870' - 875')

Same as above

(875' - 880')

Same as above

(880' - 885')

Same as above

(885 - 890')

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 46 OF ____

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	COND.	D.RATE				DEPTH	GRAPHIC LOG
										891	
										2	
										3	
										4	
										895	
										6	
										7	
										8	
										9	
										900	
										1	
										2	
										3	
										4	
										905	
										6	
										7	
										8	
										9	
										910	

PROJECT: ENSLO | NO 18396 | BORING NO. B-8

continued decrease in silt and clay

same as above

(890' - 895')

same as above

(895' - 900')

same as above

(900' - 905')

same as above

(905' - 910')

increase in silt and clay

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 47 OF ____

PROJECT: Ensco | NO 18346 | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'VD	COND.	D.RATE				DEPTH	GRAPHIC LOG
										910	
										1	
											Same as above
										2	
											(910'-915')
										3	
										4	
										915	
										6	
											Same as above
										7	
											(915'-920')
										8	
						±6					Increase in silt and clay
										9	
						hr					
										920	
										1	
											Same as above
										2	
											(920'-925')
										3	
										4	
										925	
										6	
											Same as above
										7	
											(925'-930')
										8	
										9	
											Increasing silt and clay
										930	

FF8

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 48 OF

PROJECT: Ensco | NO. 18346 | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG	
										931		Same as above
										2		(930'-935')
										3		
										4		
										935		
										6		Same as above
										7		(935'-940')
										8		
										9		LIGHT BROWN SAND (SP) [illegible] subangular to subrounded [illegible] silt clay and gravel [illegible]
										940		Sand [illegible]
										1	SP	fine to coarse grained sand. fine grains predominate.
										2		including metamorphics granite and (940'-945')
										3		volcanics (rhyolite?)
										4		
										945		Rhyolite
										6		
										7		
										8		PURPLE-GRAY RHYOLITE
										9		
										950		
	↑		↑	↑	G							

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 49 OF

PROJECT: | NO. | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	COND.	D.RATE				DEPTH	GRAPHIC LOG	
	CORE 950		4 FEET	4 FEET	↑ G ↓	2 FT Hr.				1		Moderate Reddish-Brown 10 R 4/6 Rhyolite, vesicular, vertical and horizontal fractures, 1 to 4 mm across, abundant fractures in the bottom foot (953-954), fractures and vesicles filled by secondary minerals or mineralization of SiO_2 - Qtz & christobalite, feldspars(?) and glass(?), granitic phenocrysts, and gneiss(ic) phenocrysts, some vesicles lined with euhedral to subhedral quartz crystals, lapilli structure, mixed to moderate alignment of lapilli.
	TO ↓ 954									2		
										3		
						Extremely Hard Drilling at 954. Drill Bit bouncing, Not making much hole.				4		
										955		
										6		
										7	GC	LIGHT BROWN [illegible] CRUSHED SAND (SR) [illegible] Rhyolite(?) Drill mud very thick [illegible] sample mostly coarse sand size quartz granitic fragments, 35% rhyolite chips (955 to 960)
										8		
										9		
							Easier at 960			960		
						15 ft hr				1		Rhyolite, wow! small 1 to 1.5 mm long axis subhedral perfect hexagonal in cross section quartz crystals, the crystals are nearly clear, some are complete and terminate in a point, striations on crystal faces running ⊥ to the long axis ↘ crystal face feldspar.
										2		
										3		
							chatter			4		
										965		(960 to 965)
										6		RED-BROWN [illegible] some granitic fragments (phenocrysts) up to 4 mm
										7		(965 to 970)
										8		
										9		
										970		

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED).

SHEET 50 OF

PROJECT: | NO. | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG	
												Rhyolite w/ some clay
							chatter			971		Rhyolite. with clay, I cannot find the color of the clay on the color chart. I will describe is as being Light Brown 5YR 5/6 with some orange in it light to moderate orangish brown/brownish orange.
										2		
										3		
										4		(974 to 975)
										975		
										6	CL	some rhyolite fragments are brick red small fragments of ~~[illegible]~~ obsidian (?) also balls of Olive Black 5Y 2/1 Clay some of this clay is fissile
										7		(975 to 980)
										8		RED-ORANGE CLAY with SILT (CL with ML 75 to 80% rhyolite and
										9		GREEN-BLACK CLAY (CL) with rhyolite and obsidian chips and quartz sand.
							chatter			980		
										1	SC	some rhyolite content decreased. more like a light brown 5YR 5/6 ~~sand~~ clayey sand w/ rhyolite chips red sand sized obsidian fragments? granitic fragments, quartz, feldspar sand is fine to coarse grained round to angular
										2		
										3		
										4		20% rhyolite 60% sand 20% clay/silt (980 to 985)
										985		RED-ORANGE CLAYEY SAND (SC) [illegible] Light Brown 5YR 5/6 Clayey sand fine to coarse sand, subround to angular, cobble chips/flakes.
										6		
										7		(985 to 990)
										8		
										9		
										990		

FFS

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 51 OF

PROJECT: ENSCO | NO | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG	
										991		Same,
										2		
										3		(990 to 995)
										4		
					1750		59	8.9	9.5	995		[illegible] silt and clay
												Same, clay content decreasing
										6		85% sand 15% silt/clay
										7		(995 to 1000)
							Very hard drilling @ 998			8		
										9		
										1000		Same color, sand w/clay
										1		fine to coarse sand,
												granitic
										2		This may be [illegible] granite
										3		(1000 to 1005)
										4		[illegible] sand as above with granite chips
										1005		and occasional [illegible] clay
												Same weathered granite ?
										6		
										7		
										8		
										9		
1010	CORE		4 ft	3.25 ft						1010		

chatter (cobbles)

chatter cobbles

15 ft / hr

FF8

HARDING LAWSON ASSOCIATES

PRELIMINARY DRAFT

FIELD LOG OF BORING (CONTINUED)

SHEET 52 OF

PROJECT: ENSCO | NO. | BORING NO. B-8

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG
	CORE		4 FEET	3.25 FEET		3 ft/hr				1011	
										2	
										3	
										4	
										1015	
										6	
										7	
										8	
										9	
										0	
										1	
										2	
										3	
										4	
										5	
										6	
										7	
										8	
										9	
										0	

Breccia - Granite

Composed of porphyritic granite, granodiorite, rhyo[illegible] orthoclase, quartz, epidote in fine-grained quartz matrix. Matrix is moderate yellowish-brown (10 YR 5/4) and is moderately weathered. Grains are intensely weathered to lightly weathered, subangular to subrounded, 1mm to >75mm. Small vugs: some open some filled with calcite. Several small fractures zones with calcite clay infilling.

TD = 1013.25 ft.

FF8

HARDING LAWSON ASSOCIATES

Water Resources Associates, Inc. Copy: EDR, MFG, PJW, DLK, HBD

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 1 OF 23

PROJECT	LOCATION	ELEVATION	PROJECT NO.
ENSCO	C (4-1) 32 bad	1407 (MSL)	08701261
DRILLING AGENCY: Stewart Bros.	FOREMAN: Randy Stewart	DATE STARTED: 12-15-87	DATE FINISHED: 12-18-87
DRILLING EQUIPMENT: Failing 2500		BEDROCK DEPTH	COMPLETION DEPTH
CASING: 0	SCREEN	BORING ANGLE: Vertical	INSPECTOR: MFG, DLK, HBD
SAMPLES: 5-Ft. cuttings, + cores @ selected intervals		WATER LEVEL: FIRST	COMP. / 24 HR.

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
Topsoil - Lt. Tan, poorly sorted clayey felsic sand		0				Spud-in w/ 15-inch solid stem Augers @ 0930 on 12/15/87. Drill To 20'
CLAYEY SAND - Felsic angular sand (0.5-4 mm) = 50%. Silty clay = 50%		5				
SANDY silt - SAME As Above, except 70% silty clay, 30% sand, lighter color than above		10				
		15				Drilling mud-rotary below 20 Ft. w/ 8¾-inch mill tooth bit
SANDY CLAY - SAME As Above, except 40% subRnd to subangular, coarse felsic sand. 60% silty clay		20			92 FT/HR	20-25 Ft. cuttings contain some cement cuttings from surface csg. grout.
SANDY CLAY - SAME As Above, except 10-15% of clay appears v. lt. tan. Does not react to HCl		25				
CLAYEY SAND = 65 to 70% v. coarse (1-5 mm), felsic, subrnd to angular sand. 30-35% Tan silty clay		30				Drilling Fluid
		35				Visc = 41 sec/qt
		40				wt = 8.4 #/gal
SANDY CLAY - 25% sand, as above, except coarse (3-13 mm), some caliche (5-10%)		45				
SANDY clay - 85% lt. brown silty clay, 15% subangular felsic coarse sand		50	RUN R-1			Begin R-1 @ 1230
SANDY, GRAVELLY CLAY - yellowish-brown with layer of sand and gravel (See log details on page 2)		55				cored from 50 To 60 Ft. Rotated 60 RPM. Removed 2 valves from mud pump for less fluid circ. CORE RECOVERY 5.7 ft.
SANDY CLAY & CLAYEY SILTY GRAVEL - yellowish brown to light brown opaque to clear quartz grains, coarse-grained, angular with		60				1250 a.m. end coring 0200 Hrs resumed drilling
		65				
		70				

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

FIELD LOG OF BORING NO. [illegible]

SHEET 2 OF 23

DEPTH, FEET	DESCRIPTION	ROCK CORE: Sketch	Run No.	Recov. ft	RQD	Piezometer Data	SAMPLES: Type Number	Recov. ft	Pene. Resist. Blows/6in	REMARKS
50										DETAILS OF CORE RUN NO. 1 12-15-87 50ft Time start: 11:06 p.m.
51	SANDY GRAVELLY CLAY Yellowish-brown, moderately well indurated to friable damp to moist. Sand is mostly		1	5.7ft total recovery	4.1ft					Occasional nodule of calcareous material, mildly effervescent with dilute HCL.
52	fine to medium, angular to subangular, poorly sorted pebbles of quartz to 3/4 and 1-inch in diameter. Sand is mostly									
53	quartz, biotite and other matic minerals. Coarsens downward and becomes									
54	more friable, very coarse angular grains to 3/8-inches									54.1
55	SAND AND GRAVEL yellowish-brown to clear, angular to subangular			CORE LOST	(4.3ft lost)					Samples obtained from discharge trench Core loss inferred from inspection of core, and increased drilling rate
56	quartz sand, mostly about 1/8-inch in diameter to 1/4-inch with scattered fragments of									
57	quartz up to 1-inch High permeability.									1230
58										
59	SANDY GRAVELLY CLAY Yellowish-brown to light brown with less gravel				1.6ft					58.4
60										60ft Time stop 12:50 p.m. [SEE CONTINUATION OF CUTTINGS LOG ON PAGE 3]

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 3 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
biotite and mafic minerals, occasional grains up to 1/4-inch angular to subangular, silty clayey matrix. Clay and silt decreases downward to gravel and very coarse sand; primarily quartz angular up to 1/4-inch in diameter. Becomes lighter brown increase in clay, slightly plastic. ↓ becomes white-tan to light brown clayey matrix with mostly gravel and coarse angular quartz sand. Fine sand in matrix is subrounded quartz and mafics very slight effervescence on white calcitic material. coarsens downward		70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150		RUN #2		VERY ROUGH DRILLING 0230 Hrs 0245hr Add drill collar 0255hr Resume drilling 124' 0305 hrs – Add drill collar 0310 Resume drilling Rods rattling & vibrating rough drilling 144' 0320 hrs – Add drill rod 0330 hrs – Resume drilling Rods rattling & vibrating rough drilling 0340

WATER RESOURCES ASSOCIATES, INC. FIELD LOG OF BORING NO. ____

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

SHEET 4 OF 23

DEPTH, FEET	DESCRIPTION	ROCK CORE: Sketch	Run No.	Recov. ft	RQD	Piezometer Data	SAMPLES: Type Number	Recov. ft	Penetra Result, Blows/6in	REMARKS
150										DETAILS OF CORE RUN #2 12/16/87 150 START CORING @ 0510Hrs
151–160	GRAVELLY CLAY AND CLAYEY GRAVEL – Reddish-brown, mottled white and green with some yellow oxide stains. Gravel is angular quartz and metamorphics with some granite. Sand is angular to subangular poorly sorted fine to very coarse-grained quartz. Clay matrix is friable to very friable. Low to moderate perm. Becomes coarse pebble Gravel, subangular up to 1/2-inch [from 155.5 to 156.0] Loss zone is probably gravel and sand. Coarsest fragments up to 2 inches. Last part of run is boulder fragment of metamorphic rock		2	6.0 ft; ← 4.0 ft Core Loss →						155 0600hrs 0525 END OF RUN. Log Follows on p. 5

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 5 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
GRAVELLY CLAY AND CLAYEY GRAVEL CONTINUES AS ABOVE ↓		160				0730 Resume drilling with rock bit
		161				
		162				
		163				
		164				
		165				0738 add rod
						0742 Resume drilling
		166				
		167				
		168				
		169				
		170				
		171				
		172				
		173				
		174				
		175				
		176				
		177				

P-5
6 OF 23

...urces Associates, Inc.
...ologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5
SHEET 7 OF 23

CRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
LY CLAY AND GRAVEL CONTINUE VE		195				
		196				
		197				
		198				
		199				
		200				
		201				
		202				
		203				
		204				
		205				0820
		206				0830 - Rig down - oil leak 0845 Resume drilling Rods rattling & vibrating Drilling slowly
		207				
		208				
		209				
		210				
		211				
		212				

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 8 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
GRAVELLY CLAY AND CLAYEY GRAVEL CONTINUES AS ABOVE. ↓		212				
		213				
		214				
		215				
		216				
		217				
		218				
		219				
		220				
		221				
		222				
		223				
		224				0857 2-16-87
		225				0903 Added rod Resume drilling
		226				
		227				
		228				
		229				

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 9 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
GRAVELLY CLAY AND CLAYEY GRAVEL		229				
		230				
CONTINUES AS ABOVE		231				
↓		232				
		233				
		234				
		235				
		236				
		237				
		238				
		239				
		240				
		241				
		242				
		243				
		244				
		245				
		246				

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 10 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
GRAVELLY CLAY AND CLAYEY GRAVEL CONTINUES AS ABOVE ↓		246				
		247				
		248				
		249				2-16-87
250 - 250.4 = 1-6 cm sized subangular, felsic gravel w/brown clay matrix		250				0950 Hrs End Rock Bit Trip out to Run Core
250.4 - 265.85 = CLAYEY SAND + Gravel felsic, subangular to angular sand (.5-1mm) and gravel (up to 1.5 cm), red-Brn to orange-Brn silty clay matrix. SOME 1cm lenses of chocolate-Brn. clay. Some 4-5 cm elongate pebbles, oriented horiz. crudely horiz. bedded		251				11:05 Resume Coring
		252				~12:30 end core Run
		253				Cored 7.2 Ft.,
		254	Run R-3			recovered 5.85 Ft.
		255				
		256				
LOSS		257				
		258				
Sample = 10-270' NO SAMPLE		260				Driller informed ME Thut no cuttings were in sample catcher until 270 Ft.
SAND - well sorted, coarse to v. coarse, felsic sand (85%), w/epidote + iron stains on grains. 15% med. brown clay		265			60 FT/HR	
SAND - SAME AS Above, except only a trace of clay		270				
SANDY clay - 85% med. brown silty clay. 15% sand, as above		275				
		280				

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 11 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
SAND - SAME As 270-275 Ft., except slightly coarser		280				
Clayey SAND - SAME As Above, except 40% med. brn. clay, 60% sand		285			70 FT/HR	
SAND - SAME As 270-275 Ft., except 5-10% clay		290				
		295				
		300				
		305				
		310				
SAND - SAME As above, w/ 15-20% clay		315				Drilling fluid visc = 38
		320				
		325				
		330				
		335				
		340				
Clayey SAND - SAME As Above, except 35% clay, + slightly finer sand		345				
clAyey Gravel - 85% subangular, felsic sandy gravel (1-4mm). 15% brown clay		350				
clAyey SAND - subangular, well sorted coarse felsic sand, w/ dark meta. lithic frags. 20-25% lt. brn. clay		355				
		360				
		365				

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 13 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
Clayey SAND - SAME As Above		365				
		370				
		375				Drilling fluid visc = 38
No SAMple		380				no sample collected by driller's helper 375 - 390 Ft.
		385				
Clayey SAND - SAME AS 355 - 375 Ft.; except med. to course sand, + 30% clay		390				
		395				Began core Run R4 At 1930
		396				
		397				Drilled from 395 to 403.2 Ft.
		398				
pg 13		399				Drill crew added 10 sacks bentonite prior to coring
sel		400				
		401	Run R-4			rotated 60 rpm while coring.
		402				
SAND - subangular to angular felsic + meta. fragments, v. coarse sand, 15% brown clay matrix		403				END Run R-4 @ 2105
		404				
CLAY - Brown/Gray silty clay w/ 5% course sand, as above		405				color change @ 405 to Brown-gray
		410				

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

FIELD LOG OF BORING NO. 1-3

SHEET 13 OF 23

PROJECT: Esco	BORING LOCATION		ELEVATION & DATUM		
DRILLING AGENCY		DRILLER	DATE STARTED	DATE FINISHED	
DRILLING EQUIPMENT			COMPLETION DEPTH	ROCK DEPTH	
SIZE & TYPE OF CASING			NO. SAMPLES: DIST.	UNDIST.	CORE
DRILLING METHOD			WATER ELEV.: FIRST	COMPL.	24 HRS.
CORE BARREL TYPE	LENGTH	BIT	LOGGED BY:	CHECKED BY:	
SAMPLER HAMMER	WEIGHT	DROP			

DEPTH, FEET	DESCRIPTION	ROCK CORE: Sketch	Run No.	Recov. ft	RQD	Piezometer Data	SAMPLES: Type Number	Recov. ft	Penetro Resist., Blows/6in	REMARKS
395	Alternating brown sandy clays (20% sand) and clayey gravels (60% gravel). coarse mtl. is granitic and meta. lithic frags., angular, some 1-cm thick discontinuous brown clay lenses, gravel less abundant w/ depth.									Began Run @ 1930 Ended Run @ 2105 Drilled 395.0 To 403.2 Ft. Penetration Rate = 11.6 min/ft. 7.35 FT Recovery (96%)
396										
397										
398										
	SAND - mod. to well sorted, angular, v. coarse, felsic-meta. sand, 25% Brn. clay matrix, No Bedding									
	SANDY CLAY - SAME As Above, w/ <5% sand + gravel									
399	Fine To Med Sand - Brown, well sorted, angular, same composition as above sand.									
	Discontinuous, M. to Med Brown, zoned clay lens, dipping @ ~38°									
400										
401										
402										
403	LOSS									

RUN R-4

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 14 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
SANDY CLAY - SAME As Above		410				
		415				
SANDY CLAY AND CLAYEY SAND Light yellowish-brown to grayish-tan clay with very fine to coarse sand. Very fine sand is predominantly quartz, very fine and fine quartz is subrounded; medium and coarse fraction is subangular to angular and is comprised of silica and dark metamorphic? igneous rx. (80% qtz 20% dark minerals) Silt and clay fraction (CL?) appears tuffaceous. The cuttings are very soft and slightly cohesive. Sand coarsens from ~440 with angular qtz and dark frags. to 1/4-inch. Very Coarse fraction ~10-15% of total Predominantly a clayey sand from 440 ft coarse to med, poorly sorted } slight color change - reddish & yellow brown - Fe-oxide stains? ↓ Very coarse - coarse fraction increases to 20-30% of total		420				drilling fluid Visc = 42 D. KIRCHNER LOGGED CUTTINGS FROM 420 12:20 PM (432')
		425				
		430				
		435				
		440				
		445				
		450				
		455				
		460				
		465				
(coarse) Very dense sand and pebble gravel, gran to & frags of quartz up to 1/2-inch) Angular quartz and metamorphic/igneous rocks		470				12:45 p.m. 472 ft
		475				
SANDY CLAY AND CLAYEY SAND as above, continues becomes more sandy with increasing depth. [Probably interbeds of clay & sand mixed]		480				
		485				
		490				0100 hrs 492' Add Rod, Resume Drilling 0108
		495				

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 15 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
SILTY-CLAYEY SAND/ AND CLAYEY SAND		495				
		500				
		505				
		510				0120 Hrs 512' Add Rod Resume drilling @ 0130 Hrs.
		515				
		520				522 @ 0145 hrs Change rod, resume drilling @ 0155 Hrs.
		525				
		530				
		535				
		540				
		545				
		550				552 - 0200 HRS Change rod, resume drilling at 0205 Hrs.
		555				
		560				Mucked out mud pits with backhoe. (Primary pit)
		565				
Continues to 590		570				
		575				0220 hrs Marsh Funnel Mud viscosity 60 secs.
		580				

Water Resources Associates, Inc.
Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

FIELD LOG OF BORING NO. P-5

SHEET 16 OF 23

DEPTH, FEET	DESCRIPTION	ROCK CORE: Sketch	ROCK CORE: Run No.	ROCK CORE: Recov. ft	ROCK CORE: RQD	Piezometer Data	SAMPLES: Type Number	SAMPLES: Recov. ft	SAMPLES: Penetra Resist. Blows/6in	REMARKS: DETAILED LOG OF CORE RUN #5
590										
	CLAYEY SAND/SANDY CLAY fine to coarse grained sand, grey, saturated increase sand ↓									BEGIN CORING AT 0500 HRS
591										
592	LOSS									
593										
594	SAND - fine grained ~10% clay w/ trace gravel, quartz, granite fragments, jasper, dark mica?) Mica - clay stringer - red brown.		CORE RUN #5	3.3 ft recovered	3.3'/10ft = 33%					no CaCO3 cement
595	possible loss - not much									
596	clay stringer - "claystone" - clay stringer "claystone"	run 5 run 6								Mud viscosity 45 sec. ← 0620 Hrs.
597	Thinly laminate sand & siltstone w/ some x-bedding, red beds dark brown. Thinly laminated sand & siltstone									Lost core 10.0 run 3.3 ft recov. 6.7 ft
598	SAND - fine grained brown grey brown interbedded sand - silt & clay stones.									
599	SANDSTONE - grey brown, finely claystone beds w/ quartz gravel (trace) - Sandstone									truncated clay bed at 599.2
600	interbedded sand & siltstones									end Run @ 0715 hrs
601	SAND - poorly sorted, fine to coarse [illegible] not well cemented granitic min.		CORE RUN #6	100% Recovery from 596 to 606'	10ft/10ft = 100%					Begin Run #6 @ 0930
602	same as above w/ gr. size coarsening [illegible] well indurated ↓									Driller tagged lost core and or slough in hole at 594 ft. Instructed him to core over it and complete a 10ft run in attempt to retrieve lost core. Therefore Run #6 overlaps Run #5 and extends depth of hole.
603	Claystone - red brown SAND [illegible] laminated [illegible] cemented & coarser gr.									
604	SILTY SAND [illegible] coarsening									
605	Coarser gr. w/ clay lenses - clay bed CLAYEY SILT - not indurated w/ intermittent more indurated clay beds.									End Run 6 @ 1055 hrs @ 606 ft
606	[illegible] structures. Alternating beds of claystone & siltstone - clay-red [illegible] sandstone									
607	Fine to med. gr. SAND - poorly indurated qtz, rek, micas [illegible] silt stone (?) [illegible] w/ nodules of cemented fine [illegible]		7							First couple inches a conglomerate

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 17 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
		580				0235 hrs
		585				Marsh Funnel viscosity = 60sec
C		590	CORE RUNS			0300 Hrs. Drillers tripped rods out of hole to run 20 ft core barrel.
C		595	CORE RUN #6			[SEE PAGE ___ FOR GREATER DETAIL OF CORE LOG]
		600				
C		605				Recovered 100%
		610	CORE RUN #7		11 min/1 ft	Recovered ~60%
C		615				End core run 7 @ 18:45
SAND - poorly sorted, fine to coarse grains, pink-brown angular to subrounded w/ ~5% Gravel (granitic)		620				Began Drilling ~1915 rough drilling
SAB - NO GRAVEL		625			60 ft/hr	
SAME		630				
SAME decrease coarse grains		635				Visc = 45
cuttings of claystone, siltstone & fine gr. SS + coarse built interbedded as in core probably (clay is same red-brown)		640				similar to cores
		645				
TRACE GRANITIC GRAVEL		650			30 ft/hr	smooth drilling
INCREASE INCLAY		655				
CLAYEY SILT - some coarse gr still, claystone cuttings.		660				
SAME AS ~630 ft		665				For Details CORE RUN #8 1 See pg

- might [illegible] to tell

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

FIELD LOG OF BORING NO. P-5

SHEET 18 OF 23

DEPTH, FEET	DESCRIPTION	ROCK CORE: Sketch	Run No.	Recov ft	RQD	Piezometer Data	SAMPLES: Type Number	Recov. ft	Penetra Resist. Blows/6in	REMARKS: DETAILED LOG OF CORE RUN 7
607	606.3 to 606.7 SAND - fine to coarse grained subangular to subrounded, quartz, jasper, feldspar w/ claystone peas (red-brown) @ 606.7. Well indurated from 606.9 - 607.2									coring 11 min/ft
608										core came apart when barrel split
609	607.2 to 612.1 is all [illegible] indurated, fine to coarse for SAND as above - brown [illegible]									
610										core came apart [illegible]
611										
612				6.1ft/10ft = 61%						core crumbled at end ~ 8" worth
613										
614	LOSS									
615										
616										END CORE RUN 7 @ 1745

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

FIELD LOG OF BORING NO. P-5

SHEET 19 OF 23

DEPTH, FEET	DESCRIPTION	ROCK CORE: Sketch	ROCK CORE: Run No.	ROCK CORE: Recov. ft	ROCK CORE: ROD	Piezometer Data	SAMPLES: Type	SAMPLES: Number	SAMPLES: Recov. ft	SAMPLES: Dynamic Resist. Blows/6in	REMARKS
665	CLAY - Brown, silty, high plasticity. Thin, wavy laminations and dark sinuous lines. Trace of coarse sand + gravel, angular + felsic.					666					Coring began @ 0220
666											12.5 min/1ft
667	Fracture										Rotated 60 RPM while coring.
	Gravelly CLAY - SAME AS Above w/ 15-20 % subangular gravel										core over-drilled. Recovered 10.1 FT from 10-FT Run
668	SANDY CLAY - SAME AS 665-667 except 30% fine sand, broken core clay silty + micaceous Fracture										
669	SANDY, Gravelly CLAY - SAME AS Above, except 5% coarse mtl. increases w/ depth to 15%										
670	Gravelly CLAY - 20-30% Angular to subrnd. sand + gravel, felsic and meta. lithic clasts. matrix is silty Brn clay, some lenses of well indurated Brown clay.										
671	Broken core →		CORE RUN #2	10.1 / 10ft = 101%							
672	Gravelly CLAY - SAME AS Above, except matrix coarsens to clayey silt + fine sand.										
673	Broken core →										
	Gravelly Clay - SAME AS 670 - 672 Ft.										
674											
675											END RUN #2 @ 0225

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 20 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
(C) see pg. 19 for lithologic description		665				Tripped out to core @ 2120 (12/17/97)
		670			12.5 min/ft	Cored 665.0 To 675.1
Gravelly clay - Brown silty clay, w/15% felsic angular sand (med-coarse) and gravel. (C)		675				-continued drilling 0440 (12/18/97)
		680			44 Ft/Hr	
Gravelly clay - SAME As Above except 40% gravel		685				
65% gravel		690				
SANDY CLAY - SAME As above, except 20% coarse sand		695				
Gravelly CLAY - SAME As 685 - 695 Ft		700				
		705				
SANDY CLAY - SAME As Above, except only 5-10% sand		710				
		715				
		720			80 Ft/Hr	Drilling fluid Visc. = 45
SANDY CLAY - SAME As Above, except 15% sand + gravel		725				
SANDY CLAY - SAME As 710 - 725		730				
		735				
		740				
		745			63 Ft/Hr	
		750				

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
SANDY CLAY - SAME AS Above, w/ cuttings of med. brown, fine - sandstone + some well indurated CLAY		750			63 Ft/HR	
SANDY silty CLAY - SAME AS Above, w/ 10% white clay		755				clay @ 755 - 760 Ft. doesn't react to HCl
Silty CLAY - SAME AS 750 - 755, except <5% sand (Coarse, felsic)		760			80 Ft/HR	
		765				
		770				
		775				
		780				
		785				
SANDY CLAY - Brown silty clay w/ 15% angular, v. coarse, felsic sand, + Trace of brown vf fine SS cuttings		790			57 Ft/HR	
Silty Clayey SAND - Brown - Gray, v. fine to V. Coarse sand. fine fraction has abundant biotite, coarse sand = dark minerals + felsic mtl. 30% silt + clay		795				color change at 795 Ft. from Light brown to gray-brown
		800				
		805				
		810			54 Ft/HR	
		815				
Silty, Gravely sand - V. fine, micaceous, brown silty sand w/ 5% felsic mtl. + dark meta. Rx gravel		820				color change at 820 Ft. from gray-brown to light brown
20% coarse fraction		825			75 Ft/HR	
		830				
		835				

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 22 OF 24

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
----		835			75 Ft/HR	Added 5 25-lb sacks of lost circulation mtl. @ 847. Ft., to drlg. mud,
Silty clayey SAND - med to V. fine, angular clastic mostly dark meta. Rx frags., 60% sand, 40% silty clay (brown)		840				
clayey Gravel - SAME As Above, except sand is come c 0.5-1 cm angular gravel		845			33 Ft/HR	
clAyey Gravel - SAME As Above, except only 30% gravel		850				very rough drilling @ 852 Ft.
10% gravel		855	15/27			
clAyey, Gravelly Sand - SAME As Above, except 5% gravel, 40% silty clay, 55% med., dark, micaceous sand.		860				
		865				
		870			28 FT/HR	Mud visc. = 55
clAyey SAND - SAME As Above, except 60% sand, + <5% gravel		875	29/42			
75% sand		880				
		885				
		890				
		895				
clAyey Gravel - SAME As Above, except increase in grain size to 0.5 - 0.75 cm		900				
		905				
clayey sand + Gravel - SAME As above, except 60% v. coarse sand, 30% gravel, + Tr. of white clay		910				
		915				@ 914, hard drilling
<5% gravel, 60% sand		920				

Water Resources Associates, Inc.

Hydrologists • Hydrogeologists • Engineers • Forensic Hydrologists

LOG OF BORING P-5

SHEET 23 OF 23

DESCRIPTION	WELL	DEPTH FEET	SAMPLE	WATER GPM	DRILL RATE	REMARKS
Sandy clay - SAME AS Above except 20% silty clay, 30% sand		920			38 Ft/HR	
(50%) sandy clay - same as above (50%) Lt. Purple-gray aphanetic rhyolite		925				- rough drilling & rig chatter @ 924 Ft.
Rhyolite - rhyolite cuttings - poorly indurated, aphinetic, and lt. purple silt. (50%)		930			15 Ft/HR	- Driller noted hard drilling began @ 928 Ft.
Rhyolite - SAME As above, except 70% poorly indurated cuttings 30% silt		935				
TD = 940 Ft.		940				

DRAFT

Copy: EDR, DLK, MFG, KBO, PJW

FIELD LOG OF BORING SHEET 1 OF 50

LOCATION OF BORING:

SEE P-3 LOG

PROJECT: Ensco

BORING NO. B-9

TOTAL DEPTH: 980

JOB NO.: 18396 004 14

LOGGED BY: KRR/TB

PROJ. MGR.: Carol Serlin

EDITED BY:

DRILLING CONTRACTOR: Bob James Drilling

DRILL RIG TYPE: Gardner-Denver 2000 - Mud Rotary/Core

DRILLERS NAME: Larry Marcus - tool pusher Patch Karr - contract

SAMPLING METHODS: Grab every 5' of cuttings, Core at contact

HAMMER WT.: DROP:

STARTED, TIME: 1450 DATE: 11-13-87

COMPLETED, TIME: 2300 DATE: 11-16-87

BORING DEPTH (ft.)			
CASING DEPTH (ft.)			
WATER DEPTH (ft.)			
TIME:			
DATE:			

BACKFILLED, TIME: DATE: BY:

SURFACE ELEV.: DATUM: Mean Sea Level

CONDITIONS: Alluvial Fan, Creosote bush desert.

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE-CONDITION-EC	DRILLING RATE (min/ft)	Vis	wt	pH	DEPTH IN FEET	GRAPHIC LOG
			MUD	Engineer			58	8.4	9.5		
					1800		46	9.5			

1

Moderate Brown 5 YR 4/4 Sand (SP-SM) fine to medium grained, subangular to subround grains, with silt, poorly graded quartz, feldspar, epidote?

85% sand 15% silt

(0 to 5 sample bag)

5

Light Brown 5 YR 5/6 Sand (SP) fine to med-grained, subangular to subround, poorly graded, trace silt quartz, feldspar, epidote

95% sand 5% silt

(5 to 10 bag)

10

FF7

HARDING-LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED)

SHEET 2 OF 50

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE	Vis	Wt	pH
						18 ft/ hr			
						175			

DEPTH	GRAPHIC LOG
11	
2	
3	
4	
15	
6	
7	
8	
9	
20	
1	
2	
3	
4	
25	
6	
7	
8	
9	
30	

PROJECT: | NO. | BORING NO. B-9

Sand (10 to 15 bgs)

no rig chatter

no rig chatter

Light Brown 5YR 6/4 Sand (SP) fine grained with medium grained quartz, subangular to subround, poorly graded, trace silt
90% sand 10% silt
(15 to 20 bgs)

Sand, fine to medium grained angular to subround, most of the medium grained portion is quartz effervesces with HCl, no silt
quartz, epidote, minor feldspar
90% sand 2% silt
(20 to 25 bgs)

Sand, fine grained with medium grains of quartz,
(25 to 30 bgs)

FF8

HARDING-LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED)

SHEET 3 OF ____

PROJECT: | NO. | BORING NO. B-9

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND. EC	D.RATE	VIS	WT.	pH	DEPTH	GRAPHIC LOG
										31	
										2	
										3	SP
										4	
										35	
										6	
										7	
										8	
										9	
										40	
										1	
										2	
										3	
										4	
										9.8 45	
										6	
										7	
										8	
										9	
					To	Dark	to	Lgt		50	

rig chatter

Light Brown 5YR 5/6 Gravelly Sand (SP)
fine to coarse grained, subangular to subround, well graded
quartz (epidote/chlorite?)
oxide staining on quartz

20% gravel 80% sand
(30 to 35 bgs)

Light Brown 5YR 5/6 Sand SP
fine to coarse grained, angular to subround, poorly graded
quartz, feldspar? epidote
5% gravel 95% sand
(35 to 40 bgs)

no chatter

Sand, no gravel, subangular to subround, well graded
most grains are quartz (med to coarse)
some quartz appears arkosic
very fine grains of feldspar
99% sand 1% silt
(40 to 45 bgs)

Sand, fine to medium grained
poorly graded, 95% of larger grains are quartz
99% sand 1% silt
(45 to 50 bgs)

rig chatter

FIELD LOG OF BORING (CONTINUED)

SHEET 4 OF 50

PROJECT: | NO. | BORING NO. B-9

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND. EC	D.RATE	Vis	Wt	pH	DEPTH	GRAPHIC LOG
										51	
										2	
										3	
										4	
										55	
										6	
										7	
										8	
										9	
					1800		40	8.5		60	
										1	
						16 cy/hr				2	
										3	
										4	
										65	
										6	
										7	
										8	
										9	
										70	

Light Brown 5YR 5/6 Sand(SP)
fine to medium grained,
composed mostly of quartz grains in
a fine grained matrix
(50 to 55 bgs)

same Sand
fine grained sand with occasional
coarse grained sand and gravel
quartz
100% sand - 1% gravel
(55 to 60 bgs)

same Sand
fine grained matrix with
medium grained quartz, subangular to subround
(60 to 65 bgs)
100% sand, trace silt

same Sand(SP)
fine to medium grained, subangular to
subround, poorly graded,
quartz, feldspar, epidote?
hand drilling
95% sand 5% silt lots of cuttings
(65 to 70 bgs)

FF8

HARDING-LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED)

PROJECT: | NO. | BORING NO. B-9

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	COND.	D.RATE	VIS	WT	pH	DEPTH	GRAPHIC LOG
										71	
										2	
										3	
										4	
										75	
										6	
										7	
										8	
										9	
										80	
										1	
										2	
										3	
										4	
						1800		46	8.5	7.13 85	
										6	
										7	
										8	
										9	
										90	

same. Sand,
fine to coarse grained, angular to subangular, well graded,
quartz, minor feldspar
98% sand, 2% silt
(70 to 75 bag)

same Sandy Silt (ML) — TI
med to coarse sand, angular to subangular, poorly graded,
quartz, minor K spar,
85% coarse sand
15% gravel (10 mm max size)
50% silt - non plastic
(75 to 80' bag)

5YR 6/4
Light Brown Silty Sand (SM)
fine to coarse sand, ang to subang quartz (angular), biotite, epidote (?)
15% coarse sand, 10% med sand, 75% fine sand to silt. (Note: finer than above)

(80-85' bag)

same. Silty Sand (SM)
same as above except:
15% coarse sand, 30% med sand, 55% fine sand to silt.

(85-90' bag)

FIELD LOG OF BORING (CONTINUED)

SHEET 6 OF 50

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	COND.	D.RATE	VISC	WT		DEPTH	GRAPHIC LOG

PROJECT: | NO. | BORING NO. B-9

91 Light Brown 5YR 5/6 silty Sand (SM) fine to coarse sand, angular to subangular well graded, Qtz (some staining), Kspar 50% coarse sand, 25% red sand, 25% fine sand and silt (90-95' bag)

95 Light Brown 5YR 6/4 silty Sand (SM) Coarse sand, angular to subangular well graded, predominately Qtz (90%), minor Kspar 60% coarse sand 10% medium sand 30% fine sand and silt

8 (95-100' bag)

9 same. Sand (SW)

100 same as above

1 16 ft/hr

2

3 (100-105' bag)

4

105 Light Brown 5YR 5/6 same as 95-100'

6 (105-110' bag)

7

8

9

110

FF8

HARDING-LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED)

SHEET 7 OF 50

PROJECT:	NO.	BORING NO. B-9

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE	V/S	WT	PH	DEPTH	GRAPHIC LOG
										111	
										2	
										3	
										4	
										115	
										6	
										7	
										8	
										9	
										120	
										1	
										2	
										3	
										4	
										125	
					1800		32	2.5		6	
										7	
										8	
										9	
										130	

Light Brown 5YR 5/6 Sand (SW)
fine to coarse sand. [Note: increase of sand in sample, fining of sand]
well graded, angular to subangular
Qtz, increasing K spar, biotite
40% coarse sand
30% med sand
30% fine sand
(110-115' bags)

Light Brown 5YR 5/6 Sand (SW) with trace silt
fine to medium grained sand
Qtz, K spar, biotite
40% medium sand
60% fine sand

[Note, less sand in sample, fining]
(115-120' sample bags)

Light Brown 5YR 5/6 Sand (SW)
fine to coarse grained sand, angular to subangular, well graded,
Qtz, K spar
5% coarse sand
25% medium sand
75% fine sand
(120-125' bags)

Light Brown 5YR 5/6 Sand (SW) with trace silt
fine to coarse sand with silt,
angular to subangular, well graded,
Qtz, K spar,
30% coarse sand, 30% medium sand,
40% fine sand + silt.
[Note: Less sand in sample, grain size is finer]
(125-130' bags)

FF8

HARDING-LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED)

SHEET 8 OF 50

PROJECT: | NO. | BORING NO. B-9

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	COND.	D.RATE	VISC.	WT	Mud Temp	DEPTH	GRAPHIC LOG
										131	
										2	
										3	
										4	
										135	
										6	
										7	
										8	
										9	
										140	
										1	
										2	
										3	
					1800		38	8.6	22.4 in 7	4	
										145	
										6	
										7	
										8	
										9	
										150	

Light Brown 5YR 5/6 Sand (SP) with trace silt
fine to medium grained sand, angular to subangular, poorly graded, qtz, Kspar, minor biotite,
60% medium grained sand, 40% fine sand
(130 – 135' bag)

Same Sand (SP)
same as 130-135'
(bag 135-140')

Same Sand (SP)
same as 130-135'
(bag 140-145')

Light Brown 5YR 5/6 Silty Sand (SM)
fine to coarse grained sand with silt.
Angular to subrounded, well graded sand,
sand composed of Qtz/Kspar, minor biotite,
20% coarse sand; 35% med sand,
35% fine sand.
10% silt
(bag 145-150')

FF8

FIELD LOG OF BORING (CONTINUED)

SHEET 12 OF 50

PROJECT: | NO. | BORING NO. B-9

TYPE	BLOWS	DRIVEN	REC'V'D.	COND.	D.RATE				DEPTH	GRAPHIC LOG
									210	
									2	
									3	
									4	
									215	
									6	
									7	
									8	
									9	
									220	
									1	
									2	
									3	
									4	
									225	
									6	
									7	
									8	
									9	
									230	

Light Brown 5YR 5/6 Sand (SW)

same as 185-190'
(sample bag 210-215')

same Sand (SW)

same as 185-190'
(sample bag 215-220')

same Sand (SW)

same as 185-190'
(sample bag 220-225')

(no sample taken: mechanical failure)

FIELD LOG OF BORING (CONTINUED) SHEET 16 OF

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	COND.	D.RATE	Vis	Wt		DEPTH	GRAPHIC LOG	PROJECT:	NO.	BORING NO. B-9
										291		Light Brown 5YR 6/4 clayey Sand(SC)		
										2		fine to coarse grained sand, subangular to subround, gap graded, oxide staining on quartz grains,		
										3		quartz, biotite, amphibole? feldspar?		
										4		10% coarse 30% medium, 40% fine - sand		
										295		20% clay. (285 to 295 bcp)		
										6				
										7	SC	same as above.		
										8		medium and coarse fraction composed mostly of quartz grains.		
										9		fine fraction composed of quartz, biotite, very fine feldspar and amphibole?, some quartz is reddish, opaque and blackish		
					1800		42	8.5		300		(295 to 300 bcp)		
										1				
						18 cf/hr				2		same as above.		
										3		20% coarse, 30% medium 30% fine - sand 30% clay		
										4		silt increases, clay decreases. (300 to 305 bcp)		
										305	SC			
										6		Light Brown 5YR 6/4 Clayey Sand fine to medium grained, subangular to subround, gap graded.		
										7		35% medium 35% fine sand 25% clay		
										8		(305 to 310 bcp)		
										9				
										310				

FF8