FTN Associates Ltd.
water resources / environmental consultants

PLUM POINT ENERGY STATION
COAL COMBUSTION RESIDUAL LANDFILL

EPA CCR RULE SITING CRITERIA
§257.64, UNSTABLE AREAS

PREPARED IN COMPLIANCE WITH THE
EPA FINAL RULE FOR THE DISPOSAL OF
COAL COMBUSTION RESIDUALS
TITLE 40 CODE OF FEDERAL REGULATIONS PART 257

OCTOBER 17, 2018

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TITLE 40 CODE OF FEDERAL REGULATIONS PART 257

Prepared for

Plum Point Services Company, LLC
Plum Point Energy Station
2732 South County Road 623
Osceola, AR 72370

Prepared by

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

FTN No. R14590-1960-001

October 17, 2018

PROFESSIONAL ENGINEER'S CERTIFICATION

With this certification, I certify that I, as a Professional Engineer in the State of Arkansas, am a qualified professional engineer as defined in §257.53 of Title 40 Code of Federal Regulations (40 CFR) Part 257, that this report has been prepared under my direction in accordance with generally accepted good engineering practices, that the findings are accurate to the best of my knowledge, and that the CCR unit that is subject to this certification meets the location requirements under §257.64 of 40 CFR Part 257.

DANA LYNNE DERRINGTON
No. 16372

Dana L. Derrington, Arkansas PE #16372

10/17/2018
Date

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1.0 INTRODUCTION

Plum Point Services Company, LLC (PPSC) operates a landfill for the disposal of coal combustion residuals (CCRs) generated at the Plum Point Energy Station (PPES) located in Mississippi County, Arkansas. PPES and the landfill are located approximately 2 miles south of the city of Osceola, as shown on Figure 1.

The landfill is permitted by the Arkansas Department of Environmental Quality (ADEQ) under permit no. 0303-S3N-R1 and operates in accordance with the permit and Arkansas Pollution Control and Ecology Commission (APCEC) Regulation No. 22 requirements. The landfill also operates in accordance with the Environmental Protection Agency (EPA) Coal Combustion Residuals Rule (CCR rule), promulgated at Title 40 Code of Federal Regulations (40 CFR) Part 257.

Pursuant to §257.64 of Title 40 Code of Federal Regulations (40 CFR), new and existing CCR landfills must not be located in an unstable area. An unstable area is defined by §257.53 as a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains. This report presents the findings of an evaluation of the landfill in support of the location restriction requirements of §257.64.

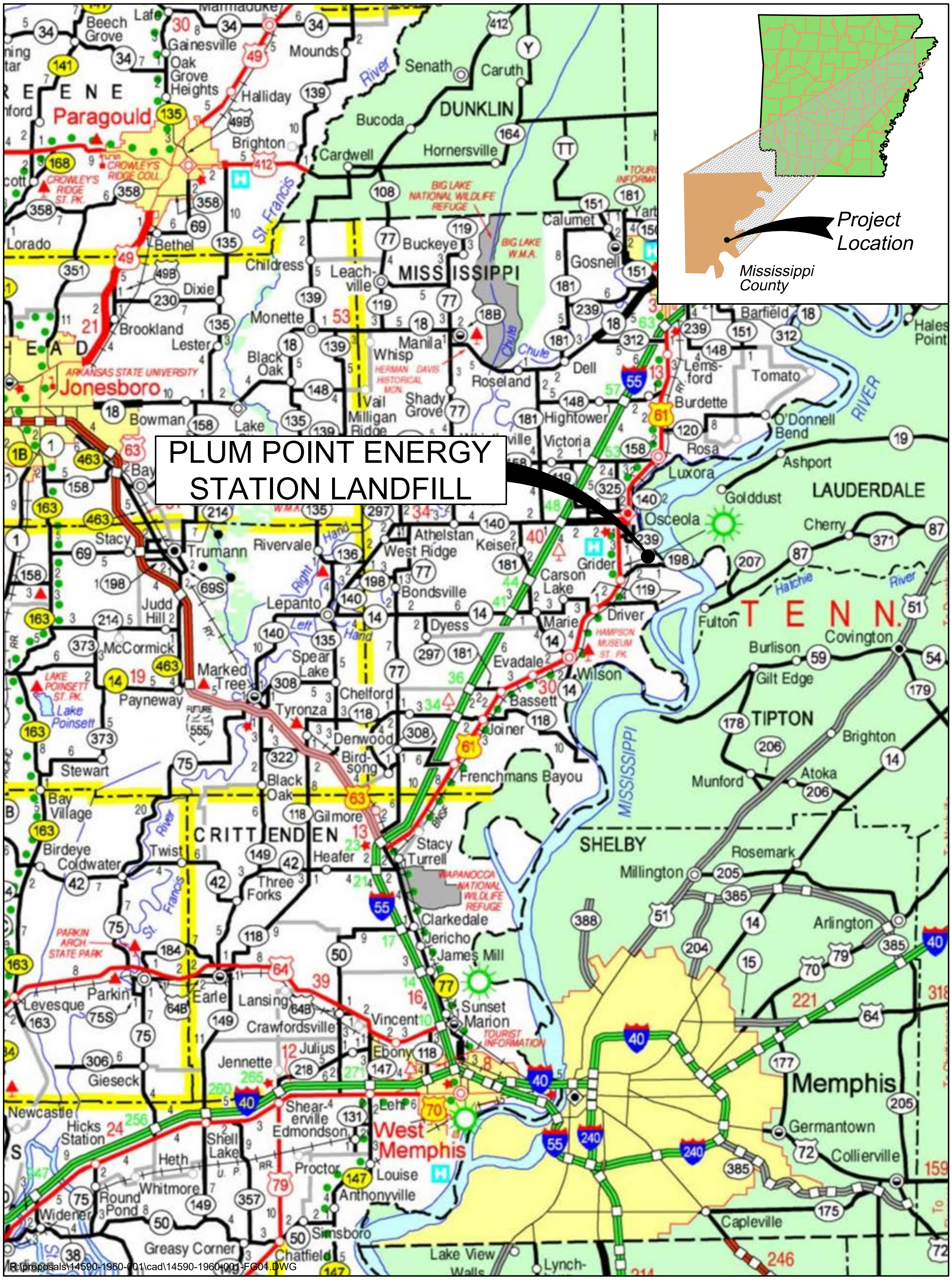


Figure 1. Location map.

2.0 BACKGROUND

This section provides a brief description of the operational history of the plant and landfill. Landfill permit documents that were reviewed as part of this evaluation are also identified.

2.1 Plant Operational History

PPES became active during March 2010 and generates electricity through the combustion of low-sulfur subbituminous coal, which is sourced primarily from the Powder River Basin in Wyoming and Montana. The combustion process produces CCR materials that are captured through the plant's air emission control systems comprised of electrostatic precipitators and flue-gas desulfurization (FGD) technologies. The CCRs produced by the plant include bottom ash/boiler slag, fly ash, and FGD materials. These CCR materials are comingled and disposed of in a moist/dry state in the landfill.

2.2 Landfill History

In October 2002, ADEQ issued solid waste permit no. 0303-S3N for construction and operation of the CCR landfill. The permit was revised in April 2016 to permit no. 0303-S3N-R1 in response to a minor permit modification application submitted by FTN Associates, Ltd. (FTN).

The permitted area is approximately 173 acres and is designed to have 12 waste disposal cells, as shown on Figure 2. Cells 1 through 10 are each approximately 15 acres in size, Cell 11 is 9.6 acres, and Cell 12 is approximately 10.8 acres. The total permitted disposal capacity for all 12 cells is 22,400,000 cubic yards. Of this area, only Cells 1 and 3 have been developed, as shown on Figure 2 and as described below.

Cell 1 and the western stormwater pond were constructed in 2008. The landfill began operation in March 2010, concurrent with the initiation of plant operation. Construction of Cell 3 began in 2014, was completed in 2015, and began receiving CCRs in December 2015. The leachate storage pond located to the west of Cell 1 was constructed in 2016.

The landfill has been designed to meet APCEC Regulation No. 22 standards. The bottom liner systems for Cell 1 and Cell 3 were constructed in accordance with the permit and include a 12-inch minimum thickness compacted clay liner with a maximum hydraulic conductivity of 1 x 10^{-7} cm/sec, a 60-mil high-density polyethylene (HDPE) liner, and a leachate collection system.

2.3 Review of Landfill Permit Documentation

The original permit application for the landfill was submitted by Genesis Environmental Consulting, Inc. (GEC) in 2001. The following three reports were submitted with the application and were reviewed as part of this evaluation:

- Geotechnical and hydrogeological investigation (GHI) report: this document was prepared by GEC in fulfillment of Regulation No. 22, Chapter 11, requirements. The report includes a review of the regional geological and hydrogeological setting of the landfill, a description of surface and subsurface exploration activities performed at the landfill site, a characterization of observed onsite lithology and hydrogeological conditions, and geotechnical testing results of onsite soils.
- Design report: this report was prepared by GEC in fulfillment of Regulation No. 22, Chapter 5, design criteria for class 3N landfills. The report is certified by an Arkansas-registered professional engineer and details the stability evaluation of the landfill.
- Site selection limitations and location restrictions report: this report was prepared by GEC in fulfillment of Regulation No. 22, Chapter 5, landfill location criteria for class 3N landfills. This report includes a determination that the landfill is not located in an unstable area.

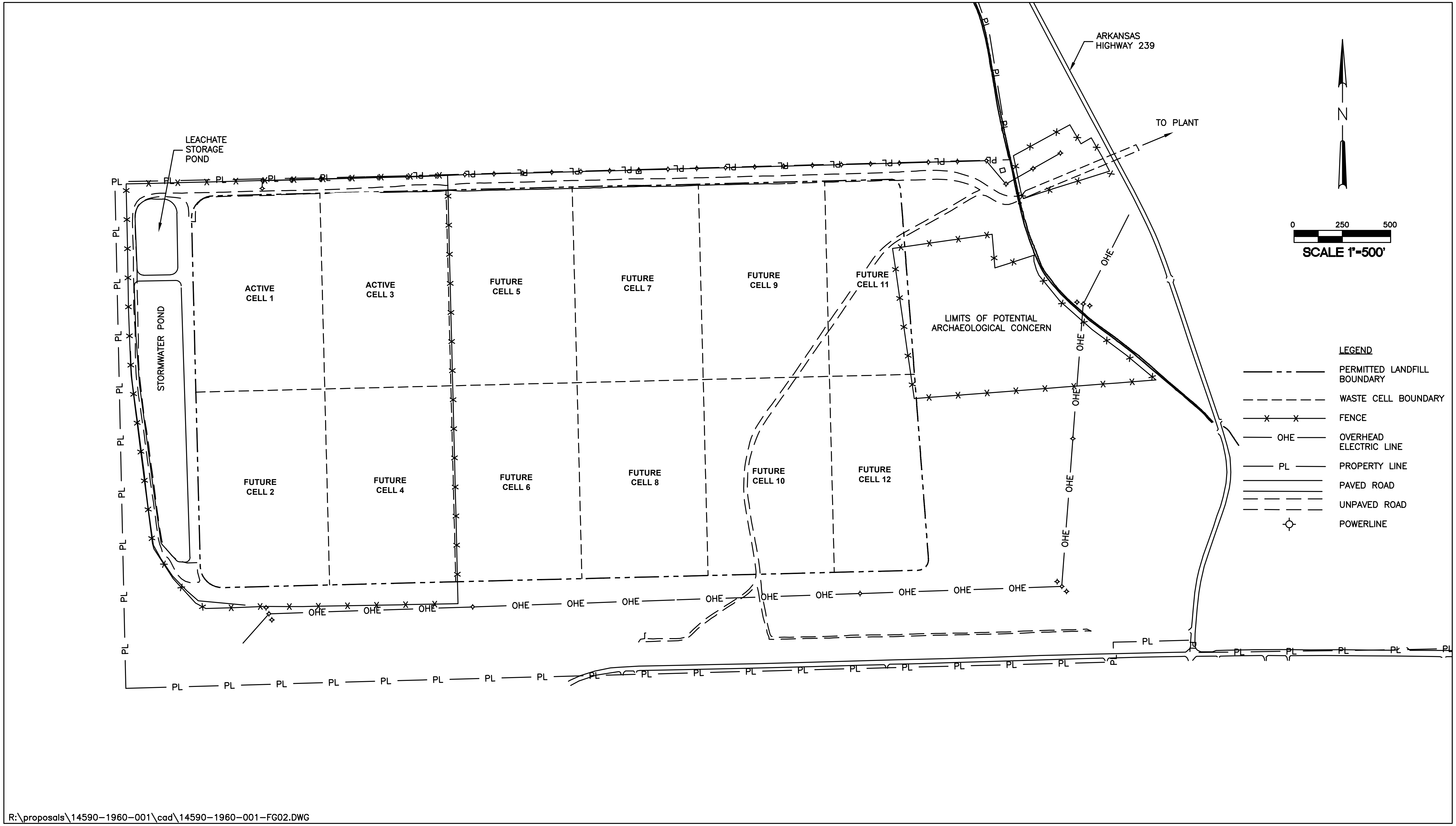


Figure 2. Landfill site map.

3.0 UNSTABLE AREA EVALUATION

Pursuant to §257.64(b), the owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

1. Onsite or local soil conditions that may result in significant differential settling;
2. Onsite or local geologic or geomorphologic features; and
3. Onsite or local human-made features or events (both surface and subsurface).

FTN reviewed the reports identified in Section 2.3 along with publicly available documents published by the US Geological Survey (USGS). Findings from this review are discussed below within the context of the factors listed in §257.64(b).

3.1 Review of Onsite or Local Soil Conditions that May Result in Significant Differential Settling

Boring logs and associated geotechnical data from the GHI report (GEC 2001) are included in Appendix A. These documents and the GHI report indicate the landfill is underlain by cohesive soils comprised of low- to high-plasticity clays and low-plasticity silts that extend to an average depth of 15 ft below ground surface (bgs), but can be as much as 30 ft thick in some areas and absent in others. The cohesive soils are underlain by fine- to coarse-grained sands and fine- to coarse-grained gravel encountered at depth. Based on one deep boring, completed to a depth of 200 ft bgs, the coarse-grained materials reach a depth of 190 ft bgs in the vicinity of the landfill.

A review of the subsurface data included in Appendix A shows that no organic soils, which are prone to settlement due to their high compressibility, were encountered in any of the borings. There are also no apparent lateral changes in the underlying lithology that would indicate a notable change in the compressibility of foundation soils, as can be seen from the soil boring logs. These factors, coupled with a review of the landfill design report and the site selection limitations and location restrictions report (GEC 2001) indicate that significant differential settling is unlikely.

3.2 Review of Onsite or Local Geologic or Geomorphologic Features

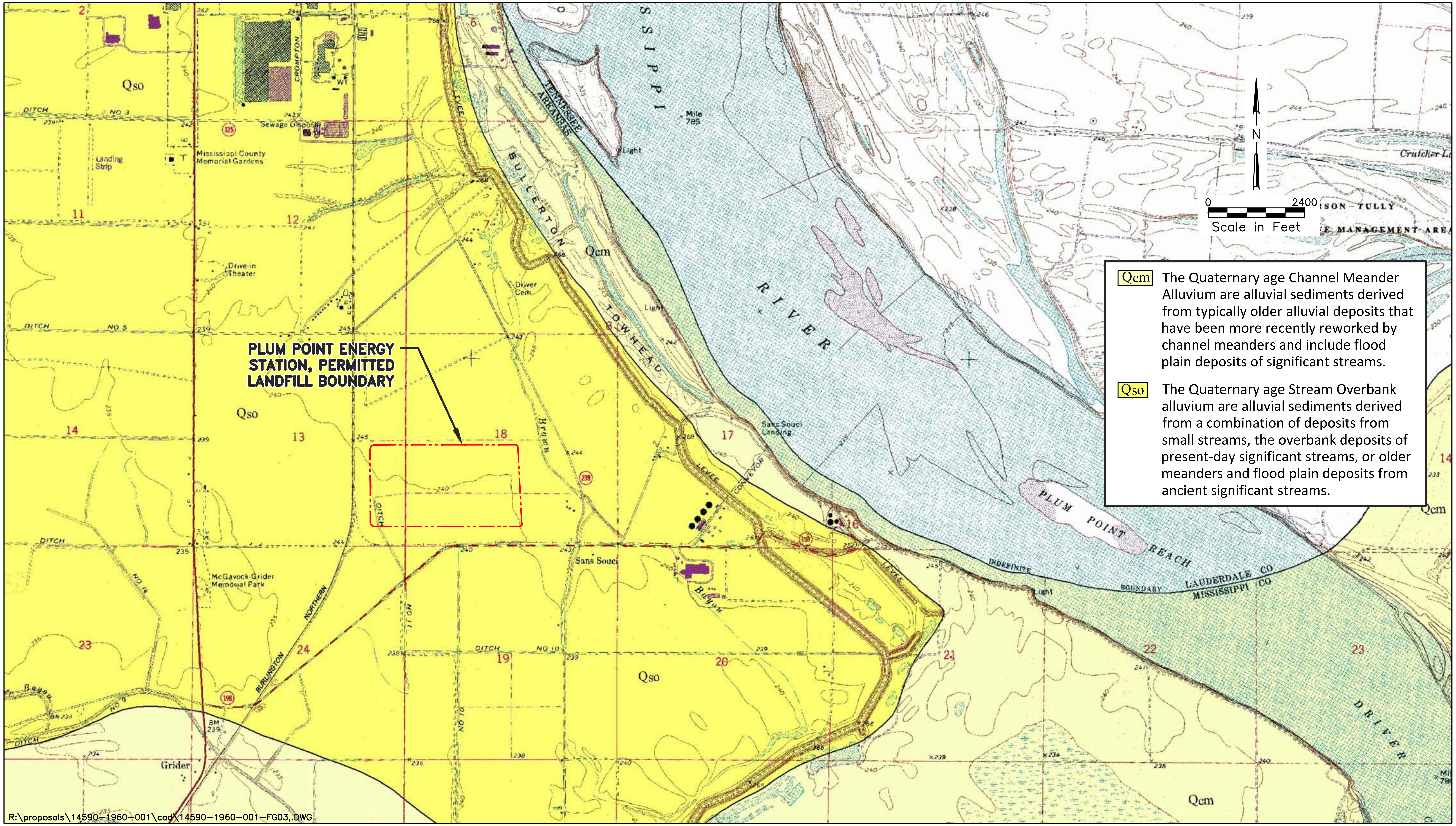
Surficial deposits in the vicinity of the landfill are Quaternary alluvial deposits, as shown on Figure 3. Regionally, the alluvium reaches depths of 100 to 200 ft bgs (Ryling 1960; Cushing, Boswell, and Hosman 1964) and is characterized by unconsolidated alluvial and terrace deposits of sands and gravels grading upward to clays interbedded with silt and fine-grained sand (Stephenson and Crider 1916; Cushing, Boswell, and Hosman 1964; Petersen, Broom, and Bush 1985). At the landfill, these deposits extend to a total depth of 190 ft bgs, as discussed in Section 3.1. These sediments are not susceptible to dissolution and as such, are not typically associated with karst topography. A review of the topographical map included as Figure 4 shows no evidence of karst features or evidence of areas susceptible to mass movement (i.e., landslides) in the vicinity of the landfill.

According to the 2001 GHI report, GEC performed a review of aerial photography to identify sedimentary, depositional, structural, and geomorphic features within and surrounding the site. This review did not identify any lineaments or surficial indication of faulting at the site.

3.3 Review of Onsite or Local Human-Made Features or Events (Both Surface and Subsurface)

Presently, there are no visible onsite or local human-made features or events that would cause the area in the immediate vicinity of the landfill to be unstable. A stability evaluation of the landfill was performed as part of the landfill design report (GEC 2001). The evaluation was certified by an Arkansas-registered professional engineer and determined that the landfill was designed to be stable under both static and seismic conditions.

According to USGS (Kresse et al. 2014), the underlying alluvial aquifer is used primarily as an irrigation source. A review of seasonal water levels collected at the landfill (FTN 2018) indicates that recharge to the aquifer is sufficient to balance seasonal withdrawals. As such, land subsidence due to groundwater removal from the alluvial aquifer is considered unlikely.



Qcm The Quaternary age Channel Meander Alluvium are alluvial sediments derived from typically older alluvial deposits that have been more recently reworked by channel meanders and include flood plain deposits of significant streams.

Qso The Quaternary age Stream Overbank alluvium are alluvial sediments derived from a combination of deposits from small streams, the overbank deposits of present-day significant streams, or older meanders and flood plain deposits from ancient significant streams.

Figure 3. Geologic map, adapted from Haley (1969) and Ausbrooks and Prior (2006).

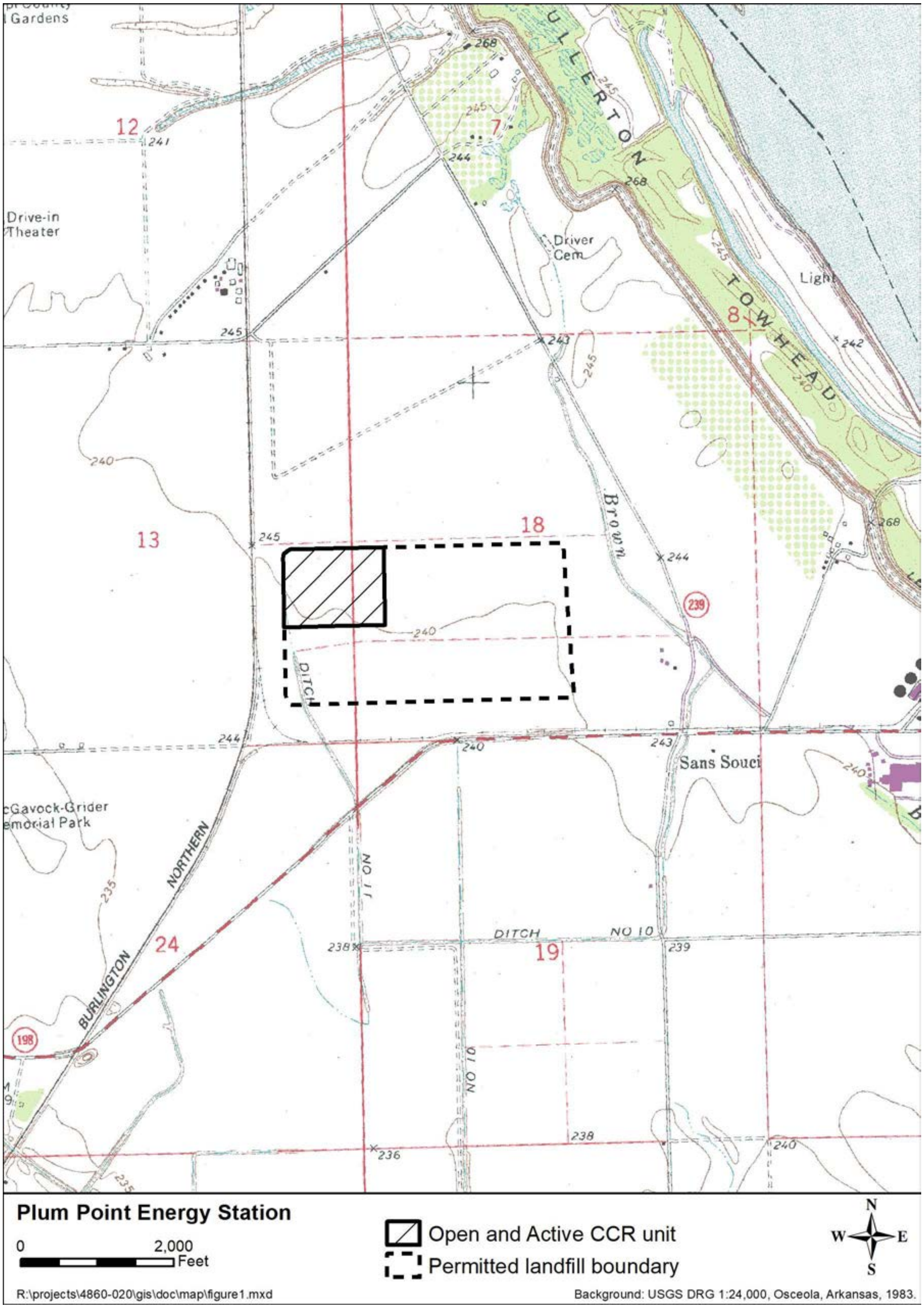


Figure 4. Topography of surrounding area based on USGS topographic quadrangle Osceola, AR (USGS 1972).

4.0 CONCLUSIONS

Based on a review of the available documentation referenced in this report, the following conclusions can be made:

1. No onsite or local soil conditions were identified that would result in significant differential settling;
2. No onsite or local geologic or geomorphologic features, such as karst areas or areas susceptible to mass movement, were identified; and
3. No onsite or local human-made features or events, either surface or subsurface, were identified that would cause the area in the immediate vicinity of the landfill to be unstable.

In consideration of these findings, the landfill meets the location restriction requirements of §257.64.

5.0 REFERENCES

Ausbrooks, S.M., and W.L. Prior. 2006. *Geologic Worksheet of the Arkansas Portion of the Osceola Quadrangle, Mississippi County, Arkansas* [1:24,000 scale digital geologic worksheet]. Updated from Haley, B.R., 1969. Little Rock, AR: Arkansas Geological Commission.

Cushing, E.M., E.H. Boswell, and R.L. Hosman. 1964. *Water Resources of the Mississippi Embayment: General Geology of the Mississippi Embayment* [USGS Professional Paper 448-B]. Washington, DC: US Government Printing Office. Available online at https://pubs.usgs.gov/pp/0448b/report.pdf.

FTN (FTN Associates, Ltd.). 2018. *Plum Point Energy Station, Groundwater Monitoring and Corrective Action 2017 Annual Report*. Little Rock, AR: FTN Associates, Ltd.

GEC (Genesis Environmental Consulting, Inc.). 2001. *Permit Application for Class 3N Solid Waste Facility, Plum Point Energy Associates, LLC*. Little Rock, AR: Genesis Environmental Consulting, Inc.

Haley, B.R. 1969. *Geologic Worksheet of the Osceola Quadrangle, Arkansas* [Open-File Report, Scale 1:62,500]. Little Rock, AR: Arkansas Geological Commission. Revised by Ausbrooks, S.M., and W.L. Prior, 2006.

Kresse, T.M., P.D. Hays, K.R. Merriman, J.A. Gillip, D.T. Fugitt, J.L. Spellman, A.M. Nottmeier, D.A. Westerman, J.M. Blackstock, and J.L. Battreal. 2014. *Aquifers of Arkansas—Protection, Management, and Hydrologic and Geochemical Characteristics of Groundwater Resources in Arkansas* [USGS Scientific Investigations Report 2014-5149]. Prepared in cooperation with the Arkansas Natural Resources Commission. Reston, VA: US Geological Survey. http://dx.doi.org/10.3133/sir20145149.

Petersen, J.C., M.E. Broom, and W.V. Bush. 1985. *Geohydrologic Units of the Gulf Coastal Plain in Arkansas* [USGS Water-Resources Investigations Report 85-4116]. Prepared in cooperation with the Arkansas Department of Pollution Control and Ecology and the Arkansas Geological Survey. Denver, CO: US Geological Survey, Western Distribution Branch, Open-File Services Collection. 24 pp.

Ryling, R.W. 1960. *Ground-Water Potential of Mississippi County, Arkansas* [Water Resources Circular No. 7]. Little Rock, AR: Arkansas Geological and Conservation Commission. 87 pp.

Stephenson, L.W., and A.F. Crider. 1916. *Geology and Ground Waters of Northeastern Arkansas* [USGS Water-Supply Paper 399]. Washington, DC: US Government Printing Office. Available online at https://pubs.usgs.gov/wsp/0399/report.pdf.

USGS (US Geological Survey). 1972 (rev 1983). “USGS 1:24000-Scale Quadrangle for Osceola, AR 1972.” US Geological Survey. Available online at https://www.sciencebase.gov/catalog/item/4f5543b2e4b018de15819c9d.

APPENDIX A

Well Construction Details, Soil Boring Logs, and Geotechnical Data

GEC GENESIS ENVIRONMENTAL CONSULTING, INC.
11400 West Baseline Road Little Rock, AR 72209
Phone: (501) 455-2199 Fax (501) 455-4547

FIELD BOREHOLE LOG

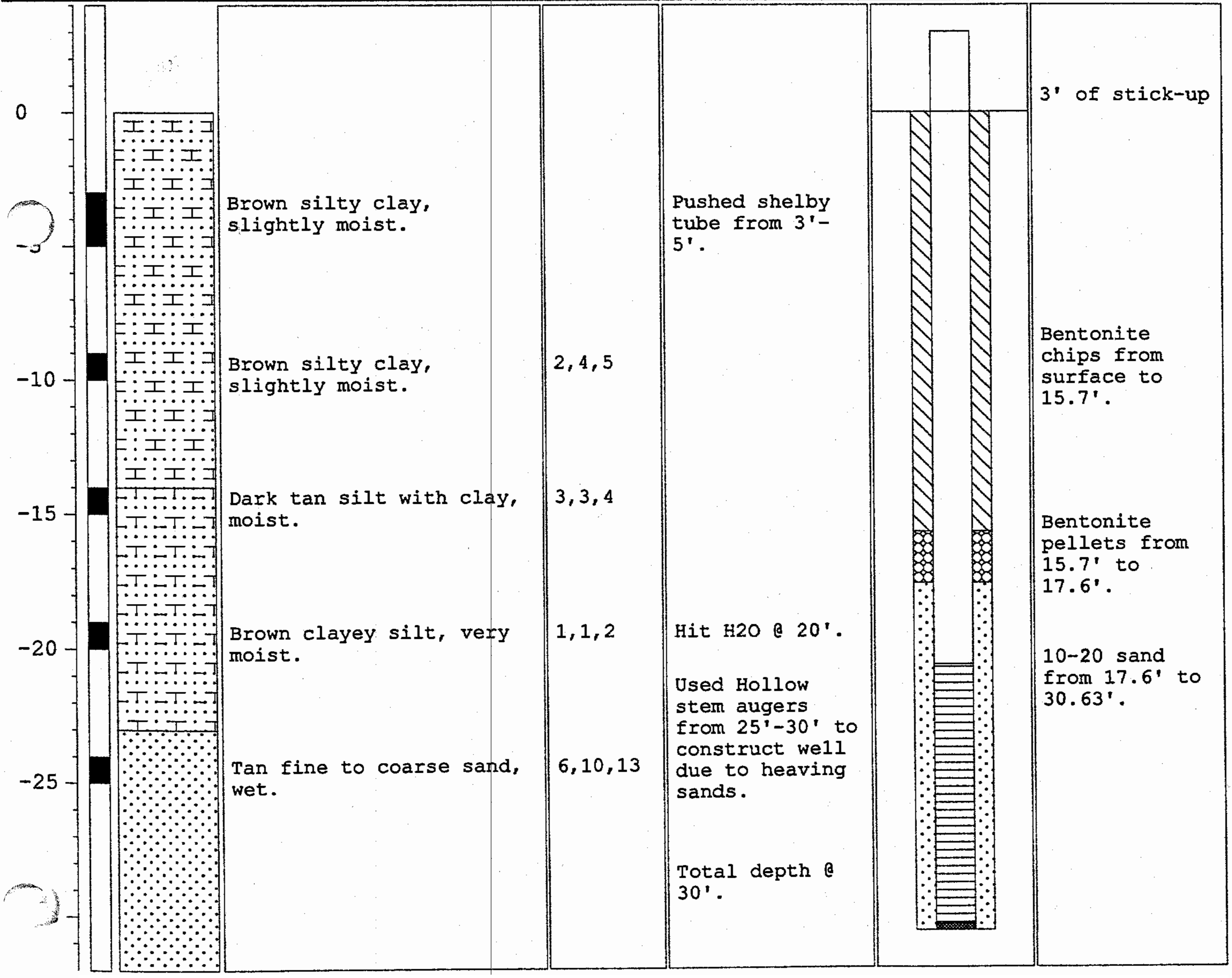
BOREHOLE NO.: MW-101 TOTAL DEPTH: 30'
COORDINATES: 489496.27N 1915916.93E
ELEVATION: TOC ELEVATION: 242.75 ft

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25" diam. Solid flight auger**
DATE DRILLED:	**4/09/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 23.63
STATIC WATER LEVEL: 21.53' BELOW TOC

SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 33.63' BELOW TOC
DATE OF WATER LEVEL: 5/02/01



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						3' of stick-up
-5		Brown silty clay, slightly moist.		Pushed shelby tube from 3'-5'.		
-10		Brown silty clay, slightly moist.	2,4,5			Bentonite chips from surface to 15.7'.
-15		Dark tan silt with clay, moist.	3,3,4			Bentonite pellets from 15.7' to 17.6'.
-20		Brown clayey silt, very moist.	1,1,2	Hit H2O @ 20'. Used Hollow stem augers from 25'-30' to construct well due to heaving sands.		10-20 sand from 17.6' to 30.63'.
-25		Tan fine to coarse sand, wet.	6,10,13	Total depth @ 30'.		

Borehole and/or well IDs were updated to reflect the nomenclature used for the EPA CCR Rule network. Vertical and horizontal coordinates were updated based on survey report dated November 18, 2016. Vertical datum is based on NAVD88 and horizontal datum is based on Arkansas State Plane NAD83 North.

GEC GENESIS ENVIRONMENTAL CONSULTING, INC.
11400 West Baseline Road Little Rock, AR 72209
Phone: (501) 455-2199 Fax (501) 455-4547

FIELD BOREHOLE LOG

BOREHOLE NO.: MW-102 TOTAL DEPTH: 30'
COORDINATES: 489523.55N 1917416.25E
ELEVATION: TOC ELEVATION: 243.99 ft

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/09/01**

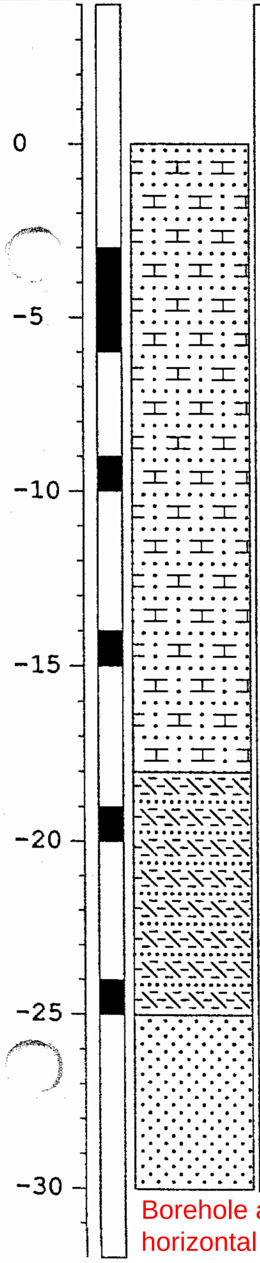
DRILLING INFORMATION

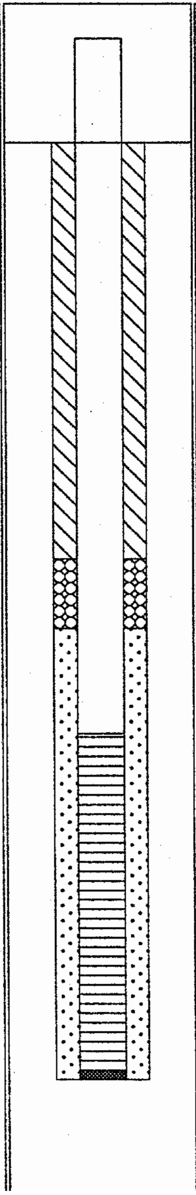
DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 20.23'
STATIC WATER LEVEL: 22.13' BELOW TOC

SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 30.23' BELOW TOC
DATE OF WATER LEVEL: 5/02/01





DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						3' of stick-up
		Brown and gray silty clay, slightly moist, medium plasticity.		Pushed shelby tube from 3'-5'.		
-5			1,1,2			Bentonite chips from surface to 12'.
-10		Brown and gray silty clay, slightly moist, medium plasticity.	3,3,6			
						Bentonite pellets from 12' to 14'.
-15		Dark brown to gray silty clay, moist.	2,2,3			
						10-20 sand from 14' to 27'.
-20		Dark brown to gray silty clay, with fine to medium grained sand, wet.	3,4,6	Hit H2O @ 20'.		
				Hollow stem augers used to construct well due to heaving sands from 25'-30'.		
-25		Dark brown to gray silty clay, with increasing fine to medium sand, wet.				
-30		Tan to brown fine to medium grained sand with some silt, wet.		Total depth @ 30'.		

Borehole and/or well IDs were updated to reflect the nomenclature used for the EPA CCR Rule network. Vertical and horizontal coordinates were updated based on survey report dated November 18, 2016. Vertical datum is based on NAVD88 and horizontal datum is based on Arkansas State Plane NAD83 North.

EDWARDS ENGINEERING, P.A.
Civil and Environmental Engineering, Planning, and Consulting

FIELD BORING LOG

BORING NO.: MW-103
PAGE: 1 of 1
TOTAL DEPTH: 30' FEET BELOW GROUND SURFACE (BGS)

CLIENT: Dynegy Services Plum Point, LLC
PROJECT: Plum Point Well Installation
JOB NO.: LSP-AR-PPES-07-02
DRILLING CO.: Anderson Engineering
LOGGED BY: Lance Powell
DRILLER: Dennis Young
DATE DRILLED: 9-26-07
RIG TYPE: Simco 2800 HS (HT)
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: Split Spoon

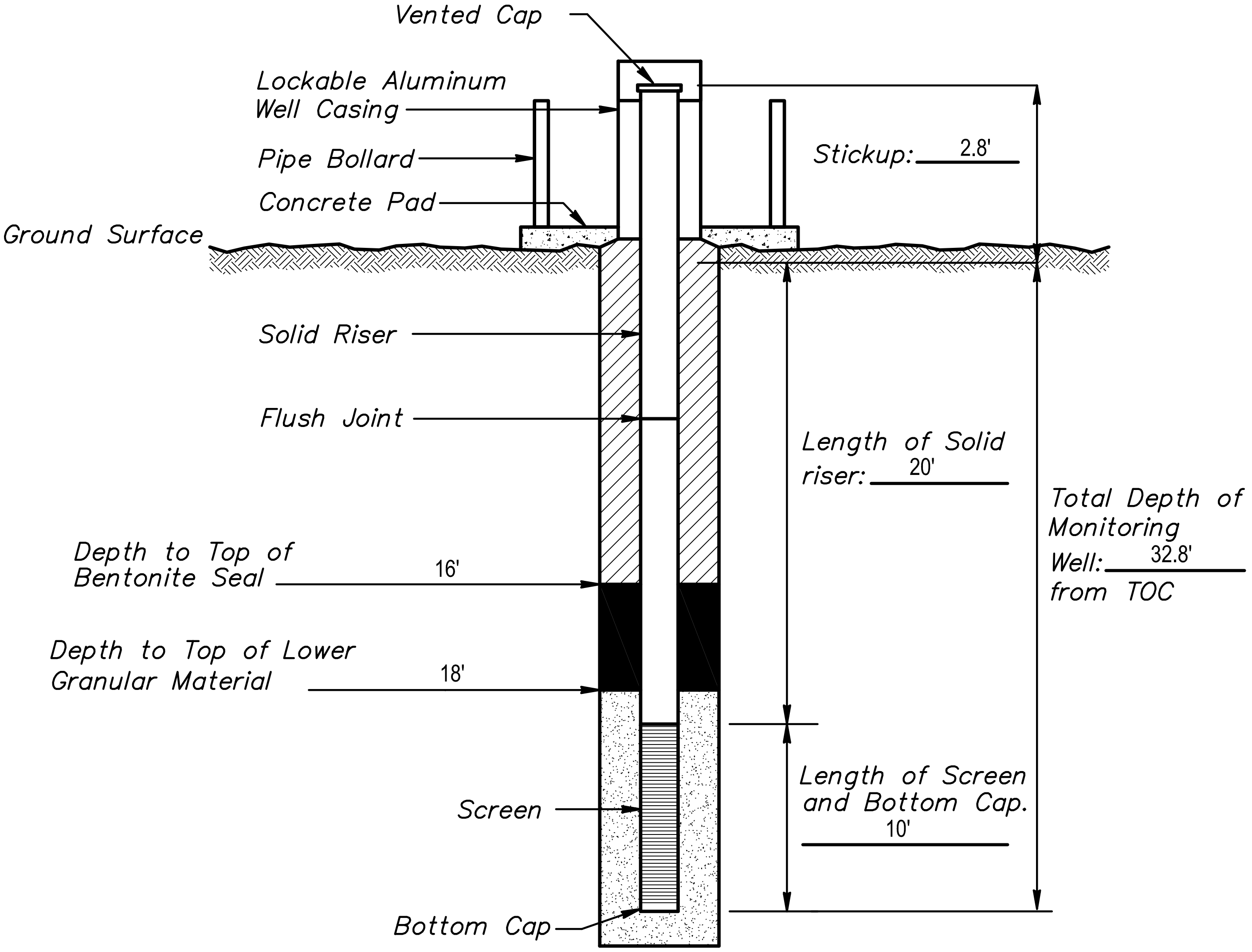
488350.05N 1915934.03E TOC: 243.25 ft

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	Blow Counts	Comments
0		Topsoil 0' - 0.5' Dark Brown Silty Clay Gray to Brown Silty Clay, trace organics, Moist	▤	1,2,2	
5		Gray Clay, Medium to High Plasticity Some Silt, Moist	▤	1,2,4	
10		Gray Clay, Medium to High Plasticity Some Silt, Moist	▤	2,5,4	
15		Gray , Medium to Coarse Sand, Some Clay, Wet, Grading into Silty Sand	▤ ░	1,1,2	Contact with medium to coarse sand at 16' Hit water at 20' ▽
20		Gray , Sandy Silt, Wet	░		Split Spoon samples not taken at 25' and 30' due to heaving sands
25		Gray , Silty, Coarse Sand, Some Clay, Wet	░		

Borehole and/or well IDs were updated to reflect the nomenclature used for the EPA CCR Rule network. Vertical and horizontal coordinates were updated based on survey report dated November 18, 2016. Vertical datum is based on NAVD88 and horizontal datum is based on Arkansas State Plane NAD83 North.

MONITORING WELL INSTALLATION RECORD

Job Name Plum Point Energy Well Station
Well Number MW-103
Job Number LSP-AR-PPES-07-02
Installation Date September 26, 2007
Location PPES Class 3N Landfill
Datum Elevation 243.25 ft
Surface Elevation 240.5 ft
Datum for Water Level Measurement Top of PVC Stickup
Screen Diameter & Material 2" PVC
Slot Size 0.010"
Riser Diameter & Material 2" PVC
Borehole Diameter 7.25"
Granular Backfill Material Sand
Representative Phillip Fields
Drilling Method Hollow Stem Auger
Drilling Contractor Anderson Engineering



Stickup: 2.8'

Length of Solid riser: 20'

Total Depth of Monitoring Well: 32.8' from TOC

Depth to Top of Bentonite Seal 16'

Depth to Top of Lower Granular Material 18'

Length of Screen and Bottom Cap. 10'

▨ Bentonite Pellets

■ Bentonite Plug

░ Granular Backfill

(Not to Scale)

Stabilized water level 22.15 feet below datum.

Measured on September 27, 2007

EDWARDS ENGINEERING, P.A.
Civil and Environmental Engineering, Planning, and Consulting

MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: LSP-AR-PPES-07-02
WELL NUMBER: MW-3R
DRAWING NUMBER: 1
CHECKED BY: LP

GEC GENESIS ENVIRONMENTAL CONSULTING, INC.
11400 West Baseline Road Little Rock, AR 72209
Phone: (501) 455-2199 Fax (501) 455-4547

FIELD BOREHOLE LOG

BOREHOLE NO.: MW-108 TOTAL DEPTH: 30'
COORDINATES: 489573.87N 1920414.52E
ELEVATION: TOC ELEVATION: 245.11 ft

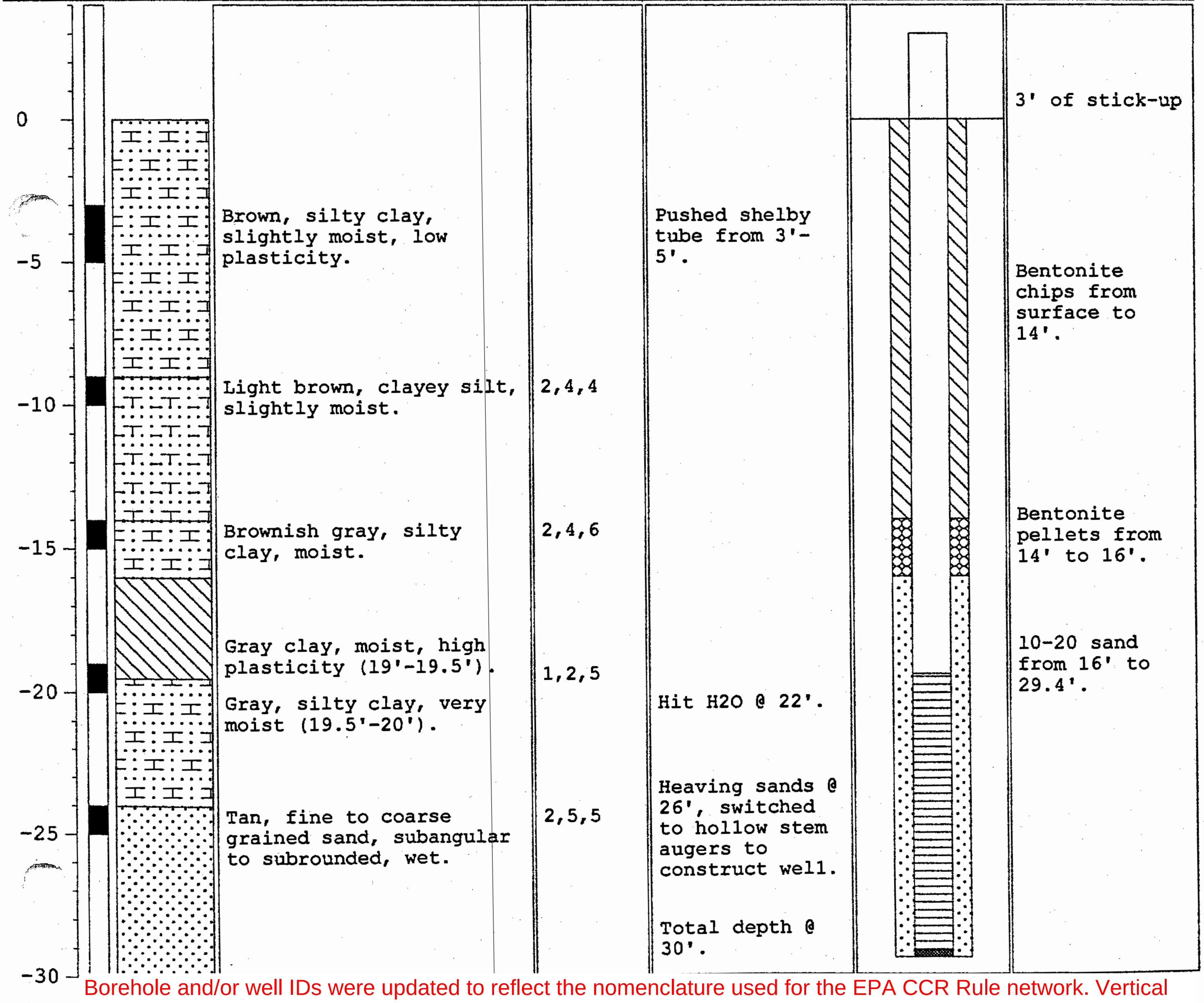
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/11/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1
CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 22.40'
STATIC WATER LEVEL: 22.54' BELOW TOC
SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 32.40' BELOW TOC
DATE OF WATER LEVEL: 5/02/01



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						3' of stick-up
-5		Brown, silty clay, slightly moist, low plasticity.		Pushed shelby tube from 3'-5'.		Bentonite chips from surface to 14'.
-10		Light brown, clayey silt, slightly moist.	2,4,4			
-15		Brownish gray, silty clay, moist.	2,4,6			Bentonite pellets from 14' to 16'.
		Gray clay, moist, high plasticity (19'-19.5').	1,2,5			10-20 sand from 16' to 29.4'.
-20		Gray, silty clay, very moist (19.5'-20').		Hit H2O @ 22'.		
-25		Tan, fine to coarse grained sand, subangular to subrounded, wet.	2,5,5	Heaving sands @ 26', switched to hollow stem augers to construct well.		
-30				Total depth @ 30'.		

Borehole and/or well IDs were updated to reflect the nomenclature used for the EPA CCR Rule network. Vertical and horizontal coordinates were updated based on survey report dated November 18, 2016. Vertical datum is based on NAVD88 and horizontal datum is based on Arkansas State Plane NAD83 North.

FIELD BORING LOG

BORING NO.: MW-113 PAGE: 1 of 1

TOTAL DEPTH: 33' FEET BELOW GROUND SURFACE (BGS)

CLIENT: Dynegy Services Plum Point, LLC

PROJECT: Plum Point MW-13 Replacement

JOB NO.: DY-09-02

DRILLING CO.: Tri-State Testing Services, Inc.

LOGGED BY: Lance Powell

DRILLER: Mike Woolfolk

DATE DRILLED: 4/7/09

RIG TYPE: CME 55

DRILLING METHOD: Hollow Stem Auger

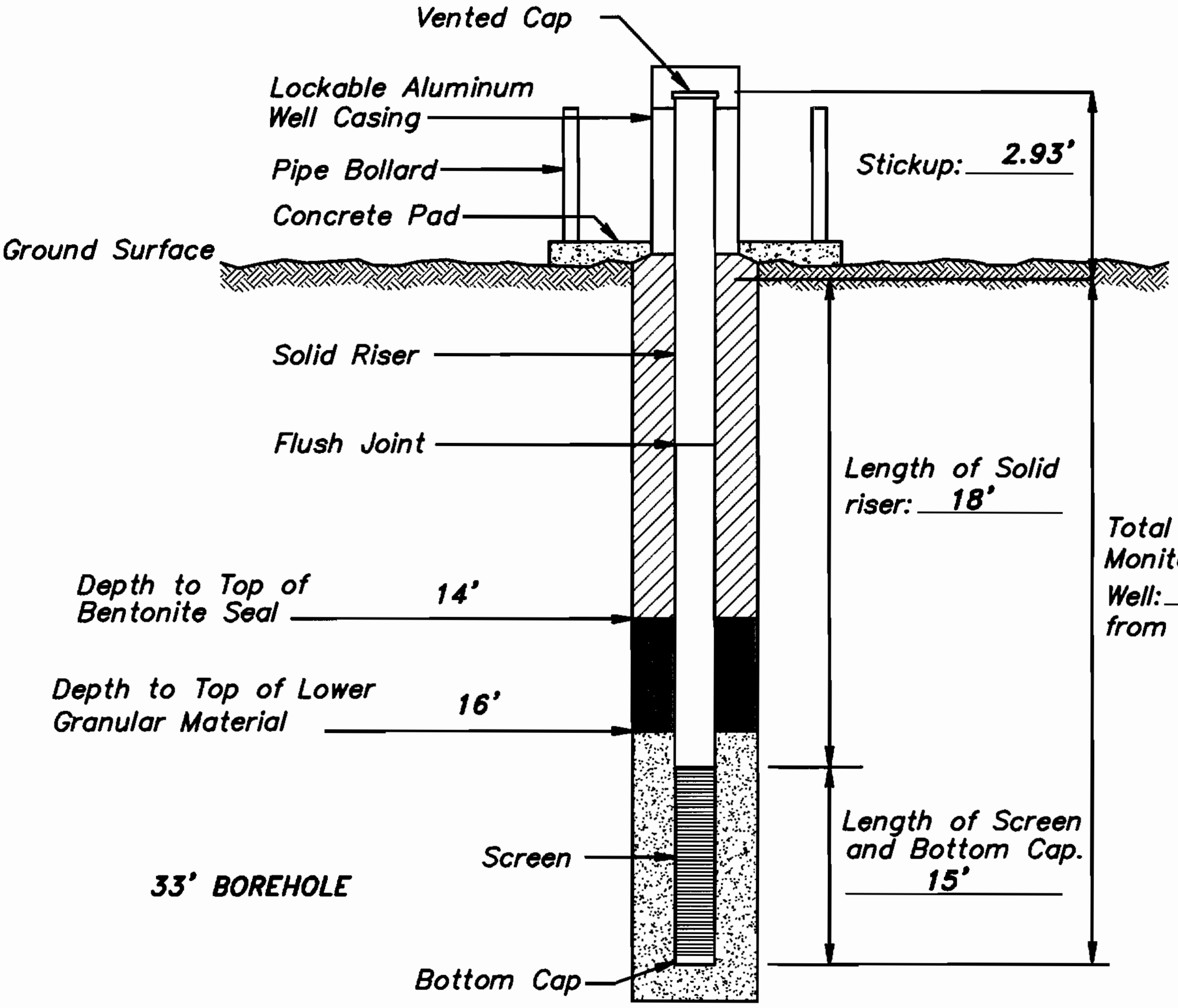
SAMPLING METHOD: Continuous

488463.15N 1919936.06E TOC: 244.63 ft

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	Comments
0		Topsoil 0' - 0.5' Dark Brown Silty Clay Gray to Brown Silty Clay, Moist, Trace Organics		
5		Tan to Brown Silty Sand, Fine to Medium grain, Moist		
10		Tan, Medium to Coarse Grain Sand, Subangular to Subrounded, Damp		
15		Tan, Medium to Coarse Grain Sand, Subangular to Subrounded, Damp		Hit water at 18' ▽
20		Tan, Fine to Medium Grain Sand with Trace Brown Clay, Subangular to Subrounded, Wet		
25		Tan, Fine to Coarse Grain Sand, Subangular to Subrounded, Wet		
30		Tan, Fine to Coarse Grain Sand, Subangular to Subrounded, Wet		Over 15' of wet sand. Auger started to lock up. Sample not taken at 33.

MONITORING WELL INSTALLATION RECORD

Job Name: Plum Point Energy Station MW-13 Replacement
Well Number: MW-113
Job Number: DY-09-02
Installation Date: 4/7/09
Location: PPES Class 3N Landfill
Datum Elevation: 244.63 ft
Surface Elevation: 241.5 ft
Datum for Water Level Measurement: Top of PVC Stickup
Screen Diameter & Material: 2" PVC
Slot Size: 0.010"
Riser Diameter & Material: 2" PVC
Borehole Diameter: 7 1/4"
Granular Backfill Material: Sand
Representative: Lance Powell
Drilling Method: Hollow Stem Auger
Drilling Contractor: Tri-State Testing Services, Inc.



Stickup: 2.93'

Length of Solid riser: 18'

Total Depth of Monitoring Well: 35.93' from TOC

Depth to Top of Bentonite Seal: 14'

Depth to Top of Lower Granular Material: 16'

Length of Screen and Bottom Cap: 15'

▨	**Bentonite Pellets**
■	**Bentonite Plug**
▒	**Granular Backfill**

(Not to Scale)

Stabilized water level 18.07 feet below datum.

Measured on 4-09-09

CEA CIVIL ENGINEERING ASSOCIATES, LLC

MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: DY-09-02
WELL NUMBER: MW-13R
DRAWING NUMBER: 1
CHECKED BY: LP

Borehole and/or well IDs were updated to reflect the nomenclature used for the EPA CCR Rule network. Vertical and horizontal coordinates were updated based on survey report dated November 18, 2016. Vertical datum is based on NAVD88 and horizontal datum is based on Arkansas State Plane NAD83 North.

EDWARDS ENGINEERING, P.A.
Civil and Environmental Engineering, Planning, and Consulting

FIELD BORING LOG

BORING NO.: MW-115 PAGE: 1 of 1

TOTAL DEPTH: 30' FEET BELOW GROUND SURFACE (BGS)

CLIENT: Dynegy Services Plum Point, LLC	PROJECT: Plum Point Well Installation
JOB NO.: LSP-AR-PPES-07-02	DRILLING CO.: Anderson Engineering
LOGGED BY: Phillip Fields	DRILLER: Dennis Young
DATE DRILLED: 9-25-07	RIG TYPE: Simco 2800 HS (HT)

DRILLING METHOD: Hollow Stem Auger

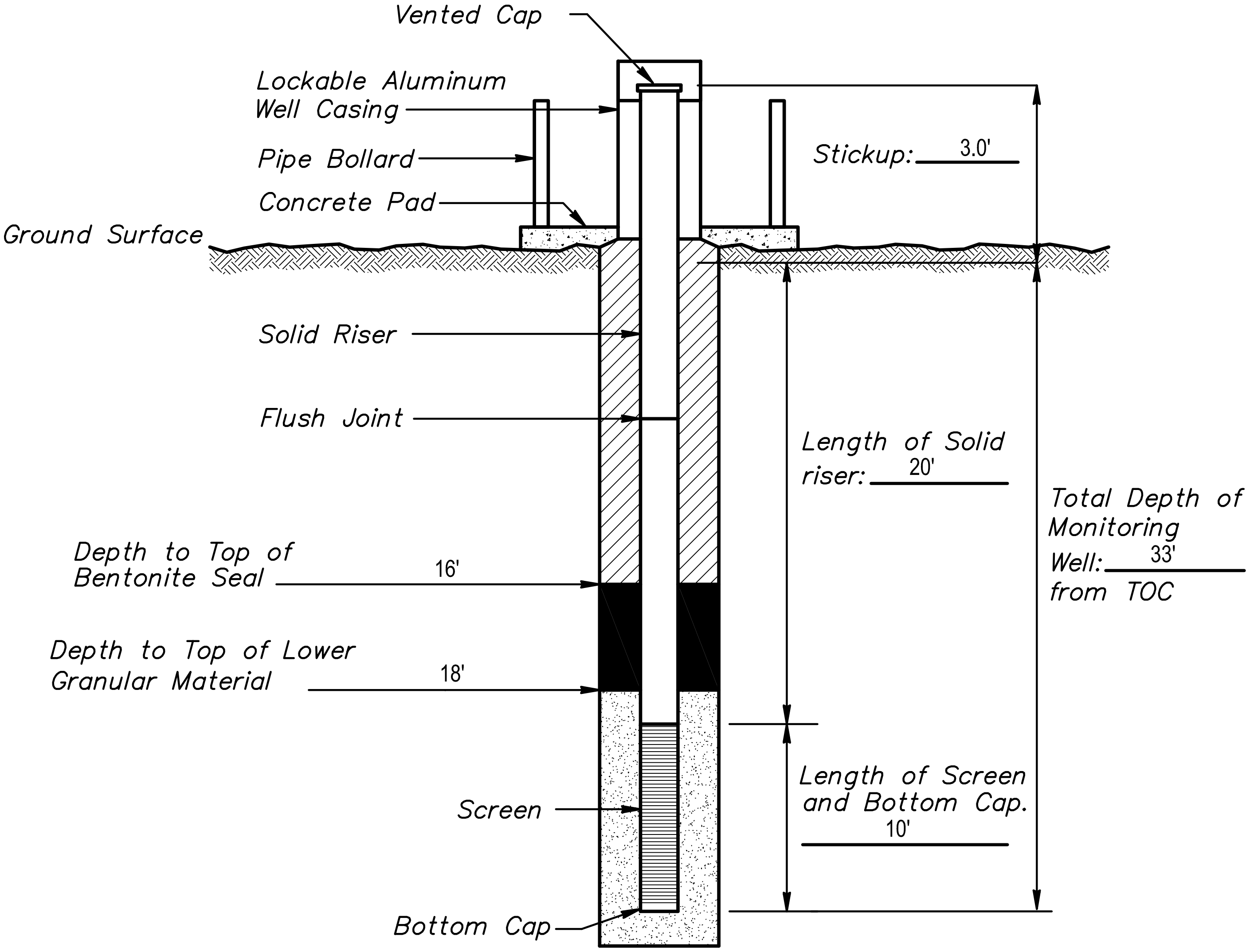
SAMPLING METHOD: Split Spoon

Depth BGS	Sample Interval	487326.36N 1920085.78E TOC: 243.55 ft DESCRIPTION	Litho. Symbol	Blow Counts	Comments
0		Topsoil 0' - 0.5' Dark Brown Silty Clay Gray to Brown Silty Clay, Moist	▤	3,5,5	
5		Tan to Brown Silty Sand, Fine to Medium grain, Moist	░	3,3,4	
10		Tan, Fine to Medium grain Sand, Trace Organics, subangular to subrounded, Damp	░	2,3,3	
15		Tan, Fine to Medium grain Sand, subangular to subrounded, Damp	░	5,5,5	
20		Tan, Fine to Medium grain Sand, subangular to subrounded, Wet	░	2,1,3	Hit water at 24' ▽
25		Tan, Fine to Medium grain Sand, subangular to subrounded, Wet	░		Split Spoon samples not taken at 25' and 30' due to heaving sands

Borehole and/or well IDs were updated to reflect the nomenclature used for the EPA CCR Rule network. Vertical and horizontal coordinates were updated based on survey report dated November 18, 2016. Vertical datum is based on NAVD88 and horizontal datum is based on Arkansas State Plane NAD83 North.

MONITORING WELL INSTALLATION RECORD

Job Name: Plum Point Energy Well Station
Well Number: MW-115
Job Number: LSP-AR-PPES-07-02
Installation Date: September 25, 2007
Location: PPES Class 3N Landfill
Datum Elevation: 243.55 ft
Surface Elevation: 240.4 ft
Datum for Water Level Measurement: Top of PVC Stickup
Screen Diameter & Material: 2" PVC
Slot Size: 0.010"
Riser Diameter & Material: 2" PVC
Borehole Diameter: 7.25"
Granular Backfill Material: Sand
Representative: Phillip Fields
Drilling Method: Hollow Stem Auger
Drilling Contractor: Anderson Engineering



Stickup: 3.0'

Length of Solid riser: 20'

Total Depth of Monitoring Well: 33' from TOC

Depth to Top of Bentonite Seal: 16'

Depth to Top of Lower Granular Material: 18'

Length of Screen and Bottom Cap: 10'

▨ Bentonite Pellets

■ Bentonite Plug

░ Granular Backfill

(Not to Scale)

Stabilized water level 27.01 feet below datum.

Measured on September 27, 2007

EDWARDS ENGINEERING, P.A.
Civil and Environmental Engineering, Planning, and Consulting

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: LSP-AR-PPES-07-02
WELL NUMBER: MW-15
DRAWING NUMBER: 5
CHECKED BY: LP

ftn Associates Ltd.
water resources / environmental consultants

PROJECT: **Plum Point Energy Station Landfill**

BORING ID: **MW-116**

LOCATION: **Osceola, AR**

WELL ID: **MW-116**

DRILLING CONTRACTOR: **McCray Drilling Inc**

NORTHING: **489511.74**

EASTING: **1916640.87**

DRILLING EQUIPMENT: **CME 750X**

GROUND SURFACE ELEV.: **239.3 ft**

TOC ELEVATION: **243.97 ft**

DRILLING METHOD: **8.5" H.S.A.**

TOTAL DEPTH: **31.9 ft below TOC**

DEPTH TO WATER: **17 ft bgs**

LOGGED BY: **DLD**

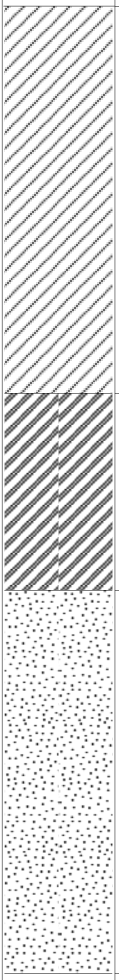
SAMPLING METHOD: **5-ft split barrel**

DATE STARTED: **6/23/2015**

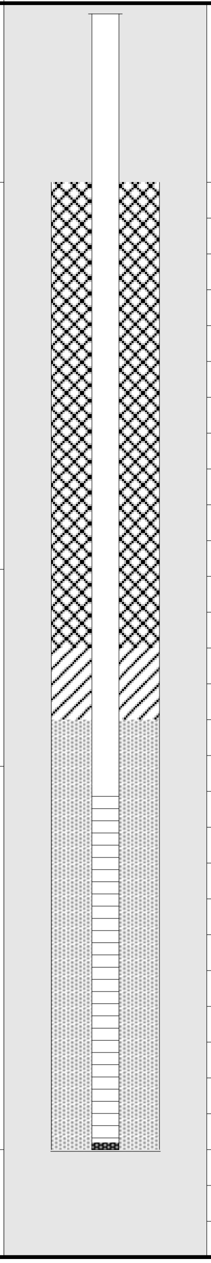
DATE COMPLETED: **6/23/2015**

Depth (feet)	% REC	USCS	Description
0			LEAN CLAY, silty, with very fine-grained sand, olive grey to grey with orange mottles, medium stiff to soft, moist.
2	0		
4			
6	70	CL	
8			
10	100		
12			FAT CLAY, grey with orange mottles, medium stiff to stiff, moist.
14	100	CH	
16			POORLY GRADED SAND, fine- to medium-grained, light brown, with carbonaceous material @ 17 ft, saturated @ 20 ft, hit heaving sands. Plugged augers to 27 ft.
18			
20	60		
22		SP	
24	n/a		
26			
28			
30			

Graphic Log



Well Construction



4.7 ft of stick up

21.5 ft of 2 in dia., Sch. 40 PVC Solid Riser to 16.8 ft bgs (including stickup)

Cement/bentonite grout from 0 to 13 ft bgs

Bentonite pellet seal from 13 to 15 ft bgs

▼ Silica size 10/20 filter pack from 15 to 27 ft bgs

10 ft of 2 in dia., 0.010 in slot, ScH 40 PVC screen from 16.8 to 26.8 ft bgs

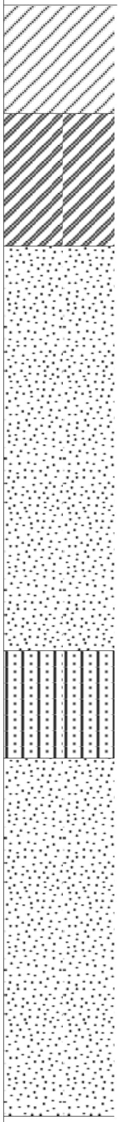
0.35 ft, 2 in dia., Sch. 40 PVC end cap

27 ft BOH

NOTES: Borehole and/or well IDs were updated to reflect the nomenclature used for the EPA CCR Rule network. Vertical and horizontal coordinates were updated based on survey report dated July 29, 2015. Horizontal and vertical coordinates are based on Arkansas State Plane NAD83 North Coordinates and NAVD88.

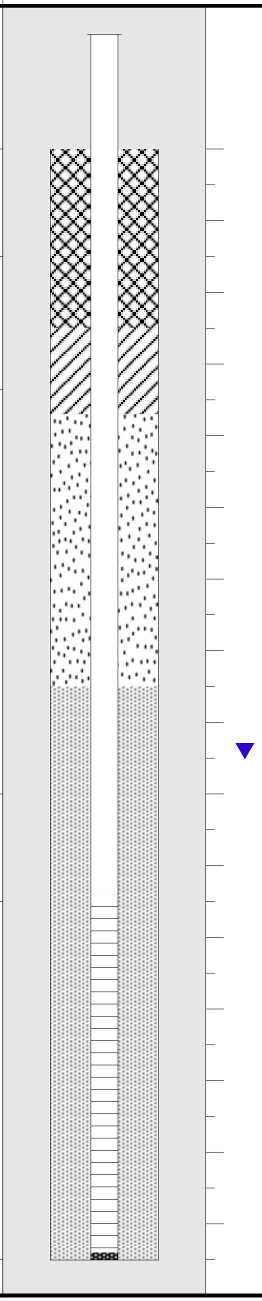
FTN Associates Ltd.
water resources / environmental consultants

PROJECT: **Plum Point Energy Station Landfill**	BORING ID: **MW-117**	
LOCATION: **Osceola, AR**	WELL ID: **MW-117**	
DRILLING CONTRACTOR: **McCray Drilling Inc**	NORTHING: **488672.25**	EASTING: **1917608.53**
DRILLING EQUIPMENT: **CME 750X**	GROUND SURFACE ELEV.: **239.4 ft**	TOC ELEVATION: **242.53 ft**
DRILLING METHOD: **8.5" H.S.A.**	TOTAL DEPTH: **34.1 ft below TOC**	DEPTH TO WATER: **17 ft bgs**
LOGGED BY: **DLD** / SAMPLING METHOD: **5-ft split barrel**	DATE STARTED: **6/24/2015**	DATE COMPLETED: **6/24/2015**



Depth (feet)	% REC	USCS	Description
0 2	100	CL	LEAN CLAY, silty, brown, medium stiff to stiff, moist. @ 1.5 ft, clayey silt lens, brown, soft.
4 6	60	CH	FAT CLAY, brown, medium stiff to soft, moist. @ 6.7 ft, with fine-grained sand. Sand content increases with depth.
8 10 12 14 16	50 50	SP	POORLY GRADED SAND, very fine- to fine-grained, brown, with carbonaceous material. @ 8 ft, no carbonaceous material. @ 16.7, sand becomes laminated with carbonaceous material. @ 17 ft, wet.
18 20	50	SM	SILTY SAND, fine-grained, brown, saturated.
22 24 26 28 30 32	n/a	SP	POORLY GRADED SAND, fine-grained, subangular to subrounded, brown, saturated. @23 ft, hit heaving sands. Plugged augers to 31 ft.

Well Construction



3.2 ft of stick up

24.0 ft of 2 in dia., Sch. 40 PVC Solid Riser to 20.8 ft bgs (including stickup)

Cement/bentonite grout from 0 to 5 ft bgs

Bentonite pellet seal from 5 to 7.4 ft bgs.

Natural sand from 7.4 to 15 ft bgs.

Silica size 10/20 filter pack from 15 to 31 ft bgs

10 ft of 2 in dia., 0.010 in slot, ScH 40 PVC screen from 20.8 to 30.8 ft bgs

0.18 ft, 2 in dia., Sch. 40 PVC end cap

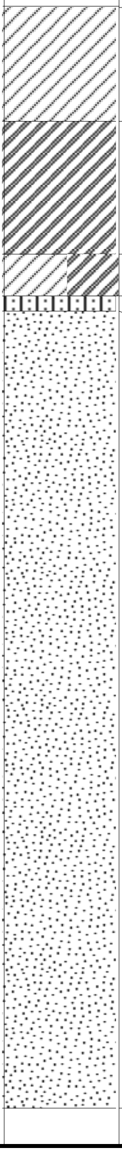
31 ft BOH

NOTES: Borehole and/or well IDs were updated to reflect the nomenclature used for the EPA CCR Rule network. Vertical and horizontal coordinates were updated based on survey report dated July 29, 2015. Horizontal and vertical coordinates are based on Arkansas State Plane NAD83 North Coordinates and NAVD88.

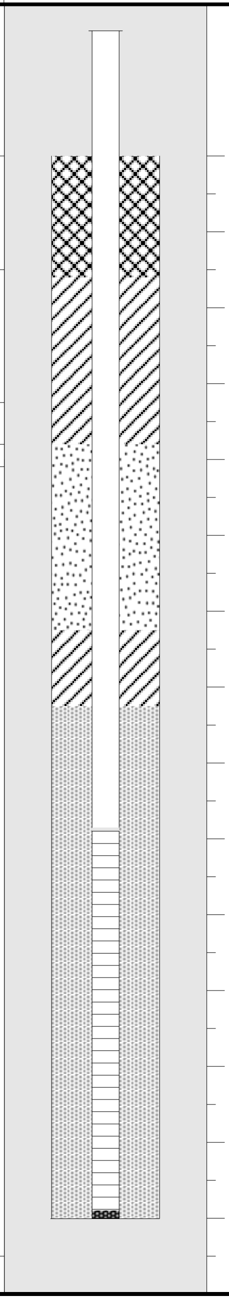
FTN Associates Ltd.
water resources / environmental consultants

PROJECT: **Plum Point Energy Station Landfill**		BORING ID: **MW-118**	
LOCATION: **Osceola, AR**		WELL ID: **MW-118**	
DRILLING CONTRACTOR: **McCray Drilling Inc**		NORTHING: **488283.34**	EASTING: **1916953.52**
DRILLING EQUIPMENT: **CME 750X**		GROUND SURFACE ELEV.: **238.0 ft**	TOC ELEVATION: **241.23 ft**
DRILLING METHOD: **8.5" H.S.A.**		TOTAL DEPTH: **31.4 ft below TOC**	DEPTH TO WATER: **17 ft bgs**
LOGGED BY: **DLD**	SAMPLING METHOD: **5-ft split barrel**	DATE STARTED: **6/24/2015**	DATE COMPLETED: **6/24/2015**

Depth (feet)	% REC	USCS	Description
0	100	CL	LEAN CLAY, silty with very fine-grained sand, brown, stiff, moist.
4	100	CH	FAT CLAY, brown and dark grey, stiff, moist.
		CL/CH	SANDY LEAN to FAT CLAY, silty, brown, very soft, moist.
8		SM	SILTY SAND, poorly graded, fine-grained, brown, moist.
10	60		POORLY GRADED SAND, fine-grained, subrounded, brown, moist to dry.
16	50		@ 17 ft, saturated.
18		SP	@ 17.5 ft, laminated with carbonaceous material.
20			@ 20 ft, hit heaving sands. Plugged augers to 28 ft.
22	n/a		
30			



Well Construction



3.3 ft ft stick up.

21.0 ft of 2 in dia. Sch. 40 PVC solid riser to 17.7 ft bgs

Cement/bentonite grout from 0 to 3.2 ft bgs

Bentonite pellet seal from 3.2 to 7.6 ft bgs

Natural sand from 7.6 to 12.5 ft bgs

Bentonite pellet seal from 12.5 to 14.5 ft bgs

Silica size 10/20 filter pack from 14.5 to 28 ft bgs

10 ft of 2 in dia. 0.010 in slot Sch. 40 PVC screen 17.7 to 27.7 ft bgs

0.35 ft 2 in dia., Sch 40 PVC end cap

Drilling terminated at 28 ft bgs

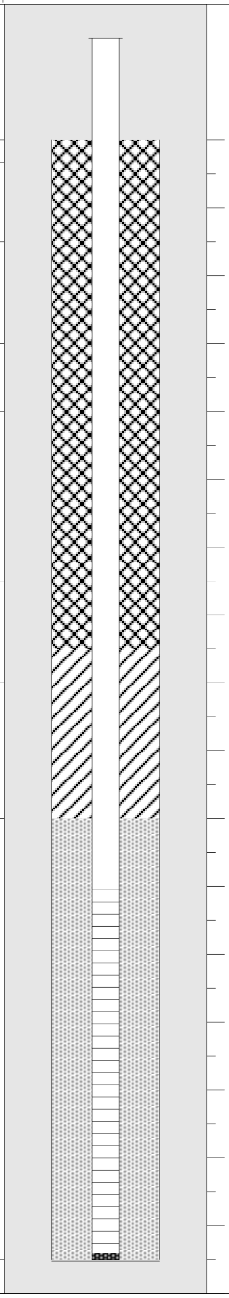
NOTES: Borehole and/or well IDs were updated to reflect the nomenclature used for the EPA CCR Rule network. Vertical and horizontal coordinates were updated based on survey report dated July 29, 2015. Horizontal and vertical coordinates are based on Arkansas State Plane NAD83 North Coordinates and NAVD88.

PROJECT: **Plum Point Energy Station Landfill**	BORING ID: **MW-119**	
LOCATION: **Osceola, AR**	WELL ID: **MW-119**	
DRILLING CONTRACTOR: **McCray Drilling Inc**	NORTHING: **489014.22**	EASTING: **1915902.58**
DRILLING EQUIPMENT: **CME 750X**	GROUND SURFACE ELEV.: **243.6 ft**	TOC ELEVATION: **246.53**
DRILLING METHOD: **8.5" H.S.A.**	TOTAL WELL DEPTH: **35.4 ft bgs**	DEPTH TO WATER (10/17/2016): **23.35 ft below TOC**
SAMPLING METHOD: **5-ft split barrel**	DATE STARTED: **10/6/2016**	DATE COMPLETED: **10/6/2016**

LOGGED BY:
DLD/EWS

Depth (feet)	% REC	USCS	Graphic Log	Description
0	100			Road Base
2	100	CL		LEAN CLAY, olive gray, sitff, moist
4		CH		FAT CLAY, dark gray, stiff, moist, with bits of organic matter
6	100	CL		LEAN CLAY, silty, brownish gray, medium stiff to soft, moist
8				
10	100	CH		FAT CLAY, dark gray, stiff, moist
12				
14	80	CL		LEAN CLAY, brownish gray, medium stiff, moist
16				
18		ML		CLAYEY SILT, with fine grained sand, brownish gray, soft, very moist
20	80			
22				POORLY GRADED SAND, medium to fine-grained, medium dense, saturated.
24				
26	40	SP		
28				@ 28 ft, some carbonaceous material
30	40			
32				
34				

Well Construction



Above ground completion including 2x2 ft concrete pad, four pipe bollards, and locking outer steel casing

2.9 ft stick up

25 ft of 2 in dia., Sch. 40 PVC solid riser (including stick up)

Cement/bentonite grout from 0 ft to 15 ft bgs

Bentonite pellet seal from 15 ft to 20 ft bgs

Silica size 10/20 filter pack from 20 ft to 33 ft bgs

10 ft of 2 in dia. 0.010 in slot Sch. 40 PVC screen

0.35 ft 2 in dia., Sch. 40 PVC end cap

Drilling terminated at 33 ft bgs

NOTES: Borehole and/or well IDs were updated to reflect the nomenclature used for the EPA CCR Rule network. Vertical and horizontal coordinates were updated based on survey report dated November 18, 2016. Horizontal and vertical coordinates are based on Arkansas State Plane NAD83 North Coordinates and NAVD88.

SECTION 22
GEOTECHNICAL AND HYDROGEOLOGICAL INVESTIGATION

PERMIT APPLICATION
CLASS 3N SOLID WASTE FACILITY
PLUM POINT ENERGY ASSOCIATES, LLC
JULY 2001

22.0 GEOTECHNICAL AND HYDROGEOLOGICAL INVESTIGATION

Section 22.533 of Arkansas Regulation 22 states that:

(a) **Applicants, permittees, owners and operators shall also refer to applicable provisions of Chapters 11, Geotechnical Investigations, Chapter 12, Ground Water Monitoring and Corrective Action, Chapter 13, Closure and Post Closure Care, and Chapter 14, Financial Assurance Criteria, for additional requirements.**

Arkansas Regulation 22.1102 (April 1995) details the requirements for geotechnical and hydrogeological investigations associated with Class 1 and Class 3 solid waste facilities. The regulations require that sufficient data be gathered to develop a conceptual hydrogeologic model of the site. The hydrogeologic model can then be utilized to determine the suitability of a given site for solid waste disposal.

This section of the permit application is intended to document compliance with Arkansas Regulation 22, Chapter 11. Extensive research, field investigations, data acquisition, compilation, and analysis were conducted in order to accurately characterize the subsurface characteristics of the Class 3N Facility and to prepare an overall site hydrogeologic model. The investigation included detailed surface mapping of the site and surrounding area, a surface geophysical study, a subsurface exploration program consisting of boreholes and piezometers, downhole geophysical analysis, collection of representative samples for geotechnical analysis, and aquifer analysis.

Based on information outlined in the Hydrogeological and Geotechnical Investigation, the site of the Class 3N Facility is suitable for development as a Class 3N Facility. The Hydrogeological and Geotechnical Investigation is presented as **APPENDIX 22-A**.

APPENDIX 22-A
GEOTECHNICAL AND HYDROGEOLOGICAL INVESTIGATION

Hydrogeologic and Geotechnical Report
Plum Point Energy Station
Class 3N Solid Waste Facility
Osceola, Arkansas

Prepared for

PLUM POINT ENERGY ASSOCIATES, LLC

For Submittal to

Arkansas Department of Environmental Quality
Solid Waste Division

Certification:

I certify that I am a qualified groundwater scientist who has received a baccalaureate or postgraduate degree in the natural sciences. I have sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration and completion of accredited university courses, that enable me to make sound professional judgements regarding groundwater monitoring and contaminant fate and transport. I further certify that this report was prepared by myself or by a subordinate working under my direction.

Merrick Rotenberry, P.G.
Project Geologist

7-12-01
Date

GEOTECHNICAL AND HYDROGEOLOGICAL INVESTIGATION

CLASS 3N SOLID WASTE FACILITY

PLUM POINT ENERGY STATION
OSCEOLA, ARKANSAS

Prepared For:
Plum Point Energy Associates, LLC

Prepared By:
Genesis Environmental Consulting, Inc.
11400 West Baseline Road
Little Rock, Arkansas 72209
GEC Project # 01008

July 2001

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1.0 INTRODUCTION

The following document presents the findings and conclusions of the hydrogeologic and geotechnical investigation associated with a proposed Class 3 Non-Commercial (3N) Facility (Class 3N Facility) to be located in Osceola, Mississippi County, Arkansas. The Class 3N Facility is being developed in conjunction with and to serve the Plum Point Energy Station (PPES), a proposed coal-fired generating plant.

The hydrogeologic investigation, conducted by Genesis Environmental Consulting, Inc. (GEC), was designed to meet the requirements of Chapter 11 of Arkansas Department of Environmental Quality (ADEQ) Solid Waste Management Division Regulation 22 (Regulation 22).

The data and information presented in the following report is intended to thoroughly characterize the hydrogeologic aspects of the Class 3N Facility, which may directly or indirectly affect the design, construction, operation and/or monitoring of the Class 3N Facility containment structure as authorized in the above specified regulations.

Section 2.0 of this report presents the regional characterization for the area surrounding the Class 3N Facility. Section 3.0 of this report presents the site-specific characterization, which includes results from the surface and subsurface geophysical investigations, soil boring program, hydrogeologic characteristics, and site specific groundwater studies. The results of the geotechnical analysis associated with samples collected during the investigation are presented in Section 4.0. Section 5.0 includes the interpreted conceptual hydrogeologic model. Section 6.0 presents the conclusions of the entire investigation. The data and information presented in this report is intended to characterize the overall hydrogeologic setting of the property and surrounding areas.

1.1 SITE LOCATION AND BACKGROUND

A site location map showing the general location of the Class 3N Facility is presented in **FIGURE 1**. More specifically, the site is located within Section 13 of Township 12 North, Range 10 East, and Section 18 of Township 12 North, Range 11 East. A site location map presenting the location of the site on a 7.5 minute USGS topographic map is included as **FIGURE 2.**

The PPES will produce up to approximately 1600 Megawatts (MW) of electrical power and will incorporate pulverized coal boiler technology utilizing primarily Powder River Basin coal for its fuel supply. Plum Point Energy Associates, LLC (PPEA), the permit applicant, will own and operate the PPES. PPEA intends to permit, design and operate the proposed Class 3N Facility to accept waste materials with the construction and operation of the PPES.

1.2 PROPOSED CLASS 3N FACILITY AREA

The Class 3N Facility will be used for disposal of combustion wastes, coal wastes and other wastes associated with the construction and operation of the PPES. The proposed waste materials are non-hazardous, inert, and non-putrescible. The property to be utilized for the Class 3N Facility encompasses roughly 245 acres; however, the actual limits of the waste disposal area comprise roughly 190 acres.

The property on which the Class 3N Facility will be located is currently used for agricultural purposes. Current land use on adjacent properties is also for agricultural purposes. **FIGURE 3** illustrates the general layout and orientation of the Class 3N Facility in relation to surrounding properties.

2.0 REGIONAL CHARACTERIZATION

This section discusses the regional features of the area surrounding the Class 3N Facility including climate, hydrology, geology, soils, hydrogeology, and groundwater quality. Information contained in this section was gathered during the literature review that was conducted as part of the investigation conducted by GEC. The information presented in this section was collected from various State and Federal government documents. References for the various reports are provided following the text of the report.

2.1 REGIONAL CLIMATE

The Class 3N Facility is located near Osceola, Arkansas in Mississippi County. Mississippi County is located in northeast Arkansas and is separated by the Mississippi River from the State of Tennessee to the east. Mississippi County is characterized by hot summers and mild winters. The average maximum temperature in summer (June through August) is 91° Fahrenheit (F). The average minimum temperature in winter (December through February) is 32° F. Annual average precipitation is 47.5 inches. Fall is the driest season and winter is the wettest. In January, the wettest month, the average monthly precipitation is 5.45 inches, nearly twice the 2.8 inches normally received in October. The average seasonal snowfall is less than 5 inches. The sun is intense from mid-May through mid-September, which keeps the humidity and loss of soil moisture through evaporation high (USDA-June 1971).

2.2 REGIONAL SURFACE DRAINAGE

Mississippi County is part of an extensive deltaic flood plain that extends from Cairo, Illinois to the Gulf of Mexico. The topography is generally level and ranges from broad flats to gently sloping ridges and swales. Elevation ranges from 150 to 300 feet above sea level. Slopes are generally less than 1 percent, but slopes on some stream banks are as much as 15 percent.

The drainage of Mississippi County is generally southward. The major natural drainageways in the county are the Mississippi River, Pemiscot Bayou, Left Hand Chute of the Little River, Right Hand Chute of the Little River, Buffalo Creek, and the Tyronza River. Areas protected by the levee of the Mississippi River drain into the St. Francis River, which, in turn, empties into the Mississippi River (USDA-June 1971). The regional and site specific drainage pathways are identified on the topographic map presented in **FIGURE 2** and the site map presented in **FIGURE 3**.

2.3 REGIONAL GEOLOGY

This section describes the geologic setting of the region. This description includes the soils located on the site, regional stratigraphy, structural geology, and geomorphology. A geologic worksheet obtained from the Arkansas Geological Commission (AGC) which illustrates the regional geology is presented in **FIGURE 4**. The following information was gathered from various State and Federal geologic publications.

2.3.1 Regional Soils

According to the USDA Soil Survey of Mississippi County - 1971, there are several soil series underlying the site. The soil series have been classified as the *Commerce Series, Convent Series, Crevasse Series, Jeanerette Series, Morganfield Series, Sharkey Series, Steele Series,* and the *Tunica Series.*

The *Commerce Series* consists of soils that are dark grayish-brown silt loam over dark grayish-brown, grayish-brown, and gray silt loam and silty clay loam. They formed in beds of loamy alluvium. These soils are somewhat poorly drained. They generally occur on the lower part of natural levees bordering stream channels.

The *Convent Series* consist of soils of brown fine sandy loam over loam, very fine sandy loam, and silt loam mottled with yellowish brown, dark brown, light gray, and dark yellowish brown. These soils are somewhat poorly drained. These soils are generally on the lower part of natural levees bordering stream channels. They formed in stratified beds of sandy and silty alluvium.

The *Crevasse Series* consist of soils of very dark grayish-brown loamy sand over pale-brown and dark grayish-brown loamy sand and sand. These soils are excessively drained. These soils formed in sandy alluvium and are located on natural levees bordering stream channels.

The *Jeanerette Series* consist of soils that are very dark grayish-brown silt loam overlying very dark gray and gray silty clay loam or loam mottled with dark yellowish brown and yellowish brown. These soils are somewhat poorly drained. These soils are on level parts of low natural levees where they formed in loamy sediments.

The *Morganfield Series* consist of soils that are dark grayish-brown or brown fine sandy loam over very dark grayish-brown, brown, and very pale brown silt loam and very fine sandy loam. These soils are well drained. These soils formed in loamy alluvium and are located on natural levees bordering stream channels.

The *Sharkey Series* contains the Sharkey silty clay, which is a poorly drained soil that has a very dark grayish-brown silty clay surface layer 4-8 inches thick. The subsoil is dark-gray or gray clay mottled with dark brown and dark yellowish brown clay. These soils are on broad flats, where they developed in thick beds of clayey sediments deposited by slack water.

The *Steele Series* consists of the Steele silty clay loam. This soil is moderately well drained and is dark grayish-brown to brown silty clay loam surface layer over a grayish-brown loamy sand. Below this is dark-gray clay mottled with yellowish brown. Steele soils are on broad flats, where they developed in sandy, loamy, and clayey sediments.

The *Tunica Series* consists of soils that are very dark grayish-brown, dark brown or dark grayish-brown silty clay surface layer 5-9 inches thick. The subsoil is dark gray and gray clay or silty clay and silty clay loam that extends to a depth of about 45 inches. These soils formed in moderately thick beds of sediments deposited by slack water and underlain by loamy sediments.

2.3.2 Regional Stratigraphy

The surface of the Class 3N Facility property is covered by Quaternary Age Alluvium deposits. These sedimentary deposits include gravels, sands, silts, clays and mixtures of any and all of these. Underlying the Quaternary alluvial deposits is the Claiborne Group of the Tertiary Period. The Claiborne Group consists of the Cockfield Formation, the Cook Mountain Formation and the Memphis Sand. Beneath the Claiborne lies the Wilcox Group, which is also of Tertiary age.

The alluvial deposits of the Quaternary Period cover most of the East Arkansas Basin of the Mississippi Embayment. The alluvium is the result of recent stream deposition in the form of point bar sequences and flood plain deposits. The alluvium consists of an upper stratum of silt and clay, and a lower stratum of sand and gravel. The gravel deposits often make up over 50 percent of the thickness of the alluvium. The approximate thickness of the alluvium of the area of the site is estimated to be 120 feet. In some areas, the alluvium can reach a thickness of 150 feet (Pugh, et. al.-1997). The bottom of the Quaternary deposits rest on the erosional surface of older Cretaceous and Tertiary formations. This erosional surface determines the dip of the overlying alluvium, which is broad and gently southward (ASWCC-1988).

Beneath the Quaternary Alluvial is the unconformable contact of the Claiborne Group of the Tertiary Period. In some areas of the Mississippi Embayment, mostly in Southeast Arkansas, the Jackson Group of the Tertiary overlies the Claiborne. In the vicinity of the Class 3N Facility property, it is not present. The Claiborne is chiefly non-marine and composed of medium to very-fine sands, silts, and silty clays. The sands tend to be light- to dark-gray, white, brown, or red depending on the degree of weathering. The silts and clays are light to dark gray and sometimes variegated. Intervals enriched with carbonaceous material are dark brown to black. The silts are usually clayey and the clays are normally silty or sandy. Lignite beds are found in this interval and seem to be controlled environmentally rather than stratigraphically.

The Claiborne Group is composed of the Cockfield Formation, Cook Mountain Formation and the Memphis Sand (McFarland -1998). The thickness of the Claiborne ranges from a thin edge to as much as 1,500 feet, but in the area of the Class 3N Facility property, the Claiborne is estimated to be approximately 920 feet thick (Peterson, et. al. - 1981). Together, the Cockfield and Cook Mountain formations of the Claiborne Group are roughly 320 feet thick. Underlying these formations is the Memphis Sand, which is also subdivided into the Sparta Sand, Cane River Formation, and the Carrizo Sand. North of the 35-degree latitude (including the site), the Sparta Sand combines with the underlying Cane River Formation and Carrizo Sand to form the Memphis Sand (ASWCC-1988). The Memphis Sand is predominantly massive unconsolidated-bedded sands with the upper portion being an alternating layer of sand and clay beds. This unit is about 600 feet thick in the Class 3N Facility site area and dips to the axis of the Mississippi Embayment at about 10 to 20 feet per mile (Petersen, et. al.-1981). The Memphis Sand outcrops on Crowley's Ridge in Poinsett and Cross Counties of Arkansas. The Memphis Sand aquifer is confined in some places by the overlying Cook Mountain formation and by the underlying sand and clay sequences of the Wilcox group.

Lying unconformably beneath the Claiborne Group is the Wilcox Group. The Wilcox is a thick series of non-marine sands, silty sands, clays, and gravels with some thick deposits of lignite.

The sands are generally fine to very-fine grained and light gray in color. The clays are light gray or brown in color and often sandy or silty. The lignites occur throughout the sequence and are controlled by depositional environment rather than stratigraphic location (McFarland-1998). The Wilcox dips to the southeast at approximately 40 feet per mile. The upper unit of the Wilcox is composed primarily of clay, while the lower unit is primarily a massively bedded fine to very fine-grained sand. This lower unit is known as the "lower Wilcox aquifer". The average thickness of the Wilcox is 850 feet and can be as thick as 1,025 feet in some areas. In the area of the Class 3N Facility site the thickness is estimated to be approximately 800 feet (Petersen, et. al.-1981).

Below the Wilcox lies the Midway Group, which represents a marginal marine depositional environment. This unit is approximately 600 feet thick and composed of calcareous shale, arenaceous limestone, calcareous glauconitic sandstone, conglomerate and light to very dark bluish-gray clay shale (McFarland-1998). **TABLE 1** illustrates the stratigraphic relationship of the geologic units found in this area.

TABLE 1
Regional Stratigraphic Column
Class 3N Facility
Osceola, Arkansas

Period	Group	Formation	Estimated Thickness (ft)	Description	Hydrologic Characteristics
Quaternary	Alluvium		120 to 150	Gravel, sand, silt and clay.	Average yield from 1000 to 2000 gpm. Major source of water for irrigation and public use.
Tertiary	Jackson		0	Light gray, thinly laminated silts, silty clays, and silty sands. Minor lignite beds and plant remains.	Formation does yield water to wells. (Formation not present in area of site)
	Claiborne Group	Cockfield Cook-Mountain	320	Medium to very-fine sands, silts, and silty clays. Environmentally controlled lignite beds and trace fossils.	Clays of the Cook-Mountain formation act as an upper confining unit to the Memphis sand aquifer.
		Memphis Sand (Sparta Sand, Cane River Formation, Carrizo Sand)	600		Yields up to 1000 gpm. High levels of iron and manganese.
	Wilcox	Undifferentiated	800	Series of non-marine sands, silty sands, clays, and gravels with lignite deposits.	Yields up to 1000 gpm. Source for municipal and industrial supply.
	Midway	Porters Creek Clay Clayton Group	600	Calcareous shales, limestone, gluaconitic sandstone and gray clay shale.	Low yield; acts as a lower confining unit for the lower Wilcox aquifer.

2.3.3 Regional Structural Geology

The Class 3N Facility site is located within the East Arkansas Basin of the Mississippi Embayment physiographic region of Arkansas. The surface of this region is of alluvial depositional origin from a non-marine environment deposited during the Quaternary Period. The Mississippi Embayment is a southward plunging syncline, which has an axis that is roughly parallel to the Mississippi River. Geologic units from the Paleozoic Era, Cretaceous Period, and Tertiary Period are present in the subsurface. The Paleozoic strata consists of sandstone and shale which outcrop in the extreme western part of the basin and dip to the southeast where they are covered by unconsolidated strata of the Tertiary and Quaternary Periods. The Paleozoic strata forms an impermeable base that dips towards the axis of the embayment, where it reaches a depth of approximately 4600 feet below sea level.

Strata above the Paleozoic strata are composed of clay, silt, lignite, sand, and gravel deposits. These sediments originate from both marine and continental environments. Succeeding transgressions and regressions of shallow seas during the late Mesozoic to the early Tertiary formed alternating layers of sand, silt and clay. The continental deposits consist of coarser grained sediments that have a high permeability and make up the aquifers of the basin. The marine deposits are composed mostly of marl and clay layers that form confining beds that greatly limit groundwater flow into and out of aquifers.

The uppermost layer of the basin is an alluvial deposit of the Quaternary Period. This alluvium consists of clay, silt, sand, and gravel deposited by stream activity, and wind-blown deposits of silt and loess. Alluvial terraces were deposited during the Pleistocene Epoch of the Quaternary Period where glacial runoff from the north (near Cairo, Illinois) reached the Gulf Coastal Plain, and sediment aggradation occurred. Fluvial activities of erosion, transportation, and deposition further shaped the alluvium and continue to do so today. The Geologic Map of Arkansas and the Geologic Worksheet (**FIGURE 4**) illustrates the defining boundaries of each geologic unit and its correlating description.

2.3.4 Regional Geomorphology

The Eastern Arkansas Basin lies within the Mississippi Embayment. The Mississippi Embayment is a basically flat, uniformly sloping floodplain formed by deposition and erosion from the Mississippi River and its tributaries during the Quaternary and Tertiary Periods. The surface of this region is of alluvial depositional origin and is dotted with prominent topographic features such as terraces, oxbow lakes, abandoned stream channels, natural levees and backswamp areas. General land surface altitudes range from 150 feet to 300 feet above sea level. The greatest relief of the embayment is Crowley's ridge, which stands as much as 300 feet above the adjacent plain. The ridge extends 198 miles from Helena, Arkansas to Thebes, Illinois, and is never more than 11 miles wide. The ridge consists of unconsolidated Eocene clay, silt, sand, and lignite, capped by Pliocene sand and gravel and middle to late Pleistocene loess. The ridge is thought to be a divide formed as ancestors of the Mississippi River to the west and the Ohio River to the east of Crowley's Ridge eroded coastal plain sediments. Recent seismic studies indicate that the geomorphology of the Ridge may have been influenced by tectonic uplift. A decrease in the Mississippi River gradient and/or tectonic activity may have caused the eastward shifting of the Mississippi River to its present day channel.

The alluvial plain east of Crowley's Ridge is drained by the St. Francis River and its tributaries. Part of the plain west of the ridge drains to the St. Francis River by way of the L'Anguille River through an opening in Crowley's Ridge. The rest of the alluvial plain west of Crowley's Ridge is drained by the White River and its tributaries including the Cache River, Bayou DeView, Big Creek, and LaGrue Bayou, and by Bayou Meto. The topography of the Class 3N Facility site is illustrated by the contour elevations shown in **FIGURE 3**.

2.4 REGIONAL HYDROGEOLOGY

The three principle sources of groundwater in the region of the Class 3N Facility are the Quaternary Alluvium, the Memphis Sand of the Claiborne Group, and the Wilcox Group.

The Wilcox Group contains the lowermost groundwater supply of the Tertiary Period. The "lower Wilcox aquifer" yields large quantities of water to wells in eastern Arkansas. East of Crowley's Ridge, the aquifer yields over 1,000 gallons per minute to wells. The Wilcox is confined by the overlying prominent sands of the Carrizo Sand (the lower unit of the Memphis Sand) and the underlying clays of the Midway Group. Recharge occurs from precipitation entering the outcrop areas or by percolating through overlying alluvium. Groundwater flow is to the southeast towards the axis of the Mississippi Embayment. Water withdrawals from the lower Wilcox aquifer occur primarily in areas east of Crowley's Ridge where yields to water wells are greater. Water pumped from the aquifer is used primarily for municipal and industrial supply (ASWC-1988).

The Memphis Sand of the Claiborne Group is a massive sand unit of the Tertiary Period. The Memphis Sand aquifer commonly yields up to 1,000 gallons per minute of water to wells. The formation dips to the southeast at about 10 to 20 feet per mile. The Memphis Sand aquifer is confined between the overlying Cook Mountain formation and the underlying Wilcox Group. The aquifer is recharged in its outcrop areas near Crowley's Ridge and at subcrop areas (places where the top confining unit is missing) from percolation through the overlying alluvium. Groundwater flows down-dip from it's recharge areas to the southeast (ASWCC-1988). The Memphis Sand aquifer is the principal source of water for Memphis, Tennessee and other areas in the northern part of the Embayment. Most wells tap only the upper part of the aquifer.

The Quaternary alluvium contains the uppermost aquifer. The Alluvial aquifer is the principal source of water for irrigation in eastern Arkansas. The Alluvial aquifer commonly yields 1,000 to 2,000 gallons per minute of water to wells with occasional occurrences of up to 5,000 gallons per minute (ASWCC–1988). Transmissivity of the aquifer ranges from 10,000 to more than 40,000 square feet per day. Recharge to the alluvial aquifer occurs essentially from precipitation percolating into the formation. This recharge is limited in areas where the upper stratum of clay is thick enough to function as a confining bed. Recharge also occurs in areas of heavy withdrawals from the aquifer, which causes underflow from the Memphis Sand to enter the alluvium. Groundwater flow within the aquifer is in the direction of general land slope and towards streams which receive water from the aquifer. Locally, flow is from areas of recharge to areas of discharge. The streams of the area are hydraulically connected to the alluvial aquifer. Therefore, during the low flow season, groundwater flow is towards streams, which are sustained by the aquifer. This stream-aquifer interflow is reversed in the spring when water levels in the streams are higher than water levels in the aquifer (ASWCC-1988).

2.5 REGIONAL GROUNDWATER QUALITY

The majority of the data presented in this section was taken from the Arkansas State Water Plan – East Arkansas Basin prepared in 1988 by the Arkansas Soil and Water Conservation Commission (ASWCC).

Groundwater quality of the Alluvial aquifer in this region is generally hard and contains high levels of iron and manganese. Most constituent concentrations are within drinking water standards; however, local excesses of nitrate, chloride, and total dissolved solids exist in several areas. Median values for iron and manganese are above drinking water standards. This condition is a natural occurrence that is uniformly dispersed throughout the Alluvial aquifer. **TABLE 2** summarizes the average groundwater chemical analysis performed on samples collected from the various Tertiary and Quaternary geologic units located in northeast Arkansas.

TABLE 2
Regional Groundwater Chemical Analysis
Class 3N Facility
Osceola, Arkansas

Geologic Unit	Alluvial Aquifer	Memphis Sand	Wilcox Group
Temperature (°C)	17.0	18.5	23.5
pH	7.5	7.4	7.5
Specific Conductance (MicroSiemen/cm)	588	N/A	N/A
Carbonate Hardness ($CaCO_3$)	250	120	15
Dissolved Calcium (Ca)	71	30	4.2
Dissolved Magnesium (Mg)	19	12	1.1
Dissolved Iron (Fe)	230	1.1	.07
Dissolved Manganese (Mn)	300	30	.02
Dissolved Sodium (Na)	21	21	35
Dissolved Potassium (K)	2.0	2.4	2.5
Dissolved Chloride (Cl)	20	3.3	2.2
Dissolved Sulfate (SO_4)	9.4	4.4	4.8
Dissolved Fluoride (F)	0.2	0.10	.10
Dissolved Silica (SiO_2)	31	16	9.9
Total Dissolved Solids (TDS)	320	154	116
Dissolved Nitrate (N)	0.11	.20	.09

Note: All concentrations are in milligrams per liter (mg/l) unless otherwise stated.

2.6 WATER WELL INVENTORY

A water well inventory was conducted on wells within a one and two mile radius of the property. The well inventory was conducted by utilizing State of Arkansas Report of Water Well Construction reports on file at the Arkansas Geological Commission, and also during site reconnaissance activities.

Four (4) wells were identified within a one-mile radius of the site, and nine (9) wells were identified within a two-mile radius of the site. A map illustrating the location of the wells and the associated construction reports (if available) are presented in **APPENDIX A**. According to the construction reports and visual observations, wells No. 1 through No. 13 are used for irrigation or are specified for usage as "other." Wells No. 14 and No. 15 are currently utilized as a source of domestic water supply; however, the wells are greater than 500 feet from the active portion of the Class 3N Facility waste disposal boundary.

It should be noted that construction reports were not on file at the Arkansas Geological Commission for wells No. 10, 11, 12, 13, 14 and 15. It was observed that wells No. 10, 11, 12, and 13 are utilized for irrigation or non-domestic purposes only. Well No. 10 should be properly plugged and abandoned prior to placing waste at the Class 3N Facility.

3.0 SITE HYDROGEOLOGIC INVESTIGATION (CHAPTER 11 OF REGULATION 22, SECTIONS 22.1101 AND 22.1102)

The material presented in this section describes site-specific information that was gathered during the field phase of the hydrogeologic investigation, including methodology and results.

3.1 PREVIOUS INVESTIGATIONS

There have been no previous hydrogeological investigations conducted at the Class 3N Facility property prior to this investigation. On May 2, 2001, the ADEQ Solid Waste Division conducted a preliminary site evaluation associated with the development of the Class 3N Facility. The investigation consisted of excavating five (5) backhoe test pits. The test pits were logged by ADEQ and GEC personnel. Soil samples were collected from the test pits by GEC for geotechnical analysis. The locations of the test pits are shown in **FIGURE 3**.

As indicated by correspondence dated June 21, 2001, the results of the ADEQ preliminary site investigation indicated that the site is suitable for the Class 3N Facility site.

3.2 AERIAL PHOTOGRAPH ANALYSIS (22.1102 (C)(1))

An aerial photograph of the site (taken in February, 2001) and of the surrounding area was reviewed to identify sedimentary, depositional, structural, and geomorphic features within and surrounding the site. A copy of the aerial photograph is included in **APPENDIX B**.

A review of the aerial photograph did not identify any photo lineaments or reveal any surficial indication of faulting within the property boundary or near the Class 3N Facility. The lack of a definitive surface expression is a reasonable but not unequivocal indication that any potential faults near the Class 3N Facility site have not been active during the Holocene age (10,000 years).

Although various irregular shaped areas (indicated by areas light tan in color) are shown on the photograph, the areas appear to represent soils in which vegetation is not present, and not historic sand blows.

A seismic investigation was also conducted as part of the current hydrogeologic investigation in order to determine the shear wave velocities of the subsurface materials at the Class 3N Facility site. The results of the seismic investigation are discussed in **SECTION 17** (Design Report) of this permit application.

3.3 GEOLOGIC MAPPING AND STRUCTURE (22.1102 (C)(2))

GEC conducted a surface geologic mapping exercise of the area within a one-half mile radius of the Class 3N Facility boundary to identify and confirm the following:

- *Features identified on the aerial photographs,*

- *Surface stratigraphy,*
- *Structural features,*
- *Springs and seeps, and*
- *Domestic, agricultural, and municipal water wells.*

An aerial photograph analysis and site reconnaissance was conducted by GEC to investigate any identified photo lineaments, drainage features, springs, and any possible water wells. The geomorphology of this region is a basically flat, uniformly sloping floodplain formed by deposition and erosion from the Mississippi River and its tributaries during the Quaternary and Tertiary Periods.

The Class 3N Facility site is flat and does not exhibit any notable structural features. Surface water is drained by several excavated ditches (Ditch No. 11 on the western portion of the property and the Brown Bayou on the eastern boundary) which flow to the south. No springs or seeps were observed during the Class 3N Facility site reconnaissance.

Domestic, agricultural, and municipal water wells identified during the water well search are discussed in **SECTION 2.6**.

3.4 SURFACE GEOPHYSICAL INVESTIGATION (22.1102 (C)(3))

The following section describes the surface geophysical studies conducted at the site by GEC. The surface geophysical survey was conducted in accordance with the Hydrogeologic and Geotechnical Investigation Workplan submitted to the ADEQ in February, 2001. The Workplan was approved by the ADEQ on April 24, 2001. A surface geophysical program is a valuable tool that enables the relevant changes in soil type, stratigraphic changes, and sedimentary features to be evaluated over an extensive area, while effectively reducing the number of borings required to accurately characterize the area.

Upon completion of the surface geophysical survey, the data was evaluated and a subsurface boring program was developed to investigate any observed anomalies and to correlate the results of the survey with the actual lithology encountered in the borings. The geophysical method chosen to evaluate the Class 3N Facility site was an electromagnetic (EM) inductive technique used to measure subsurface terrain "conductivity." The survey was conducted by utilizing a Geonics EM-34-3XL instrument. A detailed discussion of the investigation's methods and results are discussed below.

3.4.1 Surface Geophysical Study

A detailed surface EM survey of the site was conducted using grid nodes previously established at the Class 3N Facility site. The investigation was performed to gain preliminary information on the subsurface geology at the Class 3N Facility site. The field activities associated with the EM survey were conducted on March 14, 2001 through March 16, 2001.

EM surface geophysical techniques provide information about the terrain conductivity of the subsurface. The electrical resistivity/conductivity of a substance is a measure of the difficulty/ease with which an electrical current can be made to flow through it (McNeill, 1980). High terrain conductivity readings are the result of subsurface materials such as clay or saturated sediments. Low terrain conductivity readings are the result of subsurface materials such as sands. When combined with additional subsurface data, such as data obtained from test borings, this method provides a possible means for defining vertical and horizontal extent of clay layers. This method also can provide a correlation between different soil and/or rock types and their associated conductivity values. The following field procedures were used to conduct the EM terrain conductivity survey.

The surface conductivity survey was conducted using a Geonics EM34-3XL transmitting and receiving system. The entire Class 3N Facility site was initially gridded on 500-foot centers; however, the conductivity measurements for this investigation were taken on 250-foot centers. Conductivity measurements in both the horizontal dipole position (HD) and the vertical dipole position (VD), with intercoil spacings of 10, 20 and 40 meters, were recorded on 250-foot centers across the entire site.

To measure the terrain conductivity, the transmitter operator stops at the measurement station and the receiver operator moves the receiver coil backwards and forwards until the meter indicates the optimum intercoil spacing. The terrain conductivity is then read from a second meter on the instrument. The instrument is calibrated to read conductivity in millimhos per meter. Utilizing both the HD and VD instrument positions, data was collected at an intercoil spacing of 10, 20 and 40 meters. **TABLE 3** lists the exploration depths for the different intercoil spacing and dipole positions (McNeill, 1980).

TABLE 3
Exploration Depths of EM34-3XL at Different Intercoil Spacings
Class 3N Facility
Osceola, Arkansas

Intercoil Spacing (meters)	Exploration Depth (feet)	
	Horizontal Dipoles (HD)	Vertical Dipoles (VD)
10	25	50
20	50	100
40	100	200

The instrument is most responsive to variations in the near-surface conditions in the HD mode, whereas the VD mode will be relatively insensitive to such changes. The conductivity data obtained during the investigation is included in **APPENDIX C** of this report.

3.4.2 Surface Geophysical Results

The objective of the surface conductivity survey at the Class 3N Facility was in part to determine the thickness of the clay cap overlying the sands of the Alluvial deposits, and to determine the presence of any shallow sand lenses. This was accomplished by contouring the terrain conductivity values.

The data that was gathered was interpreted by contouring the terrain conductivity values after the survey had been completed. The contouring was accomplished utilizing the Surfer™ computer program from Golden Software, Inc. Four (4) contour maps, **FIGURES 5-1** through **FIGURE 5-4**, were compiled from the data collected at the 10-meter, 20-meter, and 40 meter intercoil spacings. The contour maps were generated by using data from the HD and VD mode at 10-meter spacing, VD mode at 20-meter spacing, and VD mode at 40-meter spacing.

Conductivity readings were taken along the grid system every 250 feet and identified by the identification system shown on the top and left side of **FIGURE 5-1** through **5-4**. For example, a reading was taken at point A1, at A1.5 (250 feet east of A1), at A2, and so on. Other hydrological data such as test borings and published geologic information were then used to assist in the interpretation of the data. These interpretations were verified during the boring program discussed in **SECTION 3.5**.

FIGURE 5-1 shows the 10-meter spacing (horizontal dipole) at an exploration depth of approximately 25 feet below ground surface (bgs). Because of the relatively shallow exploration depth of the 10 meter spacing, this figure best illustrates the variations of clay thickness near the ground surface. High conductivity readings indicate that there is a greater amount (thickness) of clay, while low conductivity readings indicate that more sand is present. The lithology encountered in the soil borings generally correlated well with the surface conductivity results. For example, in the areas shown by high conductivity contours, a greater thickness of clay was encountered in the soil borings in that particular area. As illustrated by **FIGURE 5-1** through **5-4**, the conductivity results illustrate natural depositional variations associated with the unconsolidated sediments and do not indicate any apparent anomalies.

3.5 SUBSURFACE EXPLORATION PROGRAM (22.1102 (C)(4))

In accordance with Section (22.1102 (c)(4)) of ADEQ Regulation 22, a minimum of one (1) boring for every five acres associated with the site was drilled and sampled during this investigation. Although the property boundary encompasses approximately 245 acres, the actual limits of the waste disposal area will comprise roughly 190 acres.

A total of fifty-seven (57) borings were drilled throughout the Class 3N property. The boring program was performed to thoroughly characterize the hydrogeologic setting of the site. Fourteen (14) of the fifty-seven (57) borings were subsequently converted into groundwater piezometers to further characterize the hydrology of the site, and one (1) of the borings was utilized to perform a seismic investigation at the site.

The information that was gathered and/or confirmed from the boring locations included:

- Stratigraphy;
- Saturated and unsaturated geologic units beneath the site;
- Thickness of the material overlying the uppermost aquifer;
- Depth to the uppermost aquifer;
- Material comprising the uppermost aquifer;

- Geotechnical information;
- Hydraulic conductivity of the aquifer and identification of any confining layers;
- Borehole geophysical logs, including natural gamma and formation conductivity; and
- Confirmation of regional published information.

The information obtained during this investigation was used to develop the conceptual hydrogeologic model of the Class 3N Facility site.

3.5.1 Soil Boring Program

On April 2 through April 24, 2001, fifty-seven (57) soil borings were advanced throughout the Class 3N Facility site under the supervision of GEC personnel. The borings were advanced to depths ranging from approximately 19 to 200 feet below ground surface (bgs) and are identified as B-1 through B-57. The locations were chosen to insure that the borings were adequately spaced to thoroughly characterize the hydrogeologic setting. Other considerations included placing the groundwater piezometers at strategic locations across the Class 3N Facility site, and correlating lithology to the results of the surface geophysical survey. Prior to drilling activities, a survey grid was established across the Class 3N Facility site based upon 500-foot centers and all borings were located and plotted on the site map in relation to this grid system. **FIGURE 3** shows the locations of the 57 borings.

The soil borings were advanced by utilizing either solid flight auger or wash rotary drilling techniques. A Simco 2400 SKL drill rig equipped with 6.25-inch solid flight augers was used to drill most of the shallow borings. A CME-55 wash rotary drill rig equipped with a 6-inch drag bit was used to drill the deep borings and to drill and install some of the piezometers. The drilling technique utilized for each boring is specified on the boring logs presented in **APPENDIX D**.

Soil samples were generally collected at 5-foot intervals throughout the entire depth of each boring utilizing a stainless steel 1.5-foot split spoon sampler. Once a depth of 50 feet bgs was reached in the deep borings, soil samples were generally collected at 10-foot intervals when possible. Shelby tube samples were also collected at various depths in the borings for geotechnical analysis. Soil samples were collected from the 57 borings (and test pits) for the purpose of logging and to characterize the geotechnical properties of the underlying soils.

The drilling contractor utilized to drill the borings was Anderson Engineering of Little Rock, Arkansas. A GEC Geologist was present during all drilling/well construction activities and the borings were logged in the field following descriptions provided in the Unified Soil Classification System (USCS). The soil boring logs are presented in **APPENDIX D**. The results of the geotechnical analysis are discussed in further detail in **SECTION 4.0** of this report.

3.5.2 Site Geology

The site is underlain by Quaternary Age unconsolidated alluvial deposits, which are characterized by a coarsening downward sequence. In general, the lithology encountered at the Class 3N Facility site consists of a clay or silty clay unit at the surface, a middle sand unit, and a thick sand and gravel unit that comprises the base of the alluvial deposits. A mixture of sand, silt, and clay was encountered in each of these units. The thickness of these units varied considerably across the Class 3N Facility site. A detailed description of the lithology encountered across the Class 3N Facility site is discussed below.

The soils encountered at the surface generally consist of brown to gray, clay to silty clay, or occasionally sandy clay. The clay is comprised of varying amounts of silt and occasionally some fine sand. The clay bed varies in thickness across the site and was encountered in the borings at a thickness ranging from 2 to over 30 feet, with an average thickness of approximately 15 feet.

Some discontinuous silty sand lenses underlie the clay bed. Underlying most of the clay material, a brown to tan, fine to coarse, sand with some silt and clay is present. The sand ranged from well to poorly sorted, and rounded to angular. The sand was encountered at depths ranging from approximately 2 feet bgs to over 30 feet bgs.

This sand unit then grades into a sand and gravel unit with some silt and clay. The sand and gravel unit consists primarily of fine to coarse sand with gravel up to 40 millimeters (mm) in diameter. The percentage of gravel varies throughout the unit and is subrounded to subangular. The top of the sand and gravel unit was encountered in the borings at depths ranging from 30 to 103 feet bgs. The sand and gravel unit comprises a large percentage of the total thickness of the alluvial deposits and represents the base of the alluvial deposits. The sand and gravel unit was present up to a depth of approximately 150 feet bgs in B-21.

Beneath the alluvial deposits, a brown to gray sand with some silt is encountered. This silty sand is believed to represent the top of the Tertiary Age Claiborne Group.

Several geologic cross sections that illustrate the underlying stratigraphy of the site were generated from the soil boring logs logged during this hydrogeologic investigation. When applicable, the cross sections contain the results of the subsurface geophysical logs, depth to groundwater encountered during drilling and potentiometric groundwater elevation, depth and location of each boring, surface topography and lithologic descriptions.

The locations of the cross section lines are shown in **FIGURE 6**. Cross sections A-A', B-B', and C-C' trend west to east across the property and are presented in **FIGURES 7-1**, **7-2**, and **7-3**, respectively. Cross sections D-D', E-E', and F-F' trend north to south across the property and are presented in **FIGURE 7-4**.

3.5.3 Subsurface Geophysical Logs

Borehole geophysical logging was conducted in eleven (11) of the borings drilled across the site. The downhole geophysical logging was conducted primarily in the deeper borings drilled at the site and included borings B-2, B-5, B-7, B-9, B-17, B-18, B-21, B-26, B-46, B-51, and B-54. The logging method included natural gamma and formation conductivity. Upon completion of drilling the borehole to be logged, 2-inch diameter Schedule 40 PVC casing was installed to the total depth of the boring. Logging of each hole was then accomplished by lowering the logging tools through the center of the casing.

Natural gamma logs are records of the amount of natural gamma radiation that is emitted from all soils and rocks. In sedimentary formations, the log normally reflects the shale or clay content of the formation under investigation. This is because the radioactive elements tend to concentrate in shale and clay. Clean formations generally have very low natural radioactivity unless a radioactive contaminant such as volcanic ash or granite wash is present or the formation waters contain dissolved radioactive salts. The most common gamma-emitting isotope normally found in sediments or rocks is potassium-40 (K^{40}). Potassium, which contains about 0.012 percent K^{40}, is typically found in feldspars and micas that are found in many different rock types and readily decompose into clays. In hydrogeologic investigations, a common application is the identification of clay or shale deposits that may act as a confining layer for the aquifer. The primary use of natural gamma logs is for the identification of lithology and stratigraphic correlation in open or cased, liquid or air filled holes (Keys and MacCary, 1983; Schlumberger, 1987).

The gamma log is interpreted by using the vertical scale (measured as depth in feet) and the horizontal scale provided at the top of the log. The horizontal scale used in this investigation increases from zero on the left, up to 300 counts per second on the right. The clay material typically exhibits high gamma values. Sand and gravel material is typically interpreted by observing when the log has a baseline shift to the left (low gamma values). This baseline shift is seen as a more gradual shift when the probe passes through gradations in lithology from clay to sand.

In addition to natural gamma, each borehole was logged with an EM-39 formation conductivity probe. This is an induction-logging tool. This type of probe operates using a transmitter and receiver coil. A high-frequency alternating current of constant intensity is sent through the transmitter coil. The alternating magnetic field created induces currents in the formation surrounding the borehole. The currents flow in circular loops parallel with the transmitter coil and create a magnetic field that induces a voltage in the receiver coil. Because of the constant amplitude and frequency of the transmitter coil, the currents induced are directly proportional to the formation conductivity. The probe is designed in such a way as to eliminate the signal originating from the transmitter. The resistivity associated with the conductivity is calculated based upon the conductivity of the formation (Keys and MacCary, 1983; Schlumberger, 1987).

The formation conductivity probe is used to assist in differentiating the conductive clay layers from the lower conductivity layers such as rock, cherty gravel, or sand. The formation conductivity is measured in milliSeimens/meter (mS/meter). The scale is read from zero on the left, up to 250 mS/meter on the right. The clay material typically exhibits high conductivity values. Sand and gravel material is typically interpreted by observing when the log has a baseline shift to the left.

The conductivity, resistivity and natural gamma plots are illustrated on all of the geophysical logging results, which are included in **APPENDIX E**.

3.6 HYDROGEOLOGIC INVESTIGATION (22.1102 (C)(5))

This section describes the data gathered during this investigation regarding the hydrologic characteristics of the uppermost aquifer underlying the site of the Class 3N Facility.

3.6.1 Installation of Piezometers

During this hydrogeologic investigation, fourteen (14) groundwater piezometers (PZ-1 through PZ-14) were installed on the Class 3N Facility site. The piezometers were utilized to characterize the hydrologic characteristics of the Class 3N Facility site, including depth to groundwater, hydraulic conductivity, aquifer transmissivity, hydraulic gradient, and groundwater flow direction. The piezometers will also be used to assist in determining the wells to be used in the proposed groundwater monitoring system and to establish water quality. All of the piezometers were constructed such that they could subsequently be converted into groundwater monitoring wells.

It should be noted that piezometers PZ-9 and PZ-14 were designed to be used only during the 24-hour pump test. Therefore, the construction material, including surface completion, of piezometers PZ-9 and PZ-14 varied somewhat from the completion of the remaining piezometers.

Each piezometer completion was performed in accordance with ASTM D 5092-90 *Design and Installation of Groundwater Monitoring Wells in Aquifers* and current industry standards. With the exception of PZ-9 and PZ-14, the piezometers were constructed using a 10-foot section of 0.010 slotted PVC screen, and 2-inch diameter Schedule 40 threaded PVC riser pipe. A 4-inch bottom cap was installed on the bottom of each screen. The screened interval was threaded to a solid 2-inch diameter PVC riser to bring the well to above ground surface completion. The annulus of each piezometer was filled with 10/20 mesh silica sand from the bottom of the boring to approximately 2 feet above the screened interval. A 2-foot layer of bentonite pellets was then placed in the annulus on top of the sand filter pack. The remaining annulus was filled with bentonite chips to ground surface.

The solid PVC riser in the piezometers was brought to approximately 3 feet above ground surface. A 4-foot long metal protective locking collar was then installed over the PVC and a 3-foot by 3-foot concrete pad constructed around each piezometer. Protective bollard posts were then installed around each corner of the concrete pad.

Piezometers PZ-9 and PZ-14 were constructed to similar standards, with the following exceptions: Four (4)-inch diameter PVC was used to construct the piezometers; PZ-14 was constructed with a 20-foot section of screen; and, metal protective locking collars and concrete pads were not constructed around these two piezometers. GEC proposes to properly plug and abandon these 2 piezometers, as discussed in **SECTION 23** (Groundwater Monitoring and Corrective Action) of this Permit Application.

Well construction details for the 14 piezometers are presented in **TABLE 4**. Well construction diagrams for the piezometers are included on the boring logs in **APPENDIX D**. The locations of the piezometers are presented in **FIGURE 3**.

TABLE 4
Piezometer Construction Details
Class 3N Facility
Osceola, Arkansas

Well Number	Total Depth[1] (ft)	Screen Length (ft)	Riser Length (includes 3' stickup) (ft)	Depth to Top of Sand[2] (ft)	Depth to Top of Bentonite Seal[2] (ft)	Depth to Top of Bentonite Grout[2] (ft)
PZ-1	33.63	10	23.63	17.6	15.7	0
PZ-2	30.23	10	20.23	14	12	0
PZ-3	32.62	10	22.62	18.5	16.4	0
PZ-4	29.43	10	19.43	14.4	12.4	0
PZ-5	32.50	10	22.50	18	16	0
PZ-6	28.45	10	18.45	13.5	11.5	0
PZ-7	31.60	10	21.60	15	13	0
PZ-8	32.40	10	22.40	16	14	0
PZ-9*	29.96	10	19.96	15	13	0
PZ-10	25.60	10	15.60	11	8	0
PZ-11	28.76	10	18.76	14	12	0
PZ-12	22.41	10	12.41	7	5	0
PZ-13	28.17	10	18.17	14.5	13	0
PZ-14*	39.92	20	19.92	18	16	0

* PZ-9 and PZ-14 are constructed with 4-inch diameter PVC

[1] below top of casing

[2] below ground surface

3.6.2 Groundwater Flow Direction

Prior to recording fluid levels, the top of casing (TOC) elevations were surveyed to the nearest 100th of a foot by Central Arkansas Surveying, Inc. in order to establish relative elevations of the wells. The static water level in each well was then determined by slowly lowering an electronic water level meter into the well. The water level meter is graduated in 0.01 feet increments and is read from the TOC to the nearest 100th of a foot.

The groundwater elevations were calculated by subtracting the depth to static water elevation from the TOC elevation for each well. Fluid level measurements (recorded on April 23 and May 2, 2001), TOC elevations, and groundwater elevations are presented in **TABLE 5**.

TABLE 5
Fluid Level Measurements
Class 3N Facility
Osceola, Arkansas

Station I.D.	Date of Fluid Level Measurement	TOC Elevation (ft)	Depth to Water[1] (ft)	Total Depth[1] (ft)	Groundwater Elevation (ft)
PZ-1	4-23-01	242.35	21.65	33.63	220.70
	5-2-01	---	21.53	---	220.82
PZ-2	4-23-01	243.57	22.18	30.23	221.39
	5-2-01	---	22.13	---	221.44
PZ-3	4-23-01	241.23	20.32	32.62	220.91
	5-2-01	---	20.35	---	220.88
PZ-4	4-23-01	240.50	19.55	29.43	220.95
	5-2-01	---	19.55	---	220.95
PZ-5	4-23-01	242.75	21.76	32.50	220.99
	5-2-01	---	21.57	---	221.18
PZ-6	4-23-01	241.92	21.33	28.45	220.59
	5-2-01	---	21.30	---	220.62
PZ-7	4-23-01	245.29	23.52	31.60	221.77
	5-2-01	---	23.45	---	221.84
PZ-8	4-23-01	244.83	22.20	32.40	222.63
	5-2-01	---	22.54	---	222.29
PZ-9	4-23-01	246.36	11.01	29.96	235.35
	5-2-01	---	11.37	---	234.99
PZ-10	4-23-01	242.51	19.57	25.60	222.94
	5-2-01	---	19.78	---	222.73
PZ-11	4-23-01	244.33	22.51	28.76	221.82
	5-2-01	---	22.76	---	221.57
PZ-12	4-23-01	247.16	10.41	22.41	236.75
	5-2-01	---	11.81	---	235.35
PZ-13	4-23-01	246.74	NR	28.17	NR
	5-2-01	---	14.85	---	231.89

[1] Feet Below Top of Casing (TOC)
NR - Not Recorded During This Event
NOTE : PZ-14 (4-inch pumping well) was not Utilized to Determine Groundwater Elevations.

The fluid levels recorded on May 2, 2001 were used to calculate the potentiometric surface of the groundwater. A groundwater flow map is presented in **FIGURE 8**. As illustrated by **FIGURE 8**, there is a minor flow component to the south from PZ-9, PZ-12 and PZ-13, towards PZ-11. This southern flow component (along the eastern property boundary only) is likely the result of the thick sequence of clay encountered in the borings associated with PZ-9, PZ-12, and PZ-13 causing the groundwater to be under confined conditions in this portion of the site. However, the overall groundwater flow direction across the entire site appears to be to the west.

Hydraulic gradient is calculated by drawing a line perpendicular to the overall groundwater elevation contours. Based on the difference in groundwater elevation between PZ-12 and PZ-3 (14.47 feet), and divided by the distance between the 2 piezometers (5,100 feet), a hydraulic gradient of 0.0028 feet per foot (ft/ft) was calculated.

3.6.3 Aquifer Testing

Aquifer testing was conducted at the Class 3N Facility site in order to determine the hydraulic conductivity, transmissivity, and storativity of the uppermost aquifer underlying the site. On April 23 and 24, 2001, a multiple well pump test was performed utilizing PZ-14 as the pumping well and piezometer PZ-5 as an observation well. PZ-14 was chosen as the pumping well based upon the proximity to the Class 3N Facility waste boundary and the representative subsurface lithology encountered in this boring. In addition to the pump test, slug tests were conducted in piezometers PZ-1, PZ-4, PZ-8 and PZ-11. **FIGURE 3** shows the location of the piezometers in which aquifer tests were conducted.

Piezometer PZ-14 (4-inch pumping well) was installed to a depth of approximately 38 feet bgs and penetrates into the sand unit encountered below the upper clay unit. The well partially penetrates the Alluvial Aquifer and groundwater was encountered between 17 and 19 feet bgs in this boring. The static groundwater level in PZ-14 is approximately 17 feet bgs and the pumping interval (screened interval) in the well is from 18 to 38 feet bgs. Piezometer PZ-5 (2-inch observation well) was installed approximately 20 feet west of PZ-14 and the screened interval in PZ-5 is from 19 to 29 feet bgs.

Monitoring of the pump test was accomplished using pressure transducers to record drawdown data in the pumping well (PZ-14) and in the observation well (PZ-5). Because the pumping well partially penetrates only the uppermost portion of the Alluvial Aquifer (only 18 feet of water standing in the well available for drawdown), and was installed in the upper sand portion of the aquifer, PZ-14 exhibited a relatively low yield during this test. During the course of the pump test, it was determined that adequate recharge to the well could not be maintained at pumping rates above 5 gallons per minute (gpm) without excessive drawdown. The pumping rate established during a majority of the constant-rate pump test was approximately 4 gpm.

The constant-rate pump test involved pumping PZ-14 at a constant rate (4 gpm) until the drawdown stabilized or until 24 hours had passed. The data loggers were set near the bottom of each piezometer and the feet of water in head above the data logger was recorded. The initial water level was identified as a zero reference point and drawdown was recorded as the difference between the initial reference value and the instantaneous pressure measurement taken by the logger. Drawdown was recorded as a positive value. The results of the pump test are discussed in **SECTION 3.6.4**. Copies of the data collected during the pump test are included in **APPENDIX F** of this report.

On April 25, 2001 slug testing was performed in piezometers PZ-1, PZ-4, PZ-8 and PZ-11, which are screened in the uppermost aquifer underlying the site. The slug tests were performed by first placing a pressure transducer into the piezometer and allowing the water level to stabilize. After stabilizing, the data recorder was started and a slug of water removed as rapidly as possible. The recharge to the well over time was recorded and the test run until the water level achieved equilibrium. The procedure was then repeated in each piezometer. This resultant recovery data was analyzed utilizing the Bower and Rice method.

3.6.4 Results of Aquifer Testing

The data collected during the pump test and the slug tests was processed using the Aqtesolv™ Aquifer Test Solver computer program. While PZ-14 was pumped during the pump test, drawdown data was collected from PZ-14 and PZ-5. The pump test was stopped after about 22 hours when the drawdown in the pumping well and the observation well had stabilized for an extended time.

The aquifer parameters were analyzed by using the Neuman (1974) curve-matching method. The results were calculated by using the unconfined solution method and were adjusted to account for partial penetration of the wells into the aquifer. The Neuman method considers the effects of partial penetration in unconfined aquifers (Freeze - 1979). The following assumptions were used in the calculation of the aquifer parameters:

- The saturated aquifer thickness is 130 feet. This is the estimated maximum saturated thickness of the Alluvial Aquifer in this region.
- The observation well is partially penetrating the aquifer.
- The ratio of the vertical hydraulic conductivity to the horizontal conductivity was assumed to equal 1.0.

Upon entry of the drawdown data, the Aqtesolv program estimates the aquifer properties automatically by determining a "best fit" matching curve from the data. A graphical presentation of the Aqtesolv calculations from drawdown in PZ-5 are presented in **APPENDIX G**.

Utilizing the Neuman method, a transmissivity of 19.22 ft^2/min (27,676 ft^2/day) was calculated from the drawdown data collected from PZ-5 during pumping of PZ-14. Additionally, a storativity value of 0.0096 was calculated from the data collected from PZ-5.

Using the data calculated by Aqtesolv™ during the pump test, the hydraulic conductivity (K) of the uppermost aquifer was calculated by using the following equation:

(1) $$K_{avg} = T_{avg} / b$$

Where:

K_{avg} = hydraulic conductivity (ft/min)
T_{avg} = transmissivity (19.22 ft^2/min)
b = thickness of saturated aquifer (130 feet)

Based upon the transmissivity data obtained during the pump test, the above calculation indicates the hydraulic conductivity of the aquifer is 1.47 X 10^{-1} ft/min (7.46 X 10^{-2} cm/sec). Copies of all calculations are included in **APPENDIX G** of this report.

Slug test data from piezometers PZ-1, PZ-4, PZ-8 and PZ-11 were also analyzed to aid in the calculated hydraulic conductivity (K) of the uppermost aquifer underlying the entire Class 3N Facility site. Two slug tests were conducted in each piezometer. As discussed in **SECTION 3.6.3** of this report, the slug test data was analyzed utilizing the Bower and Rice method. The results of the slug test data, and the conductivity value calculated from the pump test, indicate that the average hydraulic conductivity of the aquifer is 2.15 x 10^{-2} ft/min (1.09 x 10^{-2} cm/sec), which is comparable to the results calculated from the pump test data.

The results of the slug tests conducted in PZ-1, PZ-4, PZ-8 and PZ-11 are presented in **TABLE 6**. The slug test graphical calculations are presented in **APPENDIX G**.

TABLE 6
Slug Test Results
Class 3N Facility
Osceola, Arkansas

Well I.D.	K (ft/min)	K (cm/sec)
PZ-1 (Test 1)	1.14 X 10^{-2}	5.79 X 10^{-3}
PZ-1 (Test 2)	1.39 X 10^{-2}	7.06 X 10^{-3}
PZ-4 (Test 1)	8.89 X 10^{-3}	4.51 X 10^{-3}
PZ-4 (Test 2)	9.97 X 10^{-3}	5.06 X 10^{-3}
PZ-8 (Test 1)	2.03 X 10^{-4}	1.03 X 10^{-4}
PZ-8 (Test 2)	2.19 X 10^{-4}	1.11 X 10^{-4}
PZ-11 (Test 1)	1.03 X 10^{-3}	5.23 X 10^{-4}
PZ-11 (Test 2)	1.14 X 10^{-3}	5.79 X 10^{-4}
PZ-14[1]	1.47 X 10^{-1}	7.46 X 10^{-2}
AVERAGE	**2.15 X 10^{-2}**	**1.09 X 10^{-2}**

[1] As estimated by transmissivity data obtained during the pump test.

Using the calculated average hydraulic conductivity, the average linear velocity of groundwater flow at the site is calculated using Darcy's Law:

(2) $$V = \frac{Kavg\ (dh/dl)}{n_e}$$

Where:

$V =$ average linear velocity
$K_{avg} =$ average hydraulic conductivity (1.09 X 10^{-2} cm/sec, from TABLE 6)
$(dh/dl) =$hydraulic gradient (0.0028, as presented in Section 3.6.2)
$n_e =$ effective porosity (27% = 0.27)

A porosity value of 30 percent (Terzaghi, 1996) was used for the dense, poorly sorted sand material. An effective porosity (n_e) was then determined by multiplying the porosity by 0.90 (90 percent). Effective porosity is always equal to or less than the porosity and utilizing 90 percent is a conservative approach, since part of the total porosity is occupied by static fluid held to the mineral surface by surface tension. An effective porosity was determined to be 27 percent. Utilizing the above values, the groundwater flow at the site is to the west at an average linear velocity (V) of 1.13 X 10^{-4} cm/sec or 116.94 ft/year.

3.6.5 Site Groundwater Chemistry

Currently, there is no Class 3N Facility site specific groundwater quality data available. The general groundwater quality from several of the regional aquifers is discussed in **SECTION 2.5** of this report. Site specific background water quality will be determined prior to placing waste at the Class 3N Facility. The proposed groundwater monitoring system, Sampling and Analysis Plan, and Statistical Analysis and Contingency Plan are presented in **SECTION 23** (Groundwater Monitoring and Corrective Action*)* of this permit application.

4.0 GEOTECHNICAL TESTING (22.1102 (C)(6))

Geotechnical samples were collected during the drilling of the borings to characterize the geotechnical properties of the soils and to aid in the design of the Class 3N Facility. Each textural horizon was classified where appropriate with the physical tests listed below. The physical tests included:

- Atterberg limits (ASTM D 4318),
- Sieve analysis (ASTM D 1140 & D 422),
- Hydraulic conductivity (ASTM D 5084),
- Unconfined compressive strength (ASTM D 2166),
- Unconsolidated-undrained compressive strength of soils (ASTM D 2850),
- Consolidated-undrained compressive strength of soils (ASTM D 4767),
- Standard proctor density (ASTM D 698),
- One dimensional consolidation (ASTM D 2435),
- Natural moisture content of soils (ASTM 2216).

4.1 SIEVE ANALYSIS SUMMARY

Particle size analyses were conducted on soil samples collected at varying locations and depths for the purpose of analyzing grain size distribution and classification of the soils underlying the Class 3N Facility site. The sieve analysis involves a series of sieves (screens) having different size openings that are stacked with the larger sizes over the smaller. The soil sample is dried and passed through the sieves by shaking. The weight of the particle size distribution is presented as percent retained and percent finer. A silt or clay soil is generally defined as a soil passing a No. 200 sieve. Sand is defined as particles of rock passing a No. 4 sieve, but retained by a No. 200 sieve. Gravel is defined as particles of rock retained by a No. 4 sieve.

TABLE 7 summarizes the results of the sieve analyses that were performed. The geotechnical analysis report is included in **APPENDIX H**. Sieve analysis was conducted on a total of fifty-two (52) split spoon and shelby tube samples. Due to the small amount of recovery in split-spoon samples collected from the sandier units, certain intervals of similar material were composited in order to obtain an adequate amount of soil for testing.

As indicated by **TABLE 7**, the percentage of clay, silt and sand size particles in the upper clay unit encountered across the Class 3N Facility site varies somewhat. Of the 30 soil samples submitted for analysis from the 0 to 10 feet bgs interval, the percentage of clay or silt size particles passing (finer than) the No. 200 sieve ranged from 1.0 to 99.4 percent, with an average of 75 percent passing the No. 200 sieve.

Of the 17 samples that were submitted for analysis between 10 feet bgs and 30 feet bgs, the percentage of clay or silt size particles passing the No. 200 sieve ranged from 0.9 to 98.6, with an average of 39 percent. Of the remaining 5 samples submitted for analysis below 30 feet bgs, the percentage of clay or silt size particles passing the No. 200 sieve ranged from 3 to 83.4, with an average of 28 percent.

TABLE 7

Geotechnical Analysis Results
Class 3N Facility
Osceola, Arkansas

Boring	Sample Depth (ft)	USCS Classification	Natural Moisture %	Atterberg Limits			Mechanical Grain Size Analysis (percent finer than)		Permeability (cm/sec)
				L.L.	P.L.	P.I.	#4	#200	
B-1	3-5[1]	CL	29.1	45	26	19	100	98.2	1.4 X 10^{-4}
B-1	14-20[2]	CL	---	---	---	---	100	83.3	---
B-2	4-5	CL	38	47	22	25	100	95.6	---
B-4	3-5[1]	CL	33.8	41	21	20	100	99.4	6.9 X 10^{-8}
B-5	9-10	CH	33.7	58	24	34	---	---	---
	24-25	SM	---	---	---	---	---	---	---
	79-80	CL	---	27	16	11	---	---	---
B-7	3-5[1]	CL	31.9	44	23	21	100	99.4	6.7 X 10^{-4}
B-10	3-5[1]	ML	30.6	---	---	---	100	98.9	6.8 X 10^{-7}
	19-20	CL	48	38	19	19	100	92	---
	24-25	SP-SM	16.4	---	---	---	99.4	11.5	---
B-11	4-5	CL	29.8	46	21	25	100	88.9	---
B-12	9-10	SM	---	---	---	---	100	35.5	---
B-13	4-5	CL	25.8	34	20	14	100	78.6	---
	19-20	SM	20.0	---	---	---	100	16.1	---
B-14	9-10	CH	27.1	51	21	30	100	93.0	---
	14-20[2]	SP	4.2	---	---	---	100	3.0	---
B-15	4-5	CL	31.7	44	23	21	100	91.5	---

[1] Denotes Shelby Tube Sample

[2] Composite Interval Due To Low Sample Recovery

TABLE 7 (cont)

Geotechnical Analysis Results
Class 3N Facility
Osceola, Arkansas

Boring	Sample Depth	USCS Classification	Natural Moisture %	Atterberg Limits			Mechanical Grain Size Analysis (percent finer than)		Permeability (cm/sec)
				L.L.	P.L.	P.I.	#4	#200	
B-17	9-10	CH	38.1	79	32	47	100	96	---
	14-15	SM	19.0	---	---	---	100	32.4	---
	34-40[2]	CL	32.1	33	23	10	100	83.4	---
	69-70	SP-SM	21.1	---	---	---	98.8	7.1	---
	79-80	SP	19.0	---	---	---	99.7	4.8	---
B-20	9-10	SP	3.2	---	---	---	99.8	1.0	---
B-21	3-5[1]	CH	38.8	58	23	35	100	96.6	1.1 X 10^{-4}
	19-20	SM	23.4	---	---	---	100	25.3	---
B-23	9-15[2]	SP-SM	6.9	---	---	---	99.9	8.7	---
B-24	4-5	SP-SM	2.1	---	---	---	100	9.5	---
	19-20	SP	16.1	---	---	---	100	0.9	---
B-26	3-5[1]	CL	19.2	26	16	10	99.5	57.4	2.6 X 10^{-4}
	14-25[2]	SM	17.9	---	---	---	99.5	20.3	---
	49-50	SC	29.9	---	---	---	89.1	43.5	---
	59-130[2]	SP	11.9	---	---	---	82.3	3	---
B-27	19-30[2]	CH	39.9	---	---	---	99.9	93.9	---
B-28	19-20	CH	57.7	65	27	38	100	98.6	---
B-29	3-5[1]	CL	23.3	38	19	19	100	74.1	7.8 X 10^{-8}
B-30	4-5	SM	10.1	---	---	---	100	13.7	---
B-31	9-10	CL	25.2	33	19	14	100	68.1	---

[1] Denotes Shelby Tube Sample

[2] Composite Interval Due To Low Sample Recovery

TABLE 7 (cont)

Geotechnical Analysis Results
Class 3N Facility
Osceola, Arkansas

Boring	Sample Depth	USCS Classification	Natural Moisture %	Atterberg Limits			Mechanical Grain Size Analysis (percent finer than)		Permeability (cm/sec)
				L.L.	P.L.	P.I.	#4	#200	
B-33	3-5[1]	SC	10.4	22	13	9	100	21	---
B-38	4-5	CH	38	80	28	52	100	96.8	---
B-40	4-15[2]	SM	17.9	---	---	---	100	12.9	---
B-41	3-5[1]	CL	35.4	45	21	24	100	95	---
B-42	9-10	CL	20.5	---	---	---	100	56.7	---
B-43	3-5[1]	CL	34.3	44	21	23	100	99	1.0 X 10^{-6}
B-44	3-5[1]	CL	30.5	44	21	23	100	98.8	2.0 X 10^{-4}
B-45	9-10	CL	33.2	---	---	---	100	97.2	---
	20-30[2]	SM	20.1	---	---	---	100	32.2	---
B-50	9-10	SP	13.3	---	---	---	100	4.2	---
B-51	3-5[1]	CH	35.7	61	31	30	100	95.4	3.7 X 10^{-8}
B-54	4-5	CL	33.6	38	23	15	100	97.1	---
	8-10[1]	CH	44.2	74	26	48	100	98	---
	25-30[2]	SM	24.5	---	---	---	100	27.1	---
B-55	3-5[1]	CL	32.4	33	23	10	100	93.7	4.1 X 10^{-7}
	19-30[2]	CH	47.6	56	28	28	100	88.1	---
B-56	9-20[2]	SC	33.9	32	23	9	100	15.2	---

[1] Denotes Shelby Tube Sample

[2] Composite Interval Due To Low Sample Recovery

4.2 ATTERBERG LIMITS AND USCS CLASSIFICATION

In the remolded state, the consistency of clay soil varies in proportion to the water content. At high water content, the soil-water mixture possesses the properties of a liquid. At a lesser water content, the soil-water mixture possesses properties that resemble plastic. At even lower water contents, the soil-water mixture possesses the properties of a solid or semi-solid. The water content indicating the division of the liquid and plastic state has been designated the liquid limit. The division between the plastic and semi-solid state is referred to as the plastic limit. The numerical difference between the liquid limit and the plastic limit is identified as the plasticity index (P.I.). These values are often referred to as Atterberg limits. Atterberg limits are used widely in soil applications and are a good measure of the soil workability for use in solid waste liner systems.

Atterberg limits were determined on a total of twenty-nine (29) split spoon and shelby tube samples. The samples were also classified by the Unified Soil Classification System (USCS) in order to further describe the physical properties of the subsurface soils. **TABLE 7** summarizes the Atterberg limits analyses and USCS classification of the soil samples. The geotechnical laboratory analysis is included in **APPENDIX H** of this report.

As indicated by **TABLE 7**, plastic soils of the upper clay unit (0 to 10 feet bgs) exhibited a liquid limit (L.L.) ranging from 22 to 80, with an average L.L of 47. The soil samples (0 to 10 feet bgs) exhibited a plastic limit (P.L.) ranging from 13 to 32, with an average P.L. of 22.5. The soil samples (0 to 10 feet bgs) exhibited a P.I. ranging from 9 to 48, with an average P.I. of 24.5. The P.I. results indicate that the upper clay unit exhibits medium plasticity and that small to moderate amounts of silt are present within this unit.

The soil samples submitted from the 0 to 10 feet bgs interval were generally classified by the USCS classification as CL (lean clay) to CH (fat clay). However, 6 of the samples (collected within 0 to 10 feet bgs) were classified as either ML (silt and clay), SC (sandy clay), or SM (silty sand).

As indicated by B-28 (19 to 20 feet bgs), high plasticity clay (CH) was encountered at depths of up to 20 feet bgs at the site. Soils that are classified as CH are characterized by high to very high dry strength and high toughness at the plastic limit. Soils that are classified as CL are characterized by medium to high dry strength and medium toughness at the plastic limit (Terzaghi, 1996).

Soil samples collected from the sand and gravel units below 10 feet were generally classified as SC (sandy clay), SM (silty sand), and SP(sand and gravel).

4.3 STANDARD PROCTOR DENSITY (TEST PIT SAMPLES)

GEC obtained bucket samples from five (5) separate test-pit (TP) locations in order to determine the suitability of the soil in the construction of the clay liner and/or a final cover layer. The test-pits were excavated to a depth of approximately 8 feet bgs by utilizing a backhoe and a composite sample was collected from each test-pit. The bucket composite samples are identified as TP-1 through TP-5. The locations of the test-pits are shown in **FIGURE 3**.

The 5 bucket samples were submitted for various geotechnical testing parameters, including standard proctor density testing, in order to determine moisture density relationships as defined in ASTM D 698. The effectiveness of soil compaction is measured by the maximum dry density (mass of solids per unit volume) and the corresponding optimum moisture content.

Based upon the proctor analysis of the composite sample TP-1, it is anticipated that the optimum moisture content of the material will be 22 percent with a maximum dry density of 96 pounds per cubic foot (lb/cuft). The proctor analysis of composite sample TP-2 indicates that the optimum moisture content will be 22.5 percent with a maximum dry density of 98.5 lb/cuft. The proctor analysis of composite sample TP-3 indicates that the optimum moisture content will be 18 percent with a maximum dry density of 102 lb/cuft. The proctor analysis of composite sample TP-4 indicates that the optimum moisture content will be 25 percent with a maximum dry density of 94.5 lb/cuft.

Composite sample TP-5 contained excessive sand (SP) and did not contain adequate fines for compaction. The geotechnical laboratory analysis for the standard proctor analyses are included in **APPENDIX H** of this report.

4.4 PERMEABILITY SUMMARY

Shelby tube samples were obtained from various depths and locations within the upper clay unit for characterizing the permeability of in-situ clays in accordance with ASTM D 5084. **TABLE 7** summarizes the results of the permeability analysis for the subsurface soils.

A total of eleven (11) samples were submitted for permeability testing from 0 to 5 feet bgs. As indicated by **TABLE 7**, the permeability of the 11 samples ranged from 6.7 X 10^{-4} cm/sec to 3.7 X 10^{-8} cm/sec, with an average permeability of 1.26 X 10^{-4} cm/sec. Copies of the geotechnical laboratory analysis are included in **APPENDIX H** of this report.

4.5 SHEAR STRENGTH EVALUATION SUMMARY

Shear strength analysis was conducted on soil samples for defining the relative stability of the clay material in natural and engineering applications by testing for unconfined compressive strength (ASTM D 2166), unconsolidated-undrained (UU) compressive strength of soils (ASTM D 2850-70), and consolidated-undrained (CU) compressive strength of soils (ASTM D 4767). From these tests, strength properties, internal angle of friction, and cohesion of the clay were determined.

The unconfined compressive strength, shear strength values, and internal angle of friction of the soil samples submitted for geotechnical analysis are presented in **TABLE 8**. Copies of the geotechnical laboratory analysis are included in **APPENDIX H** of this report.

TABLE 8
Shear Strength Analysis Results
Class 3N Facility
Osceola, Arkansas

Sample I.D.	Depth (ft)	Unconfined Compressive Strength of Soils (ASTM D 2166)	
		Unconfined Compressive Strength (psf)	Shear Strength (psf)
B-1	3-5	3370.7	1685.3
B-4	3-5	1562.7	781.4
B-7	3-5	1766.2	883.1
B-26	3-5	4125.6	2062.8
B-43	3-5	2978.2	1489.1
B-51	3-5	1230.2	615.1
B-55	3-5	734.3	367.1

Sample I.D.	Depth (ft)	Unconsolidated Undrained Compressive Strength (ASTM D2850)	
		Strength (psf)	Internal Angle of Friction (ϕ)
B-21	3-5	1100	0^0
B-44	3-5	1750	5^0
TP-4	0-8	1964	5^0

Sample I.D.	Depth (ft)	Consolidated Undrained Compressive Strength (ASTM D 4767)			
		Total Strength (psf)	Internal Angle of Friction (ϕ)	Effective Strength (psf)	Internal Angle of Friction (ϕ)
TP-4	0-8	234.1	16.8^0	252.4	26.4^0

4.6 ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

One dimensional consolidation (ASTM D 2435) tests were conducted on two (2) of the soil samples to determine the compressibility of the soil. Compressibility is the term applied to one dimensional volume changes that occur in cohesive soils that are subjected to compressive loading (McCarthy, D. F., 1988).

The results of the one dimensional consolidation testing indicate that the coefficient of consolidation (C_V) for B-7 (3 to 5 feet bgs) were 1.8, 0.3, 0.7, 2.0, 2.0, 1.9, and 0.2 feet^2/day at pressures of 0.25, 0.5, 1, 2, 4, 8, and 16 kips per square foot (ksf), respectively. The coefficient of consolidation (C_V) for B-51 (3 to 5 feet bgs) were 2.9, 0.4, 1.3, 1.8, 1.7, 2.1, and 0.4 feet^2/day at pressures of 0.25, 0.5, 1, 2, 4, 8, and 16 kips per square foot (ksf), respectively. Copies of the geotechnical laboratory data are included in **APPENDIX H.**

5.0 CONCEPTUAL HYDROGEOLOGIC MODEL (22.1102(D))

This section provides an integrated presentation of the hydrogeological characteristics of the Class 3N Facility site. The data presented in this section is a compilation of the data gathered during the hydrogeologic investigation, supplemented by published geologic data obtained during the literature review.

The hydrogeologic investigation confirmed the presence of Quaternary Age Alluvial deposits, consisting of gravels, sands, silts, clays and mixtures of any and all of these. The alluvial deposits are characterized by a general coarsening downward sequence. The lower sand and gravel deposits are capped at the surface by a bed of clay or silty clay that varies in thickness. Underlying the alluvial deposits are very-fine sands, silts, and silty clays of the Tertiary Age Claiborne Group.

Although various mixtures of clay, silt, sand and gravel do occur throughout the alluvial deposits, the upper clay unit and underlying sand and gravel units can be grouped into somewhat distinct hydrogeologic units. The hydrogeologic units are grouped based upon similar geologic, geotechnical, and hydrogeologic properties. The hydrogeologic units are presented in **TABLE 9**. A graphical representation of the conceptual hydrogeologic model for the Class 3N Facility is illustrated in the various cross-sections presented in **FIGURES 7-1** through **7-4**.

TABLE 9
Hydrogeologic Model Units
Class 3N Facility
Osceola, Arkansas

Geologic Unit	Brief Description	Hydrologic Characteristics
1	Clay, silty clay and occasionally some sandy clay. Percentage of silt varies. USCS classification is generally CH and CL, some SC.	Confining unit. Permeability ranging from 6.7 x 10^{-4} cm/sec to 3.7 x 10^{-8} cm/sec. Can be a water bearing unit.
2	Silty fine sand in discontinuous lenses. Appears to represent a gradational change from upper silty clay unit to lower sand unit.	Often a water bearing unit. Low to moderate yield.
3	Fine to coarse sand with some silt and clay. USCS classification is generally SP and SM, some SC.	Moderate to high yield. High transmissivity.
4	Sand and gravel with some silt and clay. Gravel up to 40 mm. USCS classification is SP to SM.	High yield. High transmissivity.

Hydrogeologic Unit 1 (Unit 1) consists of a brown to gray, clay to silty clay, with some sandy clay. The clay is comprised of varying amounts of silt and some fine sand. Unit 1 varies in thickness across the site, ranging from 2 to over 30 feet, with an average thickness of approximately 15 feet. When groundwater is encountered during drilling within this unit, the water level rises several feet until reaching equilibrium with atmospheric pressure. Permeabilities range from 6.7 x 10^{-4} cm/sec to 3.7 x 10^{-8} cm/sec, with an average permeability of 1.26 x 10^{-4} cm/sec.

Hydrogeologic Unit 2 consists of a gray, silty fine sand and is encountered as a gradational zone between the upper clay unit and the lower sand unit. Unit 2 is encountered as an occasional discontinuous lense and is not present across a majority of the Class 3N Facility site. This unit is a potential water bearing unit.

Hydrogeologic Unit 3 consists of a brown to tan, fine to coarse, sand with some silt and clay present. The sand ranged from well to poorly sorted, and rounded to angular. Unit 3 was encountered at depths ranging from approximately 2 feet bgs to over 30 feet bgs. Unit 3 can range in thickness from approximately 5 to 85 feet. When groundwater is encountered during drilling within this unit, the water is under unconfined conditions.

Hydrogeologic Unit 4 consists of a gray sand and gravel with some silt and clay. The sand is fine to coarse. The percentage of gravel within this unit is generally low, but variable. The gravel is subrounded to subangular, and up to 40 millimeters (mm) in diameter. The top of the sand and gravel unit is encountered at depths ranging from 30 to 103 feet bgs. The sand and gravel unit comprises a large percentage of the total thickness of the alluvial deposits and represents the base of the alluvial deposits. Unit 4 was encountered up to a depth of approximately 150 feet bgs in B-21.

Underlying Unit 4 is a brown to gray, silty fine sand. This silty sand appears to represent the top of the Cockfield Formation of the Claiborne Group.

Groundwater at the Class 3N Facility site is consistently encountered at 17 to 22 feet bgs. When the first encountered groundwater zone occurs within the clay unit, it rises several feet in the boring/piezometer under confined conditions. When the first encountered groundwater zone occurs in the sand unit, it remains at that depth under unconfined conditions.

Although a minor groundwater flow component to the south exists along the eastern property boundary, the overall groundwater flow direction across the entire site appears to be to the west at an estimated hydraulic gradient of 0.0028 feet/foot. Based upon the pump test data and slug test data obtained during the hydrogeologic investigation, the average hydraulic conductivity of the entire uppermost aquifer is estimated to be 1.09×10^{-2} cm/sec. The transmissivity of the aquifer is calculated to be 19.22 ft^2/min, and the storativity is calculated to be 0.0096. The overall groundwater flow direction at the site is to the west at an estimated linear flow velocity of 1.13×10^{-4} cm/sec, or approximately 117 ft/year.

6.0 CONCLUSIONS

GEC has completed the hydrogeologic and geotechnical investigation at the site of the Class 3N Facility to be located near Osceola in Mississippi County, Arkansas. The investigation was performed in association with a Class 3N Facility that will include approximately 190 acres of permitted waste disposal area. The investigation was designed to meet the requirements of Chapter 11 of ADEQ Solid Waste Management Division Regulation 22. The Class 3N Facility is located within Section 13 of Township 12 North, Range 10 East, and Section 18 of Township 12 North, Range 11 East. The property boundary of the Class 3N Facility is shown in **FIGURE 3**.

The following tasks were conducted by GEC in order to thoroughly characterize the hydrogeologic setting of the site:

- an extensive literature review was performed on various State and Federal regional hydrogeologic publications;
- detailed surface geologic mapping was performed through literature review, site reconnaissance, and aerial photograph analysis;
- a surface geophysical survey was conducted across the Class 3N Facility property by utilizing electromagnetic (EM) inductive techniques to measure conductivity values of the subsurface materials;
- a subsurface exploration investigation was conducted by drilling 57 soil borings, collecting various geotechnical soil samples, and performing subsurface geophysical logging in select borings;
- extensive geotechnical testing was performed on soil samples collected from the borings in order to classify each textural horizon and to aid in the design of the Class 3N Facility;
- a seismic investigation was conducted by installing a deep test boring and determining the shear wave velocities of the subsurface materials;
- the hydrology of the Class 3N Facility site was characterized by installing 14 groundwater piezometers and performing slug and pump tests in order to determine groundwater characteristics; and,
- based upon a compilation of data obtained during the hydrogeologic investigation, a comprehensive hydrogeologic model for the Class 3N Facility site was developed.

A total of fifty-seven (57) borings were drilled across the site. The 57 borings were advanced to depths ranging from approximately 19 to 200 feet bgs and are identified as B-1 through B-57. The Class 3N Facility is underlain by Quaternary Age alluvial deposits consisting of various mixtures of clay, silt, sand, and gravel. The lithology encountered at the site consists of a coarsening downward sequence. In general, the lithology consists of a clay or silty clay unit at the surface, a middle sand unit, and a thick sand and gravel unit that comprises the base of the alluvial deposits. The thickness of each unit is variable across the site.

The upper clay unit ranged in thickness from 2 to over 30 feet, with an average thickness of approximately 15 feet. The middle sand unit was encountered at depths ranging from 2 to over 30 feet bgs. The lower sand and gravel unit comprises a large percentage of the total thickness of the alluvial deposits. The alluvial deposits are then underlain by the Cockfield Formation of the Claiborne Group, which consists of a silty fine sand. Deposits of the Cockfield Group were encountered at the site at approximately 150 feet bgs in B-21.

The surface geophysical investigation generally correlated well with the lithology identified during drilling activities and a discussion of the geophysical results are discussed in **SECTION 3.4** of this report. In addition, subsurface geophysical logging was conducted in eleven (11) of the deeper borings.

Fourteen (14) piezometers (P-1 through P-14) were installed at the Class 3N Facility site. The piezometers were utilized to characterize the hydrologic characteristics of the site, including hydraulic conductivity, aquifer transmissivity, hydraulic gradient, and groundwater flow direction. The piezometers will also be used to assist in determining the wells to be used in the proposed groundwater monitoring system and to establish water quality. All of the piezometers were constructed such that they could subsequently be converted into groundwater monitoring wells. Piezometer construction details are discussed in **SECTION 3.6.1**.

Groundwater at the Class 3N Facility site is consistently encountered at 17 to 22 feet bgs. Groundwater can be encountered within the clay unit (when present at a thickness of greater than approximately 17 feet), or within the sand unit. When the first encountered groundwater zone occurs within a clay unit, it rises several feet in the boring/piezometer under confined conditions. When the first encountered groundwater zone occurs in a sand unit, it remains at that depth under unconfined conditions.

A multiple well 24-hour pump test was performed utilizing PZ-14 as the pumping well and PZ-5 as an observation well. The drawdown results obtained from PZ-5 during the pump test indicate that the uppermost aquifer exhibits a transmissivity of 19.22 ft^2/day, and the storativity of the aquifer is calculated to be 0.0096. Based upon the slug tests, and the data obtained during the pump test, the average hydraulic conductivity (K) of the uppermost aquifer is estimated to be $1.09 \text{ X } 10^{-2}$ cm/sec. The overall groundwater flow direction across the entire site is to the west at an estimated linear flow velocity of $1.13 \text{ X } 10^{-4}$ cm/sec, or 116.94 ft/year.

Geotechnical samples were collected during the drilling of the borings in order to classify the geotechnical properties of the soils and to aid in the design of the Class 3N Facility. The results of the geotechnical testing on soil samples collected indicate that the upper clay unit is generally classified as a clay with high plasticity (CH), or a clay with low plasticity (CL). The average percentage of silt and clay size particles passing the No. 200 sieve in the upper clay unit (0 to 10 feet) is 75 percent and the average plasticity index (P.I.) of the soils is 24.5. The average permeability of the in-situ soils within the upper clay unit is 1.26 X 10^{-4} cm/sec. A detailed discussion of the geotechnical program and testing results is discussed in **SECTION 4.0**.

Based upon a compilation of data obtained during this investigation, a comprehensive hydrogeologic model for the Class 3N Facility site was developed. Geologic cross sections that illustrate the underlying stratigraphy and hydrologic characteristics are presented in **FIGURE 7-1** through **FIGURE 7-4**. When applicable, all cross sections contain the results of the subsurface geophysical logs, depth to groundwater encountered during drilling and potentiometric groundwater surface, slug testing results, location and depth of each boring, surface topography and the corresponding lithologic descriptions.

A seismic investigation was conducted as part of this hydrogeologic investigation in order to determine the shear wave velocities of the subsurface materials at the site. The results of the seismic investigation are discussed in **SECTION 17** (Design Report) of this Permit Application. Surficial mapping of the geology surrounding the Class 3N Facility site, in addition to review of geologic maps of the area, has not indicated the presence of active faulting within 200 feet of the proposed Class 3N Facility.

A water well search, using well construction reports on file at the Arkansas Geological Commission, and site reconnaissance activities, indicate that there are two (2) domestic water wells used for drinking water within a 1-mile radius of the facility. However, the wells are located greater than 500 feet from the active portion of the Class 3N Facility. The irrigation well located on the northern portion of the property (identified as well No. 10 in **APPENDIX A**) should be properly plugged and abandoned prior to placing waste at the Class 3N Facility.

The geotechnical testing results indicate that the Class 3N Facility site contains clay material suitable for construction of the liner and cover systems.

Based upon the data gathered during this investigation, the overall hydrogeologic conditions at the property appear to be suitable for the proposed 190 acre Class 3N Facility. A minimum of five (5) feet separation between the top of the Class 3N Facility liner system and the groundwater elevation must be maintained. Therefore, the depth to the first encountered groundwater ($\geq$ 17 feet bgs) should be considered in the overall design of the Class 3N Facility.

7.0 REFERENCES

Arkansas Geological Commission, 1993, Geologic Map of Arkansas.

Arkansas Soil and Water Conservation Commission (ASWCC), 1988, Arkansas State Water Plan – Eastern Arkansas Basin.

Bower, H. and Rice, R. C., 1976, A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells, Water Resources Research, Volume 12, pp. 423-428.

Freeze, R. A. and Cherry, John A., 1979, Groundwater.

Keys, W. S. and MacCary, L. M., 1983, Application of Borehole Geophysics to Water-Resources Investigations: Techniques of Water-Resources Investigations of the United States Geological Survey, Book 2, Chapter E1.

McFarland, John D., 1998, Stratigraphic Summary of Arkansas, Arkansas Geological Commission Information Circular No. 36.

McNeill, J.D., 1980, Electromagnetic Terrain Conductivity Measurement at Low Induction Numbers, Geonics Limited Technical Note TN-6.

Pugh, Aaron L. et. al., 1997, Thickness of the Mississippi Valley Alluvial Aquifer in Eastern Arkansas, USGS Water Resources Investigations Report 97-4049.

Petersen, James C., 1981, Geohydrologic Units of the Gulf Coastal Plain in Arkansas, USGS Water Resources Investigations Report No. 85-4116.

Schlumberger, 1987, Log Interpretation Principles/Applications: Schlumberger Educational Services.

Terzaghi, Karl, 1996, Soil Mechanics in Engineering Practice.

U.S. Department of Agriculture (USDA), June 1971, Soil Survey of Mississippi County, Arkansas, Soil Conservation Service in cooperation with Arkansas Agricultural Experiment Station.

FIGURES

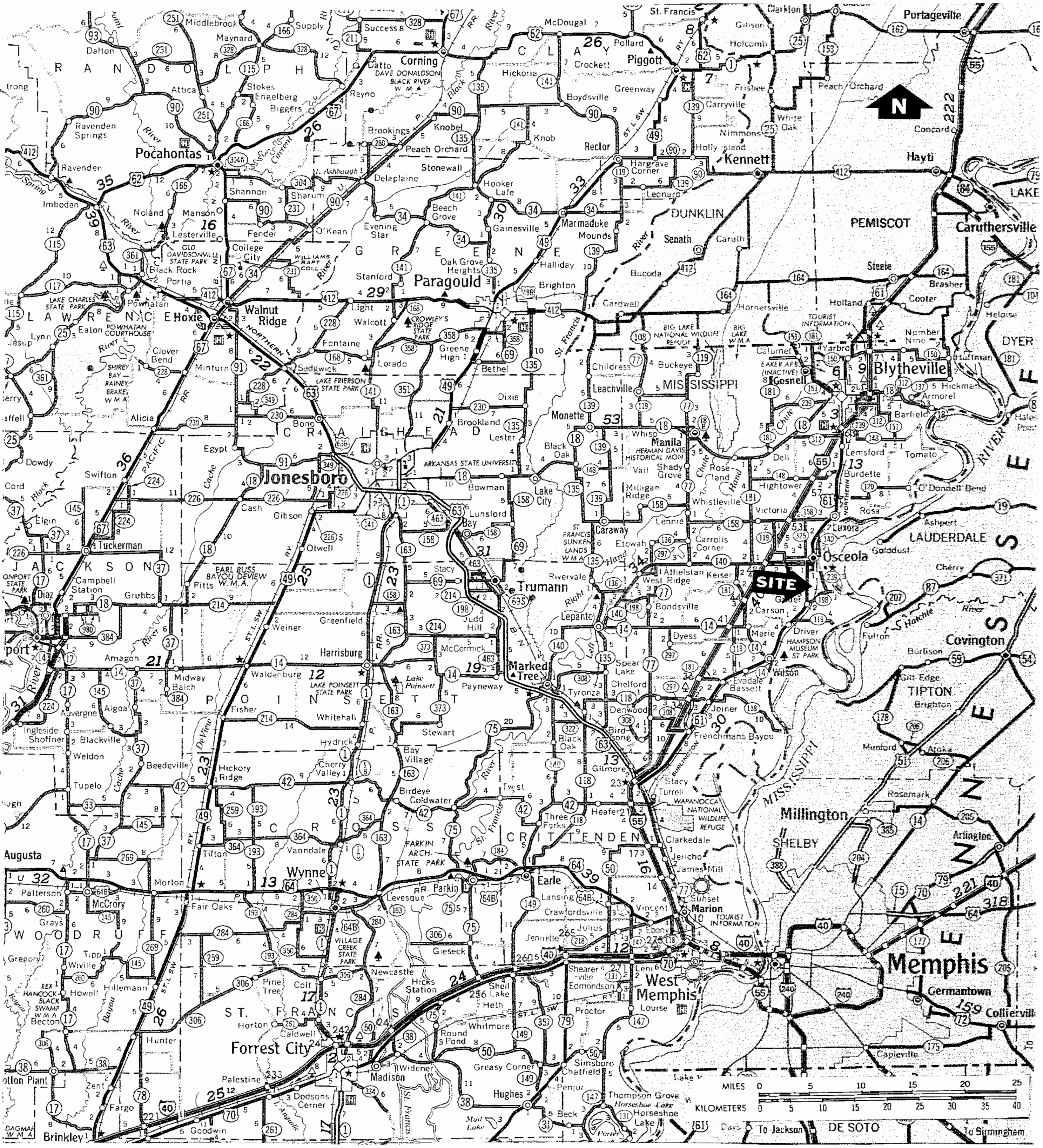


FIGURE 1

GEOGRAPHIC LOCATION MAP

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
CLASS 3N SOLID WASTE FACILITY

MISSISSIPPI COUNTY

ARKANSAS

DESIGNED BY:	MR
CHECKED BY:	MR
DRAWN BY:	ABS
MONTH/YEAR	JUNE, 2001

GEC
GENESIS
ENVIRONMENTAL CONSULTING, INC.
11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

PROJECT NO.:	084-001-01008
DATE:	6/4/01
SCALE:	AS SHOWN
ACAD NO.:	016

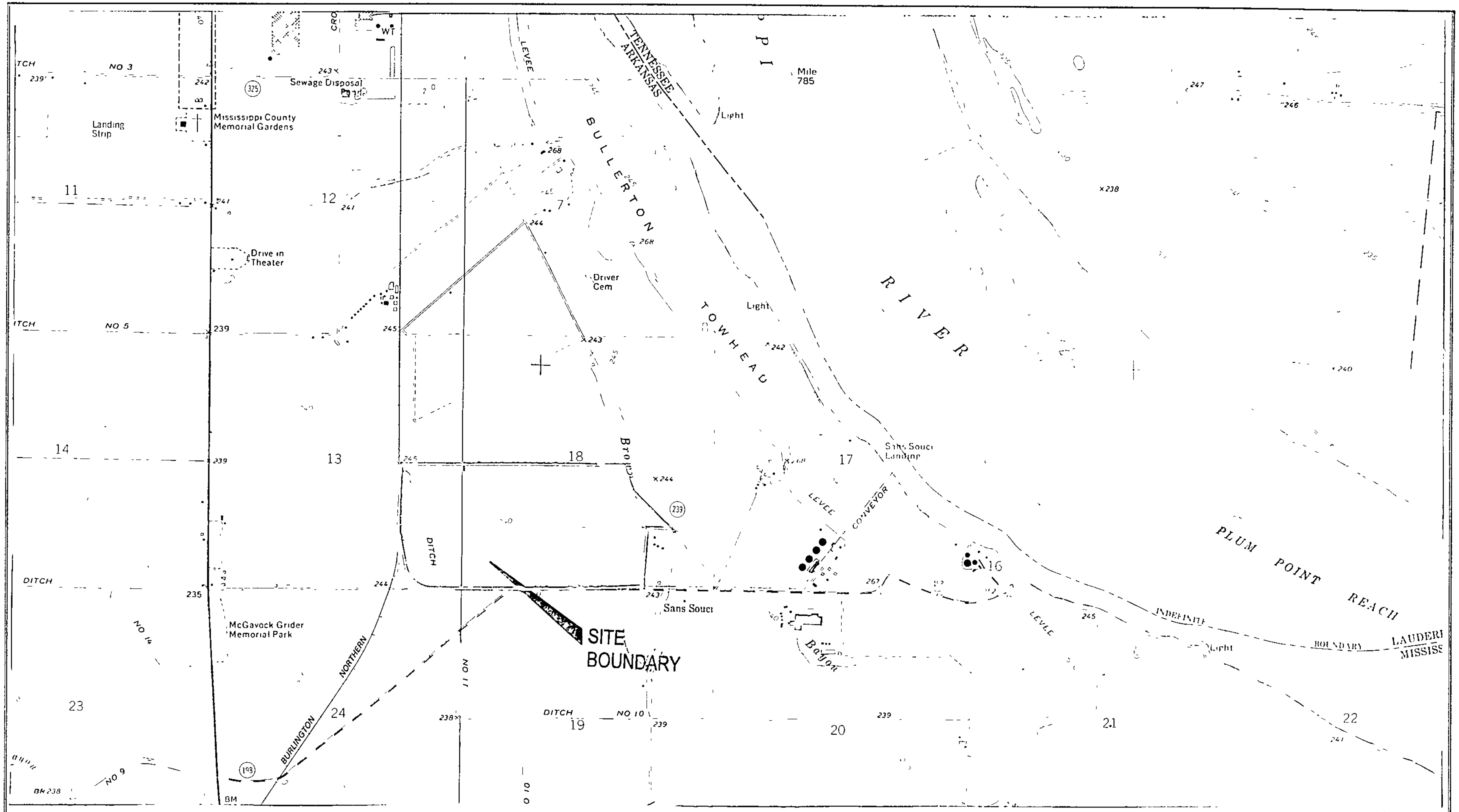


FIGURE 2

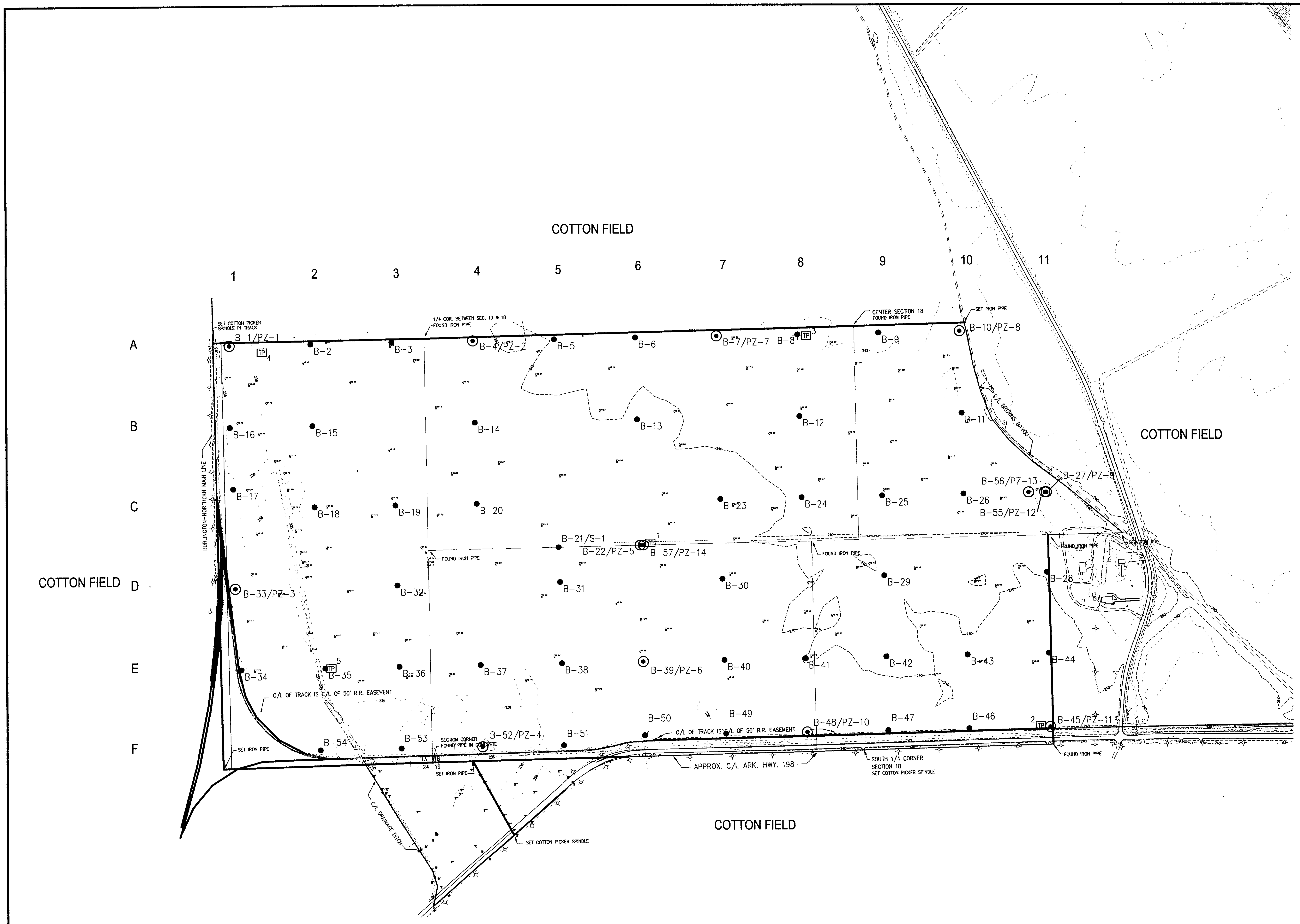
REV.	DATE	BY	DESCRIPTION

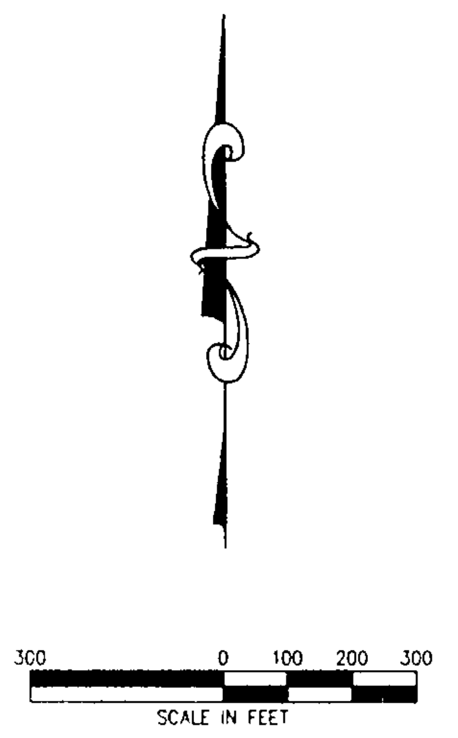
TOPOGRAPHIC SITE LOCATION MAP

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
CLASS 3N SOLID WASTE FACILITY

MISSISSIPPI COUNTY ARKANSAS

DESIGNED BY:	MR	GENESIS ENVIRONMENTAL CONSULTING, INC	PROJECT NO.:	084-001-01008
CHECKED BY:	MR		DATE:	6/15/01
DRAWN BY:	ABS	11400 West Baseline Road Little Rock, AR 72209 (501) 455-2199	SCALE:	1" = 2000'
MONTH/YEAR	JUNE, 2001		ACAD NO.:	017





SURVEYORS NOTE:

The basis for North and the location of the Section corner common to Section 13 and 14, T–12–N, R–10–E and Section 18 and 19, T–12–N, R–11–E is based on a monument set for said Section corners as refered to in the descriptions as "according to Plat prepared by John R. Archer, RLS, dated 12/13/91."

CONTROL POINT TABLE

BORING NO.	NORTHING	EASTING	DESCRIPTOR	ELEVATION
1	490931.14	1915267.41	B-1/PZ-1	242.35*
2	490940.03	1915767.34	B-2	239.75
3	490948.92	1916267 26	B-3	240.23
4	490957.81	1916767.18	B-4/PZ-2	243.57*
5	490966.71	1917267.11	B-5	241.27
6	490975 60	1917767 03	B-6	241 60
7	490984.49	1918266.96	B-7/PZ-7	245.29*
8	490993 38	1918766 88	B-8	242 60
9	491002.27	1919266.80	B-9	243.33
10	491011.17	1919766 73	B-10/PZ-8	244.83*
11	490511.27	1919777.33	B-11	242.89
12	490493.49	1918777 49	B-12	242.17
13	490475.71	1917777 64	B-13	240.88
14	490457 92	1916777.79	B-14	240.05
15	490440.14	1915777.94	B-15	239.04
16	490431.25	1915270.03	B-16	239.46
17	490051.36	1915288.62	B-17	238.57
18	489940.25	1915788.55	B-18	238.32
19	489949.14	1916288.47	B-19	238.74
20	489958.03	1916788.40	B-20	239.36
21	489687.19	1917291.70	B-21	239.61
22	489699 04	1917793.71	B-22/PZ-5	242 75*
23	489984 71	1918288.17	B-23	240.71
24	489993.60	1918788 09	B-24	241 40
25	490002 49	1919288 01	B-25	241.89
26	490011.38	1919787.94	B-26	242.20
27	490020 28	1920297.86	B-27/PZ-9	246 36*
28	489520.39	1920298 47	B-28	241.83
29	489502 60	1919298.62	B-29	241.39
30	489484.82	1918298.77	B-30	240.08
31	489467.03	1917298.92	B-31	239 08
32	489449.25	1916299.08	B-32	237 86
33	489431 47	1915299 23	B-33/PZ-3	241.23*
34	488931.58	1915334.83	B-34	238.62
35	488940 47	1915819.76	B-35	237.12
36	488949 36	1916309.68	B-36	237.69
37	488958 25	1916809 61	B-37	237.22
38	488967.14	1917309.53	B-38	237.89
39	488976 04	1917809.45	B-39/PZ-6	241.92*
40	488984.93	1918309 38	B-40	239.41
41	488993.82	1918809.30	B-41	239.72
42	489002.71	1919309.23	B-42	240.60
43	489011.60	1919809.15	B-43	241.61
44	489020.50	1920309.07	B-44	241.14
45	488570.59	1920318.62	B-45/PZ-11	244.33*
46	488561 70	1919818.69	B-46	240.11
47	488552 81	1919318.77	B-47	240.10
48	488543.92	1918818.85	B-48/PZ-10	242.51*
49	488535.03	1918318.92	B-49	238.60
50	488526 13	1917819.00	B-50	237.98
51	488467.25	1917320.14	B-51	237.55
52	488458.36	1916820 21	B-52/PZ-4	240.50*
53	488449 47	1916320.29	B-53	236.47
54	488440.58	1915820.36	B-54	236.59
55	490020.28	1920287 86	B-55/PZ-12	247.16*
56	490020.28	1920187.86	B-56/PZ-13	246.74*
57	489699 04	1917813.71	B-57/PZ-14	

* DENOTES TOP OF CASING ELEVATION

LEGEND

● B–47	SOIL BORING
⊙ B–45/PZ–11	PIEZOMETER
TP 2	TEST PIT LOCATION

REV.	DATE	BY	DESCRIPTION

GENESIS ENVIRONMENTAL CONSULTING, INC. No.77

MERRICK ROTENBERRY No 1822

GEC

GENESIS
ENVIRONMENTAL CONSULTING, INC.

11400 West Baseline Road
Little Rock, AR 72209
(501) 455–2199

SOIL BORING AND PIEZOMETER LOCATION MAP

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION

CLASS 3N SOLID WASTE FACILITY

PLUM POINT ENERGY ASSOCIATES, LLC

MISSISSIPPI COUNTY ARKANSAS

FIGURE 3

DESIGNED BY:	MR
DRAWN BY:	ABS
APPVD. BY:	MR
SCALE:	1" = 300'
DATE:	7/12/01
JOB NO.	084–001–01008
ACAD NO.	015
SHEET NO.:	OF

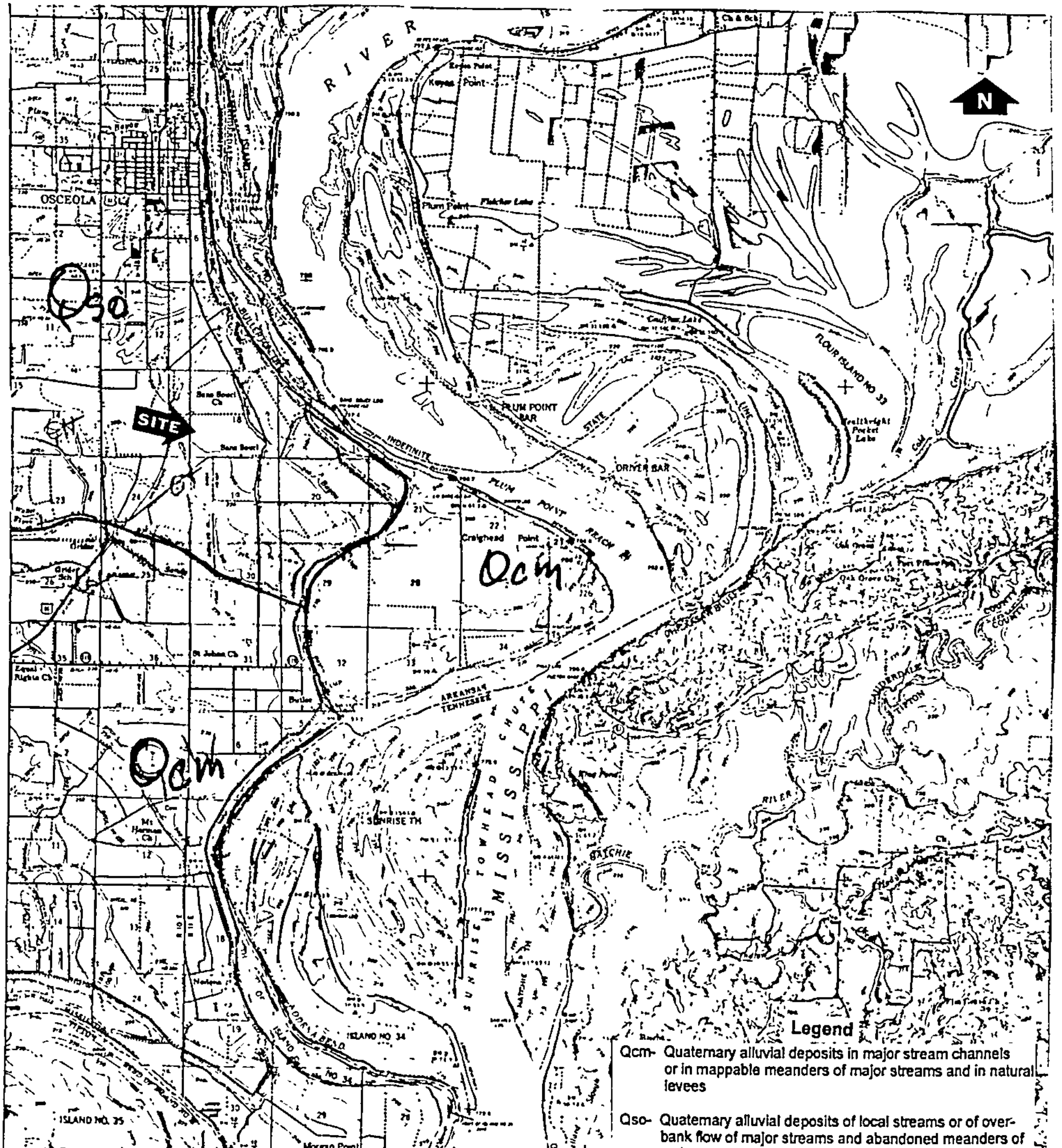


FIGURE 4

GEOLOGIC WORKSHEET

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
CLASS 3N SOLID WASTE FACILITY

MISSISSIPPI COUNTY

ARKANSAS

DESIGNED BY:	MR
CHECKED BY:	MR
DRAWN BY:	ABS
MONTH/YEAR	JUNE, 2001

GEC
GENESIS
ENVIRONMENTAL CONSULTING, INC.

11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

PROJECT NO.:	084-001-01008
DATE:	6/1/01
SCALE:	N.T.S.
ACAD NO.:	A1TITLE.DWG

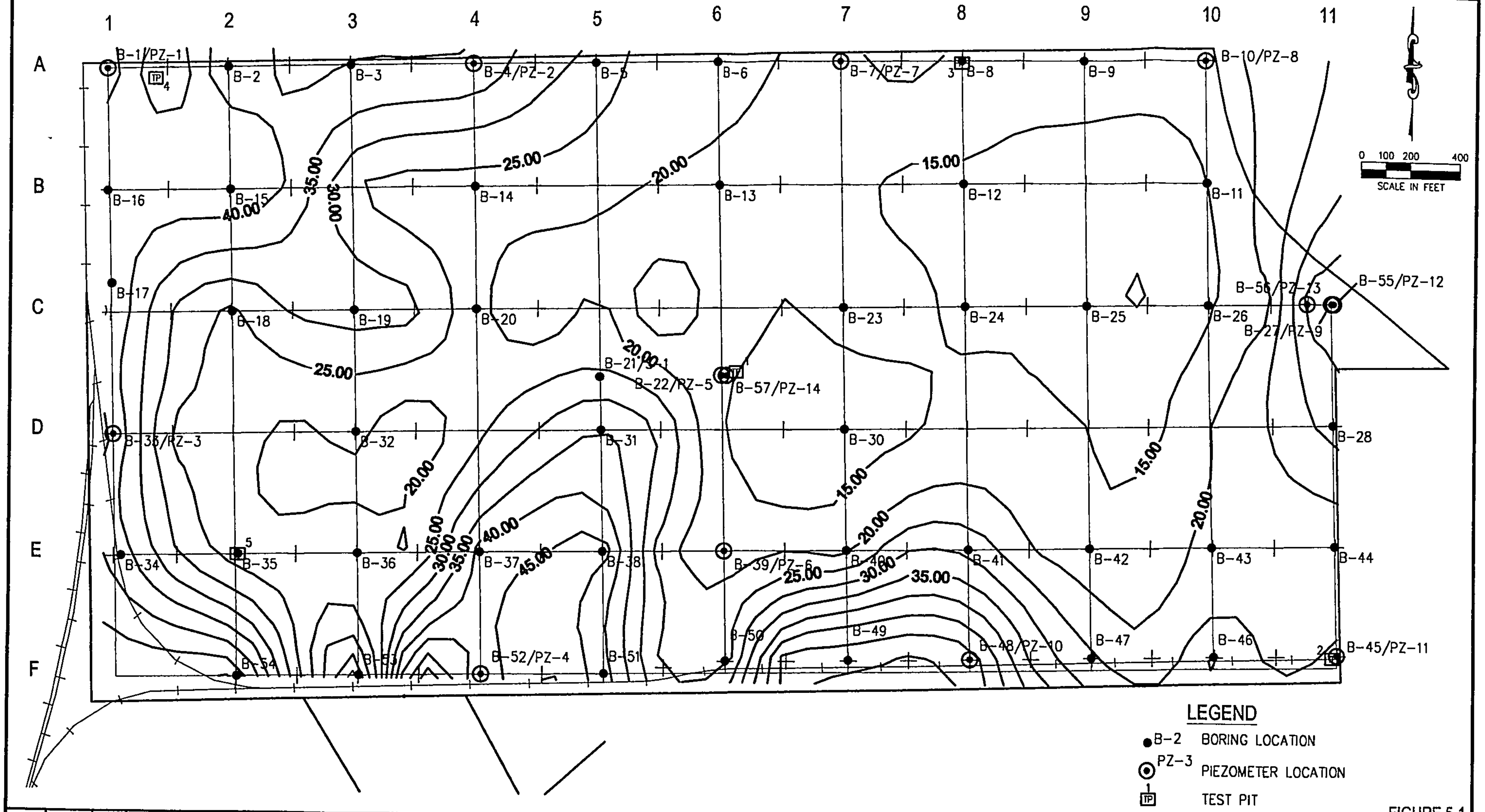


FIGURE 5-1

SURFACE CONDUCTIVITY RESULTS (10M HD)

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
CLASS 3N SOLID WASTE FACILITY

MISSISSIPPI COUNTY ARKANSAS

REV.	DATE	BY	DESCRIPTION

DESIGNED BY:	MR
CHECKED BY:	MR
DRAWN BY:	ABS
MONTH/YEAR	JUNE 2001

GEC
GENESIS
ENVIRONMENTAL CONSULTING, INC.
11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

PROJECT NO.:	084-001-01008
DATE:	6/7/01
SCALE:	1" = 400'
ACAD NO.:	003

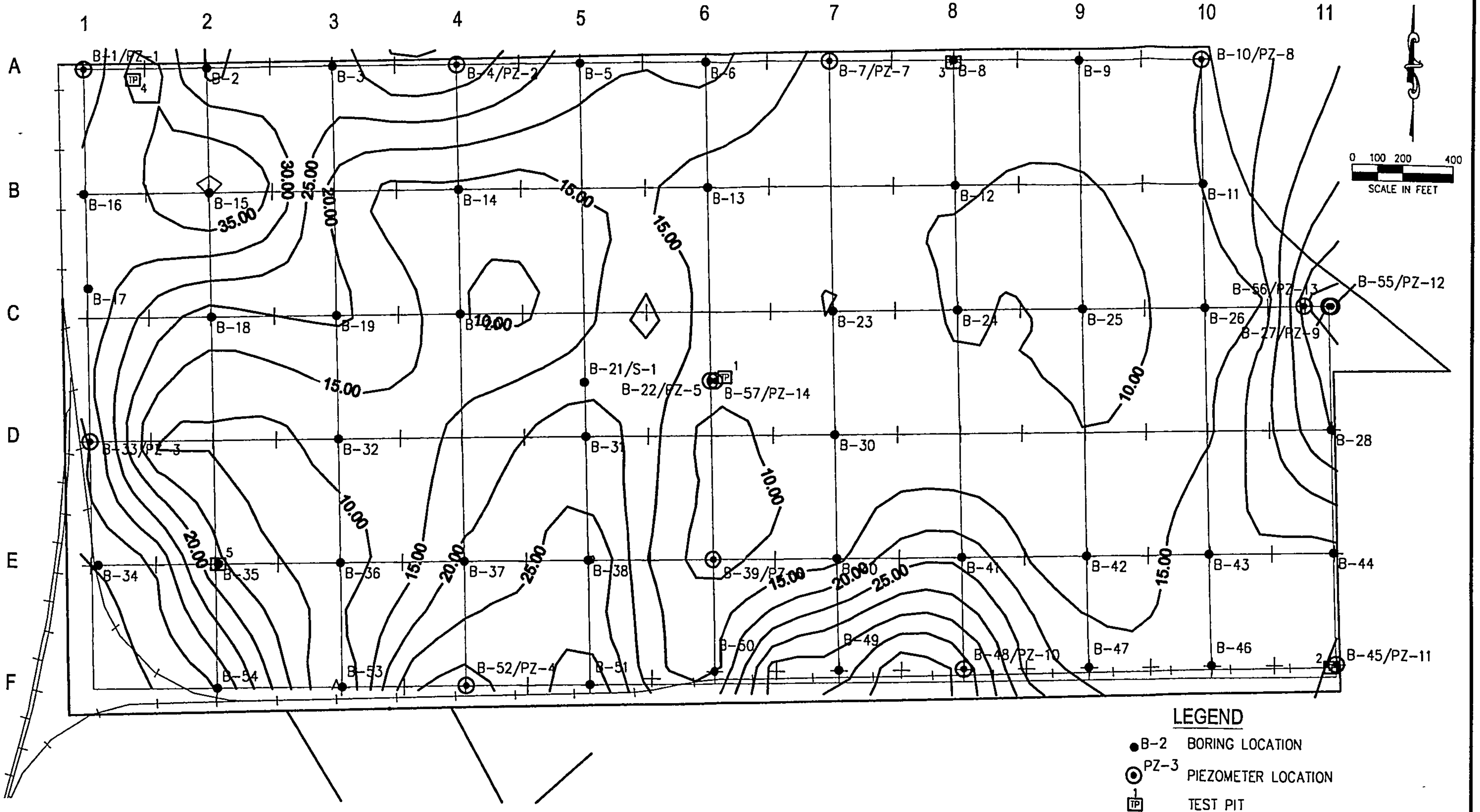


FIGURE 5-2

SURFACE CONDUCTIVITY RESULTS (10M VD)

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
CLASS 3N SOLID WASTE FACILITY

MISSISSIPPI COUNTY

ARKANSAS

REV.	DATE	BY	DESCRIPTION

DESIGNED BY:	MR
CHECKED BY:	MR
DRAWN BY:	ABS
MONTH/YEAR	JUNE 2001

GEC
GENESIS
ENVIRONMENTAL CONSULTING, INC
11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

PROJECT NO.:	084-001-01008
DATE:	6/7/01
SCALE:	1" = 400'
ACAD NO.:	004

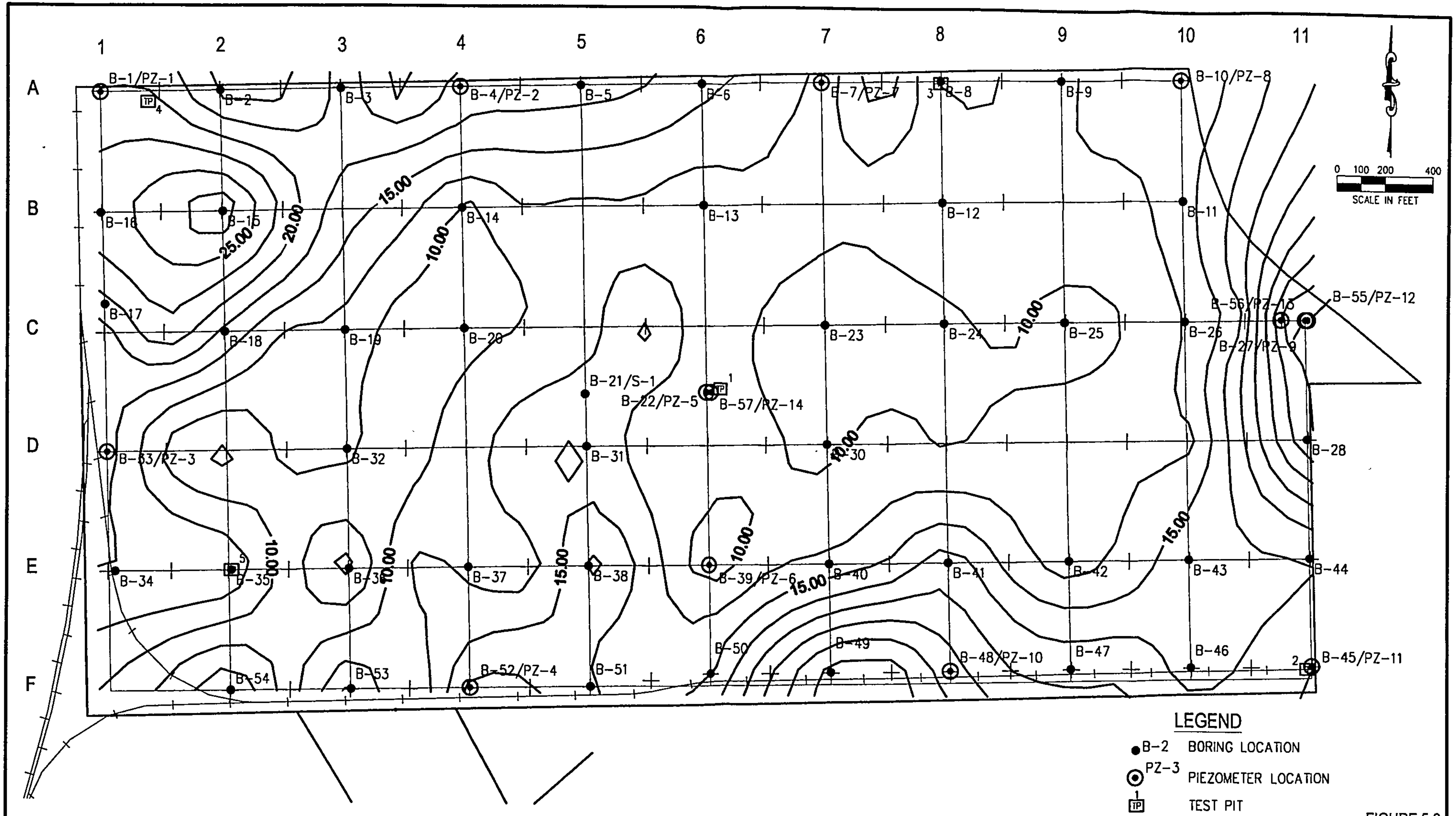


FIGURE 5-3

REV.	DATE	BY	DESCRIPTION

SURFACE CONDUCTIVITY RESULTS (20M VD)

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
CLASS 3N SOLID WASTE FACILITY

MISSISSIPPI COUNTY ARKANSAS

DESIGNED BY:	MR
CHECKED BY:	MR
DRAWN BY:	ABS
MONTH/YEAR	JUNE 2001

GEC
GENESIS
ENVIRONMENTAL CONSULTING, INC.
11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

PROJECT NO.:	084-001-01008
DATE:	6/7/01
SCALE:	1" = 400'
ACAD NO.:	005

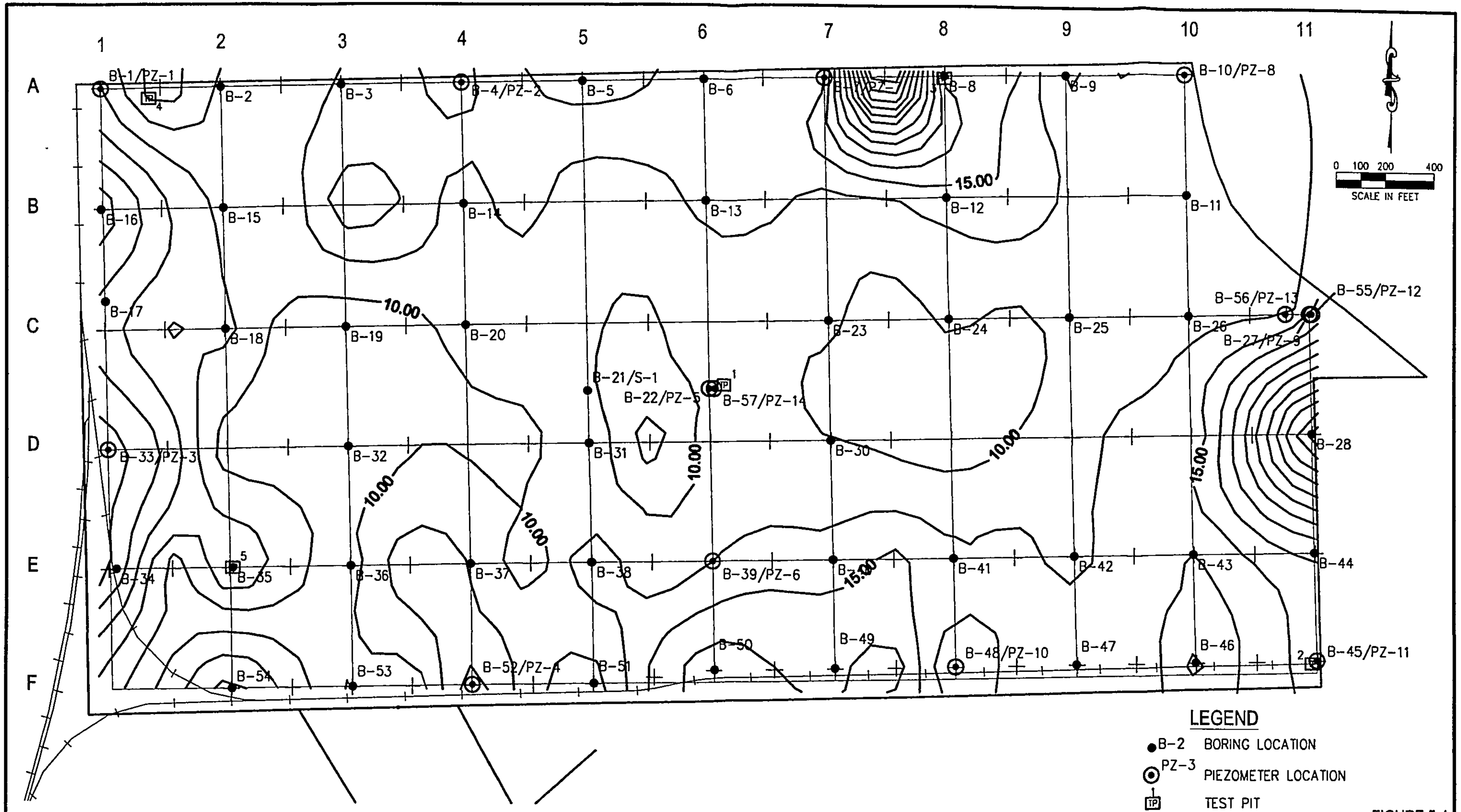


FIGURE 5-4

REV.	DATE	BY	DESCRIPTION

SURFACE CONDUCTIVITY RESULTS (40M VD)

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
CLASS 3N SOLID WASTE FACILITY

MISSISSIPPI COUNTY ARKANSAS

DESIGNED BY:	MR
CHECKED BY:	MR
DRAWN BY:	ABS
MONTH/YEAR	JUNE 2001

GEC
GENESIS
ENVIRONMENTAL CONSULTING, INC.
11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

PROJECT NO.:	084-001-01008
DATE:	6/7/01
SCALE:	1" = 400'
ACAD NO.:	006

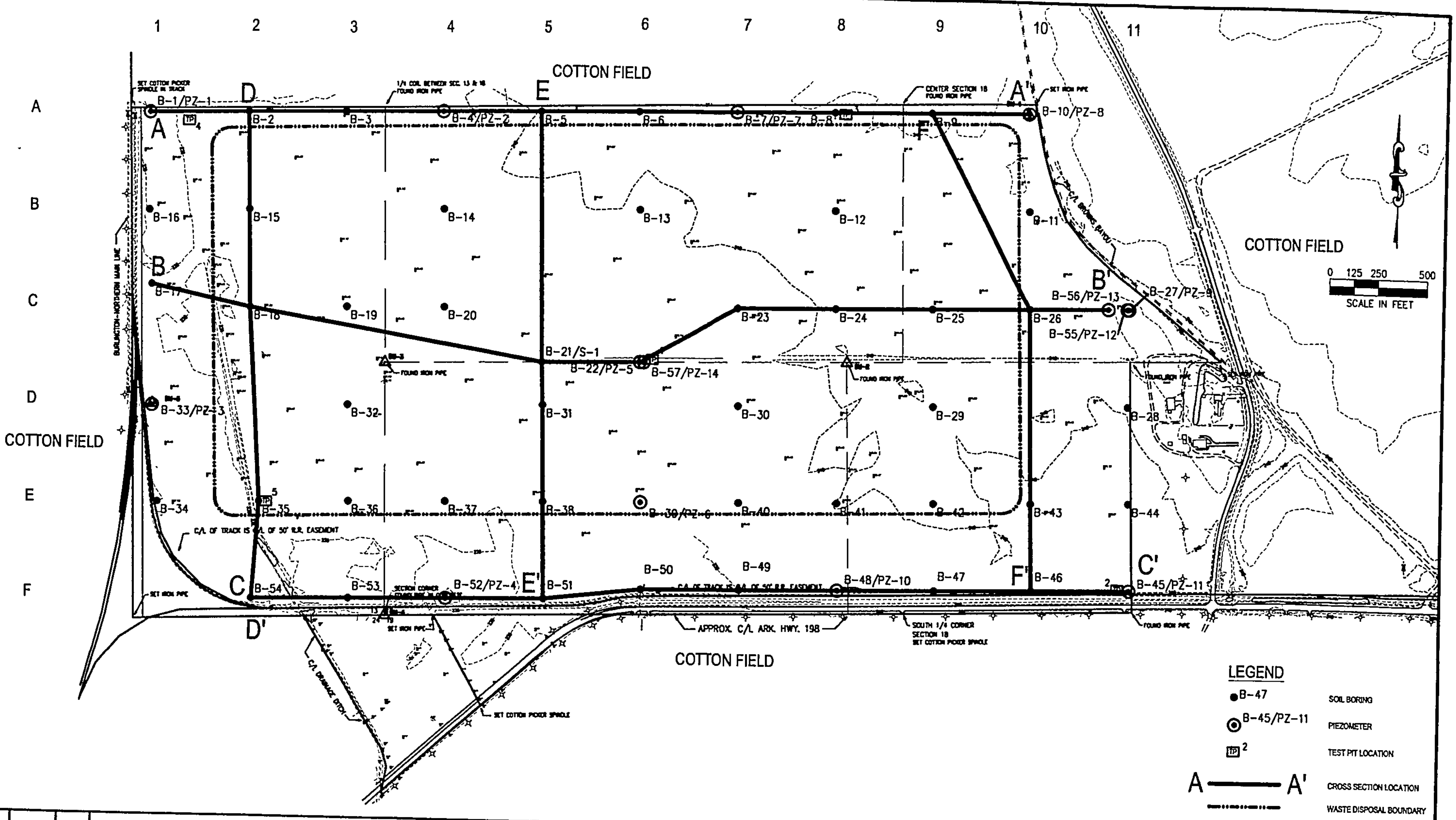


FIGURE 6

CROSS SECTION LOCATION MAP

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
PLUM POINT ENERGY STATION

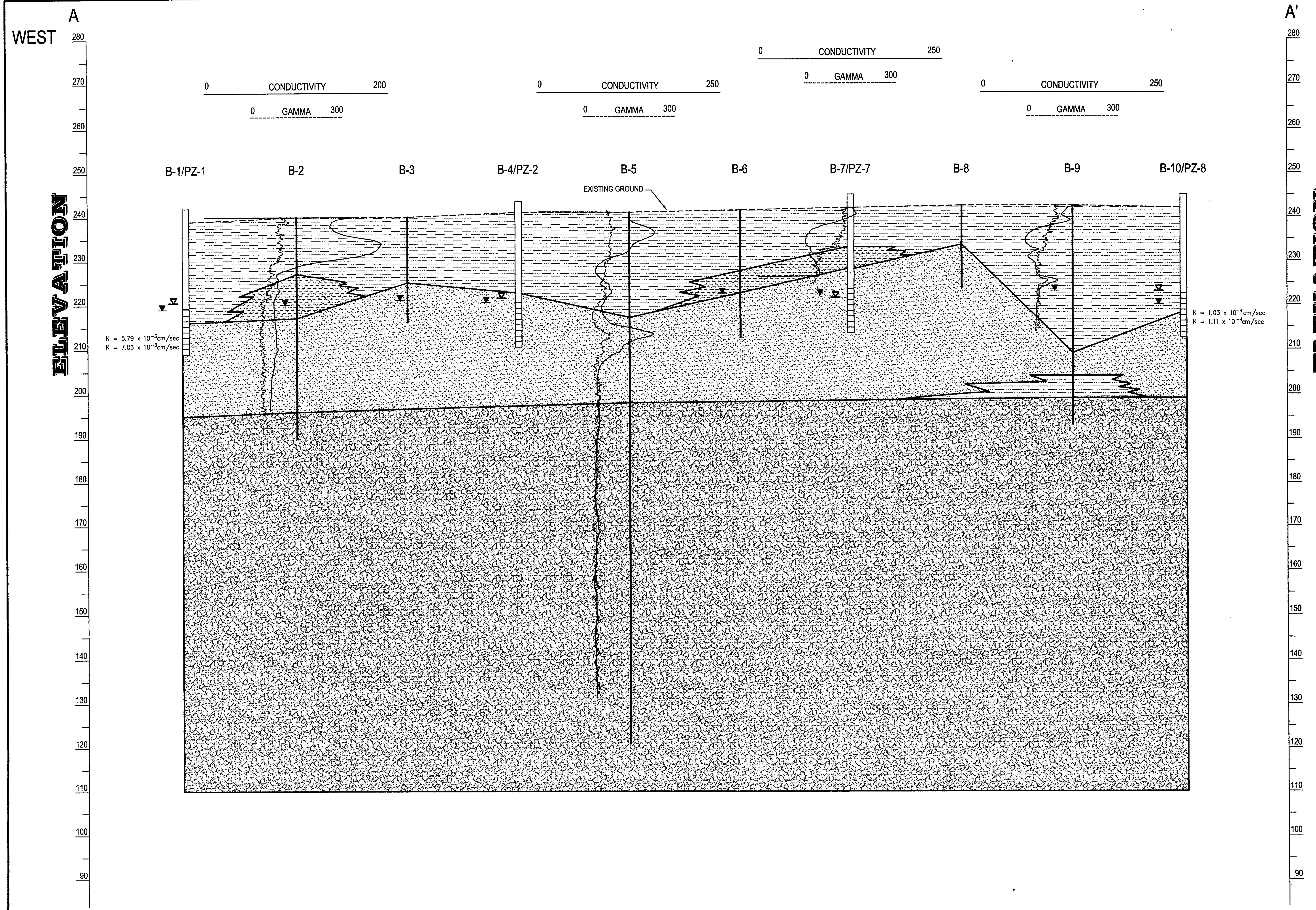
MISSISSIPPI COUNTY
ARKANSAS

REV.	DATE	BY	DESCRIPTION

DESIGNED BY:	MR
CHECKED BY:	MR
DRAWN BY:	TSW
MONTH/YEAR	JUNE 2001

GEC
GENESIS
ENVIRONMENTAL CONSULTING, INC
11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

PROJECT NO.:	084-001-01008
DATE:	6/20/01
SCALE:	1" = 500'
ACAD NO.:	036



LEGEND

▤	CLAY AND SILTY CLAY. PERCENTAGE OF SILT VARIES. OCCASIONAL FINE SAND PRESENT
▨	SILTY SAND
▨	FINE TO COARSE SAND WITH SOME SILT AND CLAY
▩	SAND AND GRAVEL. SOME SILT AND CLAY
▼	DEPTH TO GROUNDWATER ENCOUNTERED DURING DRILLING
∇	STATIC GROUNDWATER ELEVATION
	GAMMA GEOPHYSICAL PLOT
	CONDUCTIVITY GEOPHYSICAL PLOT
B-2	BORING LOCATION
B-1/PZ-1	PIEZOMETER LOCATION
K = 1.11 x 10^{-4}cm/sec	SLUG TEST RESULTS

NOTE:

BORINGS B-5 AND B-8 WERE DRILLED BY WASH ROTARY AND THE DEPTH TO GROUNDWATER WAS NOT DETERMINED.

SCALES:

1" = 200' (HORIZONTAL)
1" = 10' (VERTICAL)
VERTICAL EXAGGERATION = 20X

REV.	DATE	BY	DESCRIPTION

CERTIFICATE OF AUTHORIZATION
GENESIS ENVIRONMENTAL CONSULTING, INC.
No.77
ARKANSAS-ENGINEER

STATE OF ARKANSAS
MERRICK ROTENBERRY
1822
REGISTERED PROFESSIONAL GEOLOGIST

GEC
GENESIS
ENVIRONMENTAL CONSULTING, INC.
11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

CROSS SECTION A - A'

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION

CLASS 3N SOLID WASTE FACILITY

PLUM POINT ENERGY ASSOCIATES, LLC

MISSISSIPPI COUNTY ARKANSAS

FIGURE 7-1

DESIGNED BY:	MR
DRAWN BY:	TSW
APPVD. BY:	MR
SCALE:	AS SHOWN
DATE:	7/11/01
JOB NO.	084-001-01080
ACAD NO.	037
SHEET NO.:	OF

NOTE:

BORINGS B-17, B-21 AND B-26 WERE DRILLED BY WASH ROTARY AND THE DEPTH TO GROUNDWATER WAS NOT DETERMINED

SCALES:

1" = 200' (HORIZONTAL)
1" = 10' (VERTICAL)
VERTICAL EXAGGERATION = 20X

REV.	DATE	BY	DESCRIPTION

GENESIS ENVIRONMENTAL CONSULTING, INC. No.77

MERRICK ROTENBERRY No. 1822

GEC

GENESIS
ENVIRONMENTAL CONSULTING, INC.

11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

CROSS SECTION B - B'

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION

CLASS 3N SOLID WASTE FACILITY

PLUM POINT ENERGY ASSOCIATES, LLC

MISSISSIPPI COUNTY ARKANSAS

FIGURE 7-2

DESIGNED BY:	MR
DRAWN BY:	TSW
APPVD. BY:	MR
SCALE:	AS SHOWN
DATE:	7/12/01
JOB NO.	084-001-01080
ACAD NO.	038
SHEET NO.:	OF

NOTE:

BORINGS B-54, B-51, B-50, B-47 AND B-46 WERE DRILLED BY WASH ROTARY AND THE DEPTH TO GROUNDWATER WAS NOT DETERMINED

SCALES:

1" = 200' (HORIZONTAL)
1" = 10' (VERTICAL)
VERTICAL EXAGGERATION = 20X

REV.	DATE	BY	DESCRIPTION

GENESIS ENVIRONMENTAL CONSULTING, INC.
No.77

MERRICK ROTENBERRY
1822

GEC

GENESIS
ENVIRONMENTAL CONSULTING, INC.

11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

CROSS SECTION C - C'

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION

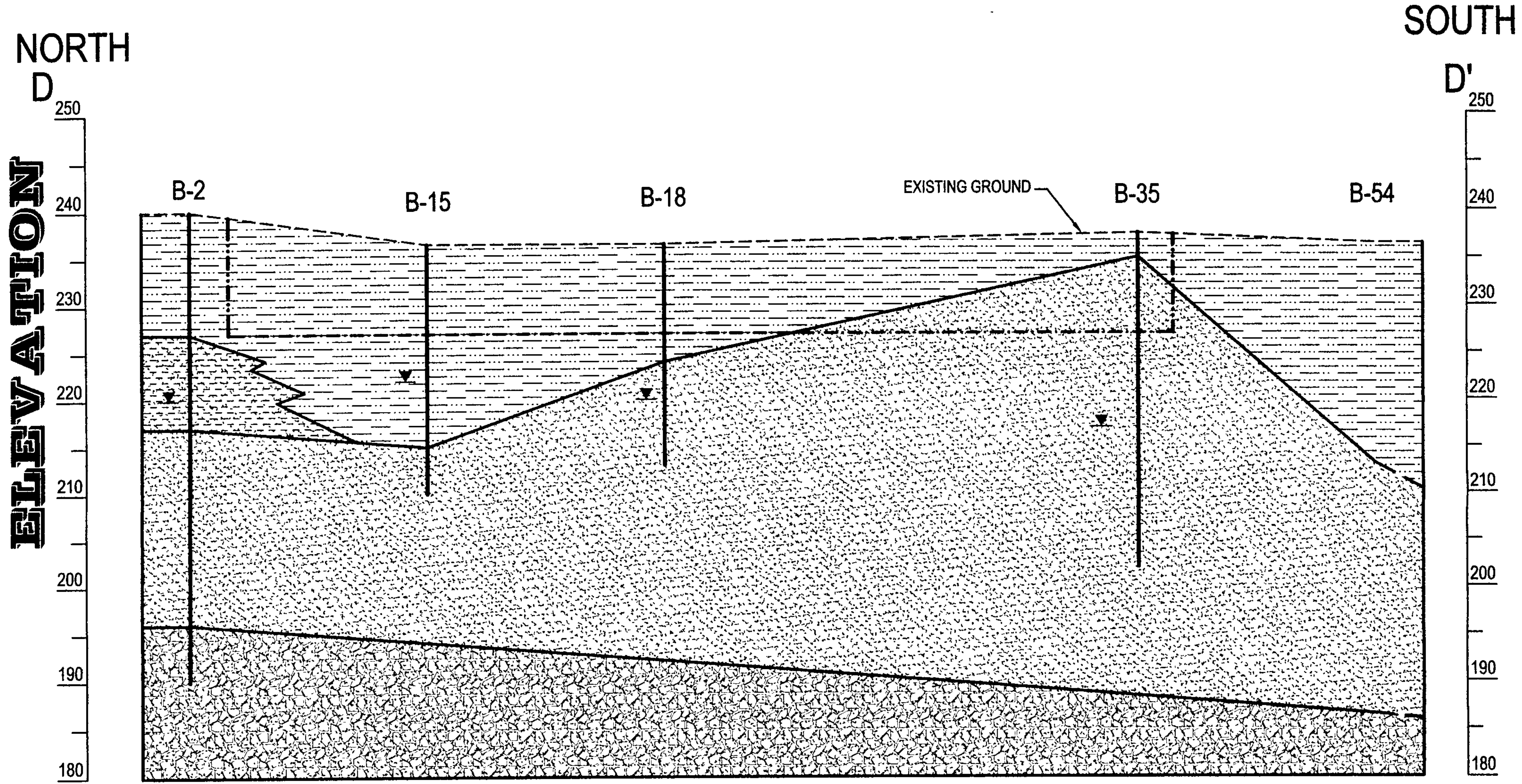
CLASS 3N SOLID WASTE FACILITY

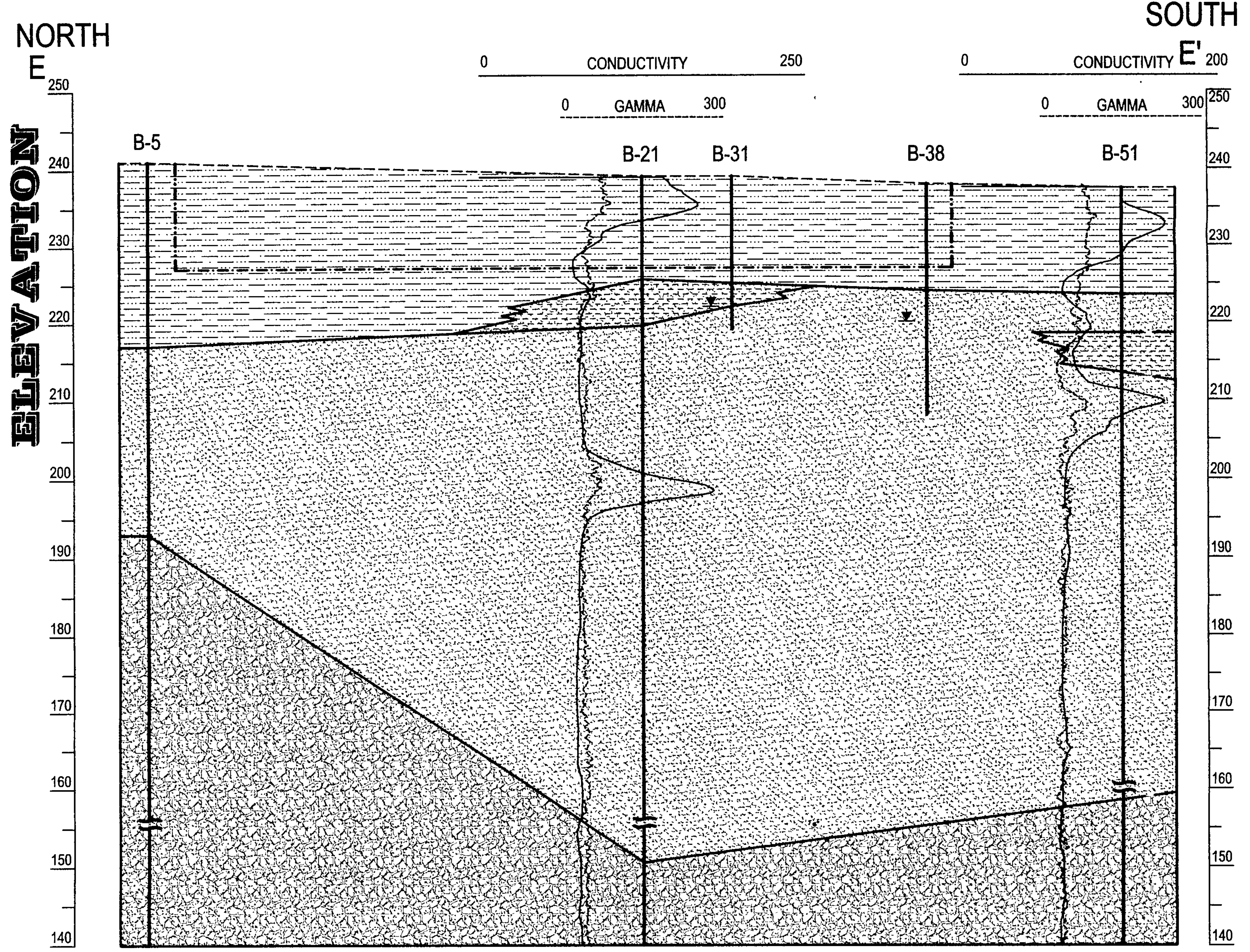
PLUM POINT ENERGY ASSOCIATES, LLC

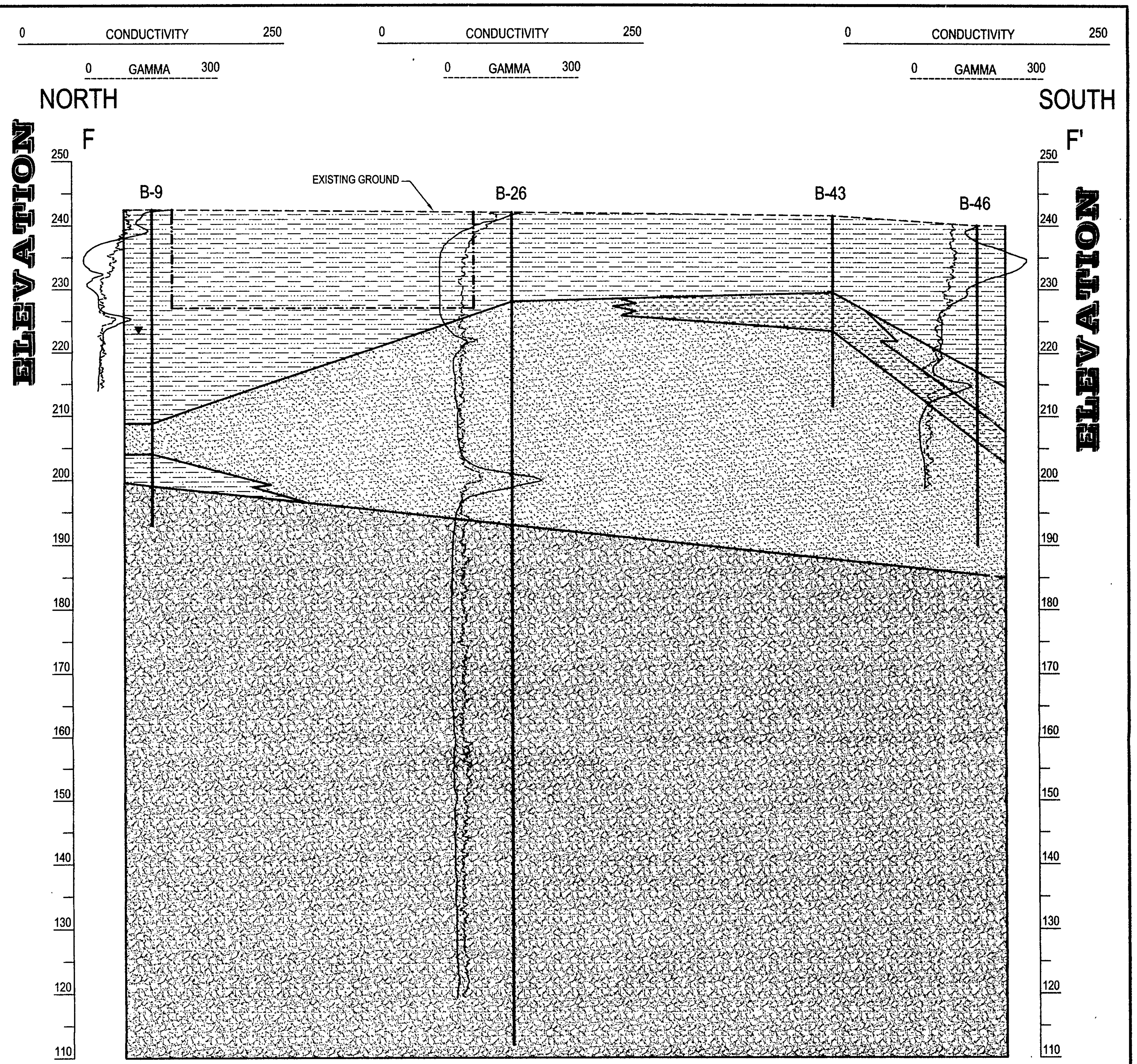
MISSISSIPPI COUNTY ARKANSAS

FIGURE 7-3

DESIGNED BY:	MR
DRAWN BY:	TSW
APPVD. BY:	MR
SCALE:	AS SHOWN
DATE:	7/12/01
JOB NO.	084-001-01080
ACAD NO.	039
SHEET NO.:	OF







NOTE:

BORINGS B-5, B-26, B-21, B-43, B-46, B-54 AND B-51 WERE DRILLED BY WASH ROTARY AND THE DEPTH TO GROUNDWATER WAS NOT DETERMINED

LEGEND

▤	CLAY AND SILTY CLAY. PERCENTAGE OF SILT VARIES. OCCASIONAL FINE SAND PRESENT
▨	SILTY SAND
▧	FINE TO COARSE SAND WITH SOME SILT AND CLAY
▩	SAND AND GRAVEL. SOME SILT AND CLAY
≋	GAMMA GEOPHYSICAL PLOT
≋	CONDUCTIVITY GEOPHYSICAL PLOT
B-54 │	BORING LOCATION
B-52/PZ-4 ▯	PIEZOMETER LOCATION
▼	DEPTH TO GROUNDWATER ENCOUNTERED DURING DRILLING
▽	STATIC GROUNDWATER ELEVATION
—··—··—	WASTE DISPOSAL BOUNDARY
—·—·—	MAXIMUM DEPTH OF EXCAVATION FOR CONTAINMENT STRUCTURE. TOP OF FINAL LINER SYSTEM WILL BE 3 FEET HIGHER IN ELEVATION

SCALES:

1" = 200' (HORIZONTAL)
1" = 10' (VERTICAL)
VERTICAL EXAGGERATION = 20X

REV.	DATE	BY	DESCRIPTION

GENESIS ENVIRONMENTAL CONSULTING, INC. No.77

MERRICK ROTENBERRY 1822

GEC

GENESIS
ENVIRONMENTAL CONSULTING, INC.

11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

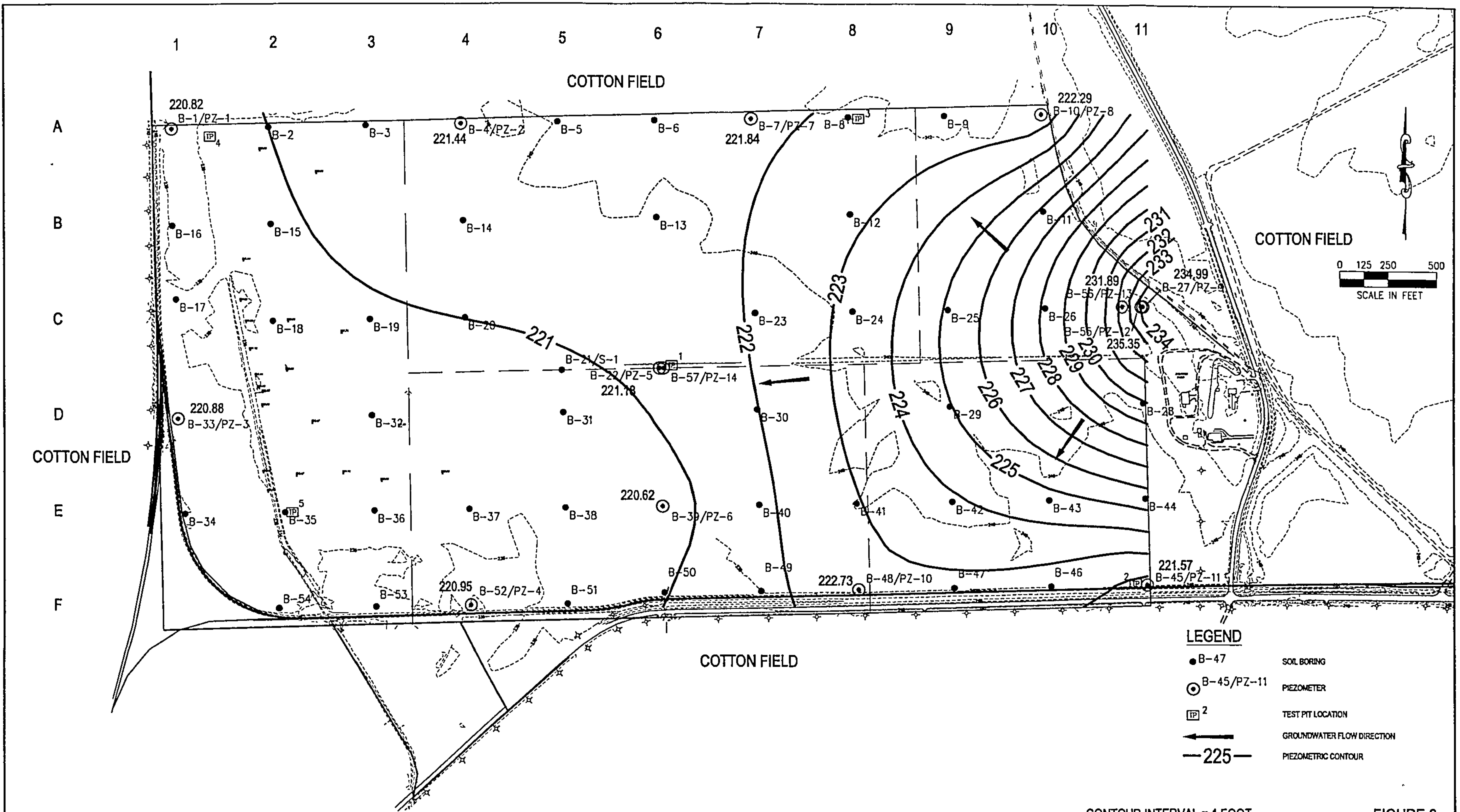
CROSS SECTIONS D - D', E - E', AND F - F'

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
CLASS 3N SOLID WASTE FACILITY
PLUM POINT ENERGY ASSOCIATES, LLC

MISSISSIPPI COUNTY ARKANSAS

FIGURE 7-4

DESIGNED BY:	MR
DRAWN BY:	TSW
APPVD. BY:	MR
SCALE:	AS SHOWN
DATE:	7/12/01
JOB NO.	084-001-01080
ACAD NO.	040
SHEET NO.:	OF



CONTOUR INTERVAL = 1 FOOT

FIGURE 8

GROUNDWATER FLOW MAP

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
CLASS 3N SOLID WASTE FACILITY

MISSISSIPPI COUNTY

ARKANSAS

REV.	DATE	BY	DESCRIPTION

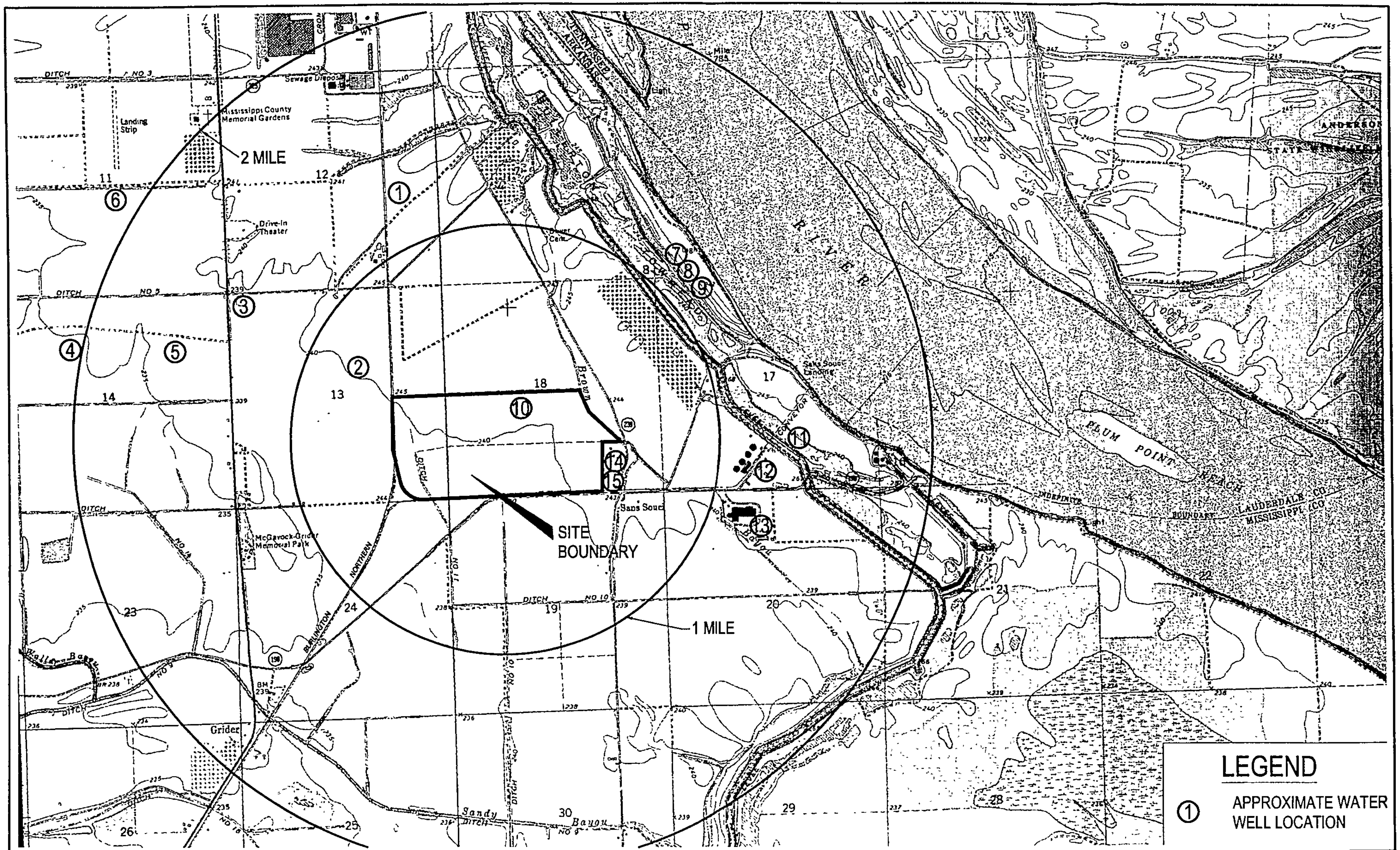
DESIGNED BY:	MR
CHECKED BY:	MR
DRAWN BY:	TSW
MONTH/YEAR	JUNE 2001

GEC
GENESIS
ENVIRONMENTAL CONSULTING, INC.

11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

PROJECT NO.:	084-001-01008
DATE:	7/12/01
SCALE:	1" = 500'
ACAD NO.:	042

APPENDIX A
WATER WELL LOGS AND WELL LOCATION MAP



REV	DATE	BY	DESCRIPTION

CERTIFICATE OF AUTHORIZATION
GENESIS ENVIRONMENTAL CONSULTING, INC.
No. 77
ARKANSAS ENGINEER

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
No 8946
BRIAN EDWARDS

GEC

GENESIS
ENVIRONMENTAL CONSULTING, INC.

11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

AREA WATER WELLS LOCATION MAP

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION

CLASS 3N SOLID WASTE FACILITY

PLUM POINT ENERGY ASSOCIATES, LLC

MISSISSIPPI COUNTY ARKANSAS

DESIGNED BY	JRB
DRAWN BY	ABS
APPVD BY	BE
SCALE	1" = 1000
DATE	6/1/01
JOB NO.	064-001-01008
ACAD NO.	019
SHEET NO.	OF

①

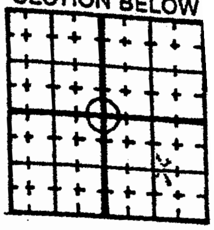
STATE OF ARKANSAS
REPORT ON WATER WELL CONSTRUCTION & PUMP INSTALLATION

A 1 Contractor Name & Number: Gipson Well Co. C# 1205
2 Driller Name & Number: Charlie Agee D# 2607
3 Pump Installer Name & Number: Leon P. Gipson Jr. P# 4378
4 Date Well Completed: 5-20-93 New Well ☒ Replace or Work-over ☐

5 COUNTY: Mississippi
6 FRACTION: NE ¼ of SE ¼ of
7 SECTION: 12
8 TOWNSHIP: 12 N
9 RANGE: 10 E

LONGITUDE 11 ____° ____' ____"
LATITUDE 11 ____° ____' ____"

10 LOCATE WITH 'X' IN SECTION BELOW



B 1 DESCRIPTION OF FORMATION: DEPTHS IN FEET

	FROM	TO
Clay	0	15
Fine Sand	15	45
Cor. Sand-Med. Sand	45	55
Coarse Sand	55	82
Cor. Sand & Gravel	82	100

ATTACH ADDITIONAL SHEETS IF NECESSARY

2 TOTAL DEPTH OF WELL 100 ft
3 DEPTHS TO WATER PRODUCING FORMATIONS. 15'
4 STATIC WATER LEVEL 6 Ft below land surface
5 YIELD 2000+ gallons per ☒ min ☐ hr
6 DIAMETER OF BORE HOLE 22 IN

C PUMP REPORT Customer's Pump

1 TYPE PUMP: SUBMERSIBLE ☐ TURBINE ☒ JET ☐
2 SETTING DEPTH: 60 FEET
3 BRAND NAME AND SERIAL NUMBERS:
Delta S#-5013 Amarillo 60HP S#-164854
4 RATED CAPACITY 3200 gallons per minute
5 TYPE LUBRICATION water
6 DROP PIPE OR COLUMN PIPE SIZE 10 x 1 3/16
7 WIRE SIZE NA
8 PRESSURE TANK . . . SIZE, MAKE, MODEL
NA
9 DATE OF INSTALLATION OR REPAIR 7-7-93
10 Is there an abandoned water well on the property? no

D 1 LAND OWNER OR OTHER CONTACT PERSON:

NAME Capital Ag #7
STREET ADDRESS 5050 Poplar Ave.
Suite 2220
CITY Memphis TN 38157 Job #-G239-071-935

2 CASING FROM 0 TO 60 W/ 16 "ID
FROM TO W/ "ID
TYPE CASING: Steel

3 SCREEN
TYPE: V-wire DIA 16 SLOT/GA
SET FROM 60 FT TO 100 FT
TYPE: DIA SLOT/GA
SET FROM FT TO FT

4 GRAVEL PACK FROM 15 FT TO 100 F

5 BACK FILLED WITH: Drill Cuttings
FROM 0 FT TO 15 FT

6 SEALED WITH:
FROM FT TO FT
FROM FT TO FT

7 DISINFECTED WITH: chlorine

8 USE OF WELL:

DOMESTIC	☐	COMMERCIAL	☐
IRRIGATION	☒	MONITOR	☐
LIVESTOCK/POULTRY	☐	TEST WELL	☐
OIL/GAS SUPPLY	☐	SEMI-PUBLIC	☐
PUBLIC SUPPLY	☐	OTHER	

(A/C HEATPUMP TYPE WELLS)
SOURCE ☐ RETURN ☐
CLOSED LOOP ☐

9 (For A/C only) Will system also be used for purposes other tha
Heating or Air Conditioning?
If yes, name use: yes ☐ no ☐

10 (For A/C open-loop only) Into what medium is water returne

11 REMARKS

12 SIGNED DATE 7-

②

STATE OF ARKANSAS
REPORT ON WATER WELL CONSTRUCTION AND PUMP INSTALLATION

A 1 Contractor Name & Number: Gipson Well Company C# 1205

2 Driller Name & Number: Charlie Agee D# 2607

3 Pump Installer Name & Number: Dave L. Gipson P# 4511

4 DATE WELL DRILLED: 11-18-98 New Well (x) Replace or Work-over ( )

10 LOCATE WITH ' X ' IN SECTION BELOW

5 to 9 FRACTION, SECTION, TOWNSHIP, RANGE, COUNTY
MISSISSIPPI CTY AR
2 MILES S OF OSCEOLA OFF HWY 61 SW NE Sec. 13 T12N R10E

LATITUDE	LONGITUDE	GIPSON WELL NO.
11 353950	895808	G980-458-9811AP

B 1 DESCRIPTION OF FORMATION: DEPTHS IN FEET

WL 16'
0-22 CLAY
22-35 CLAY & FS MIX
35-40 MCS
40-45 CS
45-48 CLAY
48-63 MS
63-105 CS CSG
105-107 CSG CLY MIX

2 TOTAL DEPTH OF WELL 105 ft

3 DEPTHS TO WATER PRODUCING FORMATIONS 22 ft

4 STATIC WATER LEVEL 16 ft below land surface

5 YIELD: 2000 + gallons per min

6 DIAMETER OF BORE HOLE 22 inchs

C PUMP REPORT

1 NATIONAL PUMP SN: 52841 W/
1-60 HP JOHNSON GEARDRIVE SN: 153652
60' X 10" X 1 1/4" COL & SHAFT
#14 PUMP BOWL
1- 10" SUCTION PIPE
1-10" Z DISCHG PIP W/ 2" AVR. & 10 " BELL

2 TYPE PUMP: SUBMERSIBLE TURBINE (X)

3 SETTING DEPTH: (60) FEET

4 RATED CAPACITY: (3500) gallons per minute

5 TYPE LUBRICATION: (WATER)

6 DROP PIPE OR COLUMN PIPE SIZE (10) inch

7 WIRE SIZE (N/A)

8 PRESSURE TANK . . . SIZE, MAKE, MODEL
N/A

9 DATE OF INSTALLATION OR REPAIR: 11/30/SS

10 Is there an abandoned water well on the property? (N)

D 1 LAND OWNER OR OTHER CONTACT PERSON:

DILLDINE FARMS
540 E ST HIGHWAY 239
BLYTHEVILLE AR 72315

2 MATERIALS USED CASING

16" PVC SCREEN 40' FROM (0) TO (6
16" PVC CASING 65'
1 BAGS POLY SCREEN
12 BAGS PLUG FROM (65) TO (10

3 GRAVEL PACK FROM (5) TO 10

4 BACK FILLED WITH GRAVEL PACK
FROM (5) TO (10

5 SEALED WITH HOLEPLUG: BENTONITE CHIPS
FROM (0) TO (

6 USE OF WELL:
DOMESTIC
IRRIGATION (X)
LIVESTOCK/POULTRY
PUBLIC SUPPLY
COMMERCIAL

7 DISINFECTED WITH: CHLORINE

8 (For A/C only) Will system also be used for purposes other than Heating or Air Conditioning?
If yes, name use:

9 (For A/C open-loop only) Into what medium is water returned?

REMARKS:

11 SIGNED Marcella Gale DATE 11 30

③

STATE OF ARKANSAS
REPORT ON WATER WELL CONSTRUCTION & PUMP INSTALLATION

A

1 Contractor Name & Number: Gipson Well Co. C# 1205

2 Driller Name & Number: Charlie Agee D# 2607

3 Pump Installer Name & Number: Leon P. Gipson Jr. P# 4378

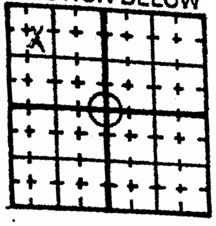
4 Date Well Completed: 5-21-93 New Well ☒ Replace or Work-over ☐

5 COUNTY	6 FRACTION	7 SECTION	8 TOWNSHIP	9 RANGE
Mississippi	NW ¼ of NW ¼ of	13	12 N	10 E

LONGITUDE 11 ____ ° ____ ' ____ "

LATITUDE 11 ____ ° ____ ' ____ "

10 LOCATE WITH 'X' I SECTION BELOW



B 1 DESCRIPTION OF FORMATION: DEPTHS IN FEET

	FROM	TO
Clay	0	12
Fine Sand	12	40
Cor. Sand, Med. Sand Mix	40	71
Cor. Sand, Very Cor. Sand & Gravel	71	112

ATTACH ADDITIONAL SHEETS IF NECESSARY

2 TOTAL DEPTH OF WELL 112 ½ ft

3 DEPTHS TO WATER PRODUCING FORMATIONS. 12'

4 STATIC WATER LEVEL 4 Ft below land surface

5 YIELD 2000 ± gallons per ☒ min ☐ hr

6 DIAMETER OF BORE HOLE 22 IN

C PUMP REPORT Customer's Pump

1 TYPE PUMP: SUBMERSIBLE ☐ TURBINE ☐ JET ☐

2 SETTING DEPTH: 60 FEET

3 BRAND NAME AND SERIAL NUMBERS:
Elec.Motor 60HP U.S. ID#-6234A,V10V265R128R-5 (VHS)

4 RATED CAPACITY 3200 gallons per minute

5 TYPE LUBRICATION water

6 DROP PIPE OR COLUMN PIPE SIZE 10 x 1 3/16

7 WIRE SIZE NA

8 PRESSURE TANK . . . SIZE, MAKE, MODEL
NA

9 DATE OF INSTALLATION OR REPAIR 5-13-93

10 Is there an abandoned water well on the property? NO

D 1 LAND OWNER OR OTHER CONTACT PERSON:

NAME Capital Ag #8
STREET ADDRESS 5050 Poplar Ave.
Suite 2220
CITY Memphis TN 38157 Job#- G240-072-93

2 CASING FROM 0 TO 72 ½ W/ 16 "ID
FROM TO W/ "ID
TYPE CASING: Steel

3 SCREEN
TYPE: V-wire DIA 16 SLOT/GA
SET FROM 72 ½ FT TO 112 ½ FT
TYPE: DIA SLOT/GA
SET FROM FT TO FT

4 GRAVEL PACK FROM 15 FT TO 112 ½ F

5 BACK FILLED WITH: Drill Cuttings
FROM 0 FT TO 15 FT

6 SEALED WITH:
FROM FT TO FT
FROM FT TO FT

7 DISINFECTED WITH: chlorine

8 USE OF WELL:

DOMESTIC	☐	COMMERCIAL	☐
IRRIGATION	☒	MONITOR	☐
LIVESTOCK/POULTRY	☐	TEST WELL	☐
OIL/GAS SUPPLY	☐	SEMI-PUBLIC	☐
PUBLIC SUPPLY	☐	OTHER	

(A/C HEATPUMP TYPE WELLS)

SOURCE	☐	RETURN	☐
CLOSED LOOP	☐		

9 (For A/C only) Will system also be used for purposes other tha
Heating or Air Conditioning?
If yes, name use: yes ☐ no ☐

10 (For A/C open-loop only) Into what medium is water returne

11 REMARKS

12 SIGNED DATE

④

STATE OF ARKANSAS
REPORT ON WATER WELL CONSTRUCTION & PUMP INSTALLATION

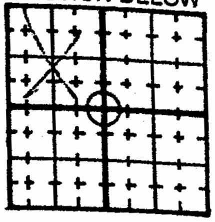
A 1 Contractor Name & Number: Gipson Well Company C# 1205
2 Driller Name & Number: Charlie Agee D# 2607
3 Pump Installer Name & Number: Leon P. Gipson Jr. P# 1378
4 Date Well Completed: 1-30-93 New Well ☑ Replace or Work-over ☐

5 COUNTY	6 FRACTION	7 SECTION	8 TOWNSHIP	9 RANGE
Mississippi	Center of 1/4 of NW ¼ of	14	12 N	10 E

LONGITUDE
11 ____° ____' ____"

LATITUDE
11 ____° ____' ____"

10 LOCATE WITH 'X' IN SECTION BELOW



B 1 DESCRIPTION OF FORMATION: DEPTHS IN FEET

	FROM	TO
Clay	0	12
Fine Sand	12	20
Fine Sand/Medium Fine Sand	20	40
Fine Sand/Medium Fine Sand	40	50
Very Course Sand	50	90
Clay/Course Sand Mix	90	92

ATTACH ADDITIONAL SHEETS IF NECESSARY

2 TOTAL DEPTH OF WELL 90 ft
3 DEPTHS TO WATER PRODUCING FORMATIONS. 12 ft.
4 STATIC WATER LEVEL 7 Ft below land surface
5 YIELD 2000+ gallons per ☑ min ☐ hr
6 DIAMETER OF BORE HOLE 22 IN

C PUMP REPORT (Pump Furnished by Others)
1 TYPE PUMP: SUBMERSIBLE ☐ TURBINE ☑ JET ☐
2 SETTING DEPTH: 50 FEET
3 BRAND NAME AND SERIAL NUMBERS:
J-Line SN14468 / Elect. Motor ID R038m
4 RATED CAPACITY 1200 gallons per minute
5 TYPE LUBRICATION Water
6 DROP PIPE OR COLUMN PIPE SIZE 8"x1 3/16"
7 WIRE SIZE NA
8 PRESSURE TANK . . . SIZE, MAKE, MODEL
NA
9 DATE OF INSTALLATION OR REPAIR 4-22-93
10 Is there an abandoned water well on the property?
No

D 1 LAND OWNER OR OTHER CONTACT PERSON:
NAME Capital Ag Properties/Prudential
STREET ADDRESS 5050 Poplar Ave.
Suite 2230
CITY Memphis TN Job#G179-MW70 #4

2 CASING FROM 0 TO 50 W/ 12 "ID
FROM TO W/ "ID
TYPE CASING: Steel

3 SCREEN
TYPE: V Slot DIA 12 SLOT/GA .040
SET FROM 50 FT TO 90 FT
TYPE: DIA SLOT/GA
SET FROM FT TO FT

4 GRAVEL PACK FROM 15 FT TO 92 F

5 BACK FILLED WITH: Drilled Cuttings
FROM 0 FT TO 15 FT

6 SEALED WITH: ____
FROM FT TO FT
FROM FT TO FT

7 DISINFECTED WITH: Chlorine

8 USE OF WELL:

DOMESTIC	☐	COMMERCIAL	☐
IRRIGATION	☒	MONITOR	☐
LIVESTOCK/POULTRY	☐	TEST WELL	☐
OIL/GAS SUPPLY	☐	SEMI-PUBLIC	☐
PUBLIC SUPPLY	☐	OTHER	

(A/C HEATPUMP TYPE WELLS)

SOURCE	☐	RETURN	☐
CLOSED LOOP	☐		

9 (For A/C only) Will system also be used for purposes other tha
Heating or Air Conditioning?
If yes, name use: yes ☐ no ☐

10 (For A/C open-loop only) Into what medium is water returnec

11 REMARKS

12 SIGNED DATE 5-25-93

AWD 7 JAN 90 Arkansas Water Well Construction Commission One Capitol Mall Suite 2-C Little Rock AR 72201
ACT 5945

⑤

STATE OF ARKANSAS
REPORT ON WATER WELL CONSTRUCTION & PUMP INSTALLATION

A 1 Contractor Name & Number: Gipson Well Company C# 1205

2 Driller Name & Number: Charlie Agee D# 2607

3 Pump Installer Name & Number: Leon P. Gipson Jr. P# 4378

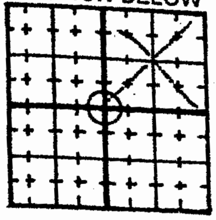
4 Date Well Completed: 12-14-92 New Well ☒ Replace or Work-over ☐

5 COUNTY	6 FRACTION	7 SECTION	8 TOWNSHIP	9 RANGE
Mississippi	Center ¼ of NE ¼ of	14	12 N	10 E

LONGITUDE 11 ____ ° ____ ' ____ "

LATITUDE 11 ____ ° ____ ' ____ "

10 LOCATE WITH 'X' IN SECTION BELOW



B 1 DESCRIPTION OF FORMATION: DEPTHS IN FEET

	FROM	TO
Clay	0	12
Fine Sand	12	20
Clay	20	24
Fine Sand	24	35
Med Sand -Med Course	356	50
Course Sand & Grabel	50	100

ATTACH ADDITIONAL SHEETS IF NECESSARY

2 TOTAL DEPTH OF WELL 100 ft

3 DEPTHS TO WATER PRODUCING FORMATIONS. 12ft

4 STATIC WATER LEVEL 14 Ft below land surface

5 YIELD 2000 + gallons per ☒ min ☐ hr

6 DIAMETER OF BORE HOLE 22 IN

C PUMP REPORT Pump furnished by others

1 TYPE PUMP: SUBMERSIBLE ☐ TURBINE ☒ JET ☐

2 SETTING DEPTH: 50. FEET

3 BRAND NAME AND SERIAL NUMBERS: J-line #-14467 / 40 HP-#R087M

4 RATED CAPACITY 1200 gallons per minute

5 TYPE LUBRICATION water

6 DROP PIPE OR COLUMN PIPE SIZE 8 x 1 3/16"

7 WIRE SIZE NA

8 PRESSURE TANK . . . SIZE, MAKE, MODEL NA

9 DATE OF INSTALLATION OR REPAIR [illegible]

10 Is there an abandoned water well on the property? NO

D 1 LAND OWNER OR OTHER CONTACT PERSON:

NAME Capital Ag Properties / Prudential #3

STREET ADDRESS 5050 Poplar Avenue Suite 2220

CITY Memphis Tenn 38157 Job#G164-MV60-9212 A

2 CASING FROM 0 TO 60 W/ 12 "ID

FROM TO W/ "ID

TYPE CASING: Steel

3 SCREEN

TYPE: V-Wire DIA 12" SLOT/GA .050

SET FROM 60 FT TO 100 FT

TYPE: DIA SLOT/GA

SET FROM FT TO FT

4 GRAVEL PACK FROM 5 FT TO 100 F

5 BACK FILLED WITH: Drill Cuttings

FROM 0 FT TO 5 FT

6 SEALED WITH: Saabs

FROM FT TO FT

FROM FT TO FT

7 DISINFECTED WITH: Chlorine

8 USE OF WELL:

DOMESTIC	☐	COMMERCIAL	☐
IRRIGATION	☒	MONITOR	☐
LIVESTOCK/POULTRY	☐	TEST WELL	☐
OIL/GAS SUPPLY	☐	SEMI-PUBLIC	☐
PUBLIC SUPPLY	☐	OTHER	

(A/C HEATPUMP TYPE WELLS)

SOURCE	☐	RETURN	☐
CLOSED LOOP	☐		

9 (For A/C only) Will system also be used for purposes other than Heating or Air Conditioning?

If yes, name use: yes ☐ no ☐

10 (For A/C open-loop only) Into what medium is water returned

11 REMARKS

12 SIGNED Leon P. Gipson DATE 1-1-93

AWWCC 1 JAN 89 Arkansas Water Well Construction Commission, One Capitol Mall, Suite 2-C, Little Rock, AR 72201

6

...ell X work-over Well____ Replacement Well____

County Mississippi
(in which well is loc

Owner of Well Chitwood Farm Equip.
Contractor J. H. Abel & Son, Inc. C1010
Driller Name and No. Alvin Barton D-2098
Date Well was Completed 8/21/86

Well is near US 61 Hiway
Section 11 Township 12 N Range 10
Directions for Reaching Well: 1½ miles S
(use permanent landm
Osceola on US61 - ½ mile we

1. Total Depth of Well 113 Ft.
2. Water Producing Formation: From 60 Ft. To 113 Ft.
3. Water Level Below Land Surface 9'
4. Gallons per Min 1200
5. Well Disinfected with Not for drinking
6. Casing to 73 Ft.
7. Cased with 12" Diameter steel Casing
8. Cemented from ____ Ft. to ____ Ft.
9. Use of Well: ____ Domestic X Irrigation ____ Municipal ____ Other

Description and Color of Formation (sand, shale, sandstone, etc.)	Depths from	in feet to
Gumbo	0 -	50
Fine sand	50 -	60
sand & gravel	60	100
gravel	100 -	113

Remarks:

Signed: Alvin Barton Date: 8/22/86

Form No. AWD-3

Mail to: Committee on Water Well Construction, 2915 So. Pine Street,
Little Rock, Arkansas 72204

GEOLOGY COPY

6

STATE OF ARKANSAS
REPORT OF WATER WELL CONSTRUCTION

New Well X Work-over Well____ Replacement Well____

County Mississippi
(in which well is located

Owner of Well Chitwood Farm Equip.
Contractor J H Abel & Son, Inc. C1010
Driller Name and No. Alvin Barton D-2098
Date Well was Completed 8/21/86

Well is near US 61 Road
Section 11 Township 12 N Range 10E
Directions for Reaching Well: 1½ miles South of
(use permanent landmark
Osceola on US61 - ½ mile West

1. Total Depth of Well 90 Ft.
2. Water Producing Formation: From ____ Ft. To ____ Ft.
3. Water Level Below Land Surface 9'
4. Gallons per ~~Hour~~ Min 1200
5. Well Disinfected with Not for drinking
6. Casing to 57 Ft.
7. Cased with 12" Diameter steel Casing
8. Cemented from ____ Ft. to ____ Ft.
9. Use of Well: ____ Domestic X Irrigation ____ Municipal ____ Other

Description and Color of Formation (sand, shale, sandstone, etc.)	Depths from	in feet to
Gumbo	0 -	25
Fine sand	25 -	35
Coarse sand	35 -	50
Sand & gravel	50 -	70
gravel	70 -	90

Remarks:

Signed: Alvin Barton Date: 8/22/86

Form No. AWD-3

Mail to: Committee on Water Well Construction, 2915 So. Pine Street
Little Rock, Arkansas 72204

GEOLOGY COPY

NEW WELL ☒ REPLACEMENT WELL ☐

STATE OF ARKANSAS
Report of Water Well Construction

County in which well is located: Mississippi

(Please print or type)

OWNER OF WELL: Union Carbide Corporation
WELL CONTRACTOR: Singer-Layne Ark. Divn.
CONTRACTOR LICENSE NO.: C-1099
NAME OF DRILLER: Herbert C. Johnson
DRILLER REGISTRATION NO.: D-2202
DATE WELL WAS COMPLETED: 9 (MO.) 5 (DAY) 75 (YR.)

Well is near ______ road, approximately ______ miles N NE E SE S SW W NW of ______ (TOWN, ETC.)
Section 8, Township 12 N, Range 11 W
Directions for reaching well: (use permanent landmarks) Northwest corner of lot 35' west of deep well

1. Total Depth of Well 159'5"
2. Water Producing Formation: From 103 ft. To 163 ft.
3. Method of Construction: Rotary X Cable ____ Driven ____ Jetted ____ Bored ____ Dug ____
4. Water Level Below Land Surface 24'4" ft.
5. Gallons per Hour ______ Gallons per Minute 1500
6. Well disinfected with HTH
7. Cased to 93' ft. with 24" Diameter .375 Casing
8. Cemented from 0 ft. to 93' ft.
9. Casing Perforated from ______ ft. to ______ ft.
10. Well Backfilled with: ______ (SAND, CLAY, CEMENT, MUD) from ______ ft. to ______ ft.
11. Gravel Pack from 99 ft. to 159 ft.
12. Screen Diameter: 16 inches from 99 ft. to 159 ft.
13. Type Screen Layne Shutter Fittings S. steel Slot Size $7\frac{1}{2}$
14. Use of Well: ______ DOMESTIC ______ IRRIGATION ______ MUNICIPAL X OTHER

Description and Color of Formation: (Sand, Shale, Sandstone, etc.)	Depths in Feet From	To
Top soil	0	1
Sandy clay	1	8
Fine sand	8	16
Clay	16	20
Medium sand	20	60
Coarse sand	60	100
Coarse sand with small gravel	100	163
Clay	163	168

Remarks:

Signed: WW Krusell

Date: 9 (MONTH) 8 (DAY) 75 (YEAR)

Mail to: Committee on Water Well Construction — 3815 W. Roosevelt Road — Little Rock, Arkansas 72204

GEOLOG OPY

FORM NO. WF-

NEW WELL ☒ REPLACEMENT WELL ☐

STATE OF ARKANSAS
Report of Water Well Construction

County in which well is located: Mississippi

(Please print or type)

OWNER OF WELL: Union Carbide Corp.

WELL CONTRACTOR: Singer-Layne Ark. Divn.

CONTRACTOR LICENSE NO.: C-1099

NAME OF DRILLER: Alven Brewer

DRILLER REGISTRATION NO.: D-2195

DATE WELL WAS COMPLETED: 7 (MO.) 30 (DAY) 75 (YR.)

Well is near ______ road, approximately ______ miles N NE E SE S SW W NW of ______ (TOWN, ETC.)

Section 8, Township 12 N, Range 11 W.

Directions for reaching well: (use permanent landmarks) 4 Miles south of Osceola

1. Total Depth of Well: 1589'
2. Water Producing Formation: From 1473 ft. To 1589 ft.
3. Method of Construction: Rotary X Cable ____ Driven ____ Jetted ____ Bored ____ Dug ____
4. Water Level Below Land Surface: 35 ft.
5. Gallons per Hour ____ Gallons per Minute 1900
6. Well disinfected with: HTH.
7. Cased to 1475' ft. with 16" Diameter .375 Casing
8. Cemented from 0 ft. to 1475 ft.
9. Casing Perforated from ____ ft. to ____ ft.
10. Well Backfilled with: ____ from ____ ft. to ____ ft. (SAND, CLAY, CEMENT, MUD)
11. Gravel Pack from 1489 ft. to 1589 ft.
12. Screen Diameter: 10 inches from 1489 ft. to 1589 ft.
13. Type Screen Layne Shutter Fittings stainless steel Slot Size #8
14. Use of Well: DOMESTIC ____ IRRIGATION ____ MUNICIPAL ____ OTHER X

Description and Color of Formation: (Sand, Shale, Sandstone, etc.)				Depths in Feet From	To
Top soil	0	1	Fine sand	753	820
Sandy clay	1	8	Medium sand	820	881
Fine sand	8	16	Hard shale	881	958
Clay	16	20	Boulders	958	960
Medium sand	20	60	Hard shale	960	1004
Coarse sand	60	100	Fine sand	1004	1053
C. sand w/grav.	100	163	Hard shale	1053	1069
Clay	163	168	Medium sand	1069	1144
Sand w/clay	168	234	Hard shale	1144	1158
Clay	234	296	Rock	1158	1159
Sand	296	312	Hard shale	1159	1205
Clay	312	403	Blue gumbo	1205	1363
Shale	403	456	Shale w/strks. sand	1363	1416
Med. sand	456	529	Hard shale	1416	1424
Shale	529	568	Med. to coarse sand	1424	1451
Sandy shale	568	616	Fine sand	1451	1473
Med. sand	616	661	Medium sand	1473	1519
Coarse sand	661	684	Med. to coarse sand	1519	1586
Shale w/sand	684	753	Stopped in sand.		

Remarks:

Signed: WW Kissell

Date: 8 (MONTH) 13 (DAY) 75 (YEAR)

Mail to: Committee on Water Well Construction — 3815 W. Roosevelt Road — Little Rock, Arkansas 72204

GEOLOGY COPY

FORM NO. WD-1

NEW WELL ☒ REPLACEMENT WELL ☐

STATE OF ARKANSAS
Report of Water Well Construction

County in which well is located: Mississippi

(Please print or type)

OWNER OF WELL Union Carbide Corporation
WELL CONTRACTOR Singer-Layne Arkansas Division
CONTRACTOR LICENSE NO. C-1099
NAME OF DRILLER Alven Brewer
DRILLER REGISTRATION NO. D-2195
DATE WELL WAS COMPLETED 9 (MO.) 17 (DAY) 75 (YR.)

Well is near ______ road, approximately ______ miles N NE E SE S SW W NW of ______ (TOWN, ETC.)
Section 8, Township 12 N, Range 11 W
Directions for reaching well: (use permanent landmarks) South of Osceola 4 miles

1. Total Depth of Well 1609'
2. Water Producing Formation: From 1508 ft. To 1609 ft.
3. Method of Construction: Rotary X Cable ____ Driven ____ Jetted ____ Bored ____ Dug ____
4. Water Level Below Land Surface 26 ft.
5. Gallons per Hour ____ Gallons per Minute 1900
6. Well disinfected with HTH.
7. Cased to 1495' ft. with 16" Diameter .375 Casing
8. Cemented from 0 ft. to 1495 ft.
9. Casing Perforated from ____ ft. to ____ ft.
10. Well Backfilled with: ____ from ____ ft. to ____ ft.
(SAND, CLAY, CEMENT, MUD)
11. Gravel Pack from 1509 ft. to 1609 ft.
12. Screen Diameter: 10 inches from 1509 ft. to 1609 ft.
13. Type Screen Layne Shutter Fittings S. Steel Slot Size #8
14. Use of Well: ____ DOMESTIC ____ IRRIGATION ____ MUNICIPAL X OTHER

Description and Color of Formation: (Sand, Shale, Sandstone, etc.)	Depths in Feet From	To
Top soil	0	1
Sandy clay	1	10
Fine sand	10	18
Clay	18	21
Coarse sand	21	60
Clay	60	87
C. sand w/grav.	87	144
Clay	144	176
Sand w/strk. clay	176	209
Med. sand	209	244
Clay w/strk. sand	244	277
Shale	277	399
Hard rock	399	401
White clay	401	445
Shale	445	480
Med. sand	480	565
Shale	565	584
Sand	584	612
Shale	612	615
Rock	615	616
Hard shale	616	623
Boulders	623	625
Hard shale	625	645
Sand	645	708
Coarse sand	708	760
Sandy shale	760	776
Fine sand	776	843
Coarse sand	843	901
Shale	901	950
Boulders	950	953
Shale	953	965
Rock	965	966
Hard shale	966	1009
Coarse sand	1009	1096
Sandy shale	1096	1131
Shale	1131	1302
Hard shale	1302	1348
Sandy shale	1348	1387
Fine sand	1387	1432
Med. fine sand	1432	1472
Break	1472	1474
Fine sand	1474	1508
Break	1508	1513
Med. sand	1513	1605
Shale	1605	1610

Remarks:

Date: MO. DAY YEAR

9/30/75

Mail to: Committee on Water Well Construction — 3815 W. Roosevelt Road — Little Rock, Arkansas 7220

GEOLOGY

FORM NO. WD-1

APPENDIX B
AERIAL PHOTOGRAPH

REV.	DATE	BY	DESCRIPTION

APPENDIX B

AERIAL PHOTO

HYDROGEOLOGIC AND GEOTECHNICAL INVESTIGATION
CLASS 3N SOLID WASTE FACILITY

MISSISSIPPI COUNTY

ARKANSAS

DESIGNED BY	MR
CHECKED BY	MR
DRAWN BY	ABS
MONTH/YEAR	JUNE, 2001

GENESIS
ENVIRONMENTAL CONSULTING INC

11400 West Baseline Road
Little Rock, AR 72209
(501) 455-2199

PROJECT NO	084-001-01008
DATE	6/5/01
SCALE	1" = 500'
ACAD NO	018

APPENDIX C
SURFACE CONDUCTIVITY DATA

Station		Coordinates		Spacing					
				10m		20m		40m	
		X	Y	HD	VD	HD	VD	HD	VD
A	1.0	1915267.41	490931.14	36.0	24.0	32.0	20.0	27.0	13.0
A	1.5	1915517.37	490935.58	52.0	40.0	44.0	20.0	28.0	5.0
A	2.0	1915767.34	490940.03	34.0	22.0	28.0	14.0	22.0	11.0
A	2.5	1916017.30	490944.48	42.0	28.0	34.0	14.0	22.5	10.0
A	3.0	1916267.26	490948.92	40.0	26.0	32.0	18.0	24.0	13.0
A	3.5	1916517.22	490953.37	40.0	36.0	36.0	24.0	25.0	13.0
A	4.0	1916767.18	490957.81	40.0	34.0	32.0	19.0	24.0	11.5
A	4.5	1917017.15	490962.26	32.0	28.0	27.5	19.0	20.0	15.0
A	5.0	1917267.11	490966.71	29.0	22.0	25.0	18.5	17.5	16.0
A	5.5	1917517.07	490971.15	21.0	20.0	18.5	18.0	15.0	15.5
A	6.0	1917767.03	490975.60	24.0	22.5	21.0	15.5	16.0	13.0
A	6.5	1918016.99	490980.04	19.5	17.0	15.5	14.5	12.0	14.0
A	7.0	1918266.96	490984.49	18.5	13.5	15.0	12.0	12.5	12.0
A	7.5	1918516.92	490988.94	22.0		15.0	5.2	6.0	50.0
A	8.0	1918766.88	490993.38	19.0	14.0	14.5	13.0	12.5	15.0
A	8.5	1919016.84	490997.83	16.5	13.0	15.0	12.5	12.0	17.0
A	9.0	1919266.80	491002.27	19.5	14.0	18.0	11.5	14.5	9.0
A	9.5	1919516.77	491006.72	18.0	15.0	16.0	15.0	14.0	13.0
A	10.0	1919766.73	491011.17	27.5	27.0	25.0	20.0	19.5	10.5
B	1.0	1915278.02	490431.25	42.0	30.0	36.0	24.0	20.0	22.0
B	1.5	1915523.99	490435.69						
B	2.0	1915777.94	490440.14	44.0	42.0	42.0	30.0	24.0	12.0
B	2.5	1916027.90	490444.59	40.0	36.0	38.0	22.0	20.0	10.0
B	3.0	1916277.87	490449.03	24.5	17.0	20.0	16.0	16.0	17.0
B	3.5	1916527.83	490453.48	23.0	13.5	17.5	14.0	16.0	15.0
B	4.0	1916777.79	490457.92	23.0	14.0	18.0	9.0	15.0	11.0
B	4.5	1917027.75	490462.37	23.0	12.5	17.5	12.5	15.0	14.0
B	5.0	1917277.71	490466.81	22.0	15.5	20.0	12.0	16.0	10.0
B	5.5	1917527.68	490471.26						
B	6.0	1917777.64	490475.71	19.0	13.0	15.0	10.5	12.0	13.0
B	6.5	1918027.60	490480.15	17.0	12.5	14.0	12.5	12.0	13.5
B	7.0	1918277.56	490484.60	16.5	12.0	13.5	10.5	12.5	11.5
B	7.5	1918527.52	490489.04	14.0	10.0	13.0	10.5	11.5	12.0
B	8.0	1918777.49	490493.49	14.5	10.5	12.0	12.5	11.0	14.0
B	8.5	1919027.45	490497.94	13.5	9.5	13.0	12.0	11.0	15.0
B	9.0	1919277.41	490502.38	12.5	9.5	11.5	12.5	8.5	
B	9.5	1919527.37	490506.83	10.0	11.5	9.0	11.5	9.0	10.5
B	10.0	1919766.73	491011.17	18.0	14.5	15.0	12.5	12.0	10.5
C	1.0	1915288.62	489931.36	45.0	34.0	39.0	16.0	18.0	16.0
C	1.5	1915538.59	489935.80	29.5	23.0	27.0	22.5	22.5	12.0
C	2.0	1915788.55	489940.25	24.0	17.5	19.0	17.0	14.0	13.5
C	2.5	1916038.51	489944.69	31.0	20.0	22.0	12.0	17.0	9.0
C	3.0	1916288.47	489949.14	32.0	21.0	22.0	12.0	16.5	8.5
C	3.5	1916538.43	489953.59	32.0	18.5	22.0	8.5	14.5	9.0
C	4.0	1916788.40	489958.03	21.5	10.0	15.5	9.5	12.0	11.0
C	4.5	1917038.36	489962.48	15.0	9.0	12.0	10.0	11.0	12.0
C	5.0	1917288.32	489966.92	22.0	12.5	18.5	11.0	17.5	10.5
C	5.5	1917538.28	489971.37	9.5	23.0	25.0	16.0	18.5	9.0

Station		Coordinates		Spacing					
				10m		20m		40m	
		X	Y	HD	VD	HD	VD	HD	VD
C	6.0	1917788.24	489975.82	18.0	12.0	14.0	10.5	12.0	13.0
C	6.5	1918038.20	489980.26	14.5	11.5	11.0	10.0	9.0	10.0
C	7.0	1918288.17	489984.71	16.5	9.5	11.0	8.5	10.0	10.5
C	7.5	1918538.13	489989.15	16.5	11.5	12.5	9.0	10.5	9.0
C	8.0	1918788.09	489993.60	14.0	9.5	10.5	9.5	9.0	10.5
C	8.5	1919038.05	489998.05	15.0	10.5	12.0	10.5	10.0	9.5
C	9.0	1919288.01	490002.49	11.5	8.5	9.5	9.0	8.5	10.5
C	9.5	1919537.98	490006.94	9.5	10.0	9.0	10.0	9.5	11.0
C	10.0	1919787.94	490011.38	15.0		12.5		7.0	
C	10.5	1920037.90	490015.83	17.0	14.0	15.5	16.5	13.5	12.0
C	11.0	1920187.86	490020.28	40.0	42.0	38.0	32.0	29.0	11.5
D	1.0	1915299.23	489431.47	46.0	37.0	39.0	16.5	30.0	21.5
D	1.5	1915549.19	489435.91	23.0	8.5	17.5	9.0	16.0	17.5
D	2.0	1915799.15	489440.36	22.5	10.0	16.0	6.4	13.0	8.0
D	2.5	1916049.11	489444.80	18.5	8.3	14.0	11.0	12.0	9.5
D	3.0	1916299.08	489449.25	21.5	13.0	15.0	10.5	13.0	7.5
D	3.5	1916549.04	489453.70	15.5	13.0	12.0	9.0	11.0	10.0
D	4.0	1916799.00	489458.14						
D	4.5	1917048.96	489462.59	30.0	20.0	23.0	14.5	16.5	9.0
D	5.0	1917298.92	489467.03	36.0	24.0	28.0	15.5	25.0	12.5
D	5.5	1917548.89	489471.48	30.0	17.0	26.0	10.5	19.0	5.5
D	6.0	1917798.85	489475.93	14.5	7.5	12.5	11.0	17.0	11.5
D	6.5	1918048.81	489480.37	12.0	11.5	13.0	10.5	14.0	10.5
D	7.0	1918298.77	489484.82	14.0	15.5	10.5	9.3	14.5	10.0
D	7.5	1918548.73	489489.26	14.0	11.5	12.0	11.5	11.0	9.5
D	8.0	1918798.70	489493.71	17.0	10.5	13.0	9.5	11.0	8.5
D	8.5	1919048.66	489498.16	17.0	12.0	13.0	11.0	11.0	10.0
D	9.0	1919298.62	489502.60	15.0	10.0	12.5	11.0	11.0	11.0
D	9.5	1919548.58	489507.05	13.5	11.0	11.5	12.5	11.5	14.0
D	10.0	1919798.54	489511.49	20.0	14.0	15.5	11.5	11.5	12.5
D	10.5	1920048.51	489515.94						
D	11.0	1920298.47	489520.39	32.0	36.0	36.0	30.0	24.5	40.0
E	1.0	1915307.67	488930.33	44.0	40.0	32.0	15.0	26.0	21.5
E	1.5	1915572.30	488936.02	30.0	36.0	26.0	15.0	19.0	7.5
E	2.0	1915809.76	488940.47	22.5	15.5	19.5	15.0	15.0	16.0
E	2.5	1916059.72	488944.91						
E	3.0	1916309.68	488949.36	24.0	8.5	14.5	3.5	12.0	8.5
E	3.5	1916559.64	488953.81	19.0	12.0	15.0	13.5	13.5	15.0
E	4.0	1916809.61	488958.25	42.5	22.0	28.5	12.0	22.0	12.5
E	4.5	1917059.57	488962.70	44.0	22.5	34.0	10.5	12.0	8.0
E	5.0	1917309.53	488967.14	48.5	32.0	34.0	18.5	26.5	15.0
E	5.5	1917559.49	488971.59	21.5	14.0	21.5	14.0	19.5	10.0
E	6.0	1917809.45	488976.04	17.0	7.5	13.5	8.2	12.5	12.5
E	6.5	1918059.42	488980.48	20.0	12.0	14.0	12.0	12.5	14.0
E	7.0	1918309.38	488984.93	17.5	12.5	15.5	13.0	13.0	13.0
E	7.5	1918559.34	488989.37	30.0	23.0	22.0	15.0	18.0	16.0
E	8.0	1918809.30	488993.82	29.0	24.0	26.0	19.5	21.5	12.5
E	8.5	1919059.26	488998.27	20.0	15.0	16.5	14.0	16.0	14.0

Station		Coordinates		Spacing					
				10m		20m		40m	
		X	Y	HD	VD	HD	VD	HD	VD
E	9.0	1919309.23	489002.71	17.0	10.5	15.0	11.0	13.5	11.0
E	9.5	1919559.19	489007.16	15.0	13.0	13.0	13.5	13.5	15.5
E	10.0	1919809.15	489011.60	23.0	20.5	20.0	17.0	15.5	12.0
E	10.5	1920059.11	489016.05						
E	11.0	1920309.07	489020.50	21.0	18.0	18.0	17.0	16.0	17.5
F	2.0	1915820.36	488440.58	56.0	36.0	0.5	2.1	0.2	1.1
F	2.5	1916070.33	488445.02						
F	3.0	1916320.29	488449.47	0.4	2.6	0.3	16.0	25.5	10.5
F	3.5	1916570.25	488453.92	62.0	29.0	43.0	9.0	29.5	7.6
F	4.0	1916820.21	488458.36	40.0	33.0	32.0	18.5	25.5	17.0
F	4.5	1917070.17	488462.81	52.0	26.0	38.0	18.0	27.0	10.5
F	5.0	1917320.14	488467.25	42.5	36.0	36.0	15.0	24.0	8.3
F	5.5	1917569.57	488496.69	23.0	16.5	18.0	13.5	14.5	16.0
F	6.0	1917819.00	488526.13	21.5	12.3	19.0	14.5	15.5	19.5
F	6.5	1918068.96	488530.58	54.0	39.5	44.0	22.5	29.0	17.5
F	7.0	1918318.92	488535.03	54.0	37.0	46.0	29.0	29.5	17.0
F	7.5	1918568.88	488539.47	56.0	50.0	49.5	29.0	31.0	19.0
F	8.0	1918818.85	488543.92	54.0	44.0	44.0	23.5	26.0	9.0
F	8.5	1919068.81	488548.36	34.0	23.0	23.5	20.0	16.0	14.0
F	9.0	1919318.77	488552.81						
F	9.5	1919568.73	488557.26	20.0	16.0	18.0	20.0	11.0	15.0
F	10.0	1919818.69	488561.70	31.0	18.0	24.0	16.0	13.0	9.0
F	10.5	1920068.66	488566.15	23.0	16.0	21.0	18.0	11.0	14.0
F	11.0	1920318.62	488570.59	26.0	21.0	24.0	20.0	15.0	16.0

APPENDIX D
BORING LOGS

GEC GENESIS ENVIRONMENTAL CONSULTING, INC.
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Phone: (501) 455-2199 Fax (501) 455-4547

FIELD BOREHOLE LOG

BOREHOLE NO.: **B-1/PZ-1** TOTAL DEPTH: **30'**
COORDINATES: **490931.14N 1915267.41E**
ELEVATION: TOC ELEVATION: **242.35'**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/09/01**

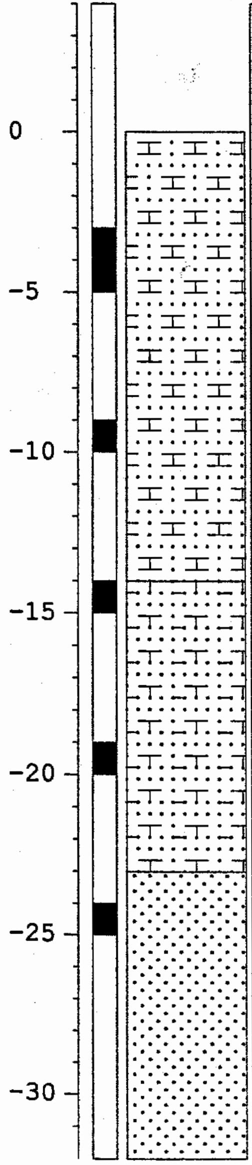
DRILLING INFORMATION

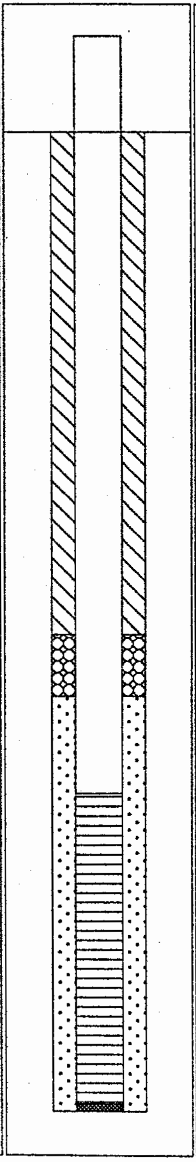
DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25" diam. Solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 23.63
STATIC WATER LEVEL: 21.53' BELOW TOC

SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 33.63' BELOW TOC
DATE OF WATER LEVEL: 5/02/01





DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						3' of stick-up
-5		Brown silty clay, slightly moist.		Pushed shelby tube from 3'-5'.		
-10		Brown silty clay, slightly moist.	2,4,5			Bentonite chips from surface to 15.7'.
-15		Dark tan silt with clay, moist.	3,3,4			Bentonite pellets from 15.7' to 17.6'.
-20		Brown clayey silt, very moist.	1,1,2	Hit H2O @ 20'. Used Hollow stem augers from 25'-30' to construct well due to heaving sands.		10-20 sand from 17.6' to 30.63'.
-25		Tan fine to coarse sand, wet.	6,10,13			
-30				Total depth @ 30'.		

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FIELD BOREHOLE LOG

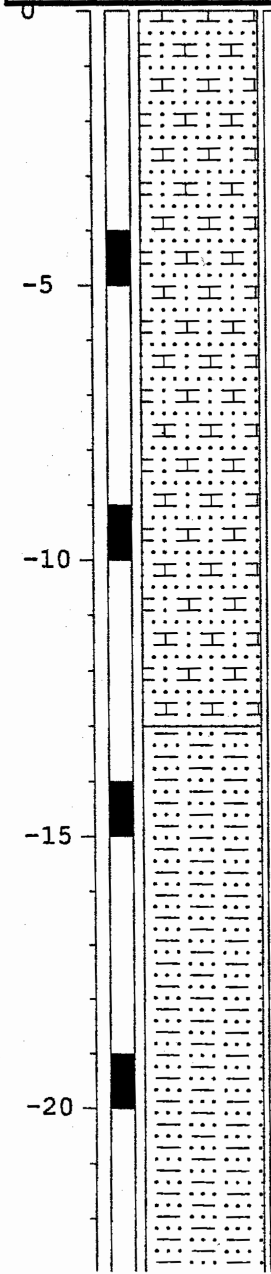
BOREHOLE NO.: **B-2** TOTAL DEPTH: **50'**
COORDINATES: **490940.03N 1915767.34E**
ELEVATION: **239.75'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Jay and Wayne Johnson**
JOB NO.:	**01008**	RIG TYPE:	**CME 55**
LOGGED BY:	**TG**	METHOD OF DRILLING:	**Wash rotary**
DATE DRILLED:	**4/03/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 2

CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC

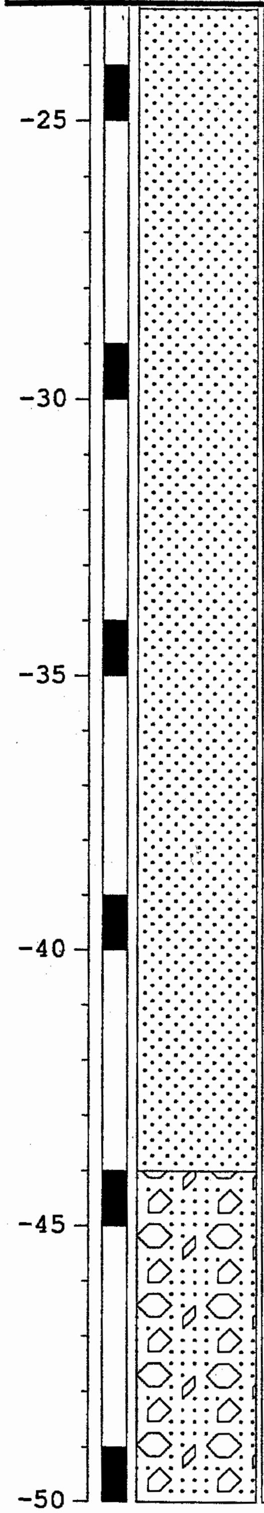
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-5		Dark brown silty clay.	1,1,1			
-10		Brown to gray silty clay, dry.	2,2,4			
-15		Brown silty sand, fine to medium grained.	5,6,8			
-20		Gray to brown silty sand, fine to medium grained, wet.	6,14,12	Hit H2O @ 20'.		

GENESIS ENVIRONMENTAL CONSULTING, INC.
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-2**
Page 2 of 2



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-25		Brown to tan, coarse to very coarse sand with trace silt, subangular to subrounded, few dark minerals, wet.	5,13,18			
-30		Brown to tan, coarse to very coarse sand with trace silt, rounded to subrounded, wet.	6,4,20			
-35		Brown to tan, coarse to very coarse sand, rounded to subrounded, wet.	6,20,22			
-40		Brown to tan, very coarse sand, subangular to subrounded, wet.	6,17,19			
-45		Brown to tan, very coarse sand with gravel, rounded to subrounded, wet.	7,26,17+			
-50		Brown to tan coarse sand to small gravel, rounded to subrounded, wet.	7,22,25	Total depth @ 50'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-3**
TOTAL DEPTH: **24'**
COORDINATES: **490948.92N 1916267.28E**
ELEVATION: **240.23**
TOC ELEVATION:

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **04/02/01**

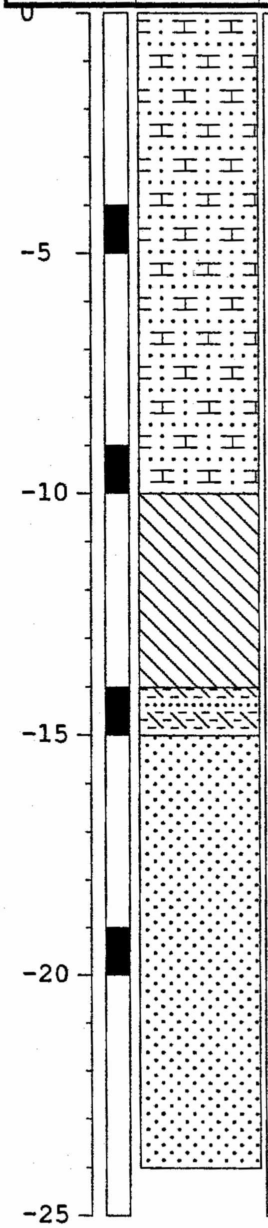
DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **Solid flight auger 6.25"diam.**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1

CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
-5		Dark grey, silty clay, slightly moist, with orange mottles, low plasticity.	2,2,4			
			1,2,2			
-10		11'-14' Grey clay, slightly moist.				
		14'-15' Grey clay with fine to medium grained sand.	2,3,3			
-15		Tan-brown sand, wet, with trace gravel, angular, up to 20 mm.				
				Hit H2O @ 19 ft.		
			3,3,2			
-20				Sands heaved @ 17'.		
				Total depth @ 24'.		
-25						

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FIELD BOREHOLE LOG

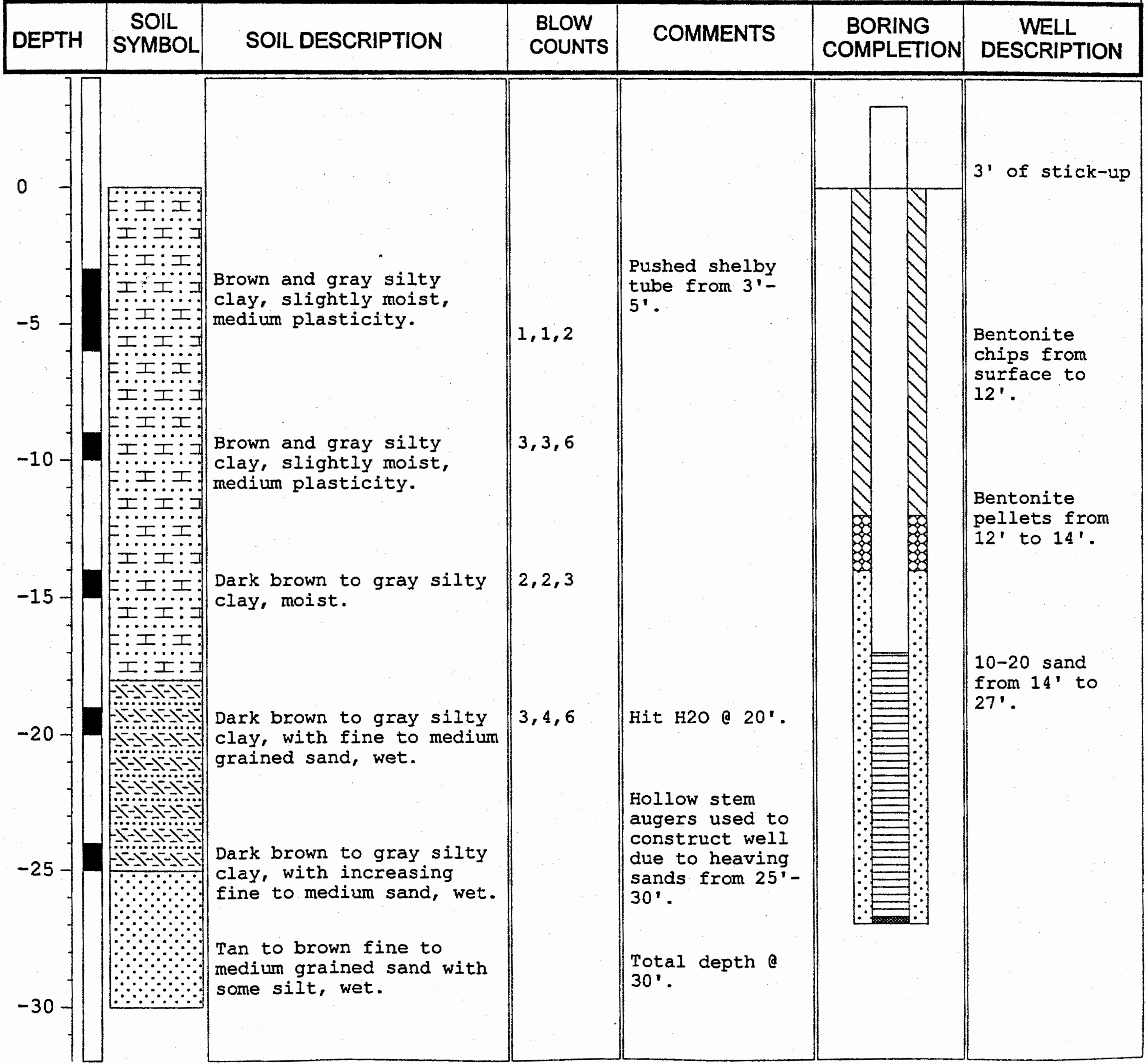
BOREHOLE NO.: **B-4/PZ-2** TOTAL DEPTH: **30'**
COORDINATES: **490957.81N 1916767.18E**
ELEVATION: TOC ELEVATION: **243.57'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25"diam. solid flight auger**
DATE DRILLED:	**4/09/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 20.23'
STATIC WATER LEVEL: 22.13' BELOW TOC

SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 30.23' BELOW TOC
DATE OF WATER LEVEL: 5/02/01



DEPTH	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	WELL DESCRIPTION
0				3' of stick-up
-5	Brown and gray silty clay, slightly moist, medium plasticity.	1,1,2	Pushed shelby tube from 3'-5'.	Bentonite chips from surface to 12'.
-10	Brown and gray silty clay, slightly moist, medium plasticity.	3,3,6		Bentonite pellets from 12' to 14'.
-15	Dark brown to gray silty clay, moist.	2,2,3		10-20 sand from 14' to 27'.
-20	Dark brown to gray silty clay, with fine to medium grained sand, wet.	3,4,6	Hit H2O @ 20'.	
-25	Dark brown to gray silty clay, with increasing fine to medium sand, wet.		Hollow stem augers used to construct well due to heaving sands from 25'-30'.	
	Tan to brown fine to medium grained sand with some silt, wet.		Total depth @ 30'.	
-30				

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-5** TOTAL DEPTH: **120'**

COORDINATES: **490966.71N 1917267.11E**

ELEVATION: **241.27'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**

SITE LOCATION: **Osceola, AR**

JOB NO.: **01008**

LOGGED BY: **TG**

DATE DRILLED: **4/03/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**

DRILLER: **Jay and Wayne Johnson**

RIG TYPE: **CME 55**

METHOD OF DRILLING: **Wash rotary**

SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a

SEAL: n/a

GROUT: n/a

CASING/SCREEN TYPE: n/a

DIAMETER: n/a

CASING LENGTH: n/a

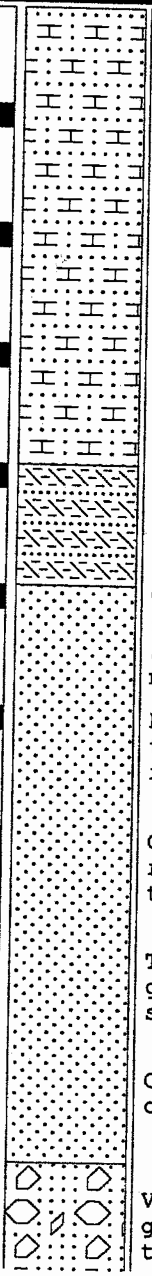
STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a

SLOT SIZE: n/a

T.D. OF WELL n/a BELOW TOC

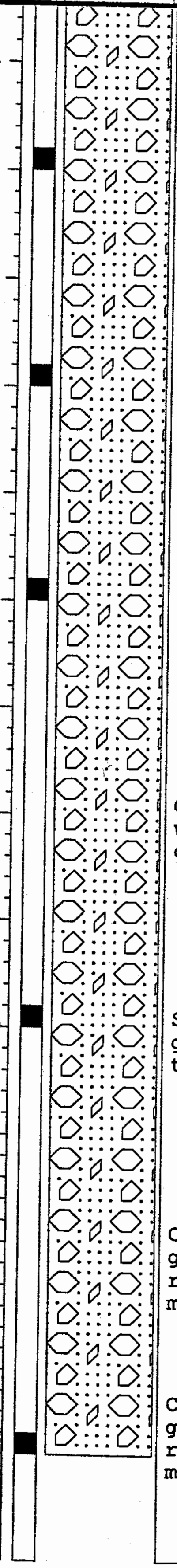
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
-5		Gray to brown, silty clay, dry.	2,3,5			
-10		Gray to brown, silty clay, dry.	3,4,5			
-15		Gray to tan, silty clay, dry.	4,5,7			
-20		Brown to tan, very fine sandy clay, moist.	5,7,9			
-25		Tan sand with some silt, fine to medium grained, subangular to subrounded, moist.	5,20,23			
-30		Brown to tan, very fine to fine sand with silt, rounded to subangular.	5,6,20			
-35		Gray medium grained sand, rounded to subangular, trace organics.	5,14,17			
-40		Tan to gray, medium grained sand, rounded to subangular, some clay.	5,14,14			
-45		Coarse sand with black organics.	5,15,21			
-50		Very coarse sand with gravel (<30 mm), angular to subrounded, some gray	5,8,12			

GENESIS ENVIRONMENTAL CONSULTING, INC.
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-5**
Page 2 of 2



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		silt.				
-55						
-60		Medium to coarse sand with gravel (<15 mm), some organics.	5,21,21			
-65						
-70		Gray, medium to coarse sand with some silt and gravel (<25 mm), subrounded to subangular, trace organics.	5,26,19			
-75						
-80		Gray medium grained sand and gravel (<35 mm), with some gray clay.	6,22,22			
-85						
-90		Gray, very coarse sand with gravel and some gray clay.				
-95						
-100		Sand with organics and gravel (<30 mm), rounded to subrounded.	6,23,25			
-105						
-110		Coarse sand with minor gravel, poorly sorted, rounded to subangular, minor gray clay.				
-115						
-120		Coarse sand with minor gravel, poorly sorted, rounded to subangular, minor gray clay.	5,24,24	Total depth @ 120'.		
-125						

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-6** TOTAL DEPTH: **29'**
COORDINATES: **490975.60N 1917767.03E**
ELEVATION: **241.60'** TOC ELEVATION:

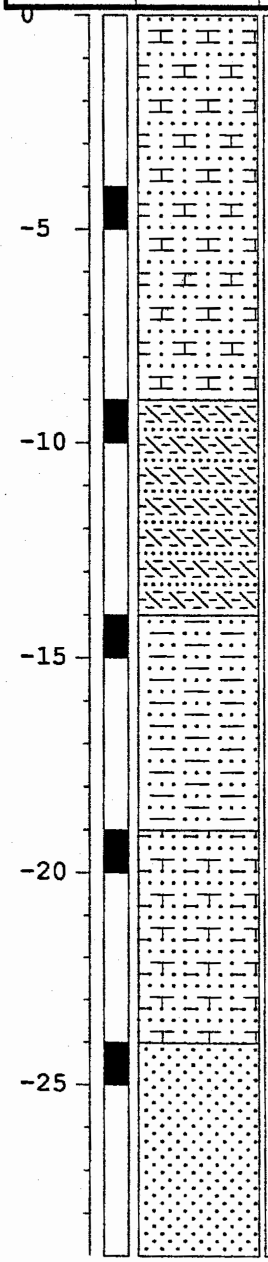
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **04/03/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25" diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-5		Dark brown to grey silty clay, slightly moist with trace fine to medium grained sand, low plasticity.	2,2,2			
-10		Dark brown to grey sandy clay, slightly moist, low plasticity.	2,3,3			
-15		Dark brown silty sand with trace clay, slightly moist.	2,4,5			
				Hit H2O @ 19'.		
-20		Dark brown to grey clayey silt with fine to medium grained sand, wet.	2,4,7	Sand heaved @ 24', no recovery at 29'-30' sampling interval due to heaving sands.		
-25		Tan to brown fine to coarse grained sand, wet, subrounded.	3,5,12			
				Total depth @ 29'.		

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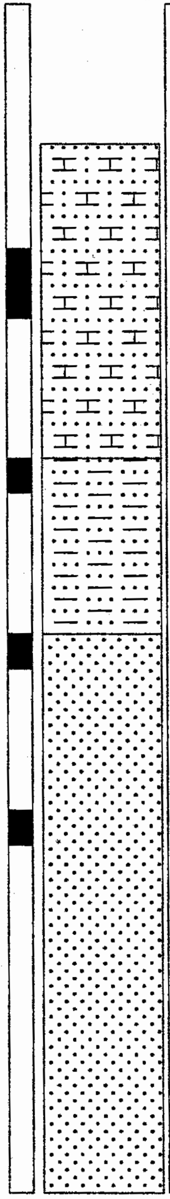
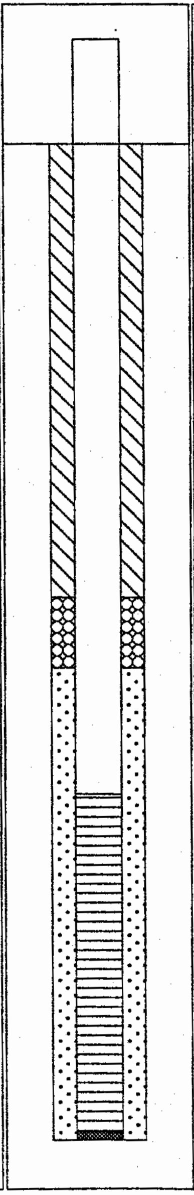
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-7/PZ-7** TOTAL DEPTH: **30'**
COORDINATES: **490984.49N 1918266.96E**
ELEVATION: TOC ELEVATION: **245.29'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25"diam. solid flight auger**
DATE DRILLED:	**4/10/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1
CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 21.60'
STATIC WATER LEVEL: 23.45' BELOW TOC
SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 31.60' BELOW TOC
DATE OF WATER LEVEL: 5/02/01





DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
						3' of stick-up
0						
		Brown, silty clay, low plasticity, slightly moist.		Pushed shelby tube from 3'-5'.		Bentonite chips from surface to 13'.
-5						
		Tan silty, fine to medium sand, slightly moist.	3,5,7			
-10						
						Bentonite pellets from 13' to 15'.
		Tan fine to coarse sand, moist.	6,8,7			
-15						
						10-20 sand from 15' to 28.6'.
		Tan fine to coarse sand, wet.	3,6,12	Hit H20 @ 20'.		
-20						
				Switched to hollow stem augers to continue bore and to construct well due to heaving sands @ 24'.		
		Tan fine to coarse sand, wet.				
-25						
				Total depth @ 30'.		
-30						

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-8** TOTAL DEPTH: **19'**

COORDINATES: **490993.38N 1918766.88E**

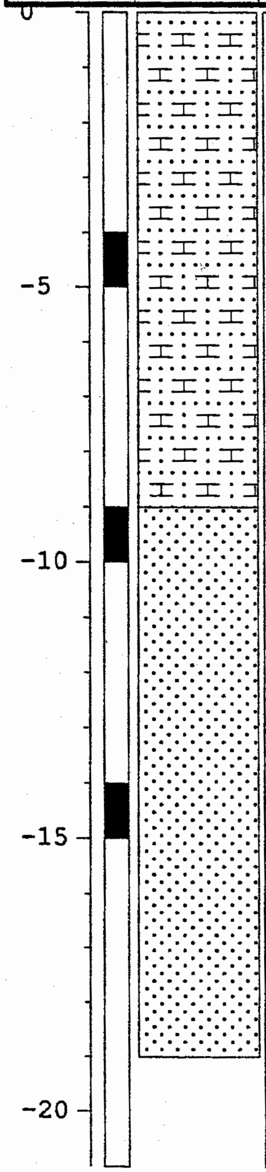
ELEVATION: **242.60'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25"diam. Solid flight auger**
DATE DRILLED:	**04/03/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1

CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Dark brown to grey clay with some silt, dry, low plasticity.	4,5,5			
		Tan to brown fine to coarse grained sand with trace silt, slightly moist.	4,6,9			
		Tan to brown fine to coarse grained sand with trace silt, moist.	4,8,9	Hit H2O @ 17'. No recovery at 19' due to heaving sands @ 17.5'. Total depth @ 19'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-9** TOTAL DEPTH: **50'**
COORDINATES: **491002.27N 1919266.80E**
ELEVATION: **243.33'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **TG**
DATE DRILLED: **4/05/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 2

CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
		Brown clay with sand.	2,3,5			
-5						
		Brown to tan clay with sand.	2,3,3			
-10						
		Brown to tan sandy clay.	3,10,10			
-15						
		Light brown to tan sandy clay, sand fine grained.	4,4,10			
-20				Hit H2O @ 20'.		

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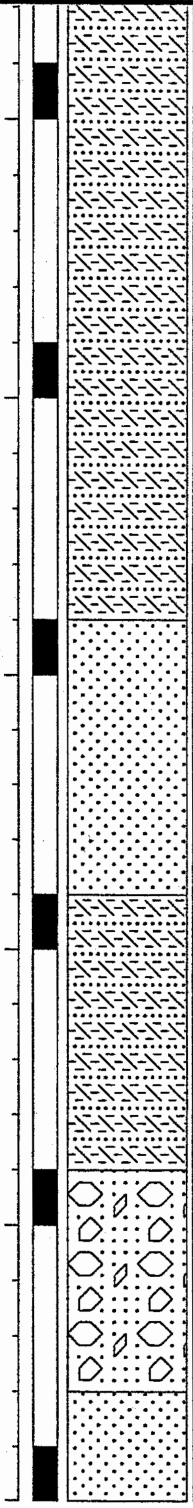
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-9**
Page 2 of 2



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-25		Brown to tan, medium to coarse sand with clay, subrounded to subangular.	5,22,23+			
-30		Brown to tan, silty clay with coarse to very coarse sand.	5,6,11			
-35		Brown to tan, fine to medium sand with some clay, rounded to subangular.	5,16,20			
-40		Brown to tan, sandy clay, fine to medium grained sand.				
-45		Coarse sand and gravel (<30mm) with minor silt.	5,16,18			
-50		Tan, coarse to very coarse sand, subangular to rounded, trace organics.	6,19,25	Total depth @ 50'.		

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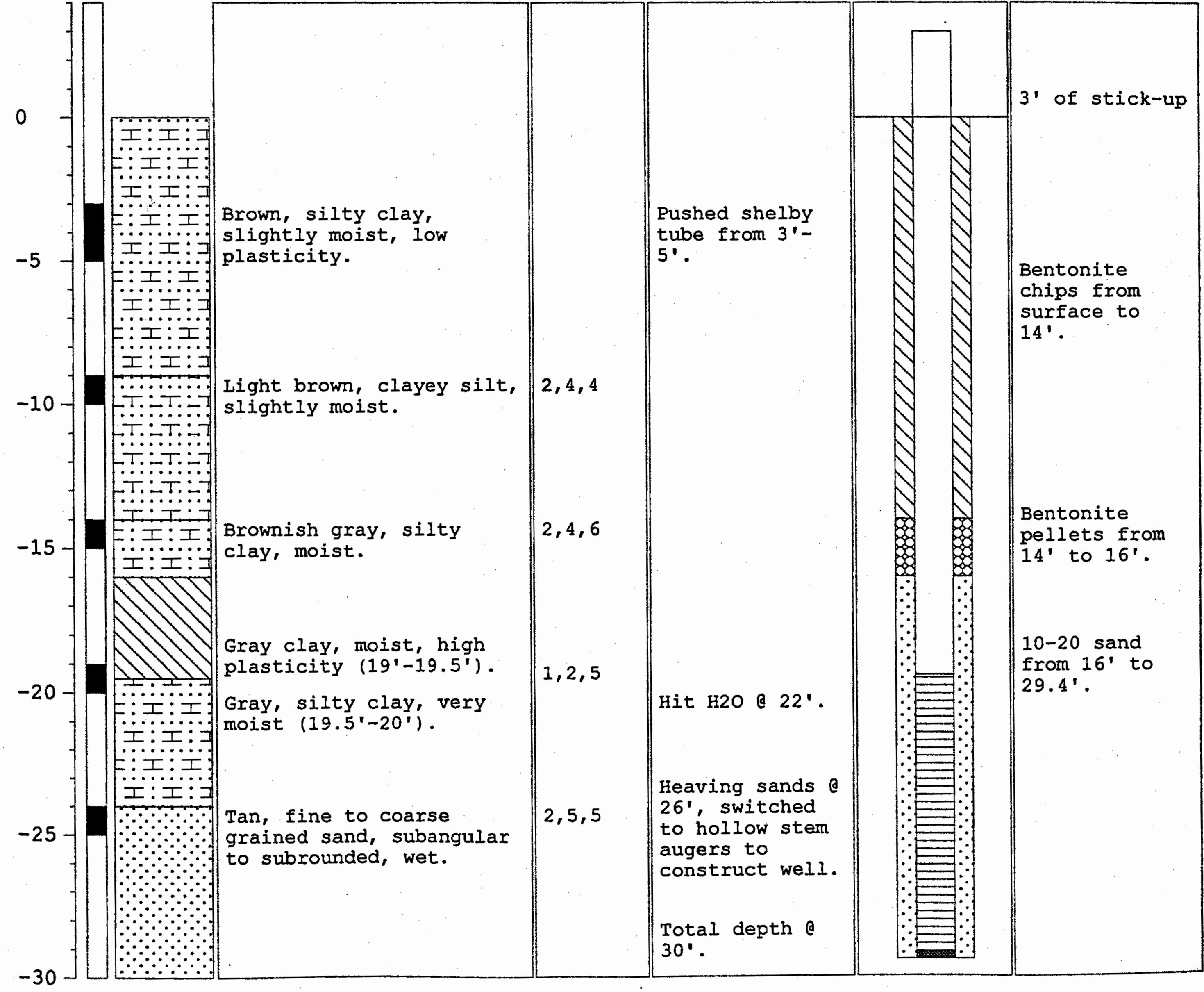
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-10/PZ-8** TOTAL DEPTH: **30'**
COORDINATES: **491011.17N 1919766.73E**
ELEVATION: TOC ELEVATION: **242.08'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25"diam. solid flight auger**
DATE DRILLED:	**4/11/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 22.40'
STATIC WATER LEVEL: 22.54' BELOW TOC
SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 32.40' BELOW TOC
DATE OF WATER LEVEL: 5/02/01



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						3' of stick-up
-5		Brown, silty clay, slightly moist, low plasticity.		Pushed shelby tube from 3'-5'.		Bentonite chips from surface to 14'.
-10		Light brown, clayey silt, slightly moist.	2,4,4			
-15		Brownish gray, silty clay, moist.	2,4,6			Bentonite pellets from 14' to 16'.
		Gray clay, moist, high plasticity (19'-19.5').				10-20 sand from 16' to 29.4'.
-20		Gray, silty clay, very moist (19.5'-20').	1,2,5	Hit H2O @ 22'.		
-25		Tan, fine to coarse grained sand, subangular to subrounded, wet.	2,5,5	Heaving sands @ 26', switched to hollow stem augers to construct well.		
-30				Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-11** TOTAL DEPTH: **25'**
COORDINATES: **490511.27N 1919777.33E**
ELEVATION: **242.89'** TOC ELEVATION: **n/a**

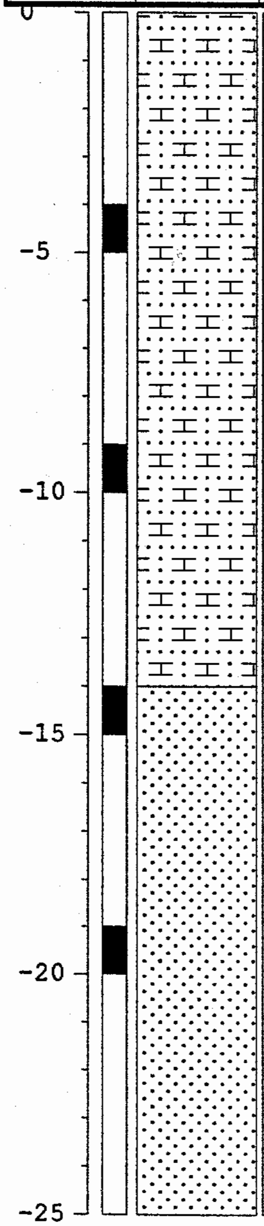
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **04/05/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
-5		Brown, silty clay, moist.	2,3,5			
-10		Brown, silty clay with some fine to medium grained sand, moist.	2,3,7			
-15		Tan, fine to medium sand, moist, subangular to subrounded.	10,12,13			
-20		Tan, fine to medium sand, moist, subangular to subrounded.	5,5,9	Hit H2O @ 21'. Heaving sands @ 23'. Total depth @ 25'.		
-25						

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-12** TOTAL DEPTH: **19'**
COORDINATES: **490493.49N 1918777.49E**
ELEVATION: **242.89'** TOC ELEVATION: **n/a**

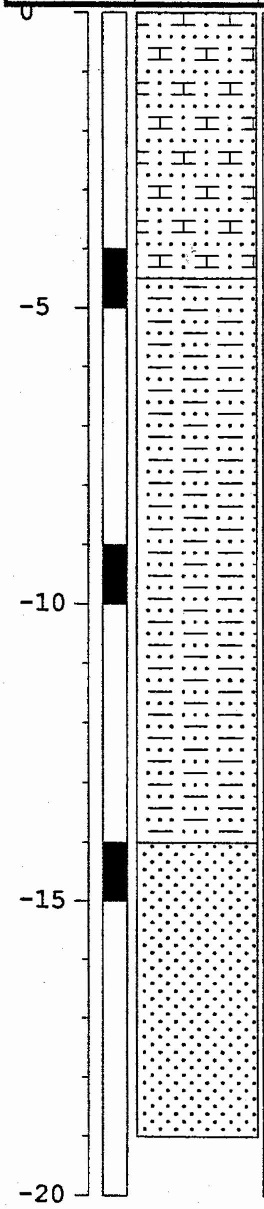
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **04/03/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Dark brown silty clay, slightly moist.	4,3,3			
		Tan silt with fine grained sand.				
		Tan silt with fine grained sand, subangular to subrounded, slightly moist.	3,4,7			
		Tan to brown fine to coarse sand, subangular to subrounded, moist.	4,9,12			
				Heaving sands @ 18'.		
				Total depth @ 19'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-13** TOTAL DEPTH: **24'**
COORDINATES: **490475.71N 1917777.64E**
ELEVATION: **240.88'** TOC ELEVATION: **n/a**

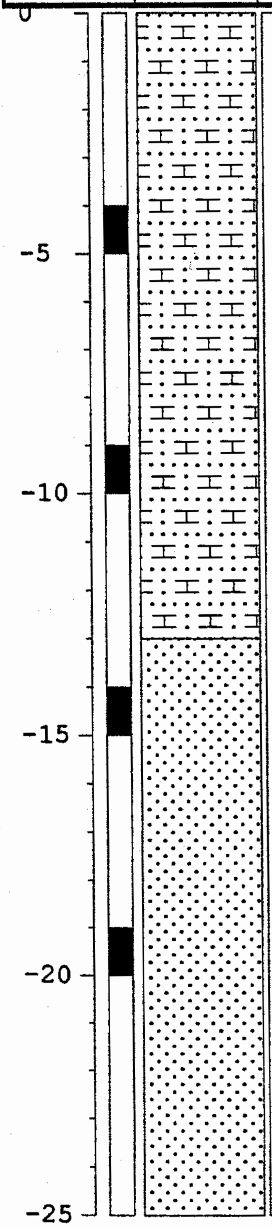
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **04/03/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-5		Dark brown silty clay, slightly moist.	3,3,4			
-10		Brown silty clay with some silt , moist.	2,2,3			
-15		Tan to brown, fine to coarse grained sand, subangular to subrounded.	5,10,11			
				Hit H20 @ 18'.		
-20		Tan to brown, fine to coarse grained sand, subangular to subrounded, wet.	6,10,13	Heaving sands @ 22'.		
				Total depth @ 24'.		

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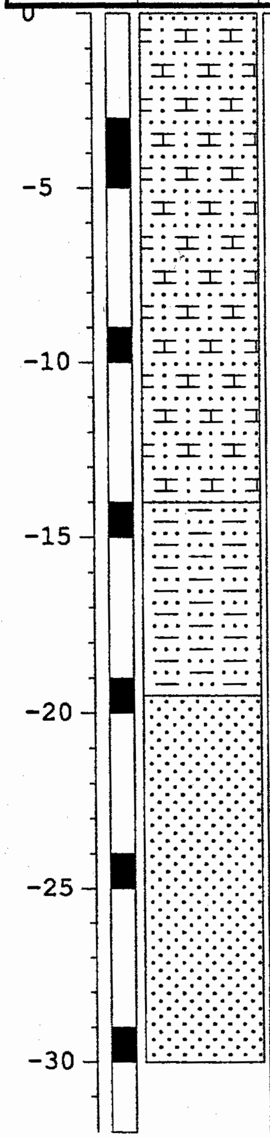
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-14** TOTAL DEPTH: **30'**
COORDINATES: **490457.92N 1916777.79E**
ELEVATION: **240.05'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25"diam. solid flight auger**
DATE DRILLED:	**4/04/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1
CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-5	Brown silty clay, slightly moist.		Pushed shelby tube from 3'-5'.		
-10	Brown silty clay, slightly moist.	2,4,7			
-15	Tan, sandy silt with trace clay, slightly moist.	3,4,3			
-20	Tan, sandy silt with trace clay (19'-19.5'). Tan to brown, fine to coarse sand, subangular to subrounded, moist.	5,6,10			
-25	Tan to brown, fine to coarse sand, subangular to subrounded, wet.	8,13,18	Hit H20 @ 24'.		
-30	Tan to brown, fine to coarse sand, subangular to subrounded, wet.	8,14,15	Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-15** TOTAL DEPTH: **29'**
COORDINATES: **490440.14N 1915777.94E**
ELEVATION: **239.04'** TOC ELEVATION: **n/a**

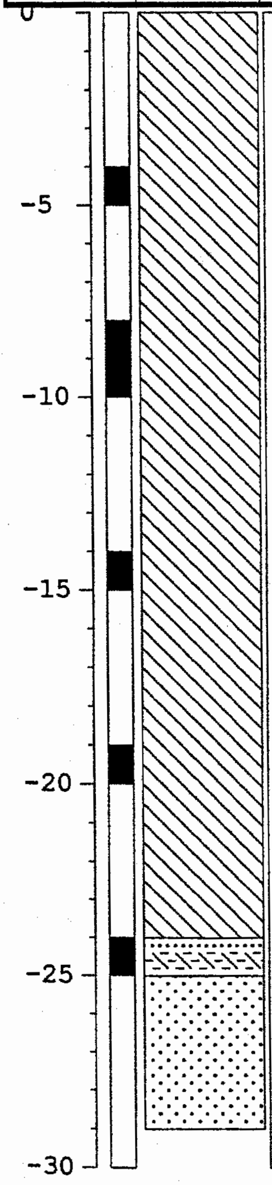
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/04/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE:n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH:n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown to gray clay, slightly moist, medium plasticity.	2,2,2			
		Brown to gray clay, slightly moist, medium plasticity.		Pushed shelby tube from 8'-10'.		
		Dark gray clay, very moist, medium plasticity.	2,2,2			
				Hit H20 @ 17'.		
		Dark gray clay, very moist, medium plasticity.	2,2,2			
		Medium to coarse sand with decreasing gray clay to 25'. (Medium to coarse sand from 25'-29')	2,2,4	Heaving sands from 25'-29'. Total depth @ 29'.		

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FIELD BOREHOLE LOG

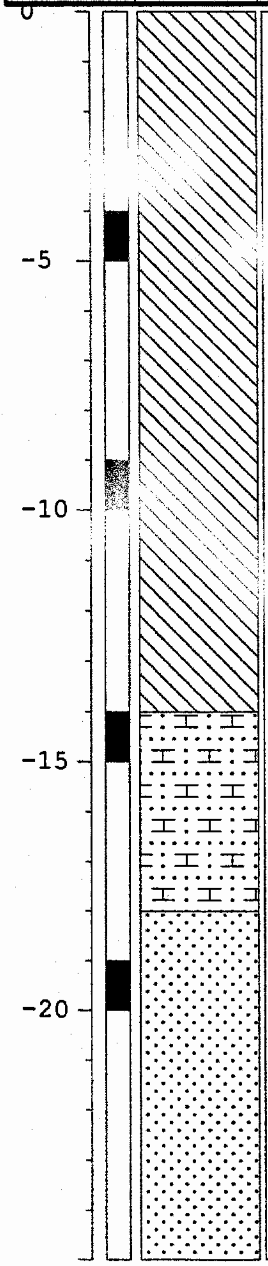
BOREHOLE NO.: **B-16** TOTAL DEPTH: **25'**
COORDINATES: **490431.25N 1915270.03E**
ELEVATION: **239.46'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25"diam. solid flight auger**
DATE DRILLED:	**4/04/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1

CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown to gray clay with trace silt, slightly moist.	2,3,4			
		Brown to gray clay with trace silt, slightly moist.	2,3,4			
		Brown, silty clay with trace fine sand, very moist, low plasticity.	2,2,4			
				Hit H2O @ 19'.		
		Tan to brown, fine to coarse sand, wet.	6,13,16	Heaving sands from 20'-24'. Total depth @ 25'		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-17** TOTAL DEPTH: **130'**
COORDINATES: **490051.36N 1915288.62E**
ELEVATION: **238.57'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **TG**
DATE DRILLED: **4/03/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 3
CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
-5		Brown to tan, silty clay, dry.	2,2,4			
-10		Brown to tan, silty clay, dry.	2,4,4			
-15		Brown to tan, sand with some clay, silt, fine to medium grain, rounded to subangular.	4,4,5			
-20		Brown to tan, sand with some clay, silt, fine to medium grain, rounded to subangular.	5,10,17			
-25		Tan to gray, coarse sand, rounded to subrounded, trace silt.	3,4,5			
-30		Tan to gray, coarse sand, rounded to subrounded, trace clay.	5,6,4			
-35		Gray, silty clay, moist.	2,2,4			

GENESIS ENVIRONMENTAL CONSULTING, INC.
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-17**
Page 2 of 3

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-40		Gray, silty clay with some fine sand, moist.	3,3,4			
-45		Medium grained sand, rounded to subrounded with some gray clay.	5,13,15			
-50		Gray, silty sand, subrounded to subangular, coarse grained.	5,15,16			
-55						
-60		Gray, silty sand, subrounded to subangular, coarse grained.	5,18,23			
-65						
-70		Gray, silty sand, subrounded to subangular, coarse grained, some minor gravel (<10mm).	5,18,27			
-75						
-80		Gray sand with some silt.	5,27,17+			
-85						

GENESIS ENVIRONMENTAL CONSULTING, INC.
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-17**
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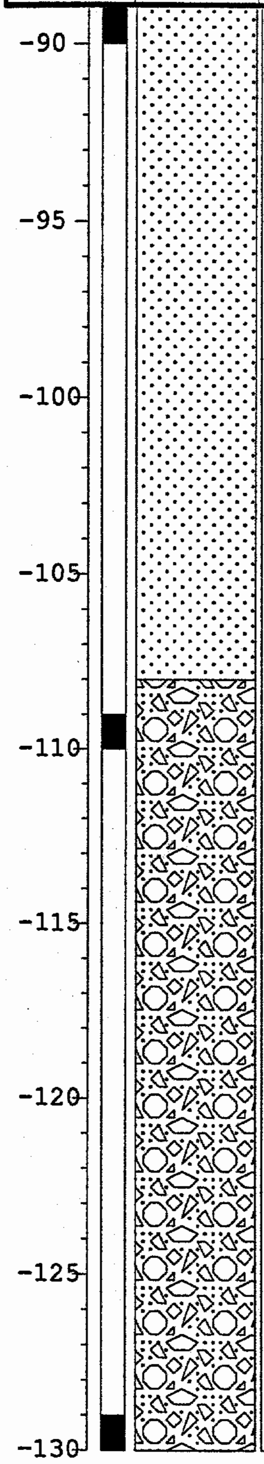
DEPTH | SOIL SYMBOL



SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
Gray sand with some silt.	5,20,21			
Gravel (<25mm) with some fine sand.				
no recovery	5,45	Total depth @ 130'.		

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FIELD BOREHOLE LOG

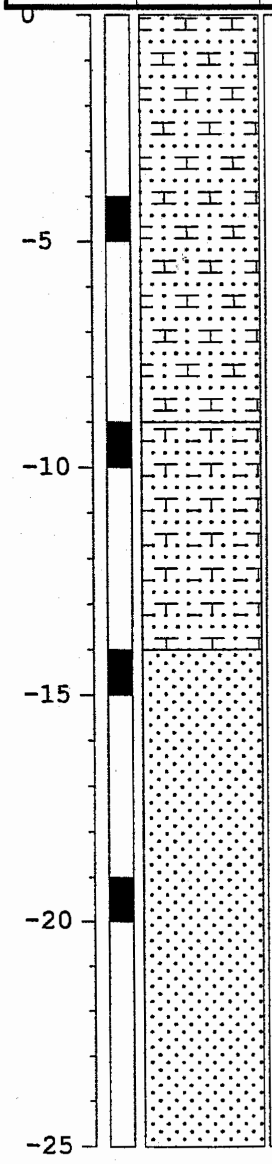
BOREHOLE NO.: B-18 TOTAL DEPTH: 25'
COORDINATES: 489940.25N 1915788.55E
ELEVATION: 238.32' TOC ELEVATION: n/a

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	Plum Point Energy Station	DRILLING CO.:	Anderson Engineering
SITE LOCATION:	Osceola, AR	DRILLER:	Paul Harris
JOB NO.:	01008	RIG TYPE:	Simco 2400 SKL
LOGGED BY:	ME	METHOD OF DRILLING:	6.25"diam. solid flight auger
DATE DRILLED:	4/06/01	SAMPLING METHODS:	Split Spoon

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1

CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
-5		Brown to gray clay with trace silt, slightly moist.	4,5,6			
-10		Brown clayey silt, slightly moist.	3,3,4			
-15		Tan to brown, fine to coarse sand, wet.	3,6,7			
				Hit H2O @ 18'.		
-20		Tan to brown, fine to coarse sand, wet.	3,4,8	Heaving sands from 20'-24'.		
				Total depth @ 25'		
-25						

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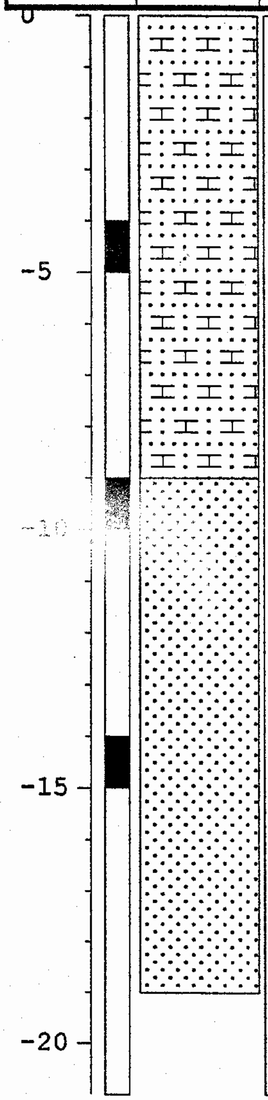
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-19** TOTAL DEPTH: **19'**
COORDINATES: **489949.14N 1916288.47E**
ELEVATION: **238.74'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25"diam. solid flight auger**
DATE DRILLED:	**4/06/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1
CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
Brown to gray, silty clay, slightly moist.	2,3,4			
Tan to brown, fine to medium sand with some silt, moist.	5,9,10			
Tan to brown, fine to coarse grained sand, moist.	4,6,9			
		Hit H2O @ 18'. Heaving sands from 15'-19'. Total depth @ 19'.		

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FIELD BOREHOLE LOG

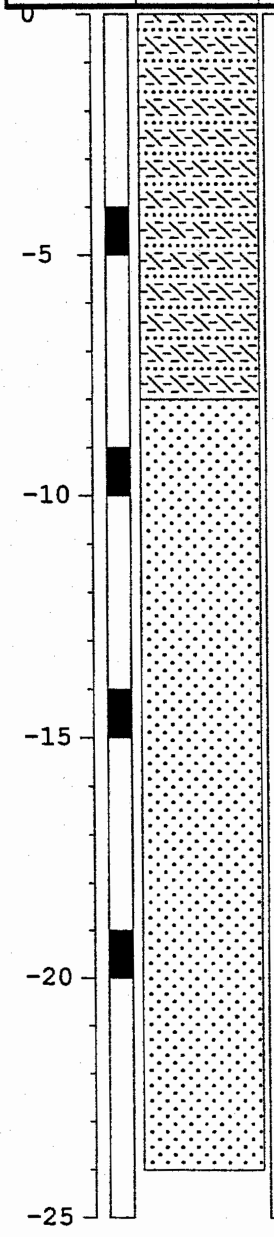
BOREHOLE NO.: B-20 TOTAL DEPTH: 24'
COORDINATES: 489958.03N 1916788.40E
ELEVATION: 239.36' TOC ELEVATION: n/a

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	Plum Point Energy Station	DRILLING CO.:	Anderson Engineering
SITE LOCATION:	Osceola, AR	DRILLER:	Paul Harris
JOB NO.:	01008	RIG TYPE:	Simco 2400 SKL
LOGGED BY:	ME	METHOD OF DRILLING:	6.25"diam. solid flight auger
DATE DRILLED:	4/05/01	SAMPLING METHODS:	Split Spoon

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1

CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-5		Dark brown, sandy clay with some silt, moist, low plasticity.	3,5,6			
-10		Tan to brown, fine to coarse sand, subangular to subrounded, moist.	5,6,9			
-15		Tan to brown, fine to coarse sand, subangular to subrounded, moist.	5,8,9	Hit H20 @ 17'.		
-20		Tan to brown, fine to coarse sand, subangular to subrounded, wet.	4,9,12	Heaving sands from 18'-24'.		
-25				Total depth @ 24'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-21/S-1** TOTAL DEPTH: **200'**
COORDINATES: **489687.19N 1917291.70E**
ELEVATION: **239.61'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **TG**
DATE DRILLED: **4/10/01**

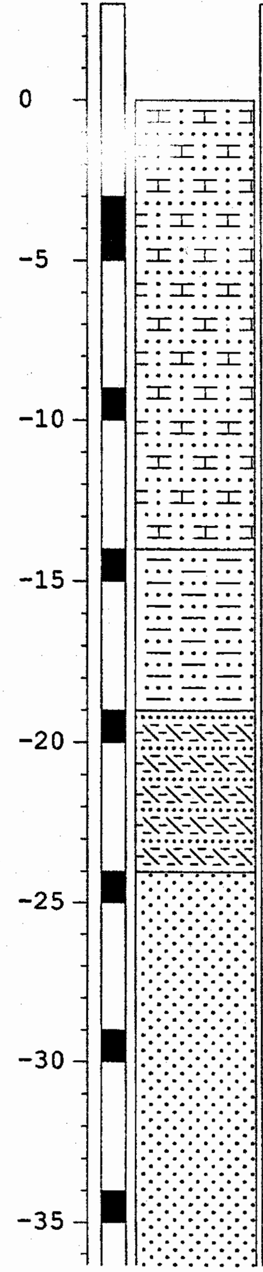
DRILLING INFORMATION

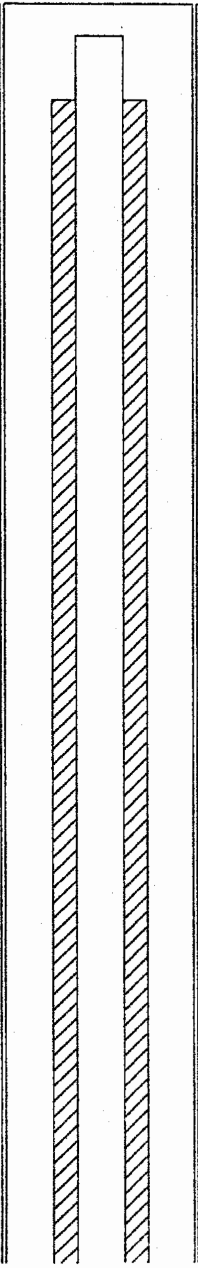
DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: Portland cement
Page 1 of 4

CASING/SCREEN TYPE: PVC
DIAMETER: 3-inch
CASING LENGTH: 120'
STATIC WATER LEVEL: n/a BELOW TOC

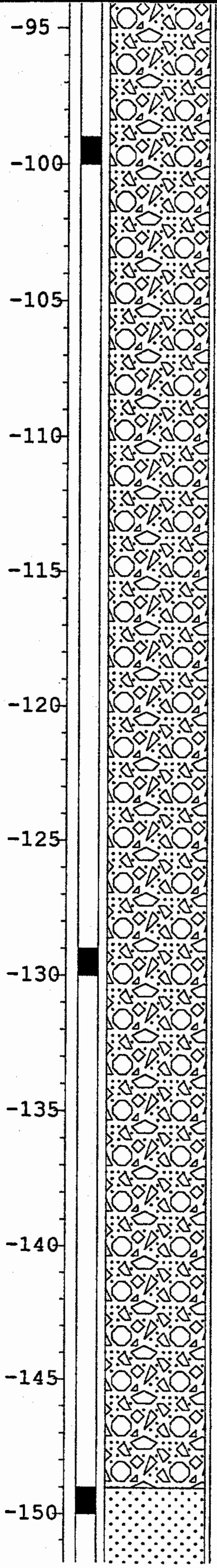
SCREEN LENGTH: none
SLOT SIZE: n/a
T.D. OF WELL 122' BELOW TOC
DATE OF WATER LEVEL: n/a

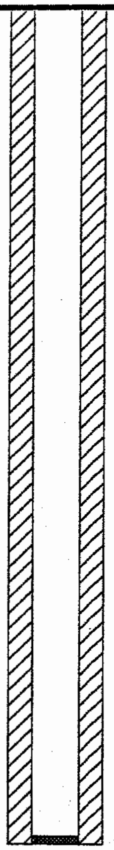




DEPTH	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	WELL DESCRIPTION
0				
	Tan, silty clay, dry.		Shelby tube pushed from 3'-5'.	3-inch solid PVC casing set for seismic demonstration.
-5				
-10	Brown to tan, silty clay.	1,2,7		
-15	Tan to brown, sandy silt with some clay, medium grained sand, subrounded to subangular.	5,5,5		
-20	Brown to tan, silty, sandy clay.	5,13,16		
-25	Brown to tan, medium to coarse grained sand with some silt, subrounded to subangular.	5,15,19		
-30	Tan, coarse to very coarse sand, subrounded to subangular, trace gravel (<15mm).	5,19,26+		
-35	Tan, coarse to very coarse sand, subrounded	5,19,16		

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		to subangular, trace gravel (<15mm).				
-40		Tan, coarse to very coarse sand, subrounded to subangular, trace gravel (<15mm).	5,19,10			
-45		Gray, coarse sand, subrounded to subangular, trace clay.	5,21,24			
-50		Gray, coarse sand, subrounded to subangular.		Logged by cuttings from 50'-200', due to lack of recovery from split spoon.		
-55						
-60		Brown, very coarse sand, subrounded to angular.				
-65						
-70		Brown, very coarse sand, subrounded to angular.				
-75						
-80		Brown, very coarse sand, subrounded to angular.				
-85						
-90		Gravel with some sand and clay, subrounded to subangular.				





DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-100		Gravel with some sand and clay, subrounded to subangular.				
-120						Due to repeated caving of sand and gravel formation, casing could only be set at 120' bgs.
-130		Gravel with soft, black shale chips.				
-150		Brown to gray, medium grained sand with some silt and gravel.				

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PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-21/S-1**
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DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-155						
-160						
-165						
-170		Brown to gray, sand with some silt.				
-175						
-180						
-185						
-190						
-195						
		Brown, silty clay.		Total depth @ 200'.		
-200						

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-22/PZ-5** TOTAL DEPTH: **30'**
COORDINATES: **489699.04N 1917793.71E**
ELEVATION: TOC ELEVATION: **242.75'**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/11/01**

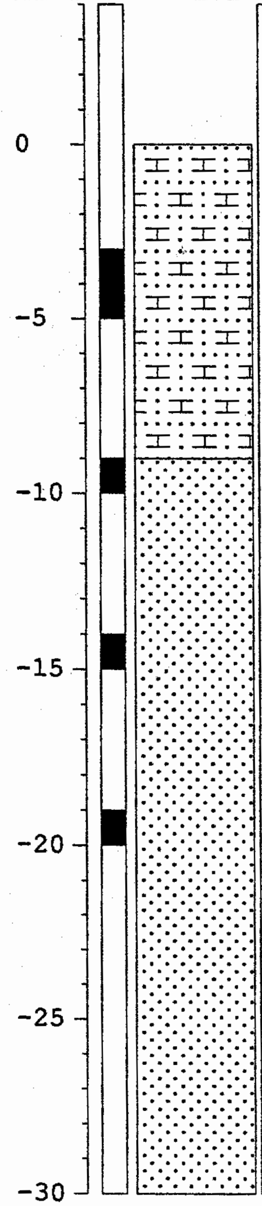
DRILLING INFORMATION

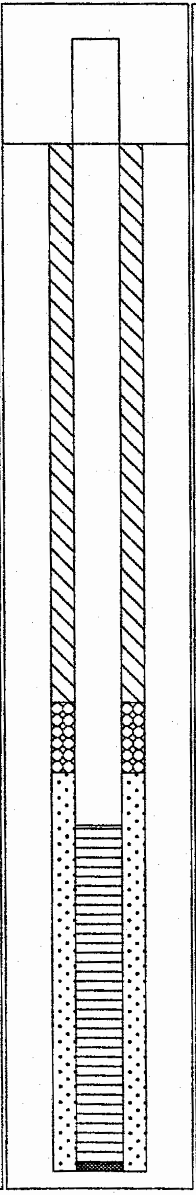
DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 22.5'
STATIC WATER LEVEL: 21.57' BELOW TOC

SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 32.50' BELOW TOC
DATE OF WATER LEVEL: 5/02/01





DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						3' of stick-up
-5		Brown, silty clay, slightly moist, low plasticity.		Pushed shelby tube from 3'-5'.		Bentonite chips from surface to 16'.
-10		Tan, fine to coarse sand with some silt, moist.	9,11,15			
-15		Tan, fine to coarse sand, subangular to subrounded, moist.	8,10,12			Bentonite pellets from 16' to 18'.
				Hit H2O @ 19'.		
-20		Tan, fine to coarse sand, subangular to subrounded, wet.		Heaving sands @ 20'-30', switched to hollow stem augers to construct well.		10-20 sand from 18' to 29.5'.
-25		Tan, fine to coarse sand, subangular to subrounded, wet.				
-30				Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-23** TOTAL DEPTH: **24'**
COORDINATES: **489964.71N 1916288.17E**
ELEVATION: **240.71'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/05/01**

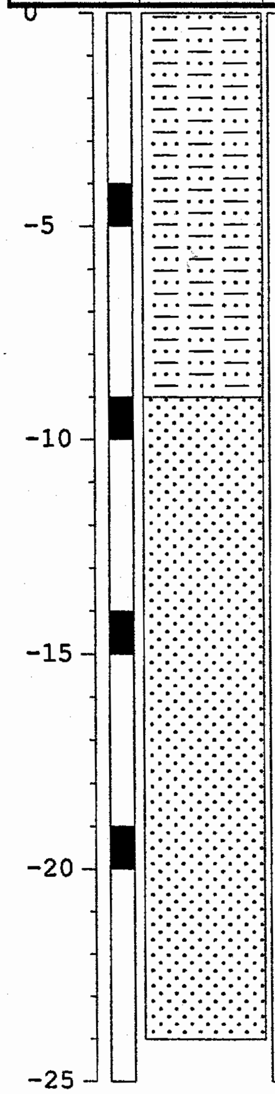
DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1

CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
-5		Tan, sandy silt with some clay, slightly moist.	4,5,5			
-10		Tan, fine to medium grained sand with silt, slightly moist.	4,8,9			
-15		Tan to brown, fine to coarse sand, subangular to subrounded, moist.	6,9,10	Hit H2O @ 18'.		
-20		Tan to brown, fine to coarse sand, subangular to subrounded, wet.	3,2,1	Heaving sands from 18'-24'. Total depth @ 24'.		
-25						

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-24** TOTAL DEPTH: **24'**
COORDINATES: **489993.60N 1918788.09E**
ELEVATION: **241.40'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/05/01**

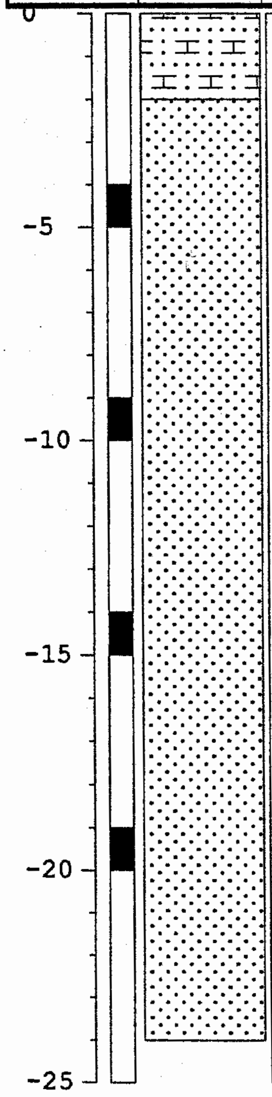
DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1

CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0		Brown silty clay, dry.				
-5		Tan, fine to medium sand with some silt, slightly moist.	4,5,5			
-10		Tan, fine to medium grained sand with silt, slightly moist.	4,5,6			
-15		Tan, fine to medium grained sand, slightly moist.	6,10,11			
				Hit H2O @ 18'.		
-20		Tan to brown, fine to coarse sand, subangular to subrounded, wet.	5,11,13	Heaving sands from 18'-24'.		
				Total depth @ 24'.		
-25						

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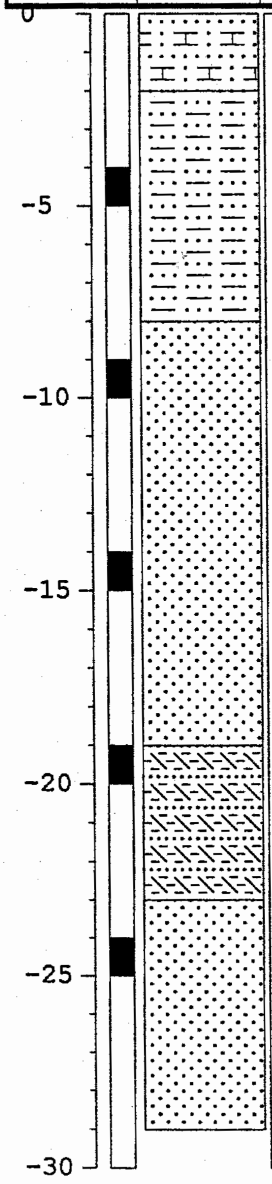
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-25** TOTAL DEPTH: **29'**
COORDINATES: **490002.49N 1919288.01E**
ELEVATION: **241.89'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25"diam. solid flight auger**
DATE DRILLED:	**4/05/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0		Brown, silty clay, dry.				
-5		Tan silt with some fine sand, dry.	5,4,4			
-10		Tan, fine to medium sand, subangular to subrounded, dry.	5,7,7			
-15		Tan, fine to medium sand, subangular to subrounded, moist.	6,9,10			
-20		Tan, fine to medium sand, subangular to subrounded, with some tan to brown clay, moist.	4,8,12	Hit H2O @ 22'. Heaving sands from 23'-29'.		
-25		Tan, fine to medium sand, subangular to subrounded, wet.	3,5,10	Total depth @ 29'.		
-30						

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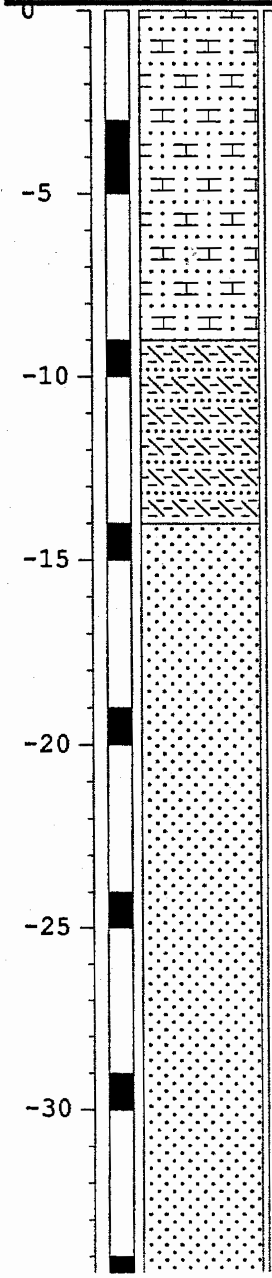
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-26** TOTAL DEPTH: **130'**
COORDINATES: **490011.38N 1919787.94E**
ELEVATION: **242.20'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Jay and Wayne Johnson**
JOB NO.:	**01008**	RIG TYPE:	**CME 55**
LOGGED BY:	**TG**	METHOD OF DRILLING:	**Wash rotary**
DATE DRILLED:	**4/05/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 3
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown to tan, silty clay, dry.		Pushed shelby tube from 3'-5'.		
		Brown to tan, sandy clay, moist.	4,4,4			
		Tan, fine sand, subangular to subrouned with minor clay, moist.	4,6,10			
		Tan, fine sand, subangular to subrouned with minor clay, moist.	4,18,21			
		Tan, fine sand, subangular to subrouned with minor clay, moist.	5,21,24+			
		Tan, fine to coarse sand, rounded to subrounded.	5,21,24+			

GENESIS ENVIRONMENTAL CONSULTING, INC.
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-26**
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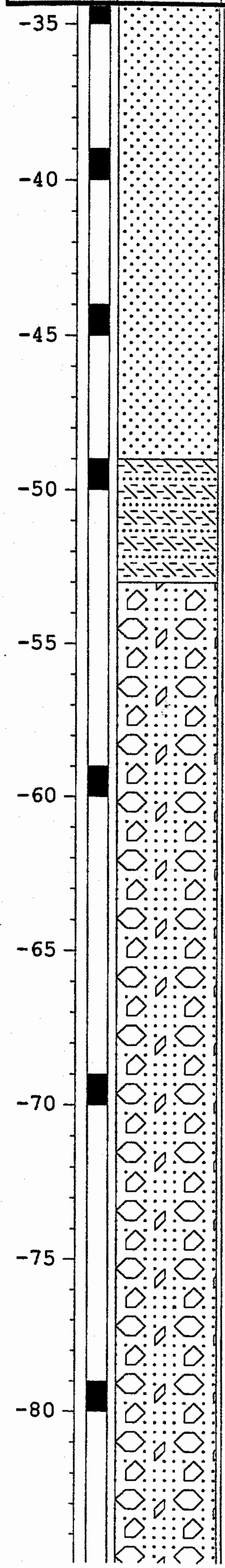

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-35		Tan, fine to coarse sand, rounded to subrounded, with some gravel (<8mm).	5,32,13+			
-40		Tan, fine to coarse sand, rounded to subrounded, with some gravel (<10mm) and organics.	5,19,22			
-45		Gray, fine to coarse sand with trace gravel and clay.	5,29,16+			
-50		Gray, sandy clay, coarse sand, trace gravel.	5,26,19+			
-55						
-60		Gray, coarse to very coarse sand, rounded to angular with gravel (<30mm), trace clay.	5,25,20+			
-65						
-70		Gray, fine to coarse sand with gravel (<40mm).	4,30,16+			
-75						
-80		Gray, fine to coarse sand with gravel (<20mm).	5,30,15+			

GENESIS ENVIRONMENTAL CONSULTING, INC.
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-26**
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DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-85						
-90		Gray, fine to coarse sand with gravel (<20mm).	5,45			
-95						
-100						
-105						
-110		Coarse to very coarse sand, rounded to angular.		Logged by cuttings due to lack of recovery from split spoon.		
-115						
-120						
-125						
-130		Coarse to very coarse sand, rounded to angular.		Total depth @ 130'.		

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FIELD BOREHOLE LOG

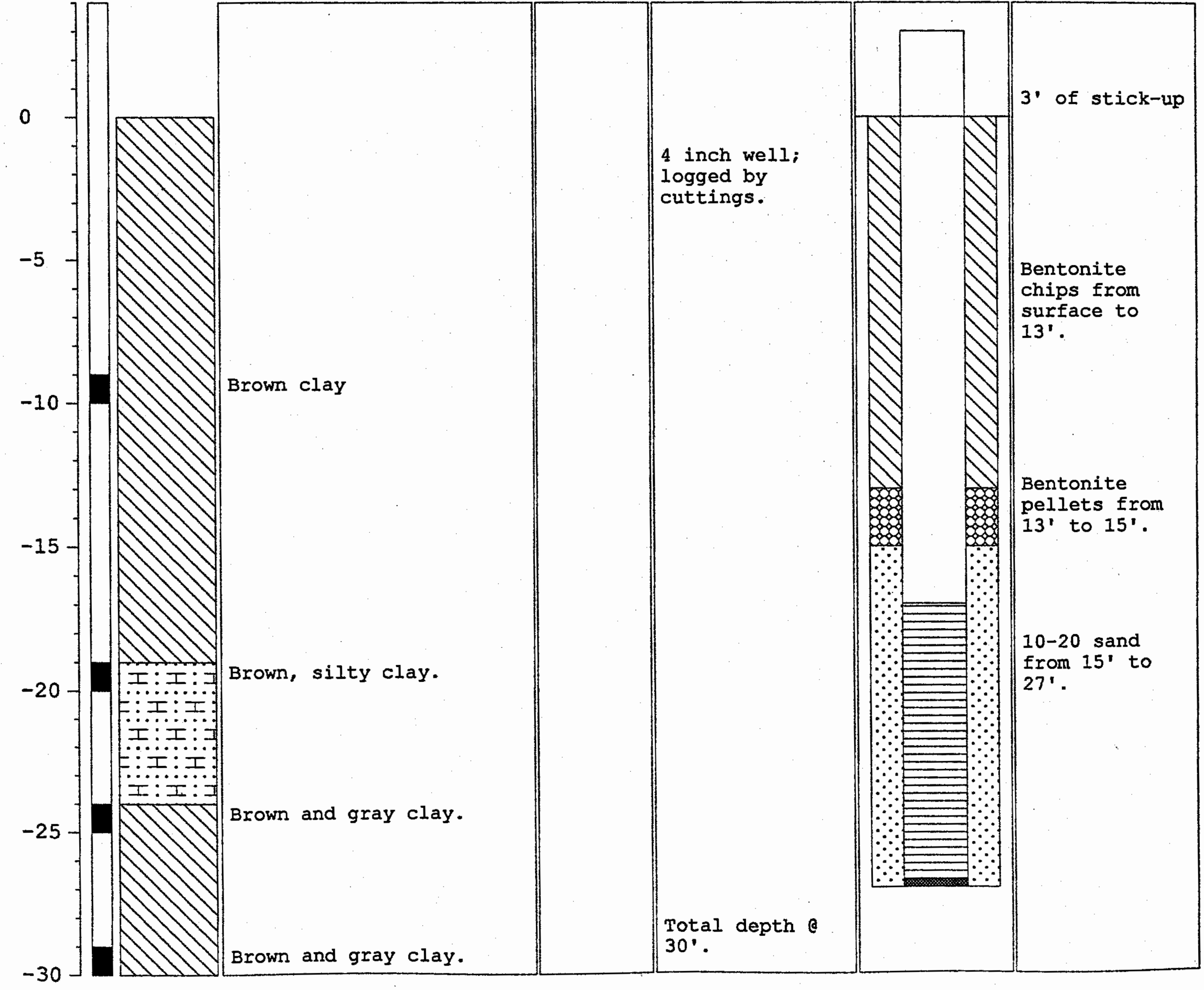
BOREHOLE NO.: B-27/PZ-9 TOTAL DEPTH: 30'
COORDINATES: 490020.28N 1920287.86E
ELEVATION: TOC ELEVATION: 246.36'

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	Plum Point Energy Station	DRILLING CO.:	Anderson Engineering
SITE LOCATION:	Osceola, AR	DRILLER:	Jay and Wayne Johnson
JOB NO.:	01008	RIG TYPE:	CME 55
LOGGED BY:	TG	METHOD OF DRILLING:	Wash rotary
DATE DRILLED:	4/11/01	SAMPLING METHODS:	Split Spoon

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 4-inch
CASING LENGTH: 19.96'
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 29.96' BELOW TOC
DATE OF WATER LEVEL: n/a

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION



Brown clay

Brown, silty clay.

Brown and gray clay.

Brown and gray clay.

4 inch well; logged by cuttings.

Total depth @ 30'.

3' of stick-up

Bentonite chips from surface to 13'.

Bentonite pellets from 13' to 15'.

10-20 sand from 15' to 27'.

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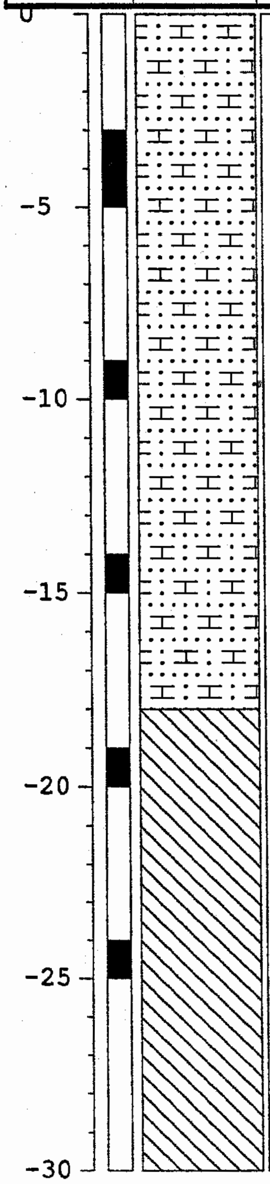
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-28** TOTAL DEPTH: **30'**
COORDINATES: **489520.39N 1920298.47E**
ELEVATION: **241.83'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25"diam. solid flight auger**
DATE DRILLED:	**4/12/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1
CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown, silty clay, slightly moist, low plasticity.		Pushed shelby tube from 3'-5'.		
		Brown, silty clay, slightly moist, low plasticity.	1,1,2			
		Brown, silty clay, very moist, low plasticity.	1,2,2			
				Hit H2O @ 18'.		
		Grey clay, high plasticity, wet.	1,1,1			
		Grey clay with organics and medium grained sand, wet.	1,1,3			
				Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-29** TOTAL DEPTH: **25'**
COORDINATES: **489502.60N 1919298.62E**
ELEVATION: **241.39'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/12/01**

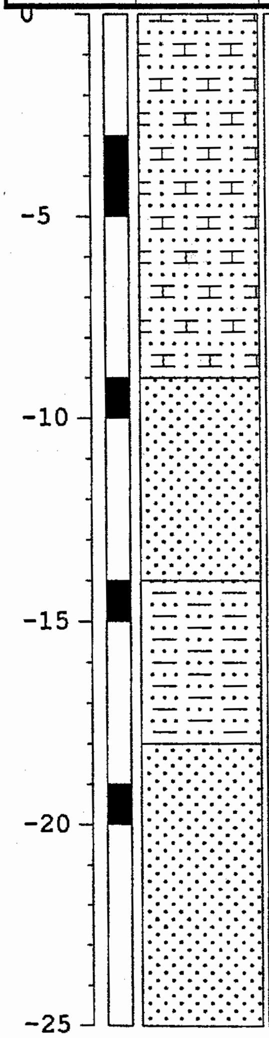
DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1

CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown, silty clay, low plasticity, slightly moist.		Pushed shelby tube from 3'-5'.		
		Tan to brown, fine to medium grained sand, subangular to subrounded.	3,5,6			
		Tan, silty sand with trace clay.	3,4,6			
				HIt H2O @ 19'.		
		Tan to brown sand, fine to coarse grained, subangular to subrounded, wet.	5,6,6	Heaving sands from 22'-25'. Total depth @ 25'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-30** TOTAL DEPTH: **30'**
COORDINATES: **489484.82N 1918298.77E**
ELEVATION: **240.08'** TOC ELEVATION: **n/a**

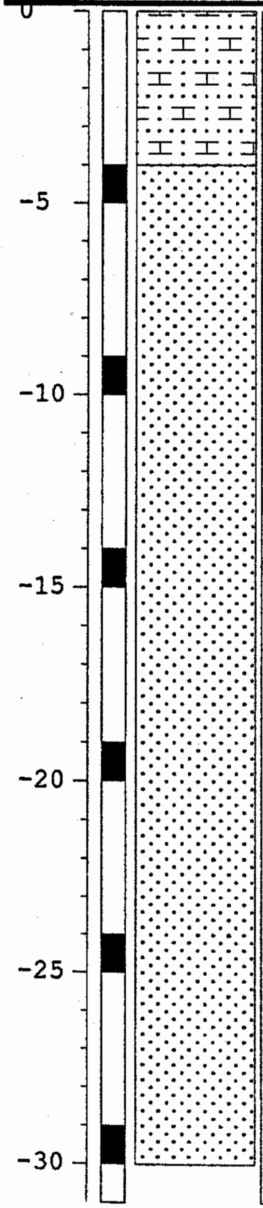
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **TG**
DATE DRILLED: **4/13/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0		Brown, silty clay.				
-5		Tan, medium grained sand with trace clay, dry.	2,3,6			
-10		Tan, medium grained sand, dry.	3,5,8			
-15		Tan, medium grained sand, slightly moist.				
-20		Tan, medium grained sand, wet.		Hit H20 @ 20'.		
-25		Tan, medium grained sand, wet.				
-30		Tan, medium grained sand, wet.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-31** TOTAL DEPTH: **20'**
COORDINATES: **489467.03N 1917298.92E**
ELEVATION: **239.08'** TOC ELEVATION: **n/a**

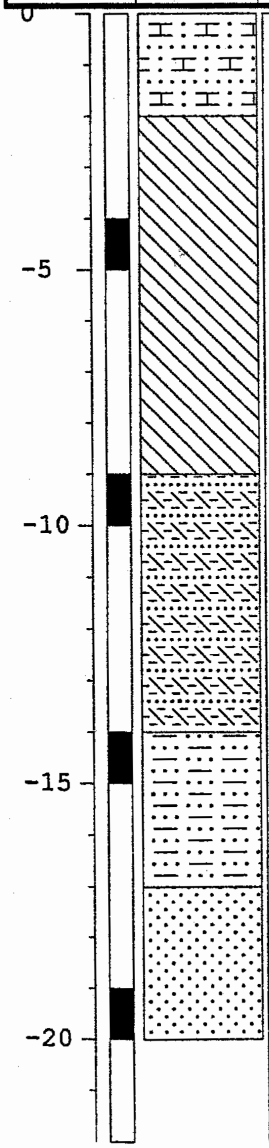
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/06/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown, silty clay, dry.				
		Brown to gray clay, ferrous staining, slightly moist.	1,3,4			
		Brown to gray, silty sandy clay, moist.	2,2,3			
		Brown, silty, fine to medium grained sand, moist.	3,4,6	Hit H2O @ 17'.		
		Brown, fine to coarse grained sand, subangular to subrounded, wet.	7,11,14	Total depth @ 20'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-32** TOTAL DEPTH: **24'**
COORDINATES: **489449.25N 1916299.06E**
ELEVATION: **237.86'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Paul Harris**
JOB NO.:	**01008**	RIG TYPE:	**Simco 2400 SKL**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**6.25"diam. solid flight auger**
DATE DRILLED:	**4/06/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
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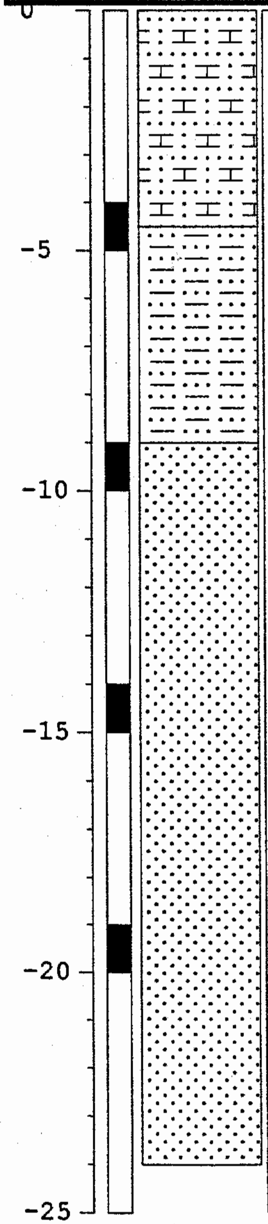
CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown, silty clay, dry.				
		Brown, silty clay, slightly moist (4'-4.5'); Tan silty sand, slightly moist (4.5'-9').	3,5,7			
		Tan, fine to coarse grained sand, subangular to subrounded, moist.	5,8,9			
		Tan, fine to coarse grained sand, subangular to subrounded, moist.	3,7,8			
				Hit H2O @ 18'.		
		Tan, fine to coarse grained sand, subangular to subrounded, with trace gravel, moist.	4,8,9	Heaving sands from 20'-24'.		
				Total depth @ 24'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-33/PZ-3** TOTAL DEPTH: **30'**
COORDINATES: **489431.47N 1915299.23E**
ELEVATION: TOC ELEVATION: **241.23'**

PROJECT INFORMATION

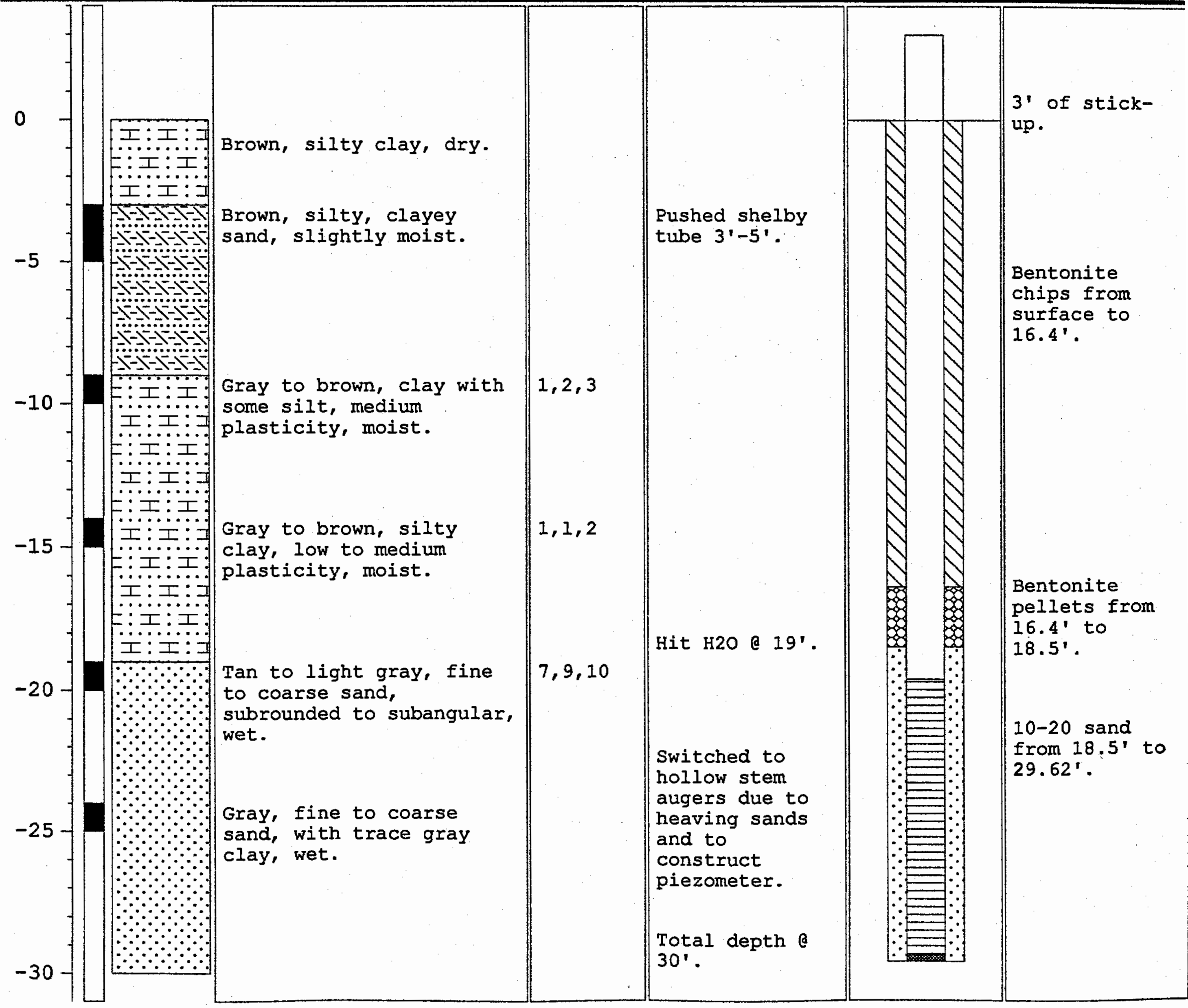
PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/11/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 22.62'
STATIC WATER LEVEL: 20.35' BELOW TOC
SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 32.62' BELOW TOC
DATE OF WATER LEVEL: 5/02/01



DEPTH	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	WELL DESCRIPTION
0	Brown, silty clay, dry.			3' of stick-up.
	Brown, silty, clayey sand, slightly moist.		Pushed shelby tube 3'-5'.	
-5				Bentonite chips from surface to 16.4'.
-10	Gray to brown, clay with some silt, medium plasticity, moist.	1,2,3		
-15	Gray to brown, silty clay, low to medium plasticity, moist.	1,1,2		Bentonite pellets from 16.4' to 18.5'.
			Hit H2O @ 19'.	
-20	Tan to light gray, fine to coarse sand, subrounded to subangular, wet.	7,9,10		10-20 sand from 18.5' to 29.62'.
			Switched to hollow stem augers due to heaving sands and to construct piezometer.	
-25	Gray, fine to coarse sand, with trace gray clay, wet.			
-30			Total depth @ 30'.	

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FIELD BOREHOLE LOG

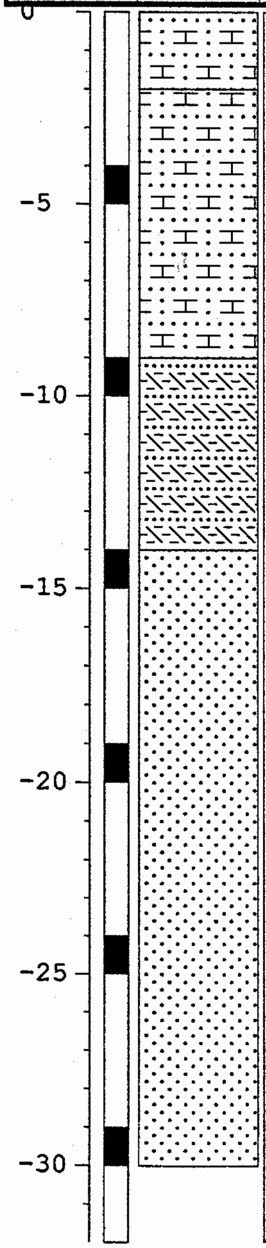
BOREHOLE NO.: **B-34** TOTAL DEPTH: **30'**
COORDINATES: **488931.58N 1915334.83E**
ELEVATION: **238.62'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Jay and Wayne Johnson**
JOB NO.:	**01008**	RIG TYPE:	**CME 55**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**Wash rotary**
DATE DRILLED:	**4/13/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1

CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown, silty clay, dry.				
		Brown, silty clay with trace fine sand, moist.	1,1,1			
		Brown, fine sandy clay, moist.				
		Tan to brown, fine to medium grained sand, moist.				
		Tan to brown, fine to medium grained sand, moist.				
		Tan to brown, fine to medium grained sand, moist.				
		Tan to brown, fine to medium grained sand, moist.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-35** TOTAL DEPTH: **30'**
COORDINATES: **488940.47N 1915819.76E**
ELEVATION: **237.12'** TOC ELEVATION: **n/a**

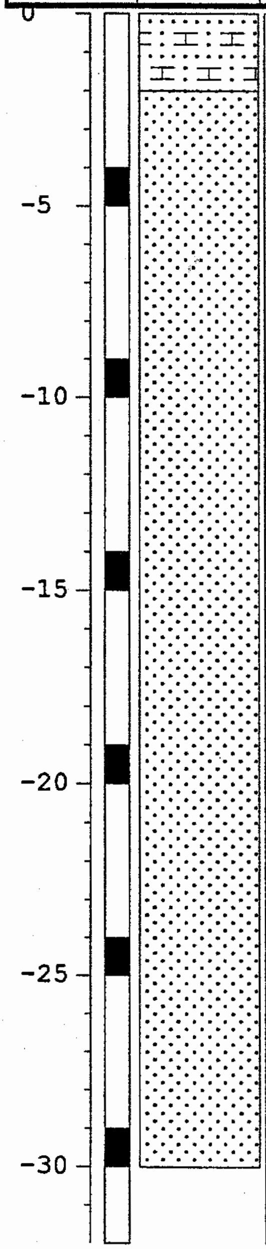
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/13/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1
CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0		Brown, silty clay, dry.				
-5		Tan to brown, silty, fine to coarse sand, subangular to subrounded.	3,6,9			
-10		Tan to brown, silty, fine to coarse sand, subangular to subrounded with trace clay.	4,10,18			
-15		Tan to brown, fine to coarse sand, subangular to subrounded.				
-20		Tan to brown, fine to coarse sand, subangular to subrounded.		Hit H2O @ 20'.		
-25		Tan to brown, fine to coarse sand, subangular to subrounded, wet.				
-30		Tan to brown, fine to coarse sand, subangular to subrounded, wet.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-36** TOTAL DEPTH: **30'**
COORDINATES: **488949.36N 1916309.68E**
ELEVATION: **237.69'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/12/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
-5		Brown, silty clay, low plasticity, slightly moist.	2,4,6			
-10		Brown, clayey silt with trace fine sand.	4,6,10			
-15		Tan, fine to coarse sand with trace clay.	3,6,7			
				Hit H2O @ 18'.		
-20		Tan, fine to coarse sand, subrounded to subangular, wet.				
-25		Tan, fine to coarse sand, subrounded to subangular, wet.				
-30		Tan, fine to coarse sand, subrounded to subangular, wet.		Total depth @ 30'.		

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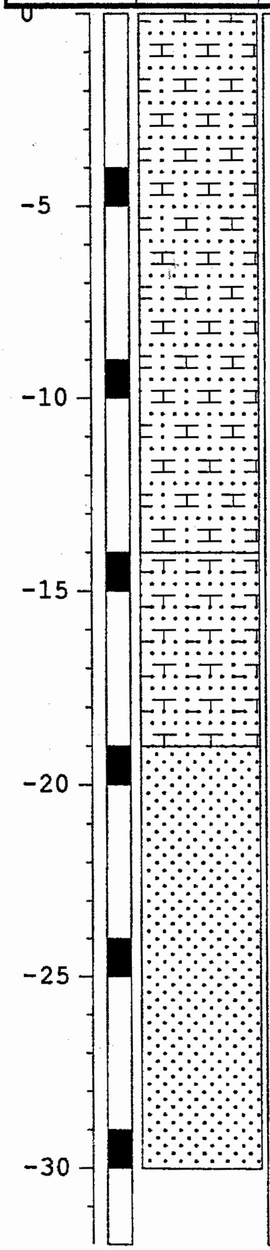
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-37** TOTAL DEPTH: **30'**
COORDINATES: **488958.25N 1916809.61E**
ELEVATION: **237.22'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Jay and Wayne Johnson**
JOB NO.:	**01008**	RIG TYPE:	**CME 55**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**Wash rotary**
DATE DRILLED:	**4/12/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-5		Brown, silty clay, low plasticity, slightly moist.	1,3,4			
-10		Brown, silty clay, low plasticity, slightly moist.	5,6,4			
-15		Tan, clayey silt, moist.	3,6,8			
				Hit H2O @ 18'.		
-20		Tan, fine to coarse sand, subrounded to subangular, wet.				
-25		Tan, fine to coarse sand, subrounded to subangular, wet.				
-30		Tan, fine to coarse sand, subrounded to subangular, wet.		Total depth @ 30'.		

FIELD BOREHOLE LOG

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BOREHOLE NO.: **B-38** TOTAL DEPTH: **30'**
COORDINATES: **488967.14N 1917309.53E**
ELEVATION: **237.89'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/12/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1

CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
-5		Brown, silty clay, low plasticity, slightly moist.	1,3,4			
-10		Brown, silty clay, low plasticity, slightly moist.	2,2,3			
-15		Tan, fine to coarse sand with trace clay.				
				Hit H2O @ 18'.		
-20		Tan, fine to coarse sand with trace clay.				
-25		Tan, fine to coarse sand, subrounded to subangular, wet.				
-30		Tan, fine to coarse sand, subrounded to subangular, wet.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

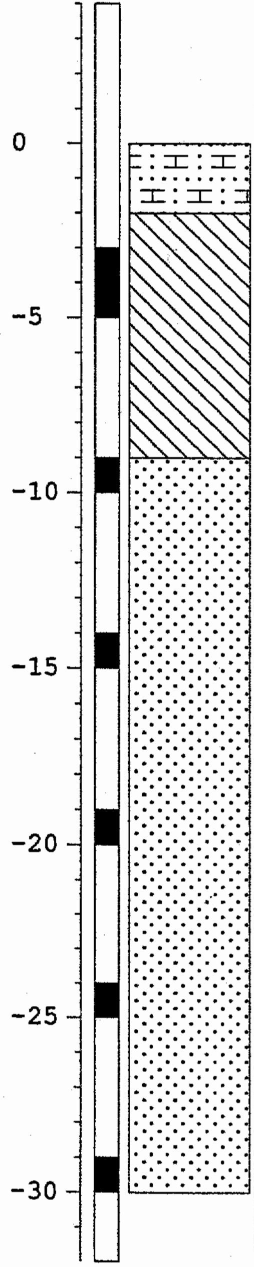
BOREHOLE NO.: **B-39/PZ-6** TOTAL DEPTH: **30'**
COORDINATES: **488976.04N 1917809.45E**
ELEVATION: TOC ELEVATION:

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Jay and Wayne Johnson**
JOB NO.:	**01008**	RIG TYPE:	**CME 55**
LOGGED BY:	**TG**	METHOD OF DRILLING:	**Wash rotary**
DATE DRILLED:	**4/12/01**	SAMPLING METHODS:	**Split Spoon**

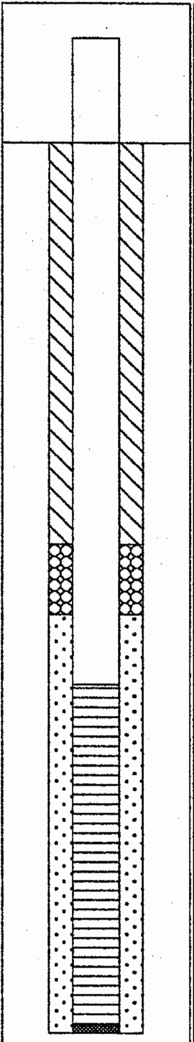
GRAVEL PACK: 10-20 Sand SEAL: Bentonite pellets GROUT: Bentonite chips Page 1 of 1

CASING/SCREEN TYPE: PVC DIAMETER: 2-inch CASING LENGTH: 18.45' STATIC WATER LEVEL: 21.30' BELOW TOC

SCREEN LENGTH: 10' SLOT SIZE: 0.010 T.D. OF WELL 28.45' BELOW TOC DATE OF WATER LEVEL: 5/02/01



DEPTH	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	WELL DESCRIPTION
0	Brown, silty clay, dry.			3' of stick-up
-5	Brown clay, slightly moist.		Pushed shelby tube from 3'-5'.	Bentonite chips from surface to 11.5'.
-10	Tan, fine to medium sand, subrounded to subangular, with trace brown clay.	1,3,6		Bentonite pellets from 11.5' to 13.5'.
-15	Tan, fine to coarse sand, with trace brown clay.	3,7,11		10-20 sand from 13.5' to 25.5'.
-20	Tan, fine to coarse sand, with trace brown clay.	4,4,8		
-25	Tan, fine to coarse sand, with trace brown clay.	5,19,26		Due to heaving sands piezometer could not be set at 30' bgs.
-30	Tan, fine to coarse sand, with trace brown clay.	4,15,15	Total depth @ 30'.	



FIELD BOREHOLE LOG

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Phone: (501) 455-2199 Fax (501) 455-4547

BOREHOLE NO.: **B-40** TOTAL DEPTH: **30'**
COORDINATES: **488984.93N 1918309.38E**
ELEVATION: **239.41'** TOC ELEVATION: **n/a**

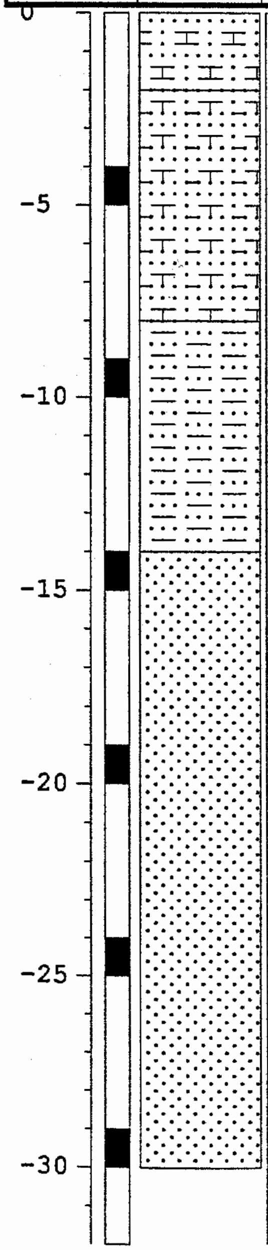
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/12/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0		Brown, silty clay, low plasticity, dry.				
-5		Tan, clayey silt, slightly moist.	2,4,6			
-10		Tan, silty sand, slightly moist.	3,5,9			
-15		Tan, fine to coarse sand, subangular to subrounded.	4,6,12			
-20		Tan, fine to coarse sand, subangular to subrounded.				
-25		Tan, fine to coarse sand, subangular to subrounded.				
-30		Tan, fine to coarse sand, subangular to subrounded.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-41** TOTAL DEPTH: **30'**
COORDINATES: **488993.82N 1918809.30E**
ELEVATION: **239.72'** TOC ELEVATION: **n/a**

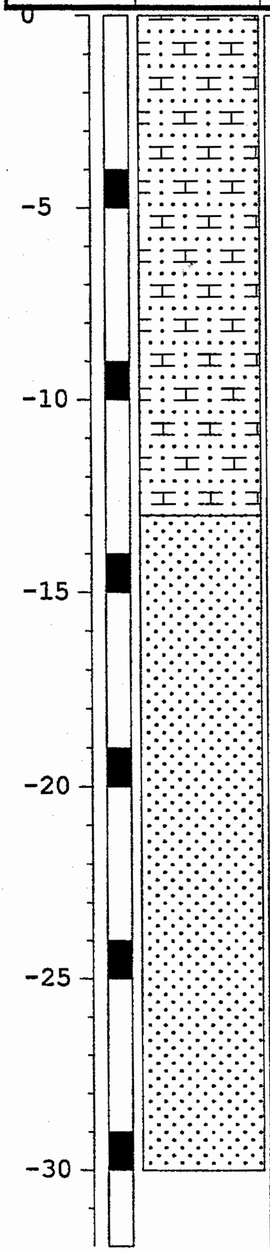
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/12/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
Brown, silty clay, low plasticity, dry.		Pushed shelby tube from 3'-5'.		
Brown, silty clay with trace fine sand, low plasticity, dry.	1,2,3			
Tan, fine to coarse sand with trace silt.	2,6,8			
Tan, fine to coarse sand, subangular to subrounded.				
Tan, fine to coarse sand, subangular to subrounded.				
Tan, fine to coarse sand, subangular to subrounded.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-42** TOTAL DEPTH: **30'**
COORDINATES: **489002.71N 1919309.23E**
ELEVATION: **240.60'** TOC ELEVATION: **n/a**

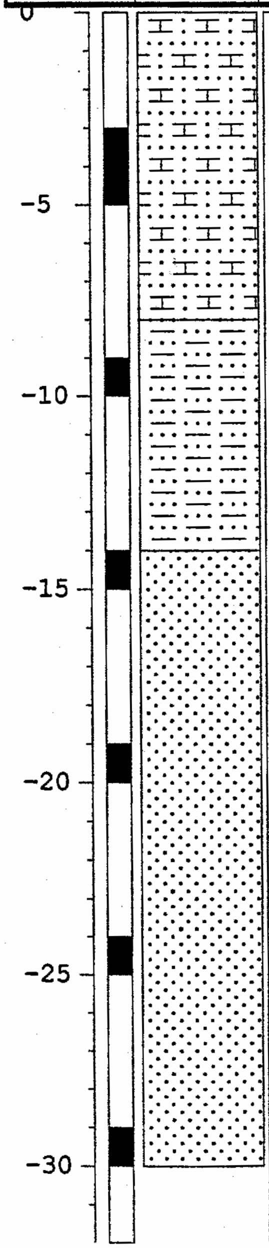
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/12/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
-5		Brown, silty clay, slightly moist.		Pushed shelby tube from 3'-5'.		
-10		Brown to tan silt, with fine to medium sand and trace clay.	3,4,6			
-15		Tan, fine to coarse sand with trace clay.	5,14,14			
-20		Tan, fine to coarse sand, wet.		Hit H2O @ 20'.		
-25		Tan, fine to coarse sand, wet.				
-30		Tan, fine to coarse sand, wet.		Total depth @ 30'.		

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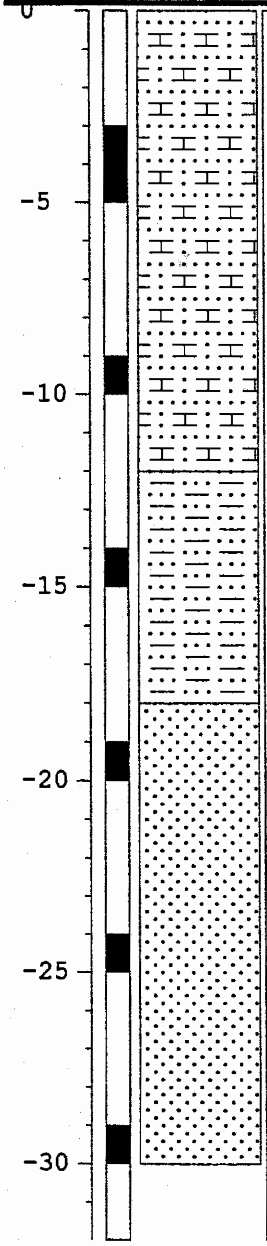
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-43** TOTAL DEPTH: **30'**
COORDINATES: **489011.60N 1919809.15E**
ELEVATION: **241.61'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Jay and Wayne Johnson**
JOB NO.:	**01008**	RIG TYPE:	**CME 55**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**Wash rotary**
DATE DRILLED:	**4/12/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-5		Brown, silty clay, slightly moist.		Pushed shelby tube from 3'-5'.		
-10		Brown, silty clay, slightly moist.	2,4,4			
-15		Tan, silty sand with trace clay.	3,12,14			
-20		Tan, fine to medium grained sand, subangular to subrounded.				
-25		Tan, fine to medium grained sand, subangular to subrounded.				
-30		Tan, fine to medium grained sand, subangular to subrounded.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-44** TOTAL DEPTH: **30'**
COORDINATES: **489020.50N 1920309.07E**
ELEVATION: **241.14'** TOC ELEVATION: **n/a**

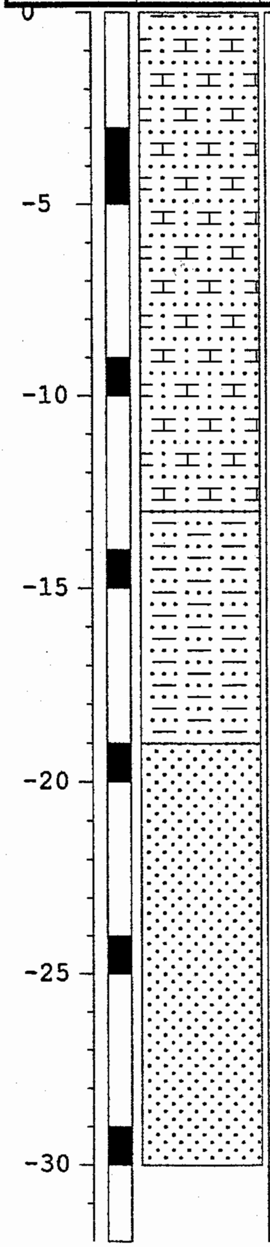
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/12/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1
CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown, silty clay, slightly moist.		Pushed shelby tube from 3'-5'.		
		Brown, silty clay, slightly moist.	2,5,5			
		Tan to brown, silty, fine to medium grained sand, moist.	5,8,12	Hit H2O @ 20'.		
		Tan to brown, fine to coarse, sand, wet.	10,15,20			
		Tan to brown, fine to coarse, sand, wet.	5,10,12			
		Tan to brown, fine to coarse, sand, wet.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-45/PZ-11** TOTAL DEPTH: **30'**
COORDINATES: **488570.59N 1920138.62E**
ELEVATION: TOC ELEVATION: **244.33'**

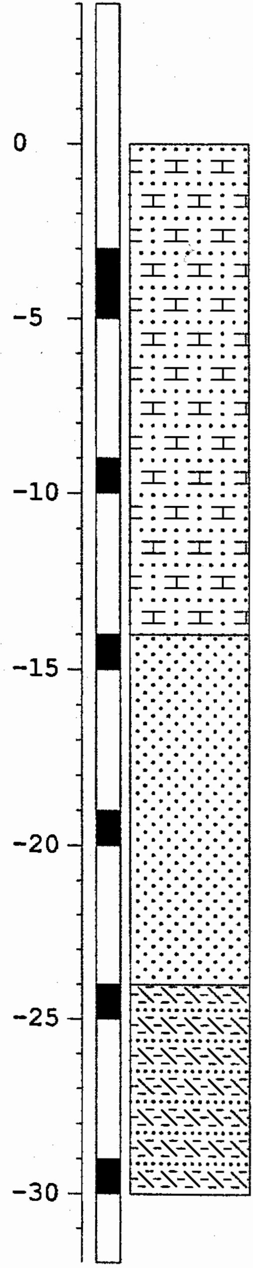
PROJECT INFORMATION

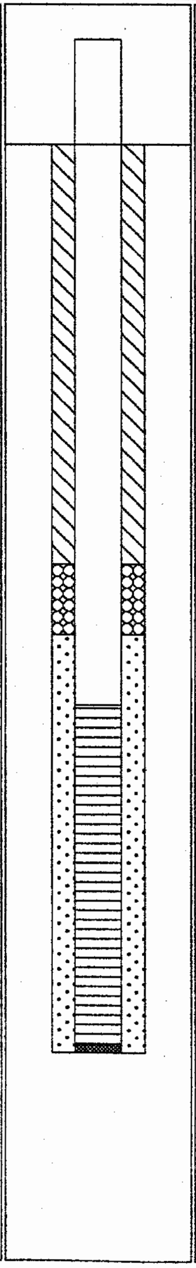
PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **TG**
DATE DRILLED: **4/12/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite chips
GROUT: Bentonite pellets
Page 1 of 1
CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 18.76'
STATIC WATER LEVEL: 22.76' BELOW TOC
SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 28.76' BELOW TOC
DATE OF WATER LEVEL: 5/02/01





DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
						3' of stick-up
0						
				Pushed shelby tube from 3'-5'; no recovery.		
-5						
						Bentonite chips from 12' to surface.
-10		Brown, silty clay.	2,2,3			
						Bentonite pellets from 12' to 14'.
-15		Tan to brown, medium grained sand, subrounded to subangular with trace clay.	3,10,12			
-20		Tan, fine to medium grained sand, subrounded to subangular with some clay.	5,12,9			
						10-20 Sand from 14' to 26'.
-25		Brown to tan, sandy clay.	4,8,17			
						Heaving sands prohibit piezometer to reach 30'bgs.
-30		Brown, fine to medium grained, sandy clay.	5,8,7	Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-46** TOTAL DEPTH: **50'**
COORDINATES: **488581.70N 1919818.69E**
ELEVATION: **240.11'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **TG**
DATE DRILLED: **4/06/01**

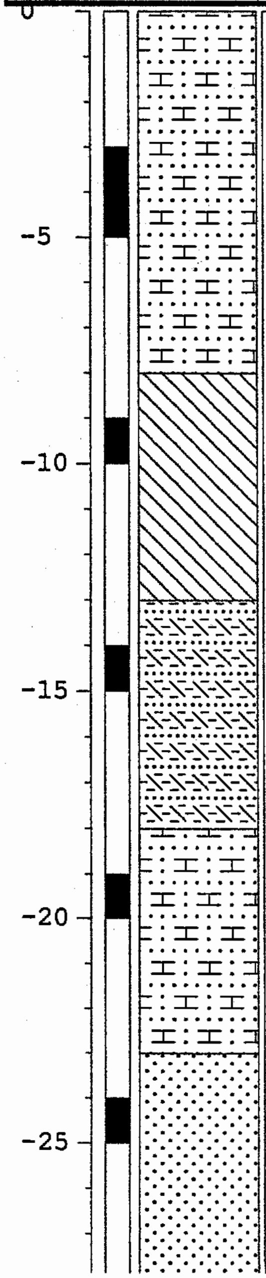
DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 2

CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC

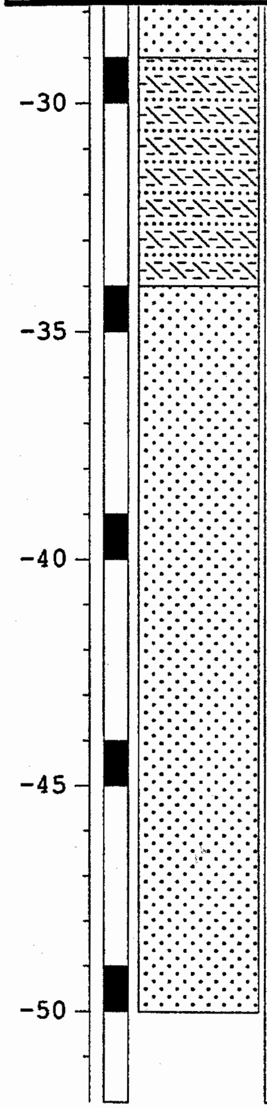
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown, silty clay.		Pushed shelby tube from 3'-5'.		
		Brown clay with trace silt.	1,5,4			
		Brown, sandy clay, sand is very fine.	4,4,7			
		Brown, silty clay, moist.	4,4,5			
		Brown to tan, medium grained sand, subangular to subrounded, with some silt	4,16,17			

GENESIS ENVIRONMENTAL CONSULTING, INC.
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-46**
Page 2 of 2



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-30		Brown to tan, silty, sandy clay with trace gray clay.	1,0,0			
-35		Gray sand, subrounded to subangular, with trace gravel (<10mm).	4,14,17			
-40		Tan to brown, very fine to coarse grained sand, subrounded to subangular with trace clay.	4,25,21+			
-45		Brown and gray, medium to coarse grained sand.	4,15,22			
-50		Brown and gray, medium to coarse grained sand.	4,16,23	Total depth @ 50'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-47** TOTAL DEPTH: **30'**

COORDINATES: **488552.81N 1919318.77E**

ELEVATION: **240.10'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**

SITE LOCATION: **Osceola, AR**

JOB NO.: **01008**

LOGGED BY: **ME**

DATE DRILLED: **4/12/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**

DRILLER: **Jay and Wayne Johnson**

RIG TYPE: **CME 55**

METHOD OF DRILLING: **Wash rotary**

SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a

SEAL: n/a

GROUT: n/a

Page 1 of 1

CASING/SCREEN TYPE: n/a

DIAMETER: n/a

CASING LENGTH: n/a

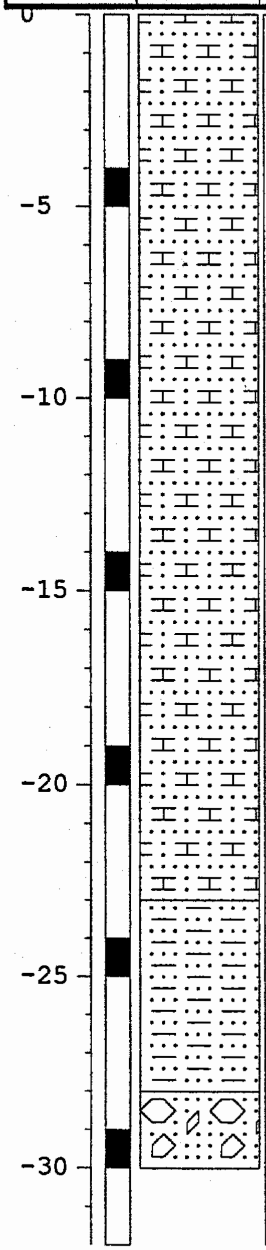
STATIC WATER LEVEL: n/a BELOW TOC

SCREEN LENGTH: n/a

SLOT SIZE: n/a

T.D. OF WELL n/a BELOW TOC

DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-5		Brown, silty clay.				
-10		Brown, silty clay.				
-15		Brown, silty clay.				
-20		Brown, silty clay.				
-25		Brown, silty sand, subangular to subrounded.				
-30		Brown, fine to coarse grained sand and gravel.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

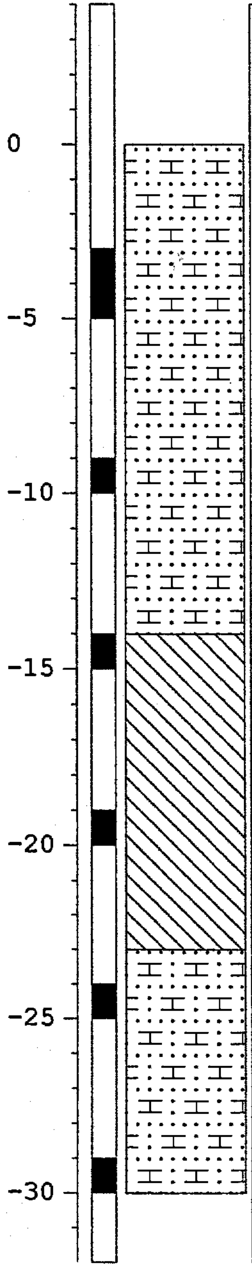
BOREHOLE NO.: **B-48/PZ-10** TOTAL DEPTH: **30'**
COORDINATES: **488543.92N 1918818.85E**
ELEVATION: TOC ELEVATION: **242.51'**

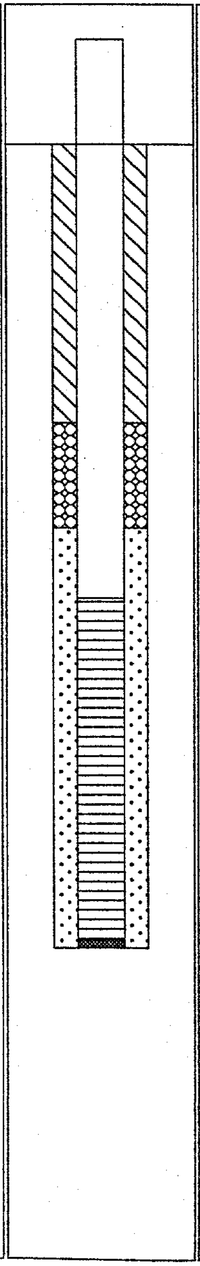
PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Jay and Wayne Johnson**
JOB NO.:	**01008**	RIG TYPE:	**CME 55**
LOGGED BY:	**TG**	METHOD OF DRILLING:	**Wash rotary**
DATE DRILLED:	**4/12/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite pellets
GROUT: Bentonite chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 15.60'
STATIC WATER LEVEL: 19.78' BELOW TOC

SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 25.60' BELOW TOC
DATE OF WATER LEVEL: 5/02/01





DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
						3' of stick-up
0						
		Brown, silty clay, slightly moist.		Pushed shelby tube from 3'-5'.		
-5						Bentonite chips from 8' to surface.
						Bentonite pellets from 8' to 11'.
-10		Brown, silty clay, slightly moist.	1,1,1			
-15		Brownish grey clay, moist.	1,1,3			10-20 Sand from 11' to 23'.
-20		Brownish grey clay, moist.	1,2,2			
-25		Gray, silty clay, wet.	2,7,10			Due to repeated cave-ins piezometer was unable to reach 30' bgs.
-30		Gray, silty clay with fine sand, wet.	6,9,12	Total depth @ 30'.		

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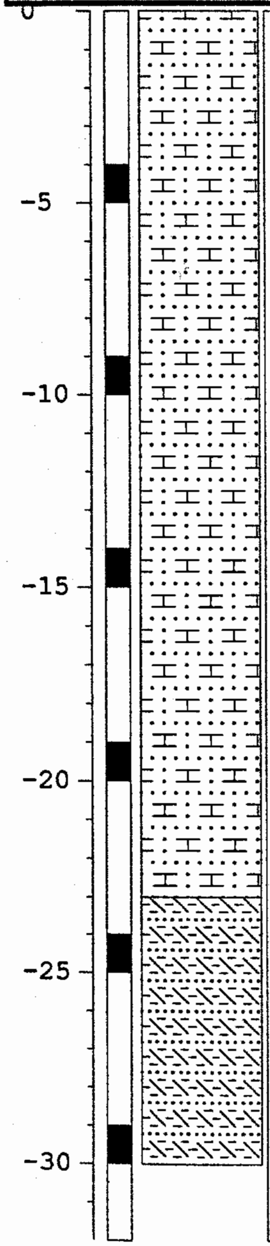
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-49** TOTAL DEPTH: **30'**
COORDINATES: **488535.03N 1918318.92E**
ELEVATION: **238.60'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Jay and Wayne Johnson**
JOB NO.:	**01008**	RIG TYPE:	**CME 55**
LOGGED BY:	**ME**	METHOD OF DRILLING:	**Wash rotary**
DATE DRILLED:	**4/13/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-5		Brown, silty clay, low plasticity, slightly moist.	1,1,2			
-10		Brown, silty clay, low plasticity, slightly moist.	1,2,1			
-15		Brown, silty clay, low plasticity, slightly moist.	2,3,3			
-20		Brown, silty clay, low plasticity, moist.	1,1,1	Hit H2O @ 20'.		
-25		Brown, sandy clay.	5,7,9			
				No recovery at 29-30'. Total depth @ 30'.		
-30						

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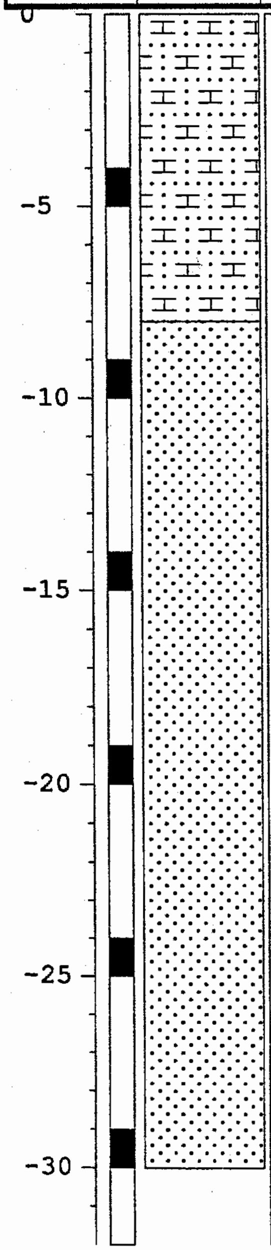
FIELD BOREHOLE LOG

BOREHOLE NO.: **B-50** TOTAL DEPTH: **30'**
COORDINATES: **488528.13N 1917819.00E**
ELEVATION: **237.98'** TOC ELEVATION: **n/a**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Jay and Wayne Johnson**
JOB NO.:	**01008**	RIG TYPE:	**CME 55**
LOGGED BY:	**TG**	METHOD OF DRILLING:	**Wash rotary**
DATE DRILLED:	**4/13/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 1
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-5		Brown, silty clay, dry.	2,3,5			
-10		Tan, medium grained sand with some silt, dry.	5,7,9			
-15		Tan, medium grained sand with some silt, slightly moist.				
-20		Tan, medium grained sand with some silt, slightly moist.				
-25		Tan, medium grained sand with some silt, wet.				
-30		Tan, medium grained sand with some silt, wet.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-51** TOTAL DEPTH: **130'**

COORDINATES:

ELEVATION: **237.55'** TOC ELEVATION: **n/a**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**

SITE LOCATION: **Osceola, AR**

JOB NO.: **01008**

LOGGED BY: **TG/ME**

DATE DRILLED: **4/4/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**

DRILLER: **Jay and Wayne Johnson**

RIG TYPE: **CME 55**

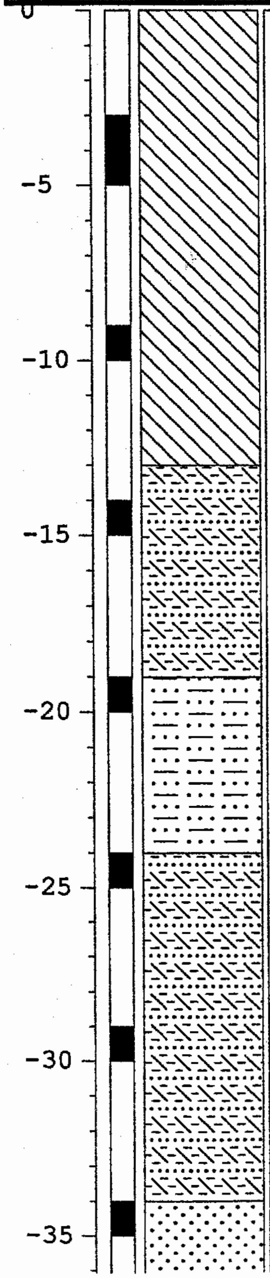
METHOD OF DRILLING: **Wash rotary**

SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 3

CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC

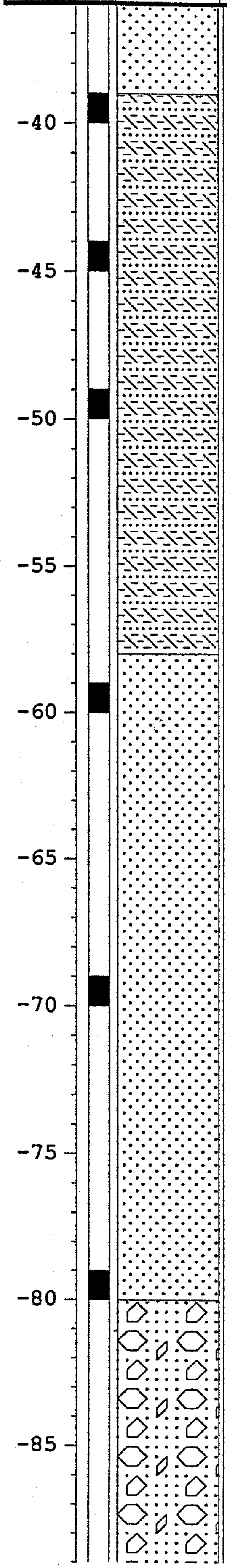
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		Brown clay with some silt, moist.		Pushed shelby tube from 3'-5'.		
		Brown to tan, clay with some silt and black organics, moist.	2,3,3			
		Tan to brown, fine to coarse grained sand with brown clay, moist.	8,10,10			
		Tan to brown, silty sand, fine to coarse grained, wet.	8,10,15			
		Brown to gray, clayey sand, fine to coarse grained, wet.	8,11,15			
		Brown to gray, fine to coarse grained sand with gray clay.	4,6,6			
		Gray to brown, medium to coarse grained sand,	6,13,14			

GENESIS ENVIRONMENTAL CONSULTING, INC.
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-51**
Page 2 of 3



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
		rounded to subangular, with some silt.				
-40		Gray clay with sand.	2,2,3			
-45		Gray clay and gray sand.	5,20,25+			
-50		Gray, clayey, fine to medium grained sand.	8,13,16			
-55						
-60		Gray to tan, fine to medium grained sand.	5,31,14+			
-65						
-70		Gray, fine to coarse grained sand.	5,24,25			
-75						
-80		Gray, fine to coarse grained sand with minor gravel.	5,17,28+			
-85						

GENESIS ENVIRONMENTAL CONSULTING, INC.
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-51**
Page 3 of 3

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-90		Gray, fine to coarse grained sand with minor gravel.				
-95						
-100						
-105						
-110		Gray, fine to coarse grained sand and gravel.	6,23,21+			
-115						
-120						
-125						
-130		Gray, fine to coarse grained sand and gravel with black organics.	6,26,23	Total depth @ 130'.		

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FIELD BOREHOLE LOG

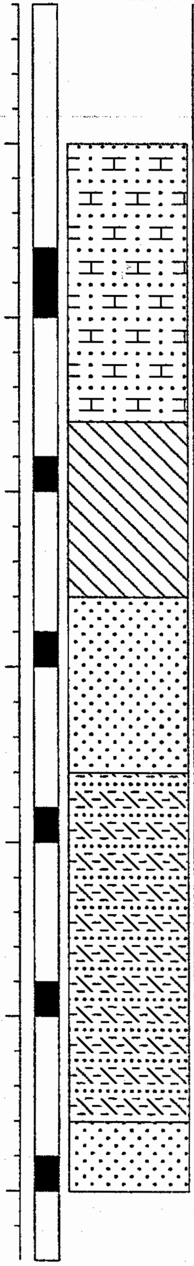
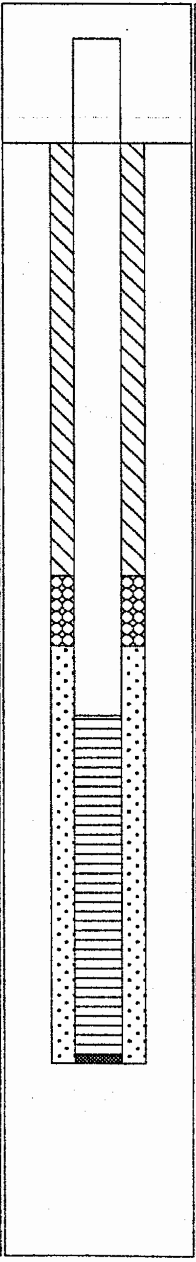
BOREHOLE NO.: **B-52/PZ-4** TOTAL DEPTH: **30'**
COORDINATES: **488458.36N 1916820.21E**
ELEVATION: TOC ELEVATION: **240.50'**

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**Plum Point Energy Station**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**Osceola, AR**	DRILLER:	**Jay and Wayne Johnson**
JOB NO.:	**01008**	RIG TYPE:	**CME 55**
LOGGED BY:	**TG**	METHOD OF DRILLING:	**Wash rotary**
DATE DRILLED:	**4/12/01**	SAMPLING METHODS:	**Split Spoon**

GRAVEL PACK: 10-20 Sand SEAL: Bentonite pellets GROUT: Bentonite chips Page 1 of 1

CASING/SCREEN TYPE: PVC DIAMETER: 2-inch CASING LENGTH: 19.43' STATIC WATER LEVEL: 19.55' BELOW TOC

SCREEN LENGTH: 10' SLOT SIZE: 0.010 T.D. OF WELL 29.43' BELOW TOC DATE OF WATER LEVEL: 5/02/01

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
						3' stick-up
0						
		Brown, silty clay.		Pushed shelby tube from 3'-5'.		
-5						
						Bentonite chips from 12.43' to surface.
-10		Brown and gray clay with organics.	1,1,1			
						Bentonite pellets from 12.43' to 14.43'
-15		Tan, medium grained sand with trace gray clay.	4,8,10			
-20		Brown to gray clay with medium grained sand.	2,3,5	Hit H2O @ 20'.		10-20 sand from 14.43' to 26.43'.
-25		Brown to tan, medium grained sand and clay.	3,15,15			
						Due to repeated cave-ins piezometer was unable to reach 30' bgs.
-30		Tan, medium to coarse grained sand.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-53** TOTAL DEPTH: **30'**
COORDINATES: **488449.47N 1916320.29E**
ELEVATION: **236.47'** TOC ELEVATION: **n/a**

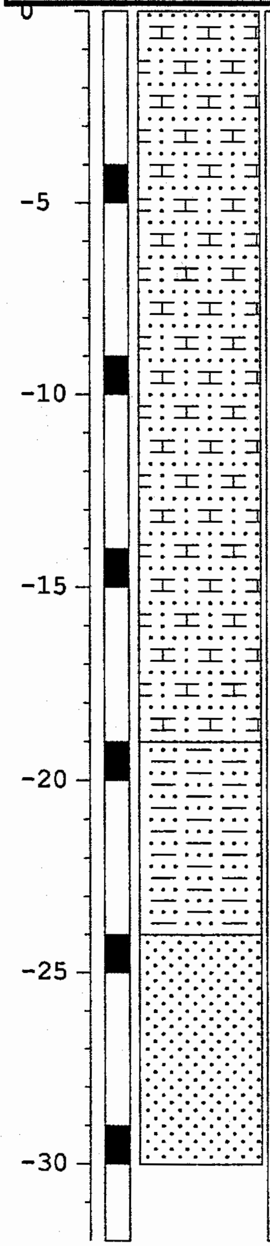
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/13/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a
SEAL: n/a
GROUT: n/a
Page 1 of 1
CASING/SCREEN TYPE: n/a
DIAMETER: n/a
CASING LENGTH: n/a
STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a
SLOT SIZE: n/a
T.D. OF WELL n/a BELOW TOC
DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						
-5		Brown to gray, silty clay, slightly moist.	2,3,4			
-10		Brown to gray, silty clay, slightly moist.	1,3,3			
-15		Brown, silty clay with fine grained sand, moist.	3,8,9			
-20		Brown, silty, fine to medium grained sand, wet.	2,8,12	Hit H2O @ 20'.		
-25		Tan to brown, fine to coarse grained sand with trace clay.				
-30		Tan to brown, fine to coarse grained sand with trace clay.		Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-54** TOTAL DEPTH: **50'**
COORDINATES: **488440.58N 1915820.36E**
ELEVATION: **236.59'** TOC ELEVATION: **n/a**

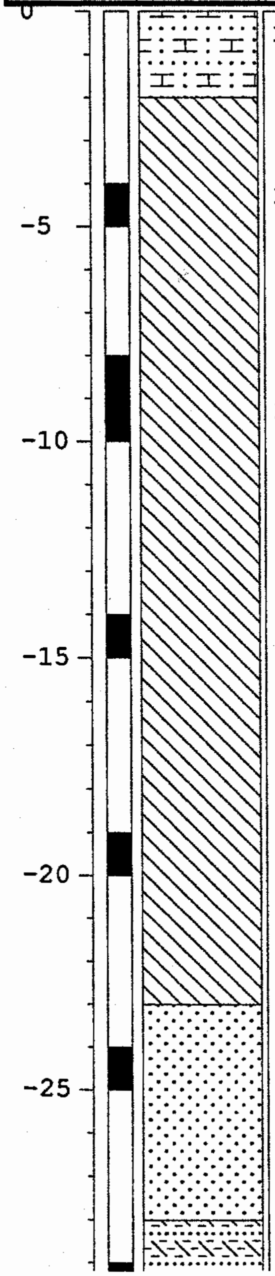
PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **TG**
DATE DRILLED: **4/04/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: n/a SEAL: n/a GROUT: n/a Page 1 of 2
CASING/SCREEN TYPE: n/a DIAMETER: n/a CASING LENGTH: n/a STATIC WATER LEVEL: n/a BELOW TOC
SCREEN LENGTH: n/a SLOT SIZE: n/a T.D. OF WELL n/a BELOW TOC DATE OF WATER LEVEL: n/a



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0		Brown, silty clay.				
-5		Brown to tan clay with some silt, moist.	2,3,4			
-10		Brown to tan clay with some silt, moist.		Pushed shelby tube from 8'-10'.		
-15		Brown to tan clay with some silt, moist.	2,1,2			
-20		Gray clay with trace silt, high plasticity, moist.	1,2,2			
-25		Gray, fine grained sand, round to subangular, some silt.	5,9,15			

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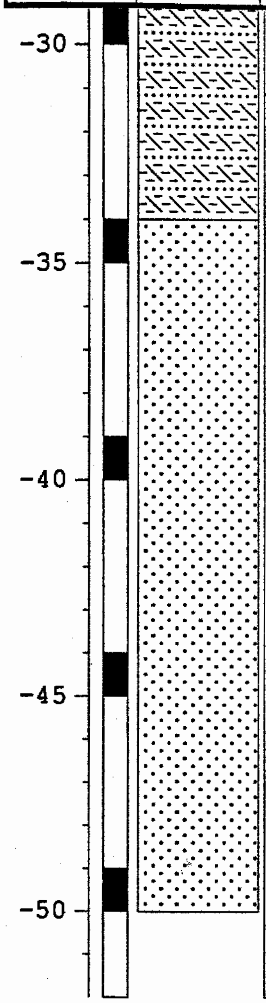
PROJECT: Plum Point Energy Station

BOREHOLE NO.: **B-54**
Page 2 of 2



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
-30		Gray, fine sandy clay with black minerals.	5,12,16			
-35		Gray, fine sand, rounded to subrounded, with organics.	5,19,25			
-40		Gray, fine to medium grained sand, subrounded to subangular with some silt.	5,25,20+			
-45		Gray, medium to coarse grained sand, subrounded to rounded with some silt.	6,25,19+			
-50		Gray, medium to coarse grained sand, subrounded to rounded with some silt and gravel.	4,26,20	Total depth @ 50'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-55/PZ-12** TOTAL DEPTH: **30'**
COORDINATES: **490020.28N 1920297.86E**
ELEVATION: TOC ELEVATION: **247.16'**

PROJECT INFORMATION

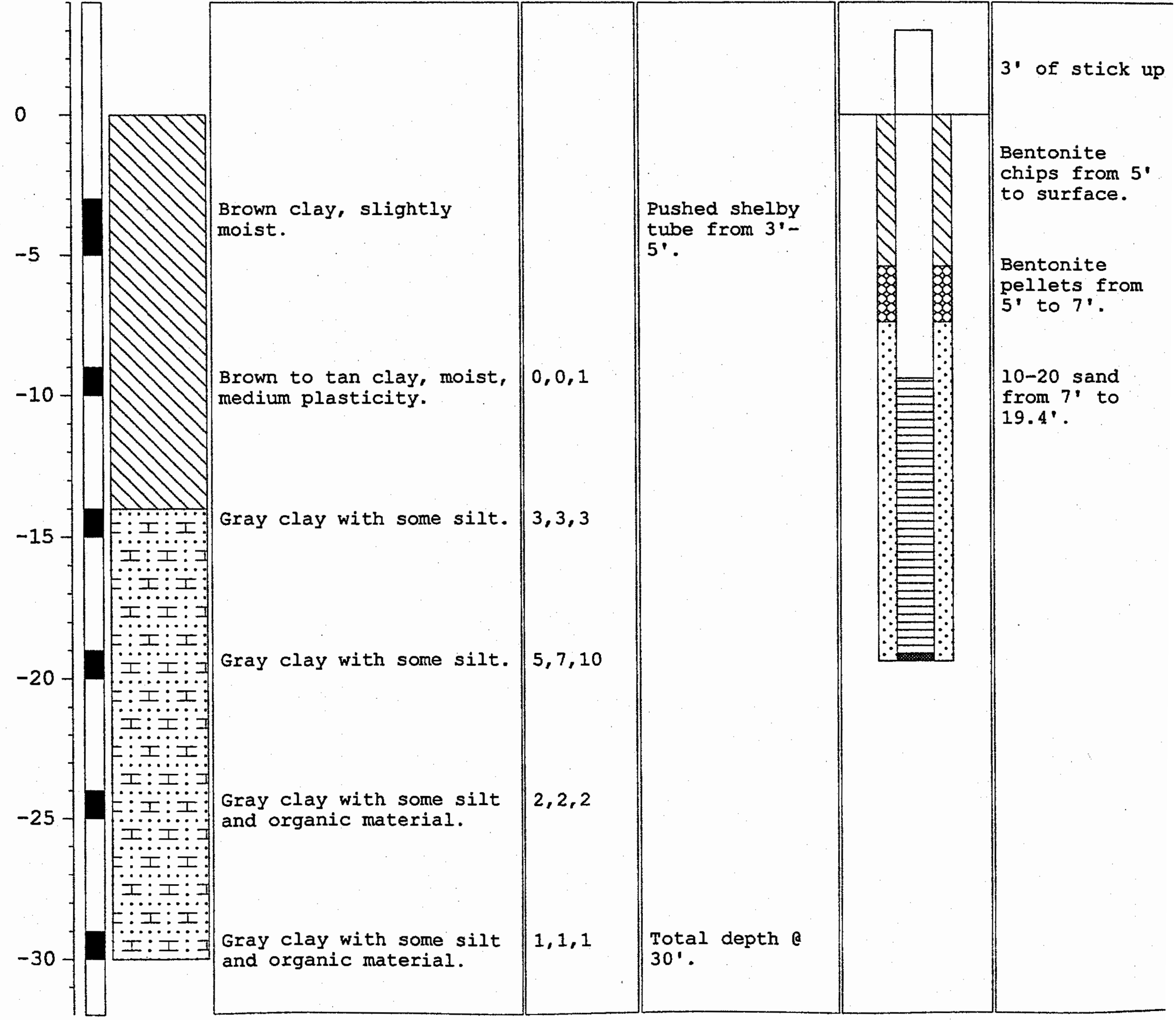
PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **TG**
DATE DRILLED: **4/11/01**

DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite Pellets
GROUT: Bentonite Chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 12.41'
STATIC WATER LEVEL: 11.81' BELOW TOC
SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 22.41' BELOW TOC
DATE OF WATER LEVEL: 5/02/01



DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
						3' of stick up
0						Bentonite chips from 5' to surface.
		Brown clay, slightly moist.		Pushed shelby tube from 3'-5'.		
-5						Bentonite pellets from 5' to 7'.
-10		Brown to tan clay, moist, medium plasticity.	0,0,1			10-20 sand from 7' to 19.4'.
-15		Gray clay with some silt.	3,3,3			
-20		Gray clay with some silt.	5,7,10			
-25		Gray clay with some silt and organic material.	2,2,2			
-30		Gray clay with some silt and organic material.	1,1,1	Total depth @ 30'.		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-56/PZ-13** TOTAL DEPTH: **30'**
COORDINATES: **490020.28N 1920187.86E**
ELEVATION: TOC ELEVATION: **246.74'**

PROJECT INFORMATION

PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **ME**
DATE DRILLED: **4/11/01**

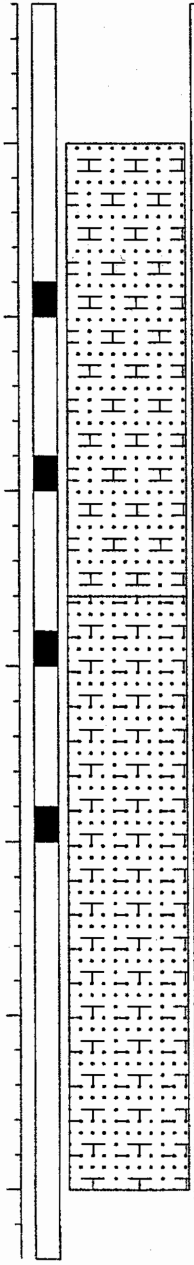
DRILLING INFORMATION

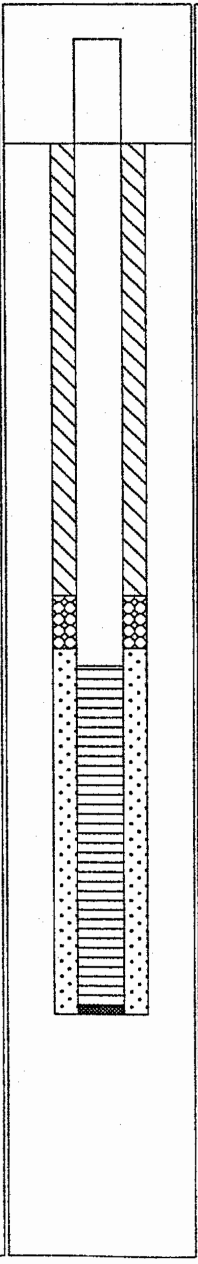
DRILLING CO.: **Anderson Engineering**
DRILLER: **Paul Harris**
RIG TYPE: **Simco 2400 SKL**
METHOD OF DRILLING: **6.25"diam. solid flight auger**
SAMPLING METHODS: **Split Spoon**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite Pellets
GROUT: Bentonite Chips
Page 1 of 1

CASING/SCREEN TYPE: PVC
DIAMETER: 2-inch
CASING LENGTH: 18.17'
STATIC WATER LEVEL: 14.85 BELOW TOC
SCREEN LENGTH: 10'
SLOT SIZE: 0.010
T.D. OF WELL 28.17' BELOW TOC
DATE OF WATER LEVEL: 5/02/01

DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
0						3' of stick-up.
-5		Brown, silty clay, slightly moist.	2,2,2			Bentonite chips from surface to 13'.
-10		Brown, silty clay, moist.	1,2,2			
						Bentonite pellets from 13'-14.5'.
-15		Gray, clayey silt, very moist.	4,4,3			10-20 sand from 14.5' to 25'.
				Hit H2O @ 18'.		
-20		Gray, clayey silt, with some fine sand, wet.	1,2,4	Switched to hollow stem augers due to continuous cave-ins and to construct piezometer.		
-25		Gray, clayey silt, with some fine sand, wet.				
-30		Gray, clayey silt, with some fine sand, wet.		Total depth @ 30'.		





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FIELD BOREHOLE LOG

BOREHOLE NO.: **B-57/PZ-14** TOTAL DEPTH: **40'**
COORDINATES: **n/a**
ELEVATION: **n/a** TOC ELEVATION: **n/a**

PROJECT INFORMATION

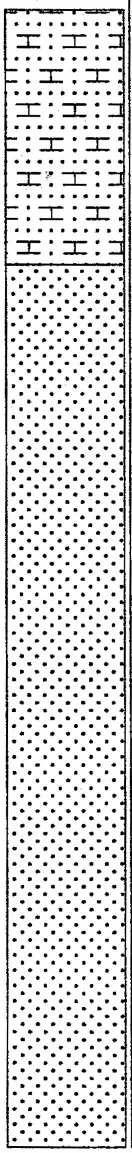
PROJECT: **Plum Point Energy Station**
SITE LOCATION: **Osceola, AR**
JOB NO.: **01008**
LOGGED BY: **MR/ME**
DATE DRILLED: **4/24/01**

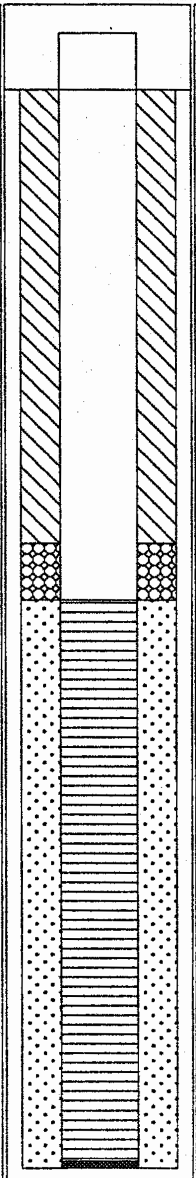
DRILLING INFORMATION

DRILLING CO.: **Anderson Engineering**
DRILLER: **Jay and Wayne Johnson**
RIG TYPE: **CME 55**
METHOD OF DRILLING: **Wash rotary**
SAMPLING METHODS: **n/a**

GRAVEL PACK: 10-20 Sand
SEAL: Bentonite
GROUT: Bentonite
Page 1 of 1

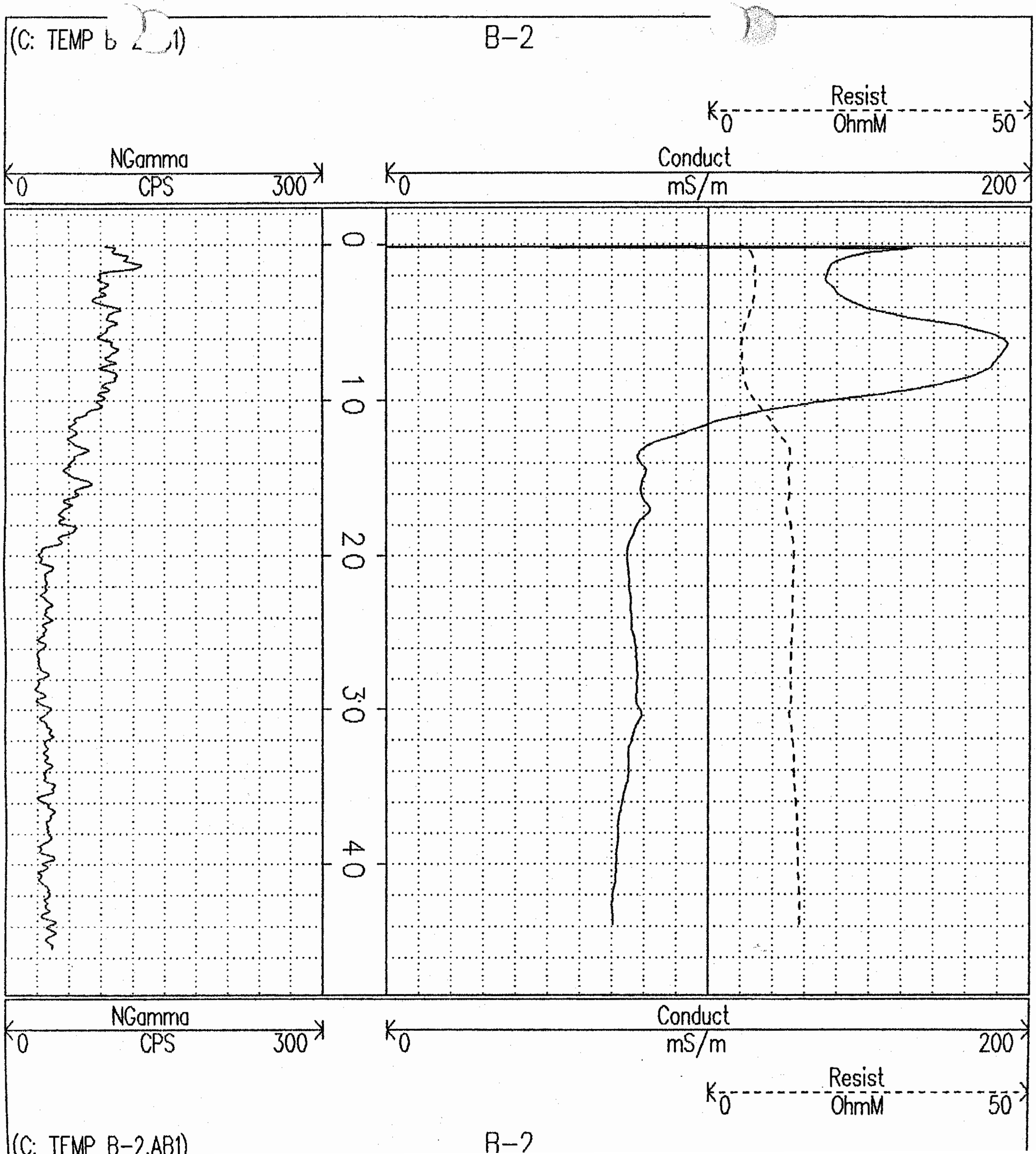
CASING/SCREEN TYPE: PVC
DIAMETER: 4-inch
CASING LENGTH: 19.92'
STATIC WATER LEVEL: 19.74' BELOW TOC
SCREEN LENGTH: 20'
SLOT SIZE: 0.010
T.D. OF WELL 39.92 BELOW TOC
DATE OF WATER LEVEL: 5/02/01

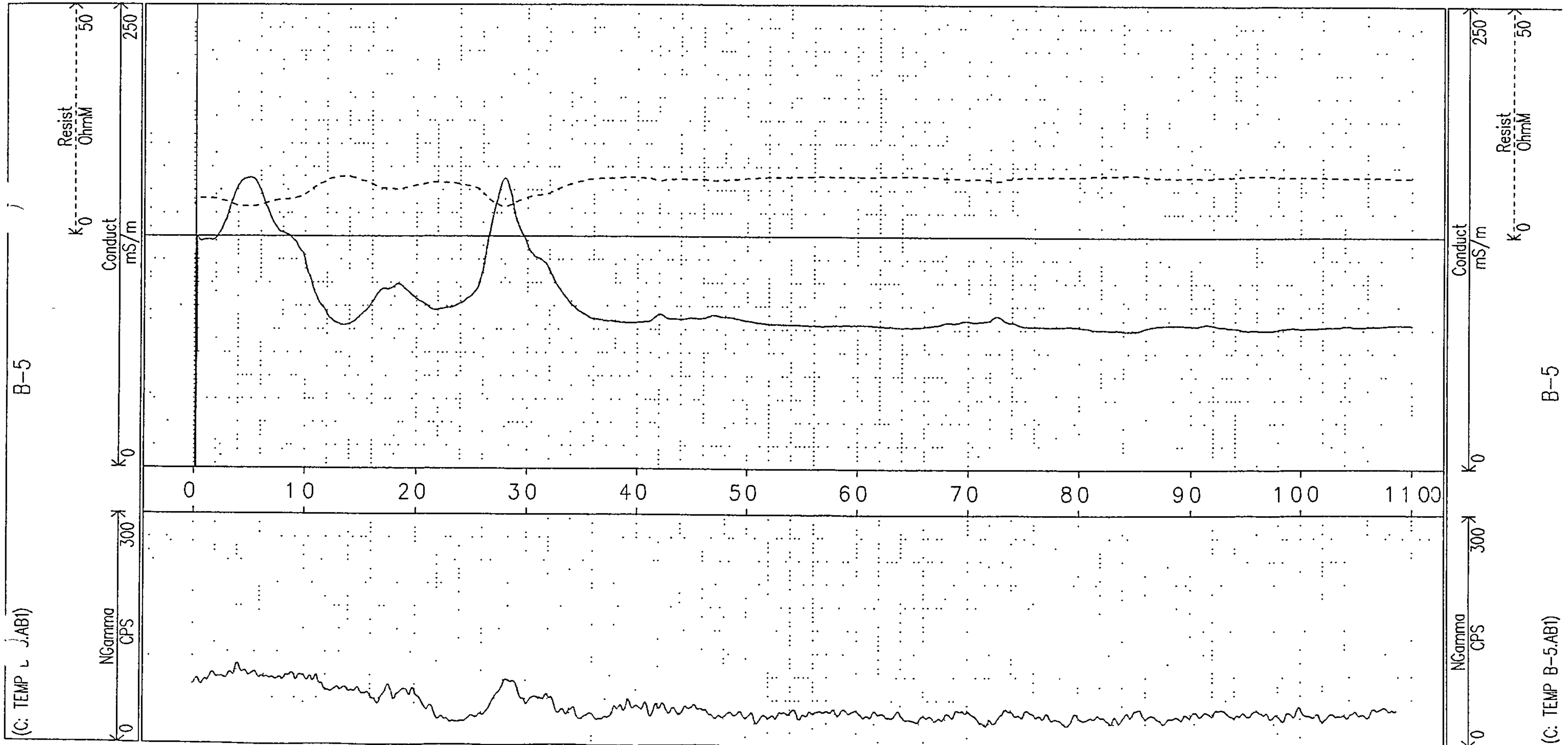


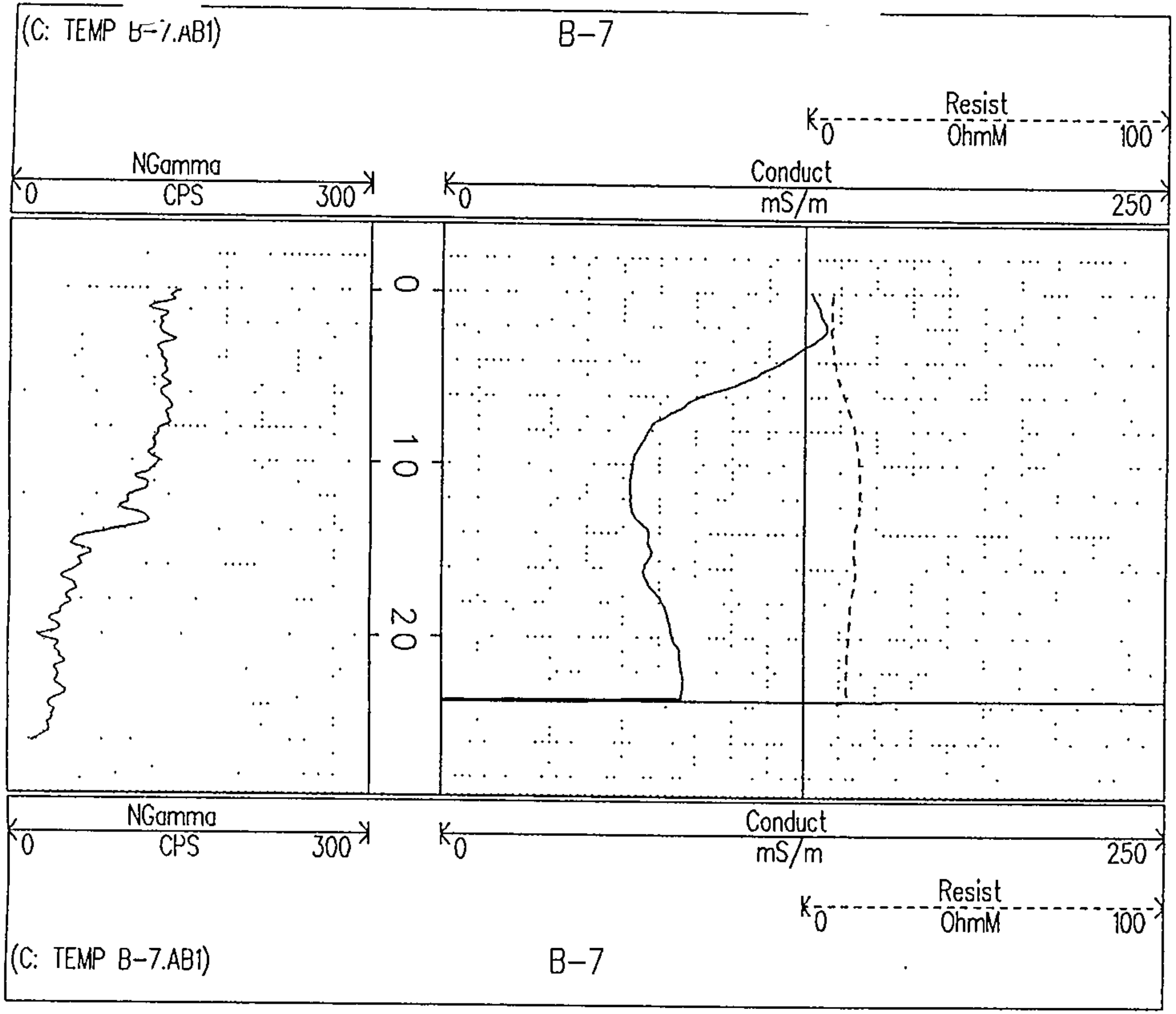


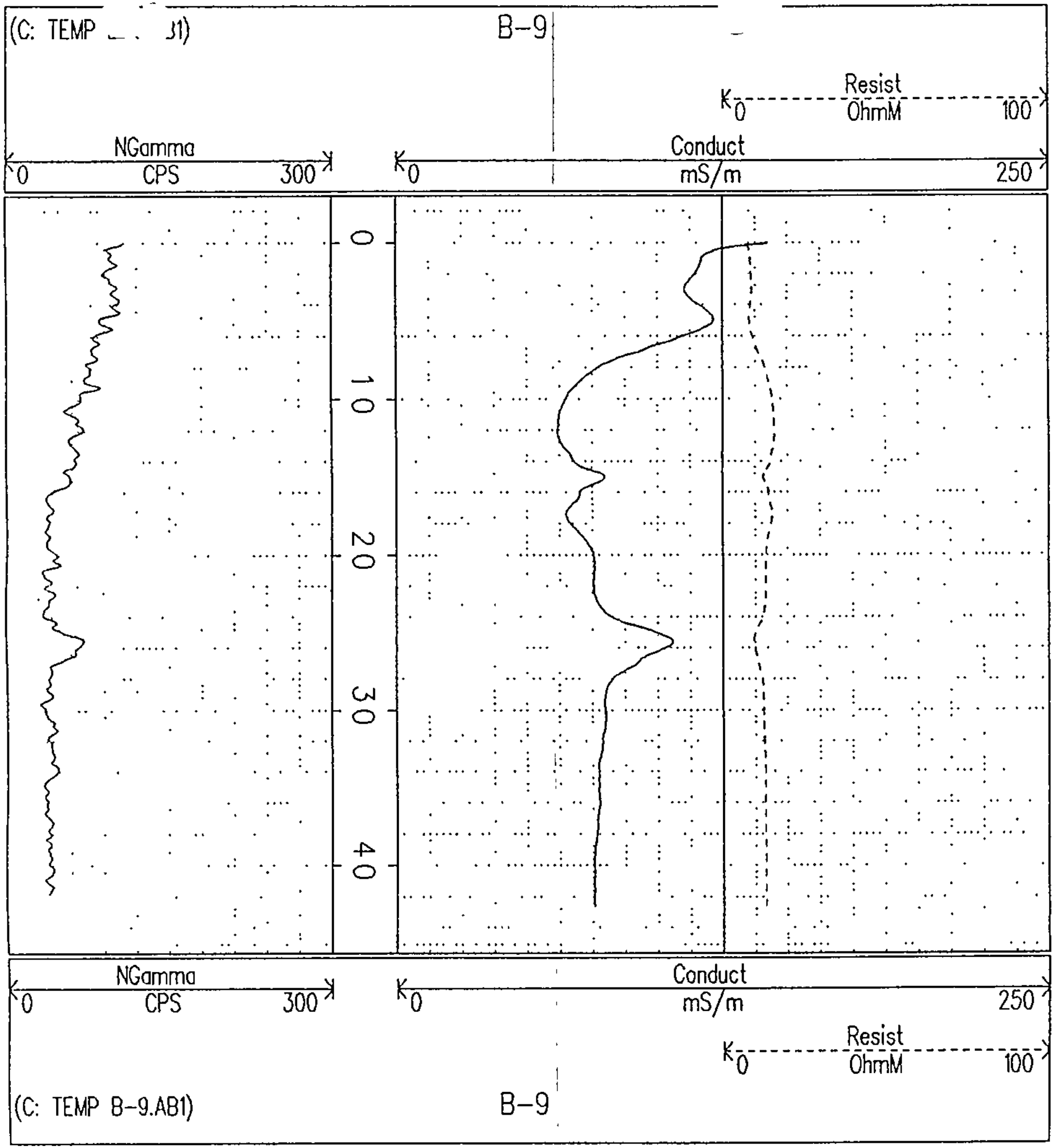
DEPTH	SOIL SYMBOL	SOIL DESCRIPTION	BLOW COUNTS	COMMENTS	BORING COMPLETION	WELL DESCRIPTION
						4" pumping well 2' of stick-up
0				Logged by cuttings.		
-5		Brown, silty clay, slightly moist, low plasticity.				Bentonite chips from surface to 16'.
-10		Tan, fine to coarse sand with some silt, moist.				
-15		Tan, fine to coarse sand, subangular to subrounded, moist.				Bentonite pellets from 16' to 18'.
-20		Tan, fine to coarse sand, subangular to subrounded, wet.				10-20 sand from 18' to 38'.
-25		Tan, fine to coarse sand, subangular to subrounded, wet.				
-30						
-35		Tan, fine to coarse sand, subangular to subrounded, wet.				
				Total depth @ 40'.		Heaved sand @ 38'.
-40						

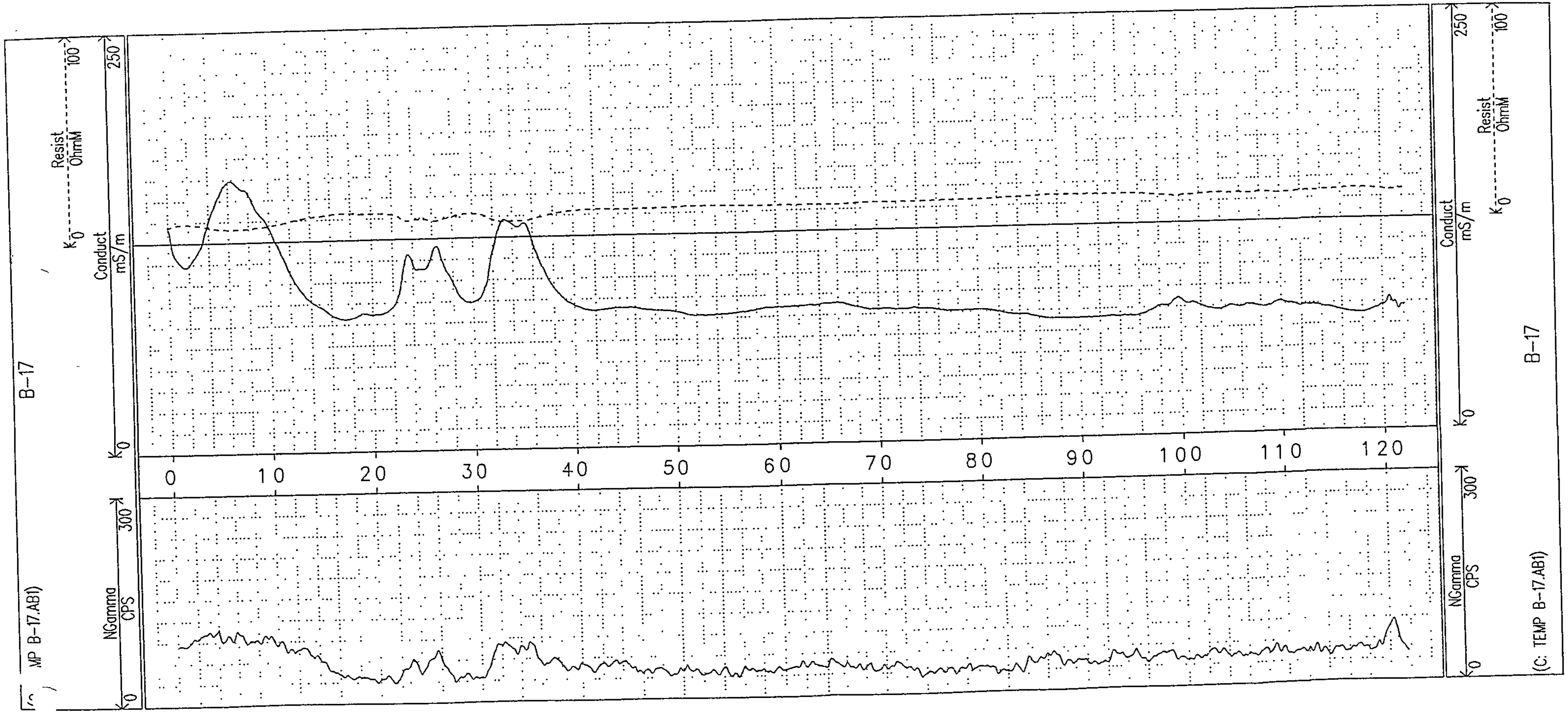
APPENDIX E
BOREHOLE SUBSURFACE GEOPHYSICAL LOGS

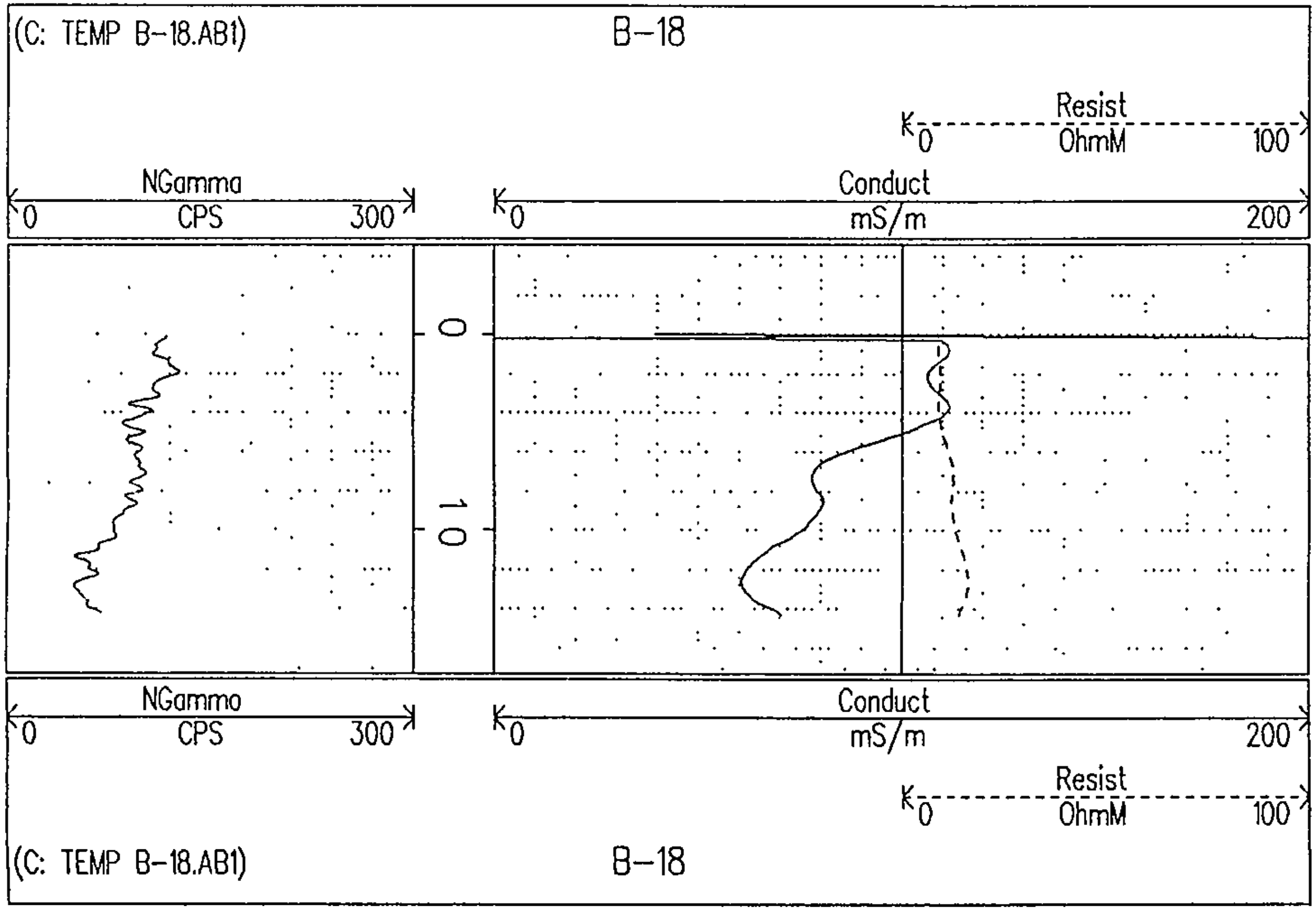

(C: TEMP B
1)
B-2
Resist
OhmM
0
50
NGamma
CPS
0
300
Conduct
mS/m
0
200
0
10
20
30
40
NGamma
CPS
0
300
Conduct
mS/m
0
200
Resist
OhmM
0
50
(C: TEMP B-2.AB1)
B-2

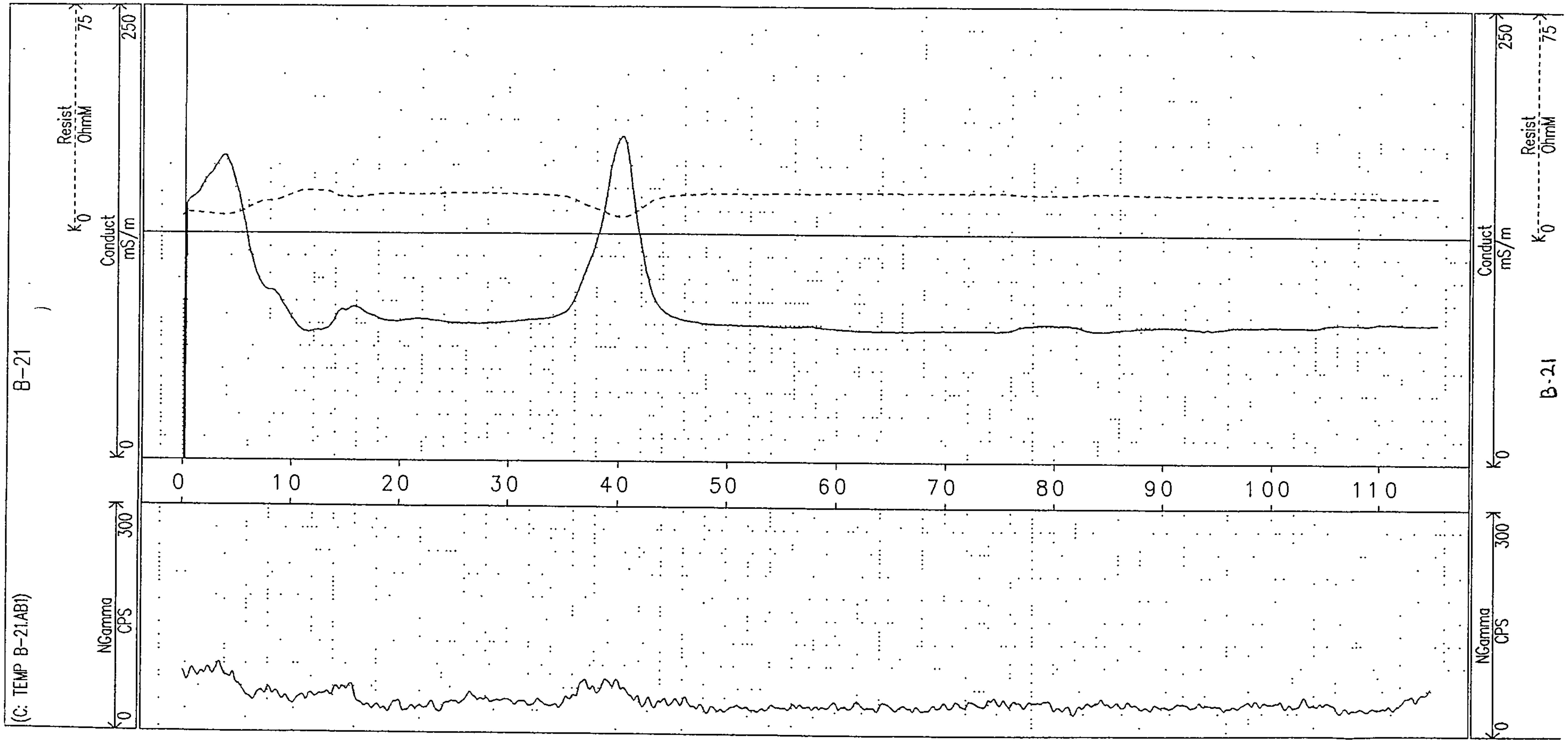

B-5
Resist
OhmM
0
50
Conduct
mS/m
0
250
0
10
20
30
40
50
60
70
80
90
100
110
NGamma
CPS
0
300
(C: TEMP L J.AB1)
(C: TEMP B-5.AB1)
B-5

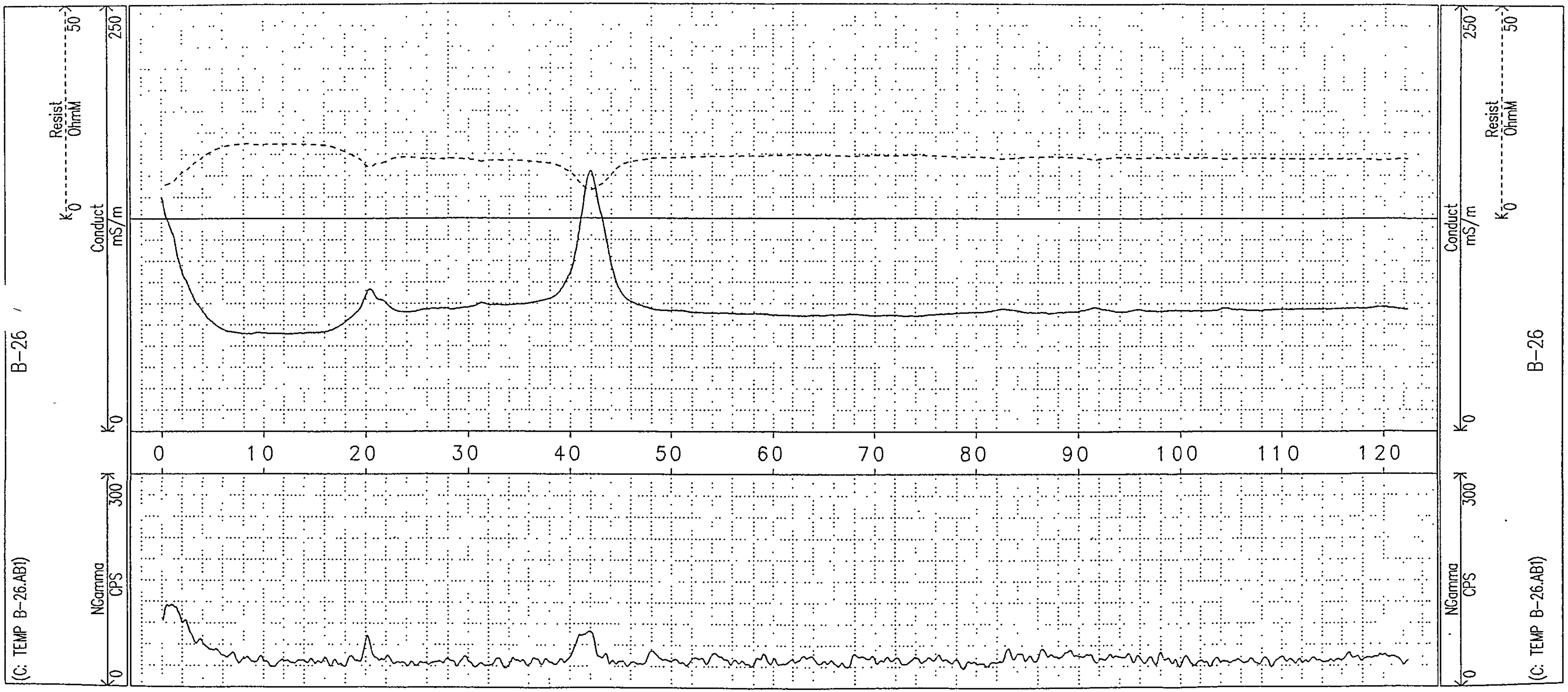

(C: TEMP B-7.AB1)
B-7
Resist
0
OhmM
100
NGamma
0
CPS
300
Conduct
0
mS/m
250
0
10
20
NGamma
0
CPS
300
Conduct
0
mS/m
250
Resist
0
OhmM
100
(C: TEMP B-7.AB1)
B-7

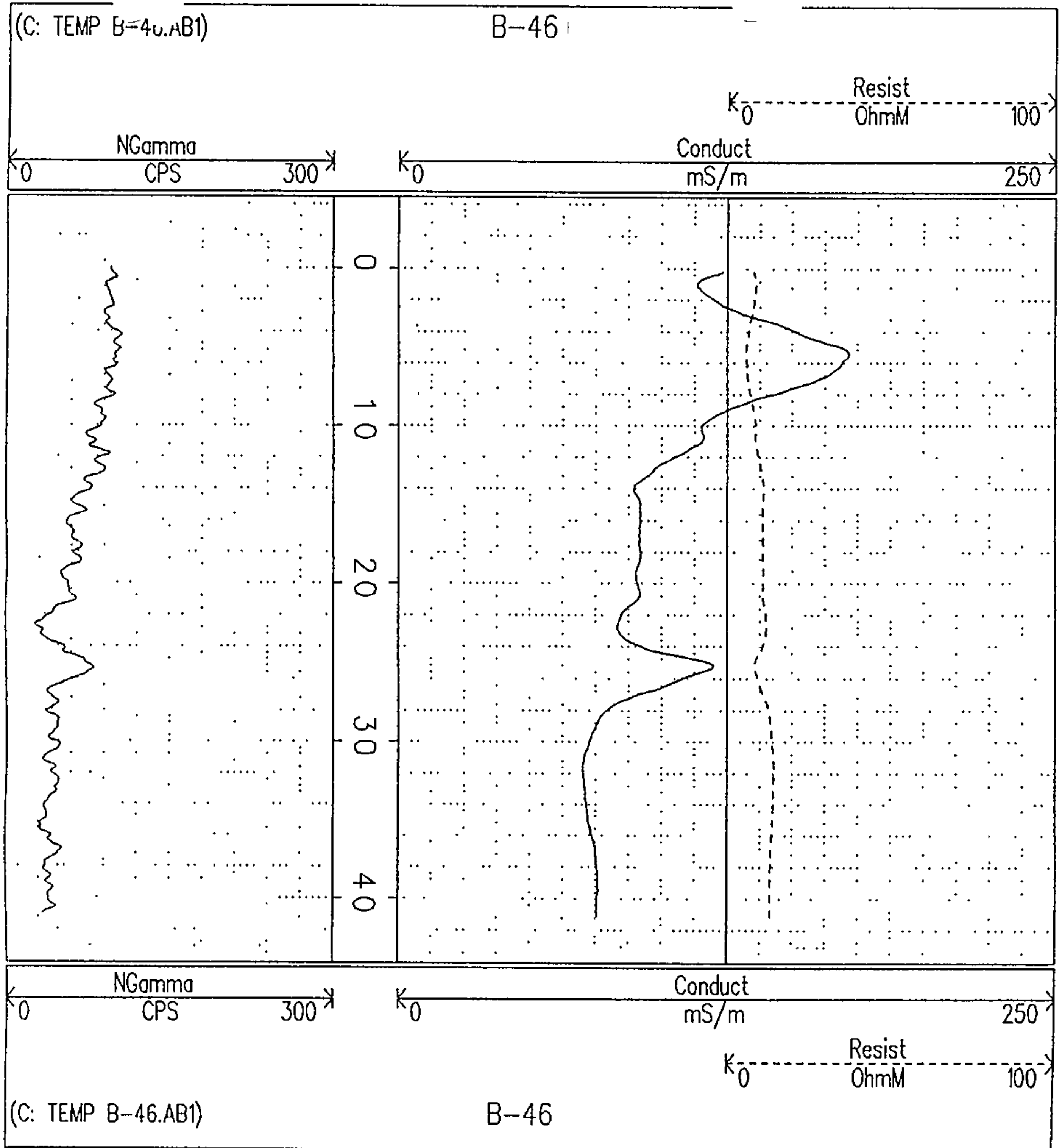

(C: TEMP B-9.AB1)
B-9
Resist
0
OhmM
100
NGamma
0
CPS
300
Conduct
0
mS/m
250
0
10
20
30
40
NGamma
0
CPS
300
Conduct
0
mS/m
250
Resist
0
OhmM
100
(C: TEMP B-9.AB1)
B-9

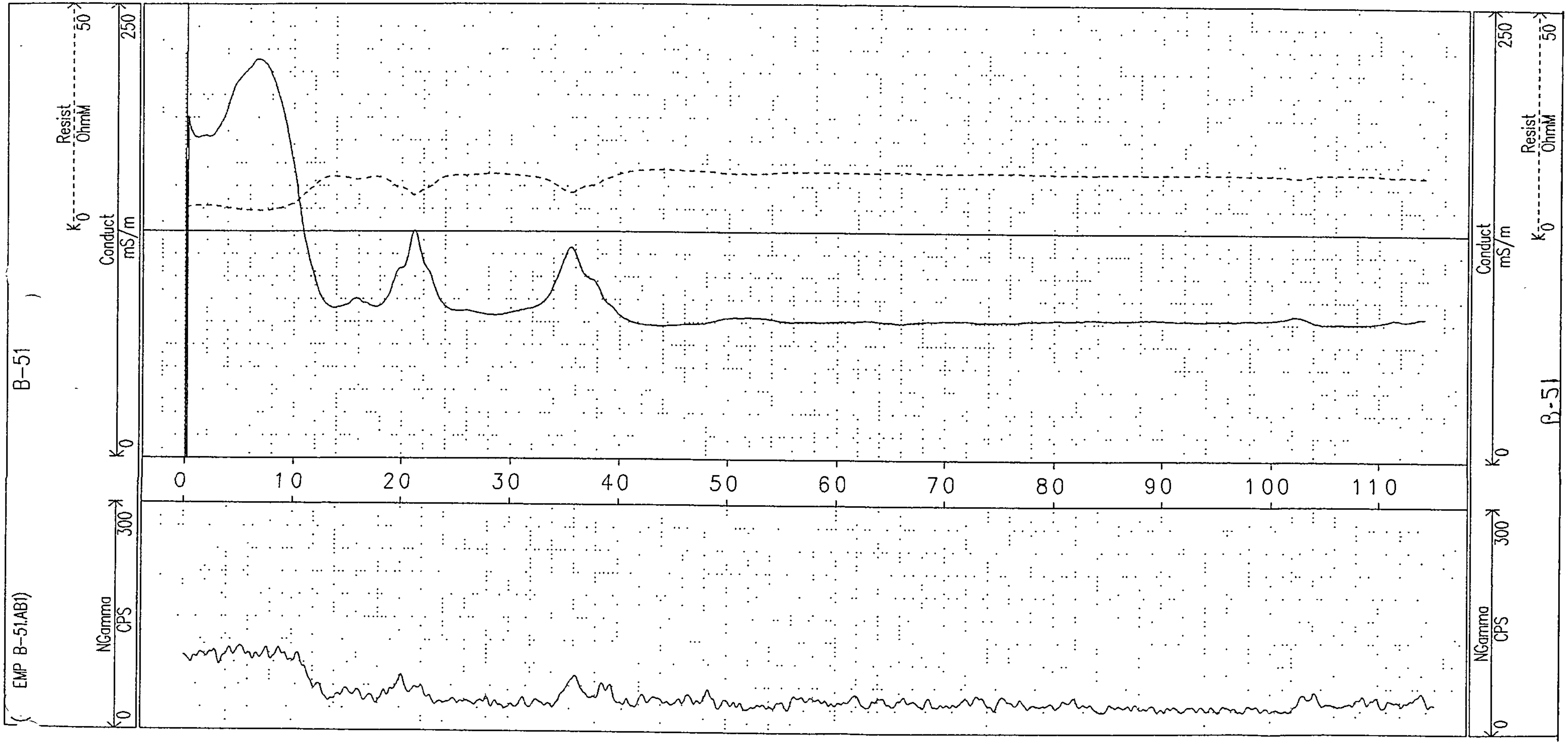

B-17
Resist
OhmM
K0
100
Conduct
mS/m
0
250
NGamma
CPS
0
300
MP B-17.AB1)
0
10
20
30
40
50
60
70
80
90
100
110
120
B-17
Resist
OhmM
K0
100
Conduct
mS/m
0
250
NGamma
CPS
0
300
(C: TEMP B-17.AB1)

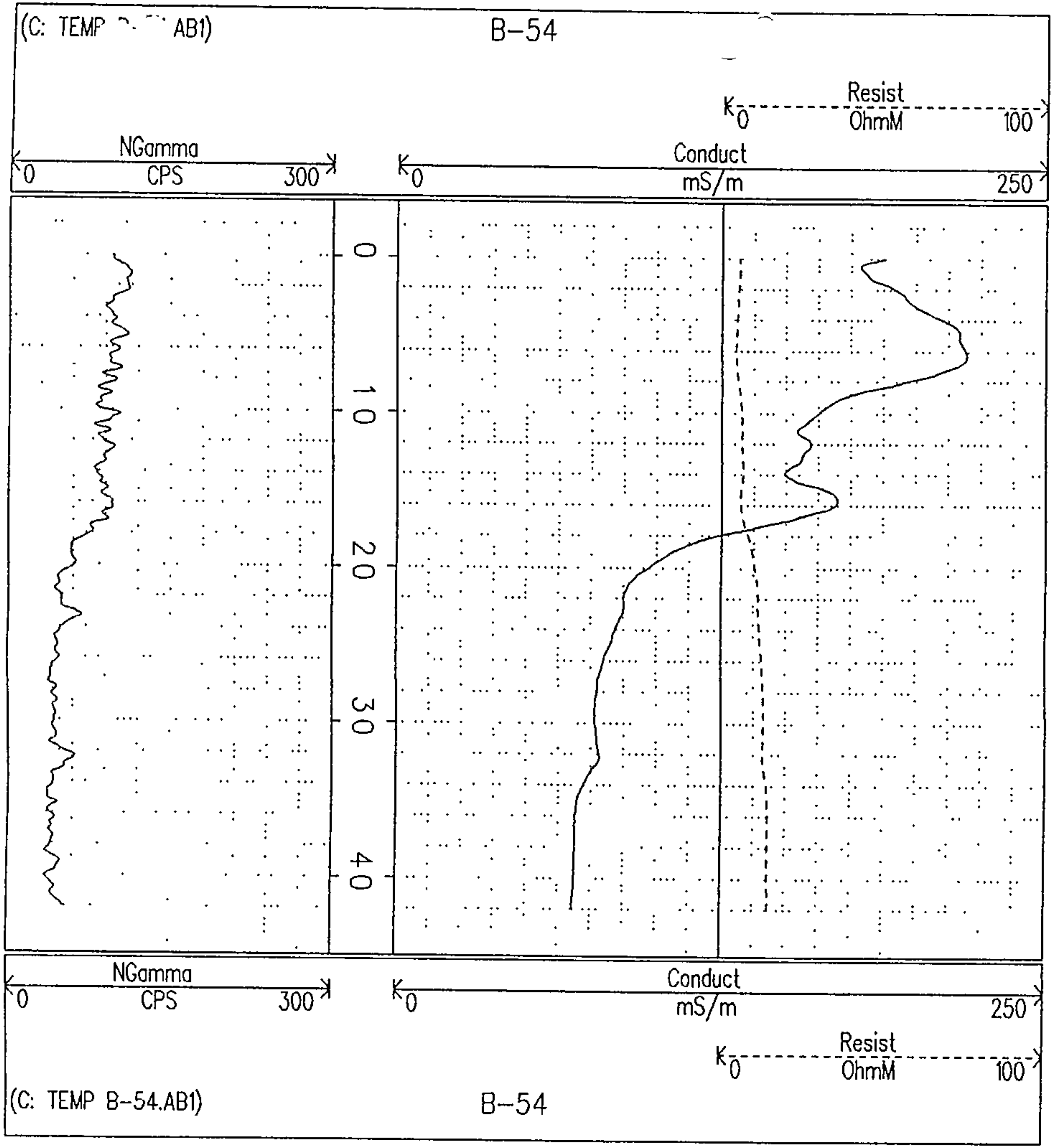

(C: TEMP B-18.AB1)
B-18
Resist
0
OhmM
100
NGamma
CPS
0
300
Conduct
mS/m
0
200
0
10
NGamma
CPS
0
300
Conduct
mS/m
0
200
Resist
0
OhmM
100
(C: TEMP B-18.AB1)
B-18


B-21
(C: TEMP B-21.AB1)
Resist
OhmM
0
75
Conduct
mS/m
0
250
NGamma
CPS
0
300
0
10
20
30
40
50
60
70
80
90
100
110
B-21
Resist
OhmM
0
75
Conduct
mS/m
0
250
NGamma
CPS
0
300


B-26
(C: TEMP B-26.AB1)
Resist
OhmM
0
50
Conduct
mS/m
0
250
NGamma
CPS
0
300
0
10
20
30
40
50
60
70
80
90
100
110
120
B-26
(C: TEMP B-26.AB1)


(C: TEMP B-46.AB1)
B-46
Resist
0
OhmM
100
NGamma
0
CPS
300
Conduct
0
mS/m
250
0
10
20
30
40
NGamma
0
CPS
300
Conduct
0
mS/m
250
Resist
0
OhmM
100
(C: TEMP B-46.AB1)
B-46


B-51
EMP B-51.AB1)
Resist
OhmM
0
50
Conduct
mS/m
0
250
NGamma
CPS
0
300
0
10
20
30
40
50
60
70
80
90
100
110
B-51


(C: TEMP B-54.AB1)
B-54
Resist
OhmM
0
100
NGamma
CPS
0
300
Conduct
mS/m
0
250
0
10
20
30
40
NGamma
CPS
0
300
Conduct
mS/m
0
250
Resist
OhmM
0
100
(C: TEMP B-54.AB1)
B-54

APPENDIX F
PUMP TEST DATA

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/24/01	11:01:28	1.4728	0
4/24/01	11:01:33	1.5613	0.002
4/24/01	11:01:39	1.6547	-0.009
4/24/01	11:01:45	1.753	0.012
4/24/01	11:01:51	1.858	0
4/24/01	11:01:58	1.9678	0
4/24/01	11:02:05	2.0845	0.004
4/24/01	11:02:12	2.2097	0.004
4/24/01	11:02:20	2.3412	0.002
4/24/01	11:02:28	2.4812	0.004
4/24/01	11:02:37	2.6297	0.002
4/24/01	11:02:47	2.7863	0.002
4/24/01	11:02:57	2.953	0.002
4/24/01	11:03:07	3.1297	0.008
4/24/01	11:03:19	3.3162	0.004
4/24/01	11:03:30	3.5145	0.004
4/24/01	11:03:43	3.7245	0.002
4/24/01	11:03:56	3.9463	0.006
4/24/01	11:04:10	4.1812	0.01
4/24/01	11:04:25	4.4295	0.01
4/24/01	11:04:41	4.6928	0.01
4/24/01	11:04:58	4.9728	0.012
4/24/01	11:05:16	5.2697	0.01
4/24/01	11:05:35	5.583	0.019
4/24/01	11:05:54	5.9145	0.019
4/24/01	11:06:16	6.2663	0.013
4/24/01	11:06:38	6.6395	0.011
4/24/01	11:07:02	7.0345	0.011
4/24/01	11:07:27	7.453	0.015
4/24/01	11:07:53	7.8962	0.011
4/24/01	11:08:22	8.3663	0.013
4/24/01	11:08:51	8.8645	0.015
4/24/01	11:09:23	9.3913	0.017
4/24/01	11:09:57	9.9497	0.021
4/24/01	11:10:32	10.5413	0.025
4/24/01	11:11:10	11.168	0.013
4/24/01	11:11:49	11.8312	0.023
4/24/01	11:12:32	12.5347	0.021
4/24/01	11:13:16	13.2795	0.021
4/24/01	11:14:04	14.0695	0.023
4/24/01	11:14:54	14.9062	0.017
4/24/01	11:15:47	15.7913	0.027
4/24/01	11:16:43	16.7295	0.031
4/24/01	11:17:43	17.723	0.034
4/24/01	11:18:46	18.7762	0.038
4/24/01	11:19:46	19.7762	0.042
4/24/01	11:20:46	20.7762	0.042
4/24/01	11:21:46	21.7762	0.044
4/24/01	11:22:46	22.7762	0.042
4/24/01	11:23:46	23.7762	0.04
4/24/01	11:24:46	24.7762	0.044
4/24/01	11:25:46	25.7762	0.046
4/24/01	11:26:46	26.7762	0.046
4/24/01	11:27:46	27.7762	0.046
4/24/01	11:28:46	28.7762	0.046
4/24/01	11:29:46	29.7762	0.046
4/24/01	11:30:46	30.7762	0.048
4/24/01	11:31:46	31.7762	0.046
4/24/01	11:32:46	32.7762	0.048
4/24/01	11:33:46	33.7762	0.048
4/24/01	11:34:46	34.7762	0.046
4/24/01	11:35:46	35.7762	0.042
4/24/01	11:36:46	36.7762	0.042
4/24/01	11:37:46	37.7762	0.046
4/24/01	11:38:46	38.7762	0.046
4/24/01	11:39:46	39.7762	0.044
4/24/01	11:40:46	40.7762	0.046
4/24/01	11:41:46	41.7762	0.05
4/24/01	11:42:46	42.7762	0.052
4/24/01	11:43:46	43.7762	0.054
4/24/01	11:44:46	44.7762	0.052
4/24/01	11:45:46	45.7762	0.054
4/24/01	11:46:46	46.7762	0.055
4/24/01	11:47:46	47.7762	0.059
4/24/01	11:48:46	48.7762	0.059
4/24/01	11:49:46	49.7762	0.057
4/24/01	11:50:46	50.7762	0.057
4/24/01	11:51:46	51.7762	0.057
4/24/01	11:52:46	52.7762	0.057
4/24/01	11:53:46	53.7762	0.057
4/24/01	11:54:46	54.7762	0.057
4/24/01	11:55:46	55.7762	0.063
4/24/01	11:56:46	56.7762	0.061
4/24/01	11:57:46	57.7762	0.061
4/24/01	11:58:46	58.7762	0.055
4/24/01	11:59:46	59.7762	0.057
4/24/01	12:00:46	60.7762	0.061
4/24/01	12:01:46	61.7762	0.059
4/24/01	12:02:46	62.7762	0.065
4/24/01	12:03:46	63.7762	0.069
4/24/01	12:04:46	64.7762	0.071
4/24/01	12:05:46	65.7762	0.073
4/24/01	12:06:46	66.7762	0.076
4/24/01	12:07:46	67.7762	0.078
4/24/01	12:08:46	68.7762	0.078
4/24/01	12:09:46	69.7762	0.076
4/24/01	12:10:46	70.7762	0.076
4/24/01	12:11:46	71.7762	0.082
4/24/01	12:12:46	72.7762	0.088
4/24/01	12:13:46	73.7762	0.084
4/24/01	12:14:46	74.7762	0.075
4/24/01	12:15:46	75.7762	0.076

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/24/01	12:16:46	76.7762	0.075
4/24/01	12:17:46	77.7762	0.076
4/24/01	12:18:46	78.7762	0.071
4/24/01	12:19:46	79.7762	0.071
4/24/01	12:20:46	80.7762	0.073
4/24/01	12:21:46	81.7762	0.076
4/24/01	12:22:46	82.7762	0.086
4/24/01	12:23:46	83.7762	0.094
4/24/01	12:24:46	84.7762	0.098
4/24/01	12:25:46	85.7762	0.116
4/24/01	12:26:46	86.7762	0.136
4/24/01	12:27:46	87.7762	0.155
4/24/01	12:28:46	88.7762	0.168
4/24/01	12:29:46	89.7762	0.179
4/24/01	12:30:46	90.7762	0.185
4/24/01	12:31:46	91.7762	0.179
4/24/01	12:32:46	92.7762	0.184
4/24/01	12:33:46	93.7762	0.188
4/24/01	12:34:46	94.7762	0.184
4/24/01	12:35:46	95.7762	0.188
4/24/01	12:36:46	96.7762	0.18
4/24/01	12:37:46	97.7762	0.187
4/24/01	12:38:46	98.7762	0.189
4/24/01	12:39:46	99.7762	0.191
4/24/01	12:40:46	100.7762	0.185
4/24/01	12:41:46	101.7762	0.19
4/24/01	12:42:46	102.7762	0.19
4/24/01	12:43:46	103.7762	0.18
4/24/01	12:44:46	104.7762	0.18
4/24/01	12:45:46	105.7762	0.18
4/24/01	12:46:46	106.7762	0.18
4/24/01	12:47:46	107.7762	0.177
4/24/01	12:48:46	108.7762	0.177
4/24/01	12:49:46	109.7762	0.177
4/24/01	12:50:46	110.7762	0.177
4/24/01	12:51:46	111.7762	0.175
4/24/01	12:52:46	112.7762	0.177
4/24/01	12:53:46	113.7762	0.177
4/24/01	12:54:46	114.7762	0.179
4/24/01	12:55:46	115.7762	0.177
4/24/01	12:56:46	116.7762	0.177
4/24/01	12:57:46	117.7762	0.176
4/24/01	12:58:46	118.7762	0.18
4/24/01	12:59:46	119.7762	0.172
4/24/01	13:00:46	120.7762	0.168
4/24/01	13:01:46	121.7762	0.174
4/24/01	13:02:46	122.7762	0.17
4/24/01	13:03:46	123.7762	0.176
4/24/01	13:04:46	124.7762	0.173
4/24/01	13:05:46	125.7762	0.166
4/24/01	13:06:46	126.7762	0.168
4/24/01	13:07:46	127.7762	0.17
4/24/01	13:08:46	128.7762	0.173
4/24/01	13:09:46	129.7762	0.172
4/24/01	13:10:46	130.7762	0.173
4/24/01	13:11:46	131.7762	0.175
4/24/01	13:12:46	132.7762	0.17
4/24/01	13:13:46	133.7762	0.173
4/24/01	13:14:46	134.7762	0.173
4/24/01	13:15:46	135.7762	0.168
4/24/01	13:16:46	136.7762	0.172
4/24/01	13:17:46	137.7762	0.183
4/24/01	13:18:46	138.7762	0.17
4/24/01	13:19:46	139.7762	0.172
4/24/01	13:20:46	140.7762	0.172
4/24/01	13:21:46	141.7762	0.168
4/24/01	13:22:46	142.7762	0.172
4/24/01	13:23:46	143.7762	0.166
4/24/01	13:24:46	144.7762	0.168
4/24/01	13:25:46	145.7762	0.168
4/24/01	13:26:46	146.7762	0.17
4/24/01	13:27:46	147.7762	0.166
4/24/01	13:28:46	148.7762	0.164
4/24/01	13:29:46	149.7762	0.166
4/24/01	13:30:46	150.7762	0.166
4/24/01	13:31:46	151.7762	0.164
4/24/01	13:32:46	152.7762	0.164
4/24/01	13:33:46	153.7762	0.168
4/24/01	13:34:46	154.7762	0.17
4/24/01	13:35:46	155.7762	0.17
4/24/01	13:36:46	156.7762	0.166
4/24/01	13:37:46	157.7762	0.172
4/24/01	13:38:46	158.7762	0.172
4/24/01	13:39:46	159.7762	0.176
4/24/01	13:40:46	160.7762	0.175
4/24/01	13:41:46	161.7762	0.172
4/24/01	13:42:46	162.7762	0.173
4/24/01	13:43:46	163.7762	0.17
4/24/01	13:44:46	164.7762	0.172
4/24/01	13:45:46	165.7762	0.174
4/24/01	13:46:46	166.7762	0.174
4/24/01	13:47:46	167.7762	0.174
4/24/01	13:48:46	168.7762	0.168
4/24/01	13:49:46	169.7762	0.174
4/24/01	13:50:46	170.7762	0.176
4/24/01	13:51:46	171.7762	0.168
4/24/01	13:52:46	172.7762	0.17
4/24/01	13:53:46	173.7762	0.17
4/24/01	13:54:46	174.7762	0.166
4/24/01	13:55:46	175.7762	0.17
4/24/01	13:56:46	176.7762	0.172
4/24/01	13:57:46	177.7762	0.17

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/24/01	13:58:46	178.7762	0.168
4/24/01	13:59:46	179.7762	0.172
4/24/01	14:00:46	180.7762	0.168
4/24/01	14:01:46	181.7762	0.166
4/24/01	14:02:46	182.7762	0.166
4/24/01	14:03:46	183.7762	0.168
4/24/01	14:04:46	184.7762	0.164
4/24/01	14:05:46	185.7762	0.168
4/24/01	14:06:46	186.7762	0.166
4/24/01	14:07:46	187.7762	0.166
4/24/01	14:08:46	188.7762	0.168
4/24/01	14:09:46	189.7762	0.17
4/24/01	14:10:46	190.7762	0.17
4/24/01	14:11:46	191.7762	0.172
4/24/01	14:12:46	192.7762	0.172
4/24/01	14:13:46	193.7762	0.17
4/24/01	14:14:46	194.7762	0.168
4/24/01	14:15:46	195.7762	0.168
4/24/01	14:16:46	196.7762	0.168
4/24/01	14:17:46	197.7762	0.17
4/24/01	14:18:46	198.7762	0.168
4/24/01	14:19:46	199.7762	0.168
4/24/01	14:20:46	200.7762	0.169
4/24/01	14:21:46	201.7762	0.172
4/24/01	14:22:46	202.7762	0.166
4/24/01	14:23:46	203.7762	0.166
4/24/01	14:24:46	204.7762	0.172
4/24/01	14:25:46	205.7762	0.174
4/24/01	14:26:46	206.7762	0.166
4/24/01	14:27:46	207.7762	0.166
4/24/01	14:28:46	208.7762	0.164
4/24/01	14:29:46	209.7762	0.17
4/24/01	14:30:46	210.7762	0.166
4/24/01	14:31:46	211.7762	0.166
4/24/01	14:32:46	212.7762	0.168
4/24/01	14:33:46	213.7762	0.162
4/24/01	14:34:46	214.7762	0.17
4/24/01	14:35:46	215.7762	0.166
4/24/01	14:36:46	216.7762	0.162
4/24/01	14:37:46	217.7762	0.168
4/24/01	14:38:46	218.7762	0.17
4/24/01	14:39:46	219.7762	0.173
4/24/01	14:40:46	220.7762	0.171
4/24/01	14:41:46	221.7762	0.169
4/24/01	14:42:46	222.7762	0.169
4/24/01	14:43:46	223.7762	0.17
4/24/01	14:44:46	224.7762	0.17
4/24/01	14:45:46	225.7762	0.17
4/24/01	14:46:46	226.7762	0.168
4/24/01	14:47:46	227.7762	0.166
4/24/01	14:48:46	228.7762	0.168
4/24/01	14:49:46	229.7762	0.172
4/24/01	14:50:46	230.7762	0.17
4/24/01	14:51:46	231.7762	0.166
4/24/01	14:52:46	232.7762	0.168
4/24/01	14:53:46	233.7762	0.17
4/24/01	14:54:46	234.7762	0.168
4/24/01	14:55:46	235.7762	0.17
4/24/01	14:56:46	236.7762	0.168
4/24/01	14:57:46	237.7762	0.166
4/24/01	14:58:46	238.7762	0.161
4/24/01	14:59:46	239.7762	0.163
4/24/01	15:00:46	240.7762	0.163
4/24/01	15:01:46	241.7762	0.164
4/24/01	15:02:46	242.7762	0.163
4/24/01	15:03:46	243.7762	0.166
4/24/01	15:04:46	244.7762	0.164
4/24/01	15:05:46	245.7762	0.16
4/24/01	15:06:46	246.7762	0.162
4/24/01	15:07:46	247.7762	0.162
4/24/01	15:08:46	248.7762	0.162
4/24/01	15:09:46	249.7762	0.164
4/24/01	15:10:46	250.7762	0.157
4/24/01	15:11:46	251.7762	0.162
4/24/01	15:12:46	252.7762	0.16
4/24/01	15:13:46	253.7762	0.155
4/24/01	15:14:46	254.7762	0.16
4/24/01	15:15:46	255.7762	0.157
4/24/01	15:16:46	256.7762	0.16
4/24/01	15:17:46	257.7762	0.16
4/24/01	15:18:46	258.7762	0.16
4/24/01	15:19:46	259.7762	0.153
4/24/01	15:20:46	260.7762	0.147
4/24/01	15:21:46	261.7762	0.158
4/24/01	15:22:46	262.7762	0.162
4/24/01	15:23:46	263.7762	0.162
4/24/01	15:24:46	264.7762	0.16
4/24/01	15:25:46	265.7762	0.162
4/24/01	15:26:46	266.7762	0.158
4/24/01	15:27:46	267.7762	0.164
4/24/01	15:28:46	268.7762	0.161
4/24/01	15:29:46	269.7762	0.163
4/24/01	15:30:46	270.7762	0.164
4/24/01	15:31:46	271.7762	0.162
4/24/01	15:32:46	272.7762	0.166
4/24/01	15:33:46	273.7763	0.164
4/24/01	15:34:46	274.7763	0.166
4/24/01	15:35:46	275.7763	0.164
4/24/01	15:36:46	276.7763	0.162
4/24/01	15:37:46	277.7763	0.166
4/24/01	15:38:46	278.7763	0.162
4/24/01	15:39:46	279.7763	0.164

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/24/01	15:40:46	280.7763	0.156
4/24/01	15:41:46	281.7763	0.16
4/24/01	15:42:46	282.7763	0.16
4/24/01	15:43:46	283.7763	0.16
4/24/01	15:44:46	284.7763	0.156
4/24/01	15:45:46	285.7763	0.16
4/24/01	15:46:46	286.7763	0.158
4/24/01	15:47:46	287.7763	0.158
4/24/01	15:48:46	288.7763	0.16
4/24/01	15:49:46	289.7763	0.16
4/24/01	15:50:46	290.7763	0.156
4/24/01	15:51:46	291.7763	0.157
4/24/01	15:52:46	292.7763	0.157
4/24/01	15:53:46	293.7763	0.16
4/24/01	15:54:46	294.7763	0.161
4/24/01	15:55:46	295.7763	0.158
4/24/01	15:56:46	296.7763	0.157
4/24/01	15:57:46	297.7763	0.157
4/24/01	15:58:46	298.7763	0.163
4/24/01	15:59:46	299.7763	0.159
4/24/01	16:00:46	300.7763	0.162
4/24/01	16:01:46	301.7763	0.163
4/24/01	16:02:46	302.7763	0.162
4/24/01	16:03:46	303.7763	0.153
4/24/01	16:04:46	304.7763	0.161
4/24/01	16:05:46	305.7763	0.161
4/24/01	16:06:46	306.7763	0.161
4/24/01	16:07:46	307.7763	0.163
4/24/01	16:08:46	308.7763	0.163
4/24/01	16:09:46	309.7763	0.163
4/24/01	16:10:46	310.7763	0.161
4/24/01	16:11:46	311.7763	0.161
4/24/01	16:12:46	312.7763	0.161
4/24/01	16:13:46	313.7763	0.159
4/24/01	16:14:46	314.7763	0.159
4/24/01	16:15:46	315.7763	0.159
4/24/01	16:16:46	316.7763	0.161
4/24/01	16:17:46	317.7763	0.159
4/24/01	16:18:46	318.7763	0.157
4/24/01	16:19:46	319.7763	0.159
4/24/01	16:20:46	320.7763	0.155
4/24/01	16:21:46	321.7763	0.159
4/24/01	16:22:46	322.7763	0.164
4/24/01	16:23:46	323.7763	0.155
4/24/01	16:24:46	324.7763	0.159
4/24/01	16:25:46	325.7763	0.153
4/24/01	16:26:46	326.7763	0.157
4/24/01	16:27:46	327.7763	0.161
4/24/01	16:28:46	328.7763	0.159
4/24/01	16:29:46	329.7763	0.159
4/24/01	16:30:46	330.7763	0.157
4/24/01	16:31:46	331.7763	0.147
4/24/01	16:32:46	332.7763	0.151
4/24/01	16:33:46	333.7763	0.153
4/24/01	16:34:46	334.7763	0.159
4/24/01	16:35:46	335.7763	0.155
4/24/01	16:36:46	336.7763	0.157
4/24/01	16:37:46	337.7763	0.155
4/24/01	16:38:46	338.7763	0.157
4/24/01	16:39:46	339.7763	0.155
4/24/01	16:40:46	340.7763	0.153
4/24/01	16:41:46	341.7763	0.153
4/24/01	16:42:46	342.7763	0.153
4/24/01	16:43:46	343.7763	0.155
4/24/01	16:44:46	344.7763	0.153
4/24/01	16:45:46	345.7763	0.155
4/24/01	16:46:46	346.7763	0.155
4/24/01	16:47:46	347.7763	0.155
4/24/01	16:48:46	348.7763	0.159
4/24/01	16:49:46	349.7763	0.159
4/24/01	16:50:46	350.7763	0.153
4/24/01	16:51:46	351.7763	0.155
4/24/01	16:52:46	352.7763	0.151
4/24/01	16:53:46	353.7763	0.157
4/24/01	16:54:46	354.7763	0.147
4/24/01	16:55:46	355.7763	0.151
4/24/01	16:56:46	356.7763	0.157
4/24/01	16:57:46	357.7763	0.153
4/24/01	16:58:46	358.7763	0.155
4/24/01	16:59:46	359.7763	0.155
4/24/01	17:00:46	360.7763	0.153
4/24/01	17:01:46	361.7763	0.157
4/24/01	17:02:46	362.7763	0.157
4/24/01	17:03:46	363.7763	0.157
4/24/01	17:04:46	364.7763	0.157
4/24/01	17:05:46	365.7763	0.155
4/24/01	17:06:46	366.7763	0.157
4/24/01	17:07:46	367.7763	0.159
4/24/01	17:08:46	368.7763	0.157
4/24/01	17:09:46	369.7763	0.141
4/24/01	17:10:46	370.7763	0.157
4/24/01	17:11:46	371.7763	0.159
4/24/01	17:12:46	372.7763	0.155
4/24/01	17:13:46	373.7763	0.157
4/24/01	17:14:46	374.7763	0.155
4/24/01	17:15:46	375.7763	0.153
4/24/01	17:16:46	376.7763	0.155
4/24/01	17:17:46	377.7763	0.157
4/24/01	17:18:46	378.7763	0.153
4/24/01	17:19:46	379.7763	0.153
4/24/01	17:20:46	380.7763	0.157
4/24/01	17:21:46	381.7763	0.151

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/24/01	17:22:46	382.7763	0.157
4/24/01	17:23:46	383.7763	0.153
4/24/01	17:24:46	384.7763	0.153
4/24/01	17:25:46	385.7763	0.155
4/24/01	17:26:46	386.7763	0.153
4/24/01	17:27:46	387.7763	0.157
4/24/01	17:28:46	388.7763	0.151
4/24/01	17:29:46	389.7763	0.153
4/24/01	17:30:46	390.7763	0.157
4/24/01	17:31:46	391.7763	0.155
4/24/01	17:32:46	392.7763	0.157
4/24/01	17:33:46	393.7763	0.155
4/24/01	17:34:46	394.7763	0.161
4/24/01	17:35:46	395.7763	0.155
4/24/01	17:36:46	396.7763	0.155
4/24/01	17:37:46	397.7763	0.155
4/24/01	17:38:46	398.7763	0.157
4/24/01	17:39:46	399.7763	0.155
4/24/01	17:40:46	400.7763	0.157
4/24/01	17:41:46	401.7763	0.153
4/24/01	17:42:46	402.7763	0.16
4/24/01	17:43:46	403.7763	0.162
4/24/01	17:44:46	404.7763	0.158
4/24/01	17:45:46	405.7763	0.158
4/24/01	17:46:46	406.7763	0.156
4/24/01	17:47:46	407.7763	0.158
4/24/01	17:48:46	408.7763	0.157
4/24/01	17:49:46	409.7763	0.157
4/24/01	17:50:46	410.7763	0.157
4/24/01	17:51:46	411.7763	0.149
4/24/01	17:52:46	412.7763	0.153
4/24/01	17:53:46	413.7763	0.151
4/24/01	17:54:46	414.7763	0.157
4/24/01	17:55:46	415.7763	0.157
4/24/01	17:56:46	416.7763	0.157
4/24/01	17:57:46	417.7763	0.155
4/24/01	17:58:46	418.7763	0.158
4/24/01	17:59:46	419.7763	0.154
4/24/01	18:00:46	420.7763	0.16
4/24/01	18:01:46	421.7763	0.158
4/24/01	18:02:46	422.7763	0.156
4/24/01	18:03:46	423.7763	0.156
4/24/01	18:04:46	424.7763	0.156
4/24/01	18:05:46	425.7763	0.158
4/24/01	18:06:46	426.7763	0.156
4/24/01	18:07:46	427.7763	0.152
4/24/01	18:08:46	428.7763	0.158
4/24/01	18:09:46	429.7763	0.156
4/24/01	18:10:46	430.7763	0.158
4/24/01	18:11:46	431.7763	0.152
4/24/01	18:12:46	432.7763	0.149
4/24/01	18:13:46	433.7763	0.153
4/24/01	18:14:46	434.7763	0.152
4/24/01	18:15:46	435.7763	0.151
4/24/01	18:16:46	436.7763	0.152
4/24/01	18:17:46	437.7763	0.152
4/24/01	18:18:46	438.7763	0.151
4/24/01	18:19:46	439.7763	0.151
4/24/01	18:20:46	440.7763	0.152
4/24/01	18:21:46	441.7763	0.149
4/24/01	18:22:46	442.7763	0.153
4/24/01	18:23:46	443.7763	0.153
4/24/01	18:24:46	444.7763	0.155
4/24/01	18:25:46	445.7763	0.151
4/24/01	18:26:46	446.7763	0.151
4/24/01	18:27:46	447.7763	0.153
4/24/01	18:28:46	448.7763	0.152
4/24/01	18:29:46	449.7763	0.153
4/24/01	18:30:46	450.7763	0.153
4/24/01	18:31:46	451.7763	0.151
4/24/01	18:32:46	452.7763	0.151
4/24/01	18:33:46	453.7763	0.151
4/24/01	18:34:46	454.7763	0.151
4/24/01	18:35:46	455.7763	0.152
4/24/01	18:36:46	456.7763	0.158
4/24/01	18:37:46	457.7763	0.155
4/24/01	18:38:46	458.7763	0.157
4/24/01	18:39:46	459.7763	0.154
4/24/01	18:40:46	460.7763	0.152
4/24/01	18:41:46	461.7763	0.151
4/24/01	18:42:46	462.7763	0.152
4/24/01	18:43:46	463.7763	0.152
4/24/01	18:44:46	464.7763	0.152
4/24/01	18:45:46	465.7763	0.149
4/24/01	18:46:46	466.7763	0.152
4/24/01	18:47:46	467.7763	0.149
4/24/01	18:48:46	468.7763	0.151
4/24/01	18:49:46	469.7763	0.151
4/24/01	18:50:46	470.7763	0.151
4/24/01	18:51:46	471.7763	0.149
4/24/01	18:52:46	472.7763	0.149
4/24/01	18:53:46	473.7763	0.153
4/24/01	18:54:46	474.7763	0.149
4/24/01	18:55:46	475.7763	0.153
4/24/01	18:56:46	476.7763	0.153
4/24/01	18:57:46	477.7763	0.149
4/24/01	18:58:46	478.7763	0.149
4/24/01	18:59:46	479.7763	0.147
4/24/01	19:00:46	480.7763	0.149
4/24/01	19:01:46	481.7763	0.143
4/24/01	19:02:46	482.7763	0.149
4/24/01	19:03:46	483.7763	0.149

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/24/01	19:04:46	484.7763	0.151
4/24/01	19:05:46	485.7763	0.151
4/24/01	19:06:46	486.7763	0.147
4/24/01	19:07:46	487.7763	0.149
4/24/01	19:08:46	488.7763	0.149
4/24/01	19:09:46	489.7763	0.149
4/24/01	19:10:46	490.7763	0.139
4/24/01	19:11:46	491.7763	0.151
4/24/01	19:12:46	492.7763	0.151
4/24/01	19:13:46	493.7763	0.151
4/24/01	19:14:46	494.7763	0.149
4/24/01	19:15:46	495.7763	0.151
4/24/01	19:16:46	496.7763	0.149
4/24/01	19:17:46	497.7763	0.149
4/24/01	19:18:46	498.7763	0.151
4/24/01	19:19:46	499.7763	0.147
4/24/01	19:20:46	500.7763	0.149
4/24/01	19:21:46	501.7763	0.147
4/24/01	19:22:46	502.7763	0.147
4/24/01	19:23:46	503.7763	0.145
4/24/01	19:24:46	504.7763	0.147
4/24/01	19:25:46	505.7763	0.141
4/24/01	19:26:46	506.7763	0.147
4/24/01	19:27:46	507.7763	0.143
4/24/01	19:28:46	508.7763	0.149
4/24/01	19:29:46	509.7763	0.151
4/24/01	19:30:46	510.7763	0.149
4/24/01	19:31:46	511.7763	0.151
4/24/01	19:32:46	512.7763	0.151
4/24/01	19:33:46	513.7763	0.151
4/24/01	19:34:46	514.7763	0.153
4/24/01	19:35:46	515.7763	0.151
4/24/01	19:36:46	516.7763	0.151
4/24/01	19:37:46	517.7763	0.151
4/24/01	19:38:46	518.7763	0.151
4/24/01	19:39:46	519.7763	0.151
4/24/01	19:40:46	520.7763	0.151
4/24/01	19:41:46	521.7763	0.151
4/24/01	19:42:46	522.7763	0.151
4/24/01	19:43:46	523.7763	0.151
4/24/01	19:44:46	524.7763	0.151
4/24/01	19:45:46	525.7763	0.147
4/24/01	19:46:46	526.7763	0.151
4/24/01	19:47:46	527.7763	0.139
4/24/01	19:48:46	528.7763	0.151
4/24/01	19:49:46	529.7763	0.149
4/24/01	19:50:46	530.7763	0.151
4/24/01	19:51:46	531.7763	0.151
4/24/01	19:52:46	532.7763	0.151
4/24/01	19:53:46	533.7763	0.151
4/24/01	19:54:46	534.7763	0.151
4/24/01	19:55:46	535.7763	0.151
4/24/01	19:56:46	536.7763	0.151
4/24/01	19:57:46	537.7763	0.151
4/24/01	19:58:46	538.7763	0.151
4/24/01	19:59:46	539.7763	0.145
4/24/01	20:00:46	540.7763	0.151
4/24/01	20:01:46	541.7763	0.151
4/24/01	20:02:46	542.7763	0.151
4/24/01	20:03:46	543.7763	0.151
4/24/01	20:04:46	544.7763	0.15
4/24/01	20:05:46	545.7763	0.148
4/24/01	20:06:46	546.7763	0.15
4/24/01	20:07:46	547.7763	0.15
4/24/01	20:08:46	548.7763	0.148
4/24/01	20:09:46	549.7763	0.15
4/24/01	20:10:46	550.7763	0.15
4/24/01	20:11:46	551.7763	0.149
4/24/01	20:12:46	552.7763	0.151
4/24/01	20:13:46	553.7763	0.149
4/24/01	20:14:46	554.7763	0.149
4/24/01	20:15:46	555.7763	0.147
4/24/01	20:16:46	556.7763	0.147
4/24/01	20:17:46	557.7763	0.149
4/24/01	20:18:46	558.7763	0.149
4/24/01	20:19:46	559.7763	0.147
4/24/01	20:20:46	560.7763	0.149
4/24/01	20:21:46	561.7763	0.149
4/24/01	20:22:46	562.7763	0.147
4/24/01	20:23:46	563.7763	0.147
4/24/01	20:24:46	564.7763	0.149
4/24/01	20:25:46	565.7763	0.145
4/24/01	20:26:46	566.7763	0.147
4/24/01	20:27:46	567.7763	0.147
4/24/01	20:28:46	568.7763	0.147
4/24/01	20:29:46	569.7763	0.149
4/24/01	20:30:46	570.7763	0.149
4/24/01	20:31:46	571.7763	0.145
4/24/01	20:32:46	572.7763	0.149
4/24/01	20:33:46	573.7763	0.149
4/24/01	20:34:46	574.7763	0.149
4/24/01	20:35:46	575.7763	0.145
4/24/01	20:36:46	576.7763	0.145
4/24/01	20:37:46	577.7763	0.149
4/24/01	20:38:46	578.7763	0.149
4/24/01	20:39:46	579.7763	0.147
4/24/01	20:40:46	580.7763	0.147
4/24/01	20:41:46	581.7763	0.149
4/24/01	20:42:46	582.7763	0.145
4/24/01	20:43:46	583.7763	0.147
4/24/01	20:44:46	584.7763	0.147
4/24/01	20:45:46	585.7763	0.143

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/24/01	20:46:46	586.7763	0.145
4/24/01	20:47:46	587.7763	0.145
4/24/01	20:48:46	588.7763	0.145
4/24/01	20:49:46	589.7763	0.147
4/24/01	20:50:46	590.7763	0.149
4/24/01	20:51:46	591.7763	0.149
4/24/01	20:52:46	592.7763	0.149
4/24/01	20:53:46	593.7763	0.145
4/24/01	20:54:46	594.7763	0.149
4/24/01	20:55:46	595.7763	0.149
4/24/01	20:56:46	596.7763	0.149
4/24/01	20:57:46	597.7763	0.149
4/24/01	20:58:46	598.7763	0.149
4/24/01	20:59:46	599.7763	0.149
4/24/01	21:00:46	600.7763	0.149
4/24/01	21:01:46	601.7763	0.151
4/24/01	21:02:46	602.7763	0.149
4/24/01	21:03:46	603.7763	0.149
4/24/01	21:04:46	604.7763	0.145
4/24/01	21:05:46	605.7763	0.145
4/24/01	21:06:46	606.7763	0.145
4/24/01	21:07:46	607.7763	0.145
4/24/01	21:08:46	608.7763	0.141
4/24/01	21:09:46	609.7763	0.149
4/24/01	21:10:46	610.7763	0.151
4/24/01	21:11:46	611.7763	0.147
4/24/01	21:12:46	612.7763	0.145
4/24/01	21:13:46	613.7763	0.145
4/24/01	21:14:46	614.7763	0.145
4/24/01	21:15:46	615.7763	0.147
4/24/01	21:16:46	616.7763	0.147
4/24/01	21:17:46	617.7763	0.147
4/24/01	21:18:46	618.7763	0.145
4/24/01	21:19:46	619.7763	0.145
4/24/01	21:20:46	620.7763	0.145
4/24/01	21:21:46	621.7763	0.145
4/24/01	21:22:46	622.7763	0.145
4/24/01	21:23:46	623.7763	0.143
4/24/01	21:24:46	624.7763	0.143
4/24/01	21:25:46	625.7763	0.145
4/24/01	21:26:46	626.7763	0.143
4/24/01	21:27:46	627.7763	0.139
4/24/01	21:28:46	628.7763	0.145
4/24/01	21:29:46	629.7763	0.145
4/24/01	21:30:46	630.7763	0.147
4/24/01	21:31:46	631.7763	0.149
4/24/01	21:32:46	632.7763	0.147
4/24/01	21:33:46	633.7763	0.147
4/24/01	21:34:46	634.7763	0.149
4/24/01	21:35:46	635.7763	0.149
4/24/01	21:36:46	636.7763	0.147
4/24/01	21:37:46	637.7763	0.149
4/24/01	21:38:46	638.7763	0.149
4/24/01	21:39:46	639.7763	0.149
4/24/01	21:40:46	640.7763	0.149
4/24/01	21:41:46	641.7763	0.151
4/24/01	21:42:46	642.7763	0.151
4/24/01	21:43:46	643.7763	0.151
4/24/01	21:44:46	644.7763	0.147
4/24/01	21:45:46	645.7763	0.153
4/24/01	21:46:46	646.7763	0.155
4/24/01	21:47:46	647.7763	0.151
4/24/01	21:48:46	648.7763	0.151
4/24/01	21:49:46	649.7763	0.149
4/24/01	21:50:46	650.7763	0.153
4/24/01	21:51:46	651.7763	0.153
4/24/01	21:52:46	652.7763	0.153
4/24/01	21:53:46	653.7763	0.151
4/24/01	21:54:46	654.7763	0.149
4/24/01	21:55:46	655.7763	0.151
4/24/01	21:56:46	656.7763	0.151
4/24/01	21:57:46	657.7763	0.151
4/24/01	21:58:46	658.7763	0.151
4/24/01	21:59:46	659.7763	0.153
4/24/01	22:00:46	660.7763	0.151
4/24/01	22:01:46	661.7763	0.151
4/24/01	22:02:46	662.7763	0.151
4/24/01	22:03:46	663.7763	0.153
4/24/01	22:04:46	664.7763	0.149
4/24/01	22:05:46	665.7763	0.149
4/24/01	22:06:46	666.7763	0.151
4/24/01	22:07:46	667.7763	0.153
4/24/01	22:08:46	668.7763	0.153
4/24/01	22:09:46	669.7763	0.153
4/24/01	22:10:46	670.7763	0.153
4/24/01	22:11:46	671.7763	0.153
4/24/01	22:12:46	672.7763	0.153
4/24/01	22:13:46	673.7763	0.153
4/24/01	22:14:46	674.7763	0.153
4/24/01	22:15:46	675.7763	0.151
4/24/01	22:16:46	676.7763	0.151
4/24/01	22:17:46	677.7763	0.153
4/24/01	22:18:46	678.7763	0.153
4/24/01	22:19:46	679.7763	0.153
4/24/01	22:20:46	680.7763	0.149
4/24/01	22:21:46	681.7763	0.149
4/24/01	22:22:46	682.7763	0.149
4/24/01	22:23:46	683.7763	0.149
4/24/01	22:24:46	684.7763	0.149
4/24/01	22:25:46	685.7763	0.149
4/24/01	22:26:46	686.7763	0.149
4/24/01	22:27:46	687.7763	0.149

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/24/01	22:28:46	688.7763	0.149
4/24/01	22:29:46	689.7763	0.149
4/24/01	22:30:46	690.7763	0.147
4/24/01	22:31:46	691.7763	0.147
4/24/01	22:32:46	692.7763	0.147
4/24/01	22:33:46	693.7763	0.145
4/24/01	22:34:46	694.7763	0.145
4/24/01	22:35:46	695.7763	0.147
4/24/01	22:36:46	696.7763	0.147
4/24/01	22:37:46	697.7763	0.147
4/24/01	22:38:46	698.7763	0.141
4/24/01	22:39:46	699.7763	0.147
4/24/01	22:40:46	700.7763	0.145
4/24/01	22:41:46	701.7763	0.145
4/24/01	22:42:46	702.7763	0.145
4/24/01	22:43:46	703.7763	0.145
4/24/01	22:44:46	704.7763	0.146
4/24/01	22:45:46	705.7763	0.151
4/24/01	22:46:46	706.7763	0.147
4/24/01	22:47:46	707.7763	0.147
4/24/01	22:48:46	708.7763	0.149
4/24/01	22:49:46	709.7763	0.149
4/24/01	22:50:46	710.7763	0.149
4/24/01	22:51:46	711.7763	0.151
4/24/01	22:52:46	712.7763	0.151
4/24/01	22:53:46	713.7763	0.149
4/24/01	22:54:46	714.7763	0.149
4/24/01	22:55:46	715.7763	0.151
4/24/01	22:56:46	716.7763	0.151
4/24/01	22:57:46	717.7763	0.149
4/24/01	22:58:46	718.7763	0.151
4/24/01	22:59:46	719.7763	0.151
4/24/01	23:00:46	720.7763	0.147
4/24/01	23:01:46	721.7763	0.147
4/24/01	23:02:46	722.7763	0.147
4/24/01	23:03:46	723.7763	0.147
4/24/01	23:04:46	724.7763	0.151
4/24/01	23:05:46	725.7763	0.151
4/24/01	23:06:46	726.7763	0.151
4/24/01	23:07:46	727.7763	0.147
4/24/01	23:08:46	728.7763	0.147
4/24/01	23:09:46	729.7763	0.147
4/24/01	23:10:46	730.7763	0.147
4/24/01	23:11:46	731.7763	0.145
4/24/01	23:12:46	732.7763	0.147
4/24/01	23:13:46	733.7763	0.145
4/24/01	23:14:46	734.7763	0.145
4/24/01	23:15:46	735.7763	0.149
4/24/01	23:16:46	736.7763	0.149
4/24/01	23:17:46	737.7763	0.149
4/24/01	23:18:46	738.7763	0.149
4/24/01	23:19:46	739.7763	0.149
4/24/01	23:20:46	740.7763	0.147
4/24/01	23:21:46	741.7763	0.147
4/24/01	23:22:46	742.7763	0.149
4/24/01	23:23:46	743.7763	0.149
4/24/01	23:24:46	744.7763	0.149
4/24/01	23:25:46	745.7763	0.149
4/24/01	23:26:46	746.7763	0.149
4/24/01	23:27:46	747.7763	0.149
4/24/01	23:28:46	748.7763	0.149
4/24/01	23:29:46	749.7763	0.147
4/24/01	23:30:46	750.7763	0.149
4/24/01	23:31:46	751.7763	0.147
4/24/01	23:32:46	752.7763	0.147
4/24/01	23:33:46	753.7763	0.147
4/24/01	23:34:46	754.7763	0.147
4/24/01	23:35:46	755.7763	0.149
4/24/01	23:36:46	756.7763	0.145
4/24/01	23:37:46	757.7763	0.145
4/24/01	23:38:46	758.7763	0.145
4/24/01	23:39:46	759.7763	0.145
4/24/01	23:40:46	760.7763	0.143
4/24/01	23:41:46	761.7763	0.143
4/24/01	23:42:46	762.7763	0.145
4/24/01	23:43:46	763.7763	0.145
4/24/01	23:44:46	764.7763	0.145
4/24/01	23:45:46	765.7763	0.145
4/24/01	23:46:46	766.7763	0.147
4/24/01	23:47:46	767.7763	0.151
4/24/01	23:48:46	768.7763	0.145
4/24/01	23:49:46	769.7763	0.145
4/24/01	23:50:46	770.7763	0.147
4/24/01	23:51:46	771.7763	0.143
4/24/01	23:52:46	772.7763	0.151
4/24/01	23:53:46	773.7763	0.151
4/24/01	23:54:46	774.7763	0.149
4/24/01	23:55:46	775.7763	0.149
4/24/01	23:56:46	776.7763	0.149
4/24/01	23:57:46	777.7763	0.149
4/24/01	23:58:46	778.7763	0.147
4/24/01	23:59:46	779.7763	0.147
4/25/01	0:00:46	780.7763	0.149
4/25/01	0:01:46	781.7763	0.149
4/25/01	0:02:46	782.7763	0.145
4/25/01	0:03:46	783.7763	0.149
4/25/01	0:04:46	784.7763	0.149
4/25/01	0:05:46	785.7763	0.146
4/25/01	0:06:46	786.7763	0.148
4/25/01	0:07:46	787.7763	0.146
4/25/01	0:08:46	788.7763	0.146
4/25/01	0:09:46	789.7763	0.148

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/25/01	0:10:46	790.7763	0.148
4/25/01	0:11:46	791.7763	0.146
4/25/01	0:12:46	792.7763	0.148
4/25/01	0:13:46	793.7763	0.148
4/25/01	0:14:46	794.7763	0.148
4/25/01	0:15:46	795.7763	0.148
4/25/01	0:16:46	796.7763	0.146
4/25/01	0:17:46	797.7763	0.149
4/25/01	0:18:46	798.7763	0.148
4/25/01	0:19:46	799.7763	0.146
4/25/01	0:20:46	800.7763	0.148
4/25/01	0:21:46	801.7763	0.146
4/25/01	0:22:46	802.7763	0.148
4/25/01	0:23:46	803.7763	0.147
4/25/01	0:24:46	804.7763	0.146
4/25/01	0:25:46	805.7763	0.148
4/25/01	0:26:46	806.7763	0.147
4/25/01	0:27:46	807.7763	0.146
4/25/01	0:28:46	808.7763	0.149
4/25/01	0:29:46	809.7763	0.148
4/25/01	0:30:46	810.7763	0.145
4/25/01	0:31:46	811.7763	0.145
4/25/01	0:32:46	812.7763	0.145
4/25/01	0:33:46	813.7763	0.143
4/25/01	0:34:46	814.7763	0.145
4/25/01	0:35:46	815.7763	0.143
4/25/01	0:36:46	816.7763	0.143
4/25/01	0:37:46	817.7763	0.147
4/25/01	0:38:46	818.7763	0.143
4/25/01	0:39:46	819.7763	0.143
4/25/01	0:40:46	820.7763	0.145
4/25/01	0:41:46	821.7763	0.143
4/25/01	0:42:46	822.7763	0.147
4/25/01	0:43:46	823.7763	0.149

Date	Time	ET (min)	Chan[2] Feet H2O
4/25/01	0:44:46	824.7763	0.149
4/25/01	0:45:46	825.7763	0.143
4/25/01	0:46:46	826.7763	0.149
4/25/01	0:47:46	827.7763	0.147
4/25/01	0:48:46	828.7763	0.147
4/25/01	0:49:46	829.7763	0.147
4/25/01	0:50:46	830.7763	0.145
4/25/01	0:51:46	831.7763	0.145
4/25/01	0:52:46	832.7763	0.147
4/25/01	0:53:46	833.7763	0.147
4/25/01	0:54:46	834.7763	0.147
4/25/01	0:55:46	835.7763	0.149
4/25/01	0:56:46	836.7763	0.147
4/25/01	0:57:46	837.7763	0.148
4/25/01	0:58:46	838.7763	0.143
4/25/01	0:59:46	839.7763	0.145
4/25/01	1:00:46	840.7763	0.145
4/25/01	1:01:46	841.7763	0.135
4/25/01	1:02:46	842.7763	0.146
4/25/01	1:03:46	843.7763	0.148
4/25/01	1:04:46	844.7763	0.149
4/25/01	1:05:46	845.7763	0.147
4/25/01	1:06:46	846.7763	0.145
4/25/01	1:07:46	847.7763	0.145
4/25/01	1:08:46	848.7763	0.145
4/25/01	1:09:46	849.7763	0.145
4/25/01	1:10:46	850.7763	0.145
4/25/01	1:11:46	851.7763	0.145
4/25/01	1:12:46	852.7763	0.145
4/25/01	1:13:46	853.7763	0.145
4/25/01	1:14:46	854.7763	0.141
4/25/01	1:15:46	855.7763	0.143
4/25/01	1:16:46	856.7763	0.145
4/25/01	1:17:46	857.7763	0.143

Date	Time	ET (min)	Chan[2] Feet H2O
4/25/01	1:18:46	858.7763	0.145
4/25/01	1:19:46	859.7763	0.149
4/25/01	1:20:46	860.7763	0.149
4/25/01	1:21:46	861.7763	0.141
4/25/01	1:22:46	862.7763	0.143
4/25/01	1:23:46	863.7763	0.143
4/25/01	1:24:46	864.7763	0.143
4/25/01	1:25:46	865.7763	0.143
4/25/01	1:26:46	866.7763	0.143
4/25/01	1:27:46	867.7763	0.143
4/25/01	1:28:46	868.7763	0.143
4/25/01	1:29:46	869.7763	0.143
4/25/01	1:30:46	870.7763	0.143
4/25/01	1:31:46	871.7763	0.143
4/25/01	1:32:46	872.7763	0.143
4/25/01	1:33:46	873.7763	0.145
4/25/01	1:34:46	874.7763	0.147
4/25/01	1:35:46	875.7763	0.147
4/25/01	1:36:46	876.7763	0.146
4/25/01	1:37:46	877.7763	0.148
4/25/01	1:38:46	878.7763	0.146
4/25/01	1:39:46	879.7763	0.146
4/25/01	1:40:46	880.7763	0.143
4/25/01	1:41:46	881.7763	0.146
4/25/01	1:42:46	882.7763	0.143
4/25/01	1:43:46	883.7763	0.146
4/25/01	1:44:46	884.7763	0.145
4/25/01	1:45:46	885.7763	0.145
4/25/01	1:46:46	886.7763	0.145
4/25/01	1:47:46	887.7763	0.147
4/25/01	1:48:46	888.7763	0.145
4/25/01	1:49:46	889.7763	0.147
4/25/01	1:50:46	890.7763	0.143
4/25/01	1:51:46	891.7763	0.145

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/25/01	1:52:46	892.7763	0.147
4/25/01	1:53:46	893.7763	0.145
4/25/01	1:54:46	894.7763	0.147
4/25/01	1:55:46	895.7763	0.145
4/25/01	1:56:46	896.7763	0.145
4/25/01	1:57:46	897.7763	0.147
4/25/01	1:58:46	898.7763	0.145
4/25/01	1:59:46	899.7763	0.145
4/25/01	2:00:46	900.7763	0.145
4/25/01	2:01:46	901.7763	0.141
4/25/01	2:02:46	902.7763	0.145
4/25/01	2:03:46	903.7763	0.145
4/25/01	2:04:46	904.7763	0.145
4/25/01	2:05:46	905.7763	0.141
4/25/01	2:06:46	906.7763	0.143
4/25/01	2:07:46	907.7763	0.141
4/25/01	2:08:46	908.7763	0.139
4/25/01	2:09:46	909.7763	0.13
4/25/01	2:10:46	910.7763	0.137
4/25/01	2:11:46	911.7763	0.141
4/25/01	2:12:46	912.7763	0.143
4/25/01	2:13:46	913.7763	0.141
4/25/01	2:14:46	914.7763	0.137
4/25/01	2:15:46	915.7763	0.143
4/25/01	2:16:46	916.7763	0.139
4/25/01	2:17:46	917.7763	0.139
4/25/01	2:18:46	918.7763	0.137
4/25/01	2:19:46	919.7763	0.141
4/25/01	2:20:46	920.7763	0.141
4/25/01	2:21:46	921.7763	0.131
4/25/01	2:22:46	922.7763	0.139
4/25/01	2:23:46	923.7763	0.141
4/25/01	2:24:46	924.7763	0.143
4/25/01	2:25:46	925.7763	0.143
4/25/01	2:26:46	926.7763	0.141
4/25/01	2:27:46	927.7763	0.145
4/25/01	2:28:46	928.7763	0.143
4/25/01	2:29:46	929.7763	0.139
4/25/01	2:30:46	930.7763	0.143
4/25/01	2:31:46	931.7763	0.145
4/25/01	2:32:46	932.7763	0.145
4/25/01	2:33:46	933.7763	0.145
4/25/01	2:34:46	934.7763	0.143
4/25/01	2:35:46	935.7763	0.141
4/25/01	2:36:46	936.7763	0.143
4/25/01	2:37:46	937.7763	0.139
4/25/01	2:38:46	938.7763	0.141
4/25/01	2:39:46	939.7763	0.141
4/25/01	2:40:46	940.7763	0.143
4/25/01	2:41:46	941.7763	0.141
4/25/01	2:42:46	942.7763	0.141
4/25/01	2:43:46	943.7763	0.143
4/25/01	2:44:46	944.7763	0.143
4/25/01	2:45:46	945.7763	0.139
4/25/01	2:46:46	946.7763	0.139
4/25/01	2:47:46	947.7763	0.139
4/25/01	2:48:46	948.7763	0.141
4/25/01	2:49:46	949.7763	0.137
4/25/01	2:50:46	950.7763	0.139
4/25/01	2:51:46	951.7763	0.139
4/25/01	2:52:46	952.7763	0.139
4/25/01	2:53:46	953.7763	0.139
4/25/01	2:54:46	954.7763	0.139
4/25/01	2:55:46	955.7763	0.137
4/25/01	2:56:46	956.7763	0.139
4/25/01	2:57:46	957.7763	0.141
4/25/01	2:58:46	958.7763	0.141
4/25/01	2:59:46	959.7763	0.135
4/25/01	3:00:46	960.7763	0.141
4/25/01	3:01:46	961.7763	0.141
4/25/01	3:02:46	962.7763	0.141
4/25/01	3:03:46	963.7763	0.141
4/25/01	3:04:46	964.7763	0.143
4/25/01	3:05:46	965.7763	0.143
4/25/01	3:06:46	966.7763	0.139
4/25/01	3:07:46	967.7763	0.141
4/25/01	3:08:46	968.7763	0.141
4/25/01	3:09:46	969.7763	0.141
4/25/01	3:10:46	970.7763	0.141
4/25/01	3:11:46	971.7763	0.135
4/25/01	3:12:46	972.7763	0.137
4/25/01	3:13:46	973.7763	0.137
4/25/01	3:14:46	974.7763	0.135
4/25/01	3:15:46	975.7763	0.139
4/25/01	3:16:46	976.7763	0.139
4/25/01	3:17:46	977.7763	0.135
4/25/01	3:18:46	978.7763	0.134
4/25/01	3:19:46	979.7763	0.135
4/25/01	3:20:46	980.7763	0.133
4/25/01	3:21:46	981.7763	0.135
4/25/01	3:22:46	982.7763	0.137
4/25/01	3:23:46	983.7763	0.137
4/25/01	3:24:46	984.7763	0.139
4/25/01	3:25:46	985.7763	0.133
4/25/01	3:26:46	986.7763	0.139
4/25/01	3:27:46	987.7763	0.139
4/25/01	3:28:46	988.7763	0.137
4/25/01	3:29:46	989.7763	0.137
4/25/01	3:30:46	990.7763	0.139
4/25/01	3:31:46	991.7763	0.139
4/25/01	3:32:46	992.7763	0.137
4/25/01	3:33:46	993.7763	0.137

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/25/01	3:34:46	994.7763	0.137
4/25/01	3:35:46	995.7763	0.137
4/25/01	3:36:46	996.7763	0.133
4/25/01	3:37:46	997.7763	0.137
4/25/01	3:38:46	998.7763	0.133
4/25/01	3:39:46	999.7763	0.137
4/25/01	3:40:46	1000.776	0.137
4/25/01	3:41:46	1001.776	0.139
4/25/01	3:42:46	1002.776	0.137
4/25/01	3:43:46	1003.776	0.139
4/25/01	3:44:46	1004.776	0.137
4/25/01	3:45:46	1005.776	0.139
4/25/01	3:46:46	1006.776	0.139
4/25/01	3:47:46	1007.776	0.139
4/25/01	3:48:46	1008.776	0.139
4/25/01	3:49:46	1009.776	0.139
4/25/01	3:50:46	1010.776	0.139
4/25/01	3:51:46	1011.776	0.139
4/25/01	3:52:46	1012.776	0.139
4/25/01	3:53:46	1013.776	0.139
4/25/01	3:54:46	1014.776	0.139
4/25/01	3:55:46	1015.776	0.139
4/25/01	3:56:46	1016.776	0.139
4/25/01	3:57:46	1017.776	0.139
4/25/01	3:58:46	1018.776	0.139
4/25/01	3:59:46	1019.776	0.139
4/25/01	4:00:46	1020.776	0.141
4/25/01	4:01:46	1021.776	0.139
4/25/01	4:02:46	1022.776	0.141
4/25/01	4:03:46	1023.776	0.141
4/25/01	4:04:46	1024.776	0.141
4/25/01	4:05:46	1025.776	0.139
4/25/01	4:06:46	1026.776	0.139
4/25/01	4:07:46	1027.776	0.139
4/25/01	4:08:46	1028.776	0.139
4/25/01	4:09:46	1029.776	0.139
4/25/01	4:10:46	1030.776	0.139
4/25/01	4:11:46	1031.776	0.139
4/25/01	4:12:46	1032.776	0.139
4/25/01	4:13:46	1033.776	0.139
4/25/01	4:14:46	1034.776	0.139
4/25/01	4:15:46	1035.776	0.139
4/25/01	4:16:46	1036.776	0.139
4/25/01	4:17:46	1037.776	0.139
4/25/01	4:18:46	1038.776	0.137
4/25/01	4:19:46	1039.776	0.135
4/25/01	4:20:46	1040.776	0.137
4/25/01	4:21:46	1041.776	0.137
4/25/01	4:22:46	1042.776	0.139
4/25/01	4:23:46	1043.776	0.137
4/25/01	4:24:46	1044.776	0.135
4/25/01	4:25:46	1045.776	0.133
4/25/01	4:26:46	1046.776	0.133
4/25/01	4:27:46	1047.776	0.133
4/25/01	4:28:46	1048.776	0.133
4/25/01	4:29:46	1049.776	0.135
4/25/01	4:30:46	1050.776	0.135
4/25/01	4:31:46	1051.776	0.135
4/25/01	4:32:46	1052.776	0.134
4/25/01	4:33:46	1053.776	0.137
4/25/01	4:34:46	1054.776	0.13
4/25/01	4:35:46	1055.776	0.135
4/25/01	4:36:46	1056.776	0.134
4/25/01	4:37:46	1057.776	0.135
4/25/01	4:38:46	1058.776	0.137
4/25/01	4:39:46	1059.776	0.137
4/25/01	4:40:46	1060.776	0.139
4/25/01	4:41:46	1061.776	0.139
4/25/01	4:42:46	1062.776	0.137
4/25/01	4:43:46	1063.776	0.135
4/25/01	4:44:46	1064.776	0.135
4/25/01	4:45:46	1065.776	0.134
4/25/01	4:46:46	1066.776	0.134
4/25/01	4:47:46	1067.776	0.135
4/25/01	4:48:46	1068.776	0.137
4/25/01	4:49:46	1069.776	0.137
4/25/01	4:50:46	1070.776	0.134
4/25/01	4:51:46	1071.776	0.135
4/25/01	4:52:46	1072.776	0.136
4/25/01	4:53:46	1073.776	0.137
4/25/01	4:54:46	1074.776	0.135
4/25/01	4:55:46	1075.776	0.137
4/25/01	4:56:46	1076.776	0.137
4/25/01	4:57:46	1077.776	0.137
4/25/01	4:58:46	1078.776	0.137
4/25/01	4:59:46	1079.776	0.137
4/25/01	5:00:46	1080.776	0.135
4/25/01	5:01:46	1081.776	0.132
4/25/01	5:02:46	1082.776	0.137
4/25/01	5:03:46	1083.776	0.135
4/25/01	5:04:46	1084.776	0.137
4/25/01	5:05:46	1085.776	0.135
4/25/01	5:06:46	1086.776	0.135
4/25/01	5:07:46	1087.776	0.135
4/25/01	5:08:46	1088.776	0.137
4/25/01	5:09:46	1089.776	0.135
4/25/01	5:10:46	1090.776	0.127
4/25/01	5:11:46	1091.776	0.135
4/25/01	5:12:46	1092.776	0.135
4/25/01	5:13:46	1093.776	0.135
4/25/01	5:14:46	1094.776	0.135
4/25/01	5:15:46	1095.776	0.135

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/25/01	5:16:46	1096.776	0.135
4/25/01	5:17:46	1097.776	0.137
4/25/01	5:18:46	1098.776	0.135
4/25/01	5:19:46	1099.776	0.135
4/25/01	5:20:46	1100.776	0.137
4/25/01	5:21:46	1101.776	0.137
4/25/01	5:22:46	1102.776	0.135
4/25/01	5:23:46	1103.776	0.135
4/25/01	5:24:46	1104.776	0.137
4/25/01	5:25:46	1105.776	0.135
4/25/01	5:26:46	1106.776	0.137
4/25/01	5:27:46	1107.776	0.135
4/25/01	5:28:46	1108.776	0.132
4/25/01	5:29:46	1109.776	0.134
4/25/01	5:30:46	1110.776	0.137
4/25/01	5:31:46	1111.776	0.134
4/25/01	5:32:46	1112.776	0.134
4/25/01	5:33:46	1113.776	0.134
4/25/01	5:34:46	1114.776	0.134
4/25/01	5:35:46	1115.776	0.134
4/25/01	5:36:46	1116.776	0.134
4/25/01	5:37:46	1117.776	0.132
4/25/01	5:38:46	1118.776	0.13
4/25/01	5:39:46	1119.776	0.132
4/25/01	5:40:46	1120.776	0.135
4/25/01	5:41:46	1121.776	0.134
4/25/01	5:42:46	1122.776	0.132
4/25/01	5:43:46	1123.776	0.134
4/25/01	5:44:46	1124.776	0.132
4/25/01	5:45:46	1125.776	0.132
4/25/01	5:46:46	1126.776	0.128
4/25/01	5:47:46	1127.776	0.135
4/25/01	5:48:46	1128.776	0.132
4/25/01	5:49:46	1129.776	0.132
4/25/01	5:50:46	1130.776	0.13
4/25/01	5:51:46	1131.776	0.13
4/25/01	5:52:46	1132.776	0.13
4/25/01	5:53:46	1133.776	0.134
4/25/01	5:54:46	1134.776	0.135
4/25/01	5:55:46	1135.776	0.134
4/25/01	5:56:46	1136.776	0.135
4/25/01	5:57:46	1137.776	0.134
4/25/01	5:58:46	1138.776	0.136
4/25/01	5:59:46	1139.776	0.136
4/25/01	6:00:46	1140.776	0.13
4/25/01	6:01:46	1141.776	0.124
4/25/01	6:02:46	1142.776	0.132
4/25/01	6:03:46	1143.776	0.132
4/25/01	6:04:46	1144.776	0.134
4/25/01	6:05:46	1145.776	0.132
4/25/01	6:06:46	1146.776	0.132
4/25/01	6:07:46	1147.776	0.135
4/25/01	6:08:46	1148.776	0.131
4/25/01	6:09:46	1149.776	0.135
4/25/01	6:10:46	1150.776	0.133
4/25/01	6:11:46	1151.776	0.131
4/25/01	6:12:46	1152.776	0.13
4/25/01	6:13:46	1153.776	0.131
4/25/01	6:14:46	1154.776	0.131
4/25/01	6:15:46	1155.776	0.131
4/25/01	6:16:46	1156.776	0.134
4/25/01	6:17:46	1157.776	0.131
4/25/01	6:18:46	1158.776	0.134
4/25/01	6:19:46	1159.776	0.134
4/25/01	6:20:46	1160.776	0.132
4/25/01	6:21:46	1161.776	0.13
4/25/01	6:22:46	1162.776	0.135
4/25/01	6:23:46	1163.776	0.135
4/25/01	6:24:46	1164.776	0.134
4/25/01	6:25:46	1165.776	0.134
4/25/01	6:26:46	1166.776	0.134
4/25/01	6:27:46	1167.776	0.134
4/25/01	6:28:46	1168.776	0.133
4/25/01	6:29:46	1169.776	0.133
4/25/01	6:30:46	1170.776	0.133
4/25/01	6:31:46	1171.776	0.131
4/25/01	6:32:46	1172.776	0.132
4/25/01	6:33:46	1173.776	0.132
4/25/01	6:34:46	1174.776	0.13
4/25/01	6:35:46	1175.776	0.131
4/25/01	6:36:46	1176.776	0.13
4/25/01	6:37:46	1177.776	0.131
4/25/01	6:38:46	1178.776	0.133
4/25/01	6:39:46	1179.776	0.13
4/25/01	6:40:46	1180.776	0.13
4/25/01	6:41:46	1181.776	0.131
4/25/01	6:42:46	1182.776	0.131
4/25/01	6:43:46	1183.776	0.131
4/25/01	6:44:46	1184.776	0.133
4/25/01	6:45:46	1185.776	0.133
4/25/01	6:46:46	1186.776	0.133
4/25/01	6:47:46	1187.776	0.133
4/25/01	6:48:46	1188.776	0.135
4/25/01	6:49:46	1189.776	0.133
4/25/01	6:50:46	1190.776	0.134
4/25/01	6:51:46	1191.776	0.134
4/25/01	6:52:46	1192.776	0.132
4/25/01	6:53:46	1193.776	0.132
4/25/01	6:54:46	1194.776	0.134
4/25/01	6:55:46	1195.776	0.132
4/25/01	6:56:46	1196.776	0.134
4/25/01	6:57:46	1197.776	0.134

PZ-5 Drawdown Data

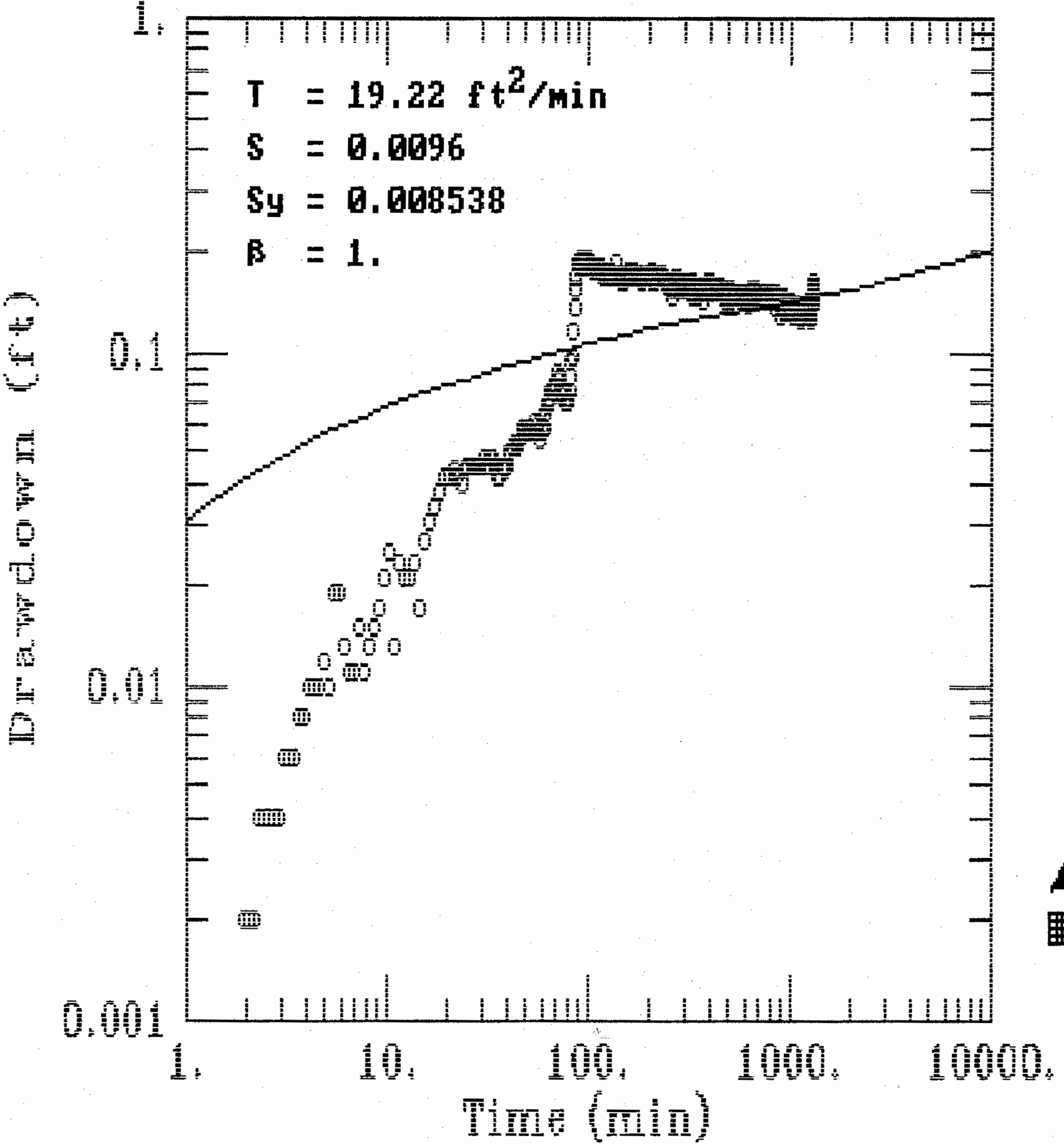
Date	Time	ET (min)	Chan[2] Feet H2O
4/25/01	6:58:46	1198.776	0.134
4/25/01	6:59:46	1199.776	0.134
4/25/01	7:00:46	1200.776	0.135
4/25/01	7:01:46	1201.776	0.137
4/25/01	7:02:46	1202.776	0.137
4/25/01	7:03:46	1203.776	0.137
4/25/01	7:04:46	1204.776	0.137
4/25/01	7:05:46	1205.776	0.135
4/25/01	7:06:46	1206.776	0.135
4/25/01	7:07:46	1207.776	0.137
4/25/01	7:08:46	1208.776	0.137
4/25/01	7:09:46	1209.776	0.13
4/25/01	7:10:46	1210.776	0.137
4/25/01	7:11:46	1211.776	0.137
4/25/01	7:12:46	1212.776	0.138
4/25/01	7:13:46	1213.776	0.132
4/25/01	7:14:46	1214.776	0.136
4/25/01	7:15:46	1215.776	0.137
4/25/01	7:16:46	1216.776	0.134
4/25/01	7:17:46	1217.776	0.137
4/25/01	7:18:46	1218.776	0.135
4/25/01	7:19:46	1219.776	0.135
4/25/01	7:20:46	1220.776	0.135
4/25/01	7:21:46	1221.776	0.135
4/25/01	7:22:46	1222.776	0.137
4/25/01	7:23:46	1223.776	0.135
4/25/01	7:24:46	1224.776	0.137
4/25/01	7:25:46	1225.776	0.137
4/25/01	7:26:46	1226.776	0.133
4/25/01	7:27:46	1227.776	0.131
4/25/01	7:28:46	1228.776	0.131
4/25/01	7:29:46	1229.776	0.131
4/25/01	7:30:46	1230.776	0.133
4/25/01	7:31:46	1231.776	0.134
4/25/01	7:32:46	1232.776	0.134
4/25/01	7:33:46	1233.776	0.131
4/25/01	7:34:46	1234.776	0.132
4/25/01	7:35:46	1235.776	0.133
4/25/01	7:36:46	1236.776	0.137
4/25/01	7:37:46	1237.776	0.134
4/25/01	7:38:46	1238.776	0.137
4/25/01	7:39:46	1239.776	0.135
4/25/01	7:40:46	1240.776	0.135
4/25/01	7:41:46	1241.776	0.137
4/25/01	7:42:46	1242.776	0.137
4/25/01	7:43:46	1243.776	0.133
4/25/01	7:44:46	1244.776	0.133
4/25/01	7:45:46	1245.776	0.139
4/25/01	7:46:46	1246.776	0.139
4/25/01	7:47:46	1247.776	0.137
4/25/01	7:48:46	1248.776	0.137
4/25/01	7:49:46	1249.776	0.135
4/25/01	7:50:46	1250.776	0.135
4/25/01	7:51:46	1251.776	0.135
4/25/01	7:52:46	1252.776	0.135
4/25/01	7:53:46	1253.776	0.134
4/25/01	7:54:46	1254.776	0.134
4/25/01	7:55:46	1255.776	0.133
4/25/01	7:56:46	1256.776	0.132
4/25/01	7:57:46	1257.776	0.131
4/25/01	7:58:46	1258.776	0.131
4/25/01	7:59:46	1259.776	0.131
4/25/01	8:00:46	1260.776	0.135
4/25/01	8:01:46	1261.776	0.13
4/25/01	8:02:46	1262.776	0.124
4/25/01	8:03:46	1263.776	0.134
4/25/01	8:04:46	1264.776	0.134
4/25/01	8:05:46	1265.776	0.135
4/25/01	8:06:46	1266.776	0.131
4/25/01	8:07:46	1267.776	0.131
4/25/01	8:08:46	1268.776	0.131
4/25/01	8:09:46	1269.776	0.135
4/25/01	8:10:46	1270.776	0.139
4/25/01	8:11:46	1271.776	0.139
4/25/01	8:12:46	1272.776	0.141
4/25/01	8:13:46	1273.776	0.141
4/25/01	8:14:46	1274.776	0.141
4/25/01	8:15:46	1275.776	0.139
4/25/01	8:16:46	1276.776	0.133
4/25/01	8:17:46	1277.776	0.143
4/25/01	8:18:46	1278.776	0.141
4/25/01	8:19:46	1279.776	0.143
4/25/01	8:20:46	1280.776	0.143
4/25/01	8:21:46	1281.776	0.143
4/25/01	8:22:46	1282.776	0.143
4/25/01	8:23:46	1283.776	0.144
4/25/01	8:24:46	1284.776	0.144
4/25/01	8:25:46	1285.776	0.145
4/25/01	8:26:46	1286.776	0.146
4/25/01	8:27:46	1287.776	0.146
4/25/01	8:28:46	1288.776	0.146
4/25/01	8:29:46	1289.776	0.146
4/25/01	8:30:46	1290.776	0.146
4/25/01	8:31:46	1291.776	0.146
4/25/01	8:32:46	1292.776	0.148
4/25/01	8:33:46	1293.776	0.146
4/25/01	8:34:46	1294.776	0.148
4/25/01	8:35:46	1295.776	0.148
4/25/01	8:36:46	1296.776	0.14
4/25/01	8:37:46	1297.776	0.146
4/25/01	8:38:46	1298.776	0.15
4/25/01	8:39:46	1299.776	0.148

PZ-5 Drawdown Data

Date	Time	ET (min)	Chan[2] Feet H2O
4/25/01	8:40:46	1300.776	0.15
4/25/01	8:41:46	1301.776	0.148
4/25/01	8:42:46	1302.776	0.154
4/25/01	8:43:46	1303.776	0.156
4/25/01	8:44:46	1304.776	0.158
4/25/01	8:45:46	1305.776	0.158
4/25/01	8:46:46	1306.776	0.158
4/25/01	8:47:46	1307.776	0.16
4/25/01	8:48:46	1308.776	0.16
4/25/01	8:49:46	1309.776	0.16
4/25/01	8:50:46	1310.776	0.16
4/25/01	8:51:46	1311.776	0.158
4/25/01	8:52:46	1312.776	0.162
4/25/01	8:53:46	1313.776	0.162
4/25/01	8:54:46	1314.776	0.16
4/25/01	8:55:46	1315.776	0.16
4/25/01	8:56:46	1316.776	0.158
4/25/01	8:57:46	1317.776	0.16
4/25/01	8:58:46	1318.776	0.156
4/25/01	8:59:46	1319.776	0.156
4/25/01	9:00:46	1320.776	0.156
4/25/01	9:01:46	1321.776	0.156
4/25/01	9:02:46	1322.776	0.156
4/25/01	9:03:46	1323.776	0.156
4/25/01	9:04:46	1324.776	0.158
4/25/01	9:05:46	1325.776	0.158
4/25/01	9:06:46	1326.776	0.16
4/25/01	9:07:46	1327.776	0.158
4/25/01	9:08:46	1328.776	0.157
4/25/01	9:09:46	1329.776	0.155
4/25/01	9:10:46	1330.776	0.157
4/25/01	9:11:46	1331.776	0.152
4/25/01	9:12:46	1332.776	0.143
4/25/01	9:13:46	1333.776	0.128
4/25/01	9:14:46	1334.776	0.107
4/25/01	9:15:46	1335.776	0.084
4/25/01	9:16:46	1336.776	0.069
4/25/01	9:17:46	1337.776	0.048
4/25/01	9:18:46	1338.776	0.04
4/25/01	9:19:46	1339.776	0.032
4/25/01	9:20:46	1340.776	0.027
4/25/01	9:21:46	1341.776	0.023
4/25/01	9:22:46	1342.776	0.019
4/25/01	9:23:46	1343.776	0.018
4/25/01	9:24:46	1344.776	0.016
4/25/01	9:25:46	1345.776	0.012
4/25/01	9:26:46	1346.776	0.011
4/25/01	9:27:46	1347.776	0.003

APPENDIX G
SLUG TEST AND PUMP TEST DATA

PPES PZ-5 Drawdown Data



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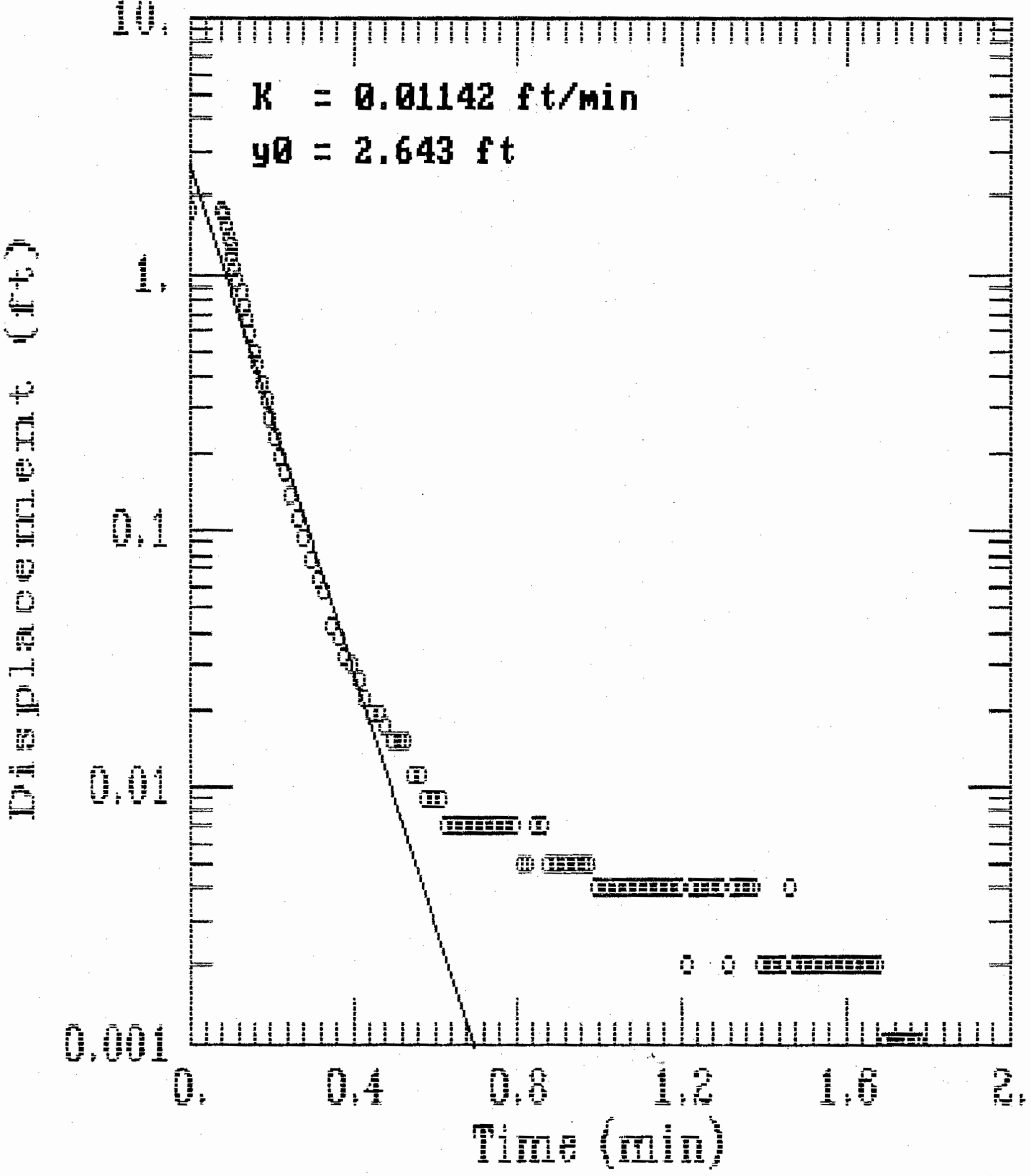

PPES PZ-1 (Test 1)

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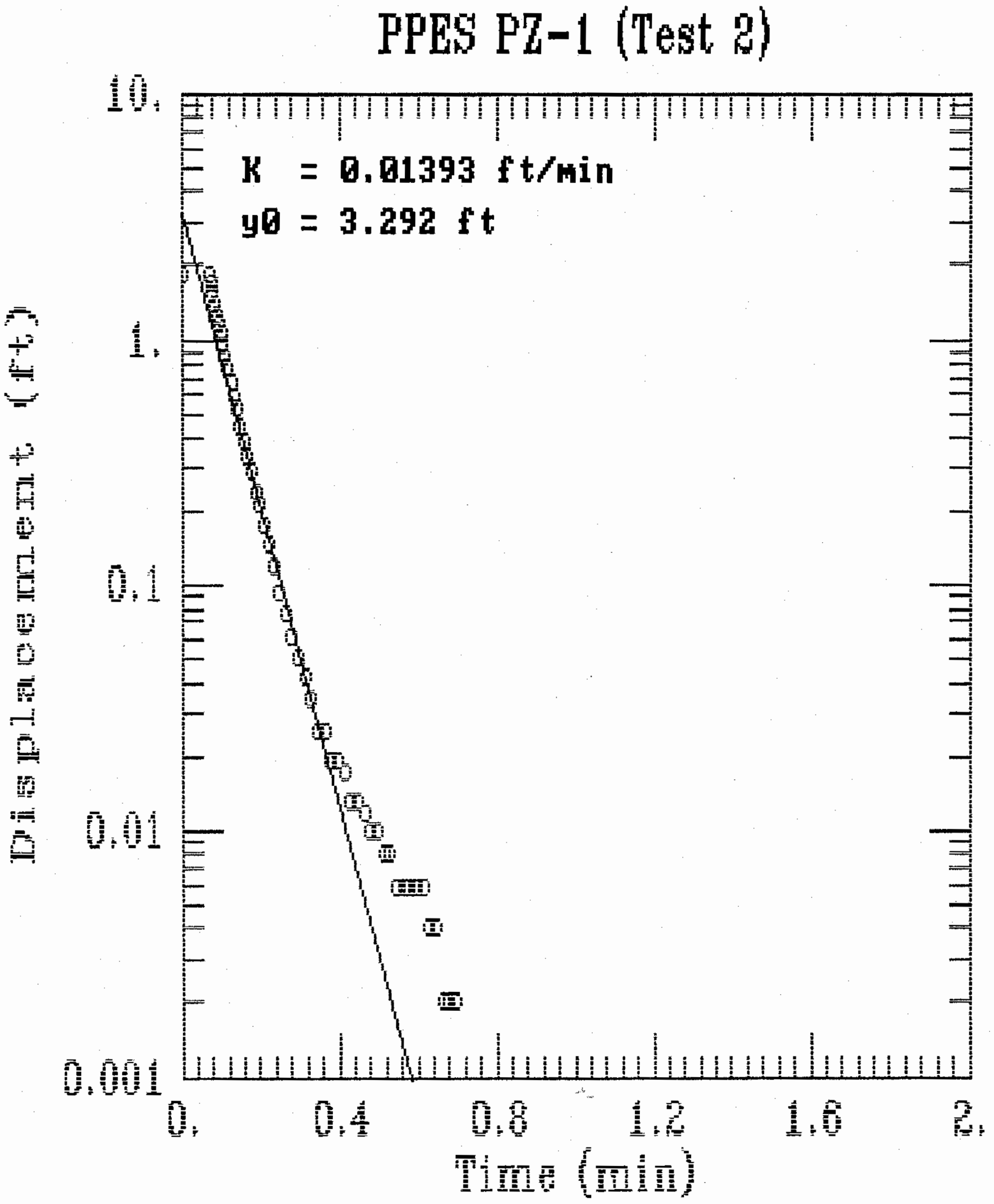

AQTESOLV

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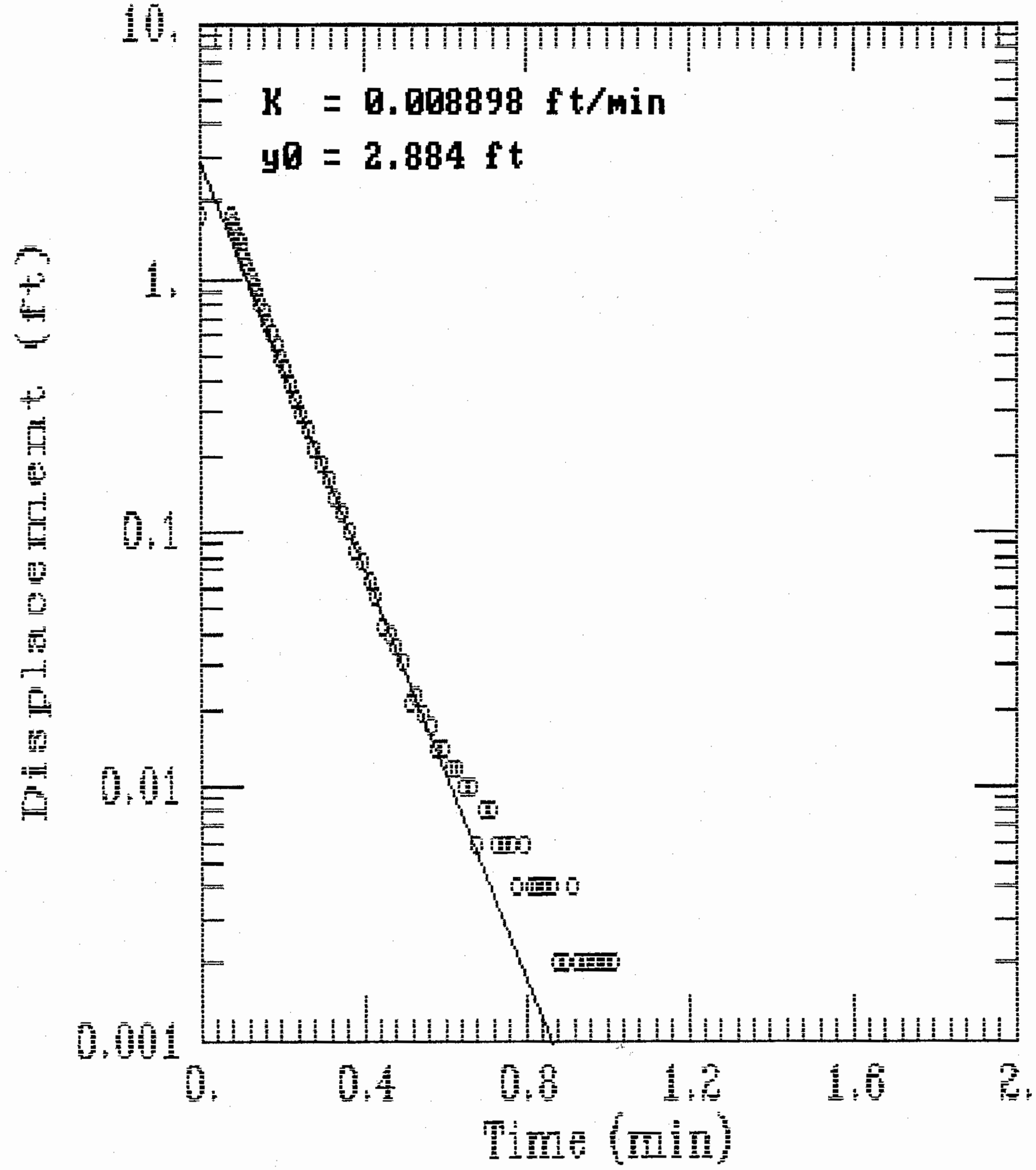
Modeling Group

PPES PZ-4 (Test 1)



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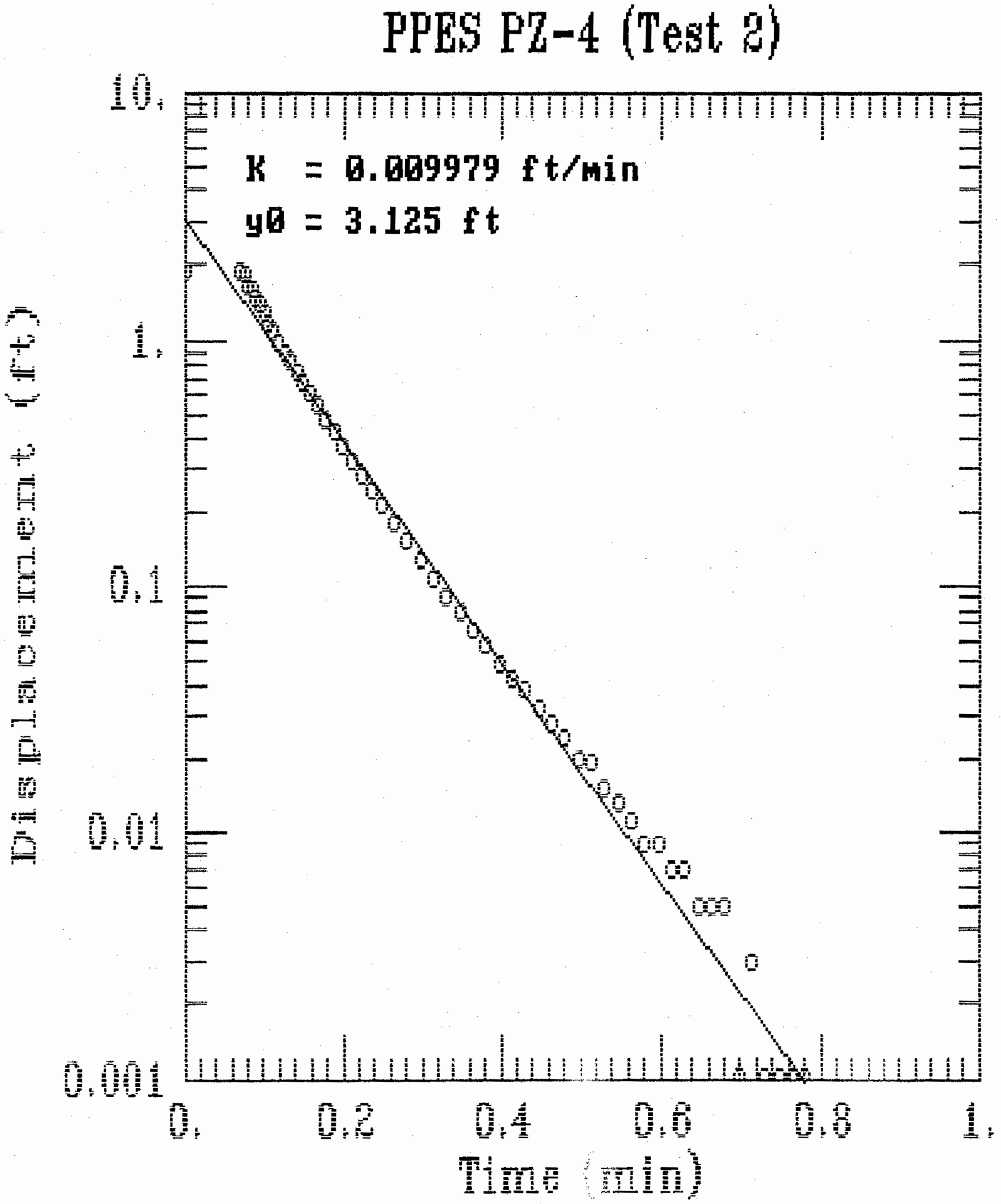
Modeling Group

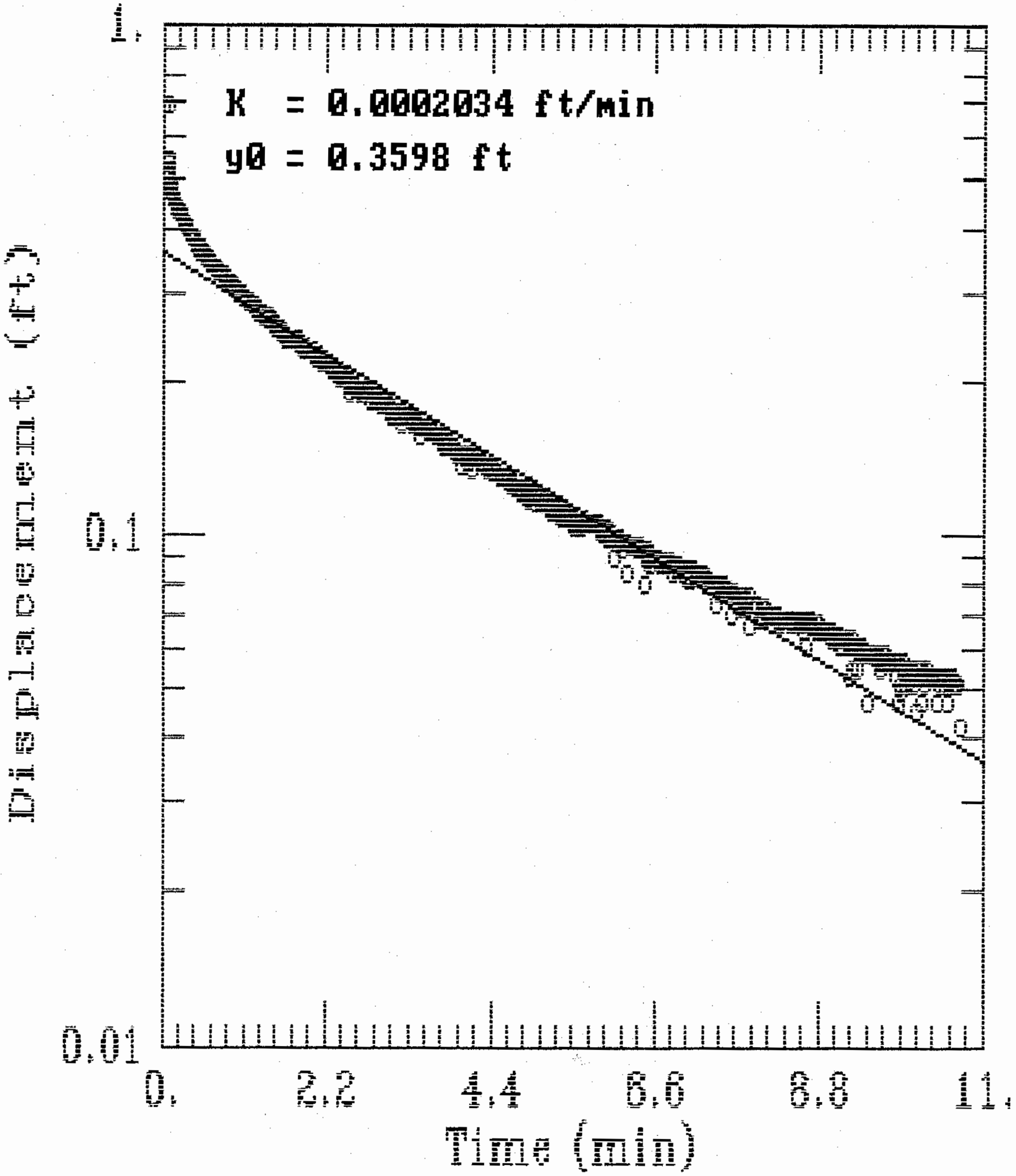


AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

PPES PZ-8 (Test 1)



AQTESOLV

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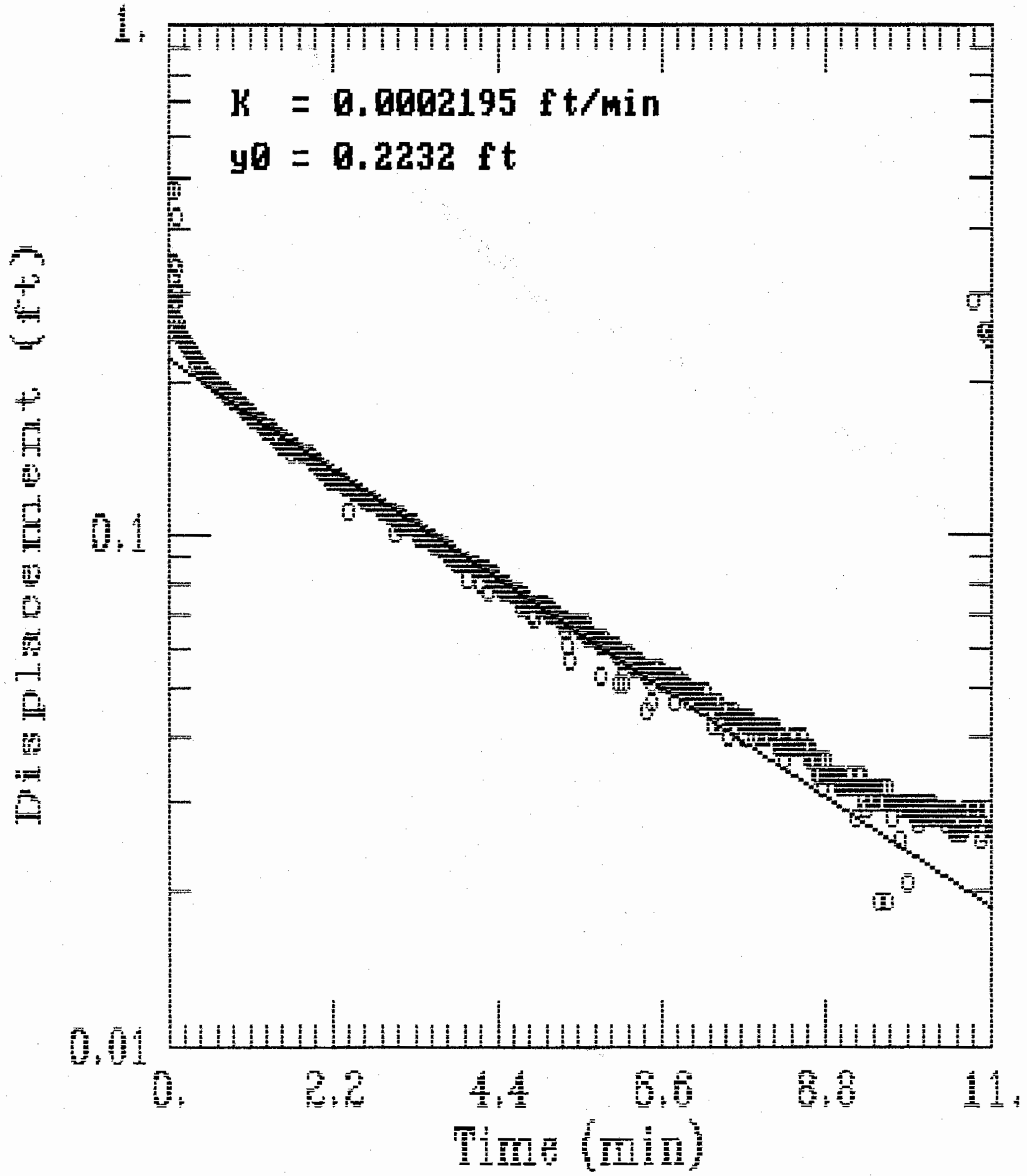
& MILLER, INC.

Modeling Group

PPES PZ-8 (Test 2)



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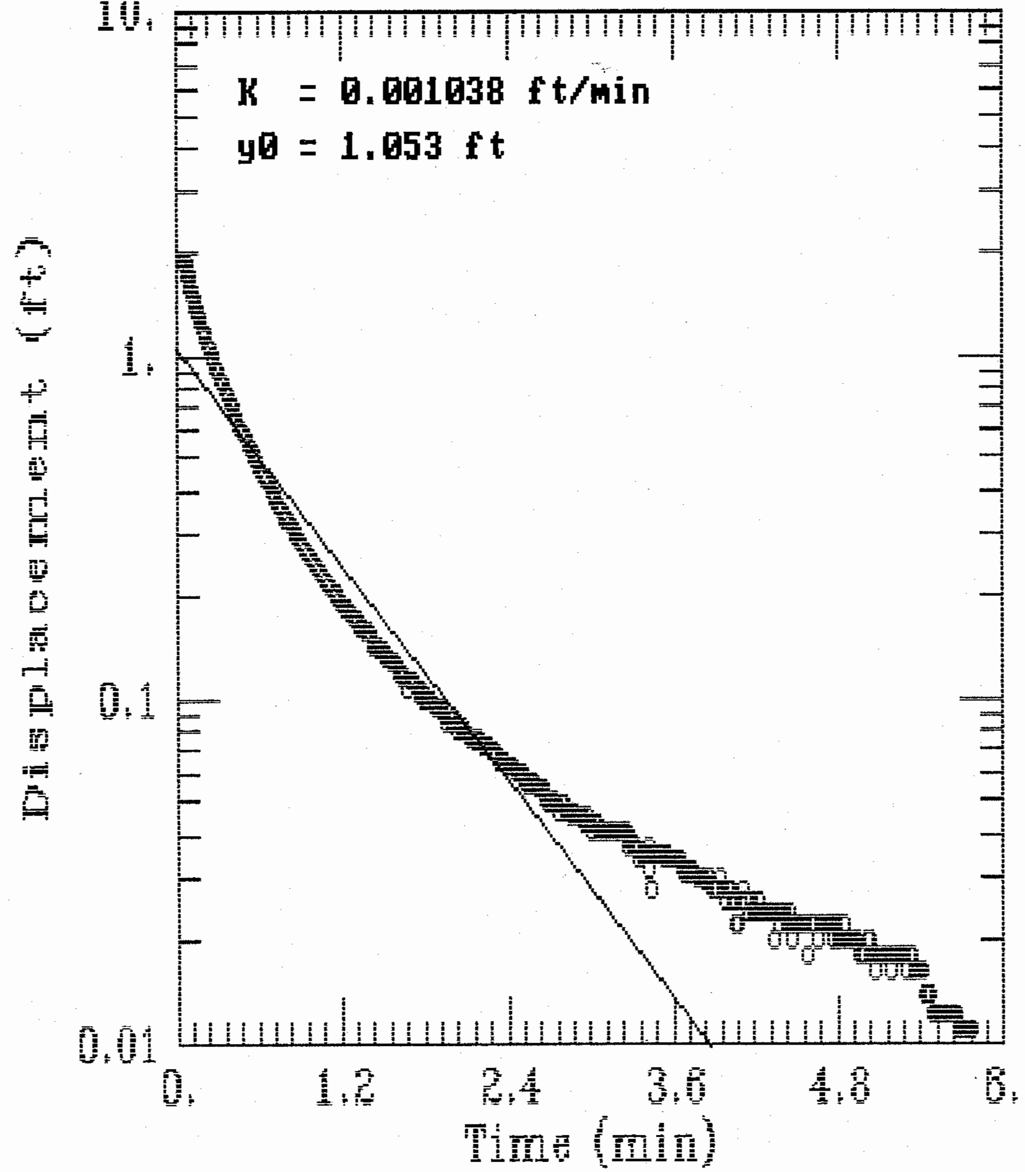
Modeling Group

PPES PZ-11 (Test 1)



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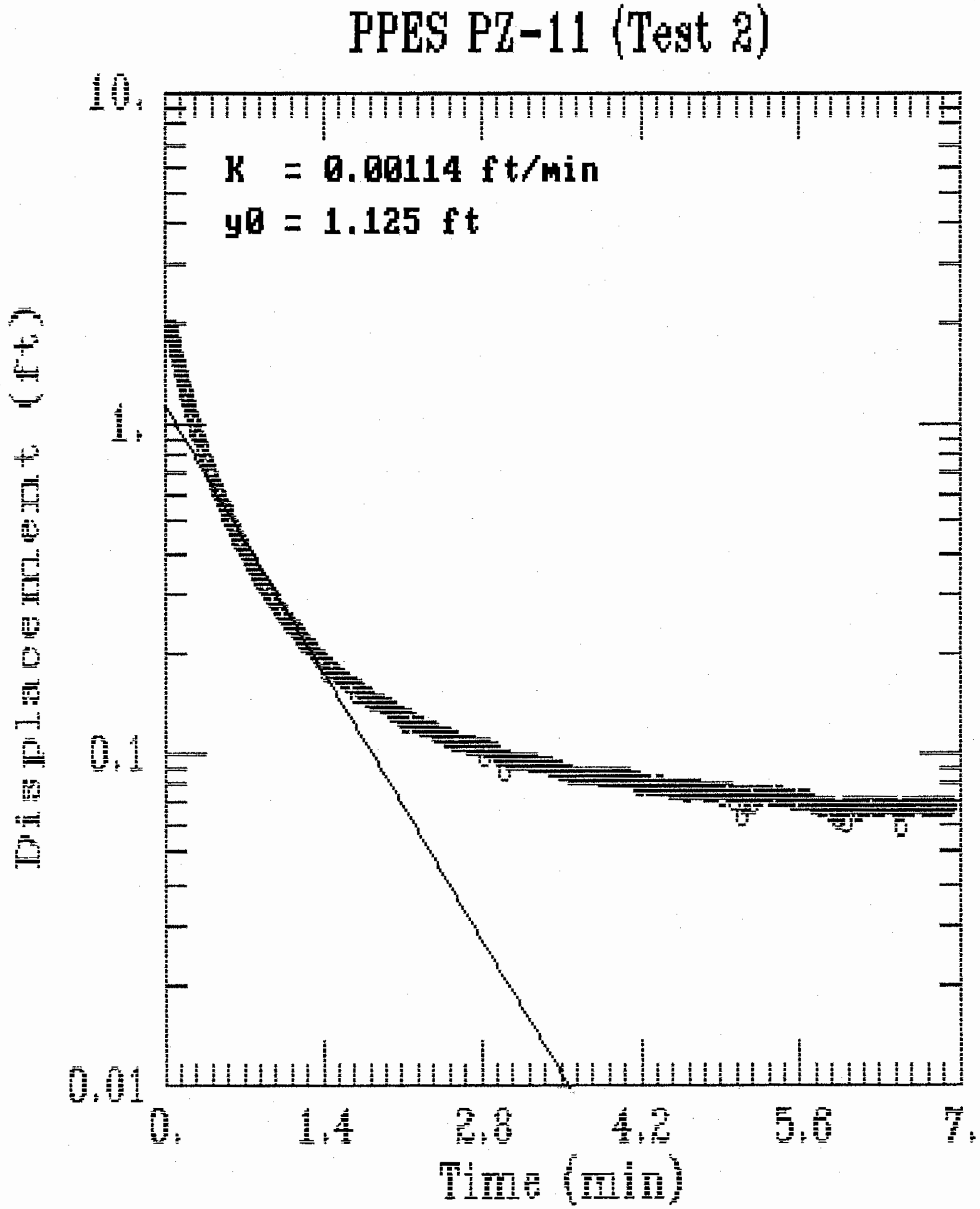
Modeling Group



AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

APPENDIX H
GEOTECHNICAL LABORATORY REPORT

MAY 2001

013-3205

GENESIS/PLUM POINT ENERGY/AR
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classification	Natural Moisture %	Atterberg Limits				S.L. %	Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability (cm/sec)	Carbonate Content	Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.		% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %		Moisture %	Dry (lb/cuft)			
TP-1	Bulk	-	CL	27.3	47	20	27	0.28		100.0	92.3	-	96.0	22.0	2.72	24.6	92.6	7.9E-06	-	-
TP-2	Bulk	-	CL	31.1	41	20	21	0.50		100.0	99.1	-	98.5	22.5	2.72	28.3	93.5	1.1E-08	-	-
TP-3	Bulk	-	CL	22.8	36	19	17	0.20		100.0	95.9	-	102.0	18.0	2.71	25,2	96.3	5.2E-08	-	-
TP-4	Bulk	-	CH	32.8	50	23	27	0.35	16.2	100.0	99.3	52.0	94.5	25.0	2.72	29.9	88.9	2.9E-07	-	C,T
TP-5	Bulk	-	(SM)	-	-	-	-	-		100.0	27.6	-	-	-	-	9.6	89.1	1.3E-03	0	-

ABBREVIATIONS: LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SHRINKAGE LIMIT (SI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES: T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

Golder Associates Inc.

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME:	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER:	013-3205
SAMPLE ID:	TP-1 - **SAMPLE DEPTH:**
SAMPLE TYPE:	Bulk

SAMPLE PREPARATION

*Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				25	25	
Weight of Wet Soil & Tare (gm)	21.99	21.36	21.60	24.29	21.77	211.39
Weight of Dry Soil & Tare (gm)	20.24	19.78	19.94	18.68	16.14	177.07
Weight of Tare (gm)	11.48	11.77	11.49	6.74	4.32	51.38
Weight of Water (gm)	1.75	1.58	1.66	5.61	5.63	34.32
Weight of Dry Soil (gm)	8.76	8.01	8.45	11.94	11.82	125.69
Water Content %	19.98	19.73	19.64	46.98	47.63	27.31

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

PLASTIC LIMIT (PL): 20

LIQUID LIMIT (LL): 47

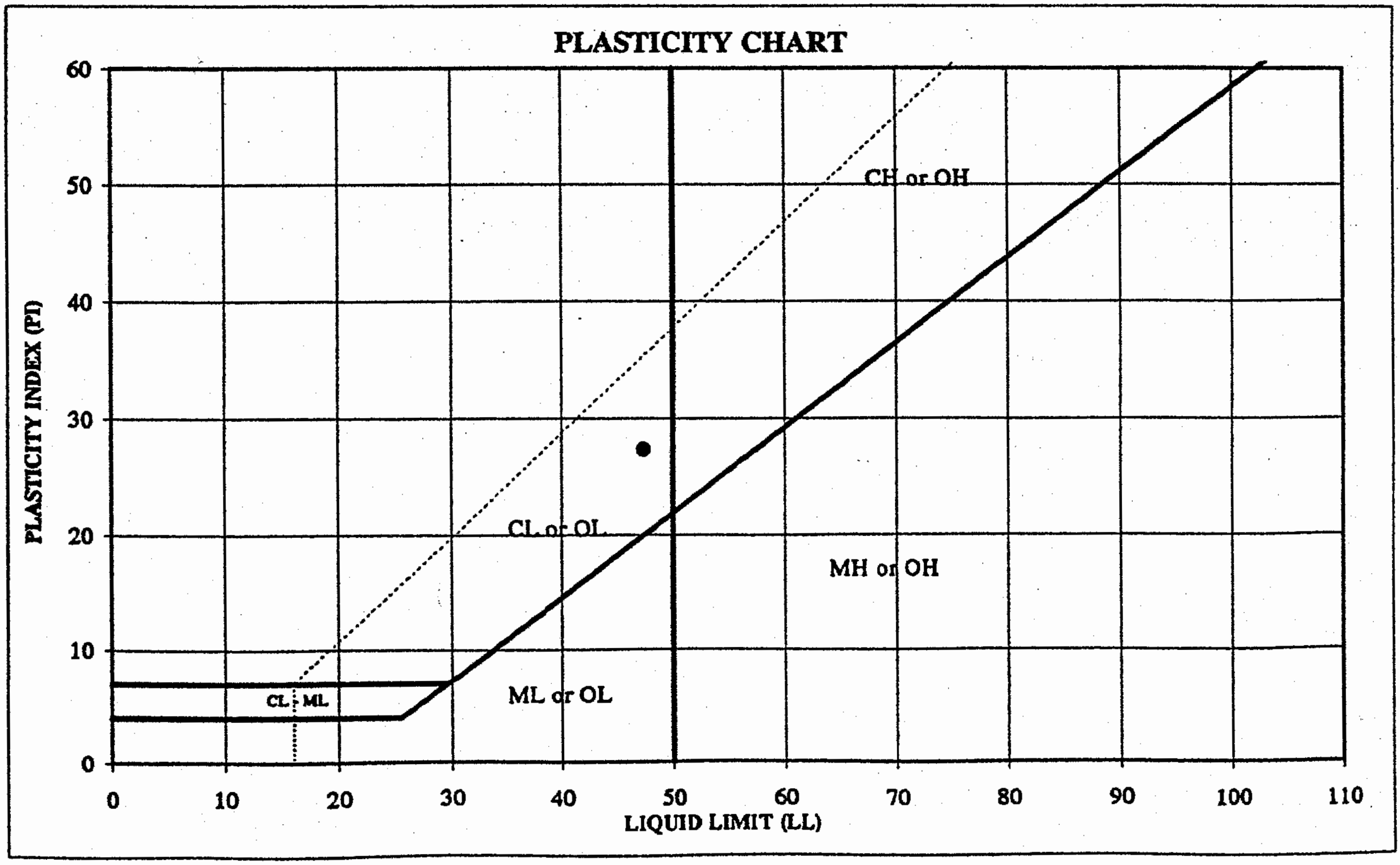
PLASTICITY INDEX (PI): 27

LIQUIDITY INDEX (LI): 0.28

NOTE:

DESCRIPTION: Olive Brown, SILTY CLAY, little medium to fine sand.

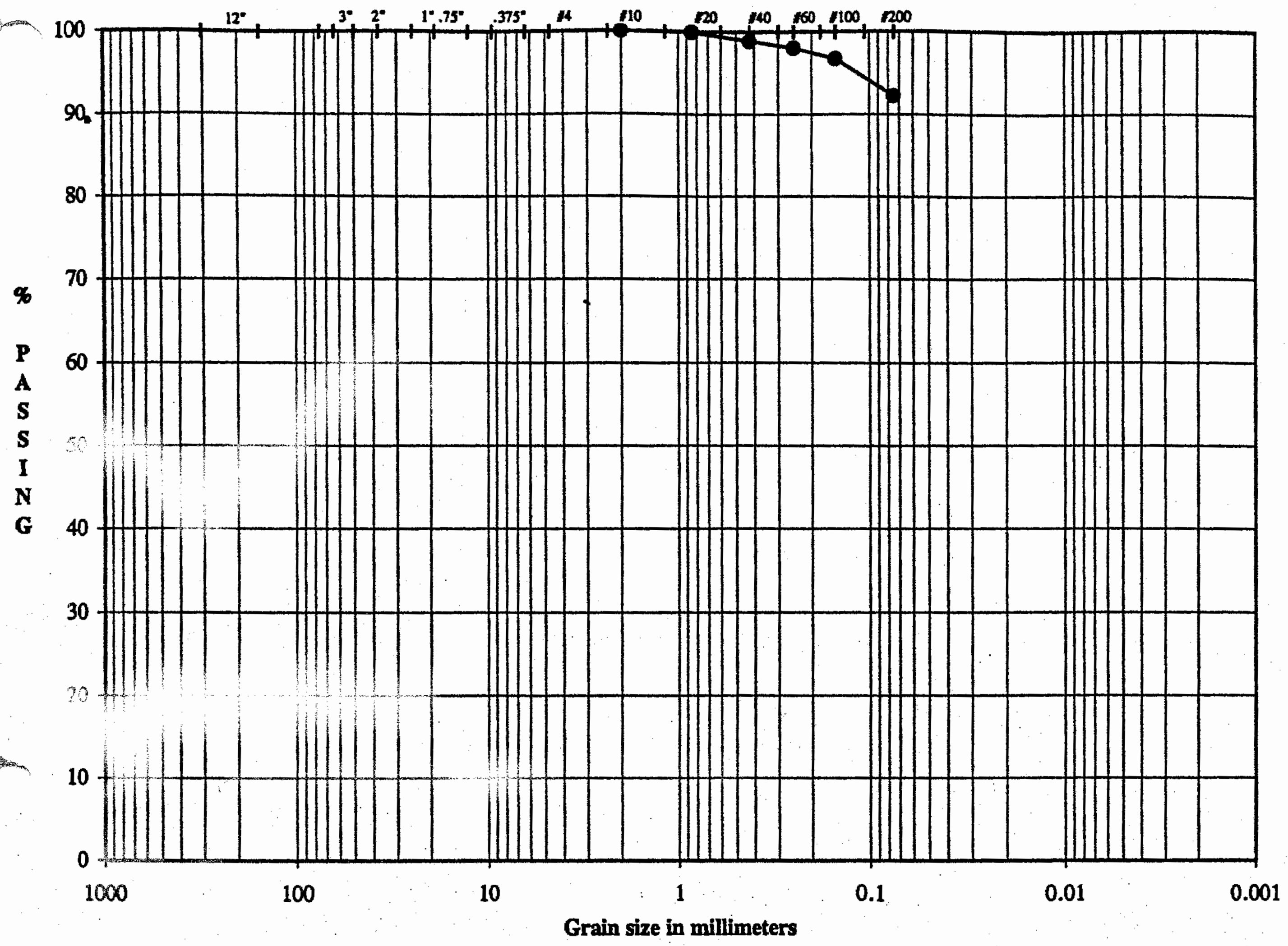
USCS: CL



TECH	DR
DATE	5/9/01
CHECK	
REVIEW	

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	TP-1
SAMPLE TYPE	Bulk
SAMPLE DEPTH	-

LL	47
PL	20
PI	27

DESCRIPTION Olive Brown, SILTY CLAY, little medium to fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DH/TJ
DATE	5/8/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	TP-1
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bulk
REMARKS		**SAMPLE DEPTH**	-

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	211.39
Wt Dry Soil & Tare (gm)	(w2)	177.07
Weight of Tare (gm)	(w3)	51.38
Weight of Water (gm)	(w4=w1-w2)	34.32
Weight of Dry Soil (gm)	(w5=w2-w3)	125.69
Moisture Content (%)	(w4/w5)*100	27.31

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	38.12
Dry Soil & Tare (gm)	37.22
Tare Weight (gm)	3.47
Moisture Content (%)	2.67

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)	54.51
Tare Weight (gm)	0.00
(W6) Total Dry Weight (gm)	53.09

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.05	0.05	0.09	99.91	#20	medium sand
#40	0.58	0.58	1.09	98.91	#40	fine sand
#60	1.04	1.04	1.96	98.04	#60	fine sand
#100	1.72	1.72	3.24	96.76	#100	fine sand
#200	4.11	4.11	7.74	92.26	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	1.09
% F SAND	6.65
% FINES	92.26
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	47
PL	20
PI	27
Gs	-

DESCRIPTION Olive Brown, SILTY CLAY, little medium to fine sand.

USCS CL

TECH	DH/TJ
DATE	5/8/01
CHECK	
REVIEW	

MOISTURE DENSITY CURVES
ASTM D 698 & 1557

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR		
PROJECT NUMBER	013-3205		
SAMPLE IDENTITY	TP-1	-	-
SAMPLE TYPE	Bulk		

TEST TYPE D 698
PROCEDURE METHOD A

MOLD NUMBER	4
MOLD WEIGHT (gm)	2020.00
MOLD DIAMETER (in)	4.001
MOLD HEIGHT (in)	4.569
MOLD VOLUME (cu.ft)	0.0332

TYPE COMPACTOR Mechanical
PREPARATION Wet Method
TYPE PROCTOR STANDARD

5.5 -lbf. RAMMER WITH 12 INCH DROP

METHOD A: 20% OR LESS RETAINED ON #4
METHOD B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"
METHOD C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil	(W1)		211.39
Wt Tare & Soil	(W2)		177.07
Wt Tare	(W3)		51.38
Wt Moisture	(W4=W1-W2)	0.00	34.32
Wt Dry Soil	(W5=W2-W3)	0.00	125.69
Water Content (dec)	(wc=W4/W5)		0.2731
Water Content (%)	(W4/W5)*100		27.31%

TOTAL WEIGHT BEFORE PROCESSING AND PERCENT RETAINED	
TOTAL WEIGHT, WET (COARSE & FINE)	16305.00
TOTAL WEIGHT, DRY (COARSE & FINE)	12807.80
WEIGHT RETAINED ON # 4 SIEVE (WET)	0.00
WEIGHT RETAINED ON 3/8" SIEVE (WET)	
WEIGHT RETAINED ON 3/4" SIEVE (WET)	
PERCENT RETAINED ON # 4 SIEVE (DRY)	0.00%
PERCENT RETAINED ON 3/8" SIEVE (DRY)	0.00%
PERCENT RETAINED ON 3/4" SIEVE (DRY)	0.00%

POINT RESULTS (FINE)		1	2	3	4	5	6	7
Wt. Soil & Mold	(W1)	3784.80	3811.40	3799.50	3751.90	3629.50		
Weight of Mold	(W2)	2020.00	2020.00	2020.00	2020.00	2020.00		
Wt. Of Wet Soil	(W3=W1-W2)	1764.80	1791.40	1779.50	1731.90	1609.50		
Wet Density, wd (pcf)	(W3/453.6*Vm)	117.04	118.80	118.01	114.85	106.74		
WATER CONTENTS								
Wt Tare & Soil	(W4)	1923.53	1881.41	1942.45	336.11	477.46		
Wt Tare & Soil	(W5)	1610.26	1531.66	1565.48	299.50	428.93		
Wt Tare	(W6)	162.82	106.24	164.50	114.89	115.53		
Wt Moisture	(W7=W4-W5)	313.27	349.75	376.97	36.61	48.53		
Wt Dry Soil	(W8=W5-W6)	1447.44	1425.42	1400.98	184.61	313.40		
Water Content (%)	(W7/W8)*100	21.64%	24.54%	26.91%	19.83%	15.49%		
Dry Density (pcf)	(wd/(1+wc))	96.2	95.4	93.0	95.8	92.4		

MAXIMUM DRY DENSITY (pcf)	96.5
OPTIMUM MOISTURE CONTENT (%)	22.0
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION Olive Brown, SILTY CLAY, little medium to fine sand.
USCS CL

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127-88

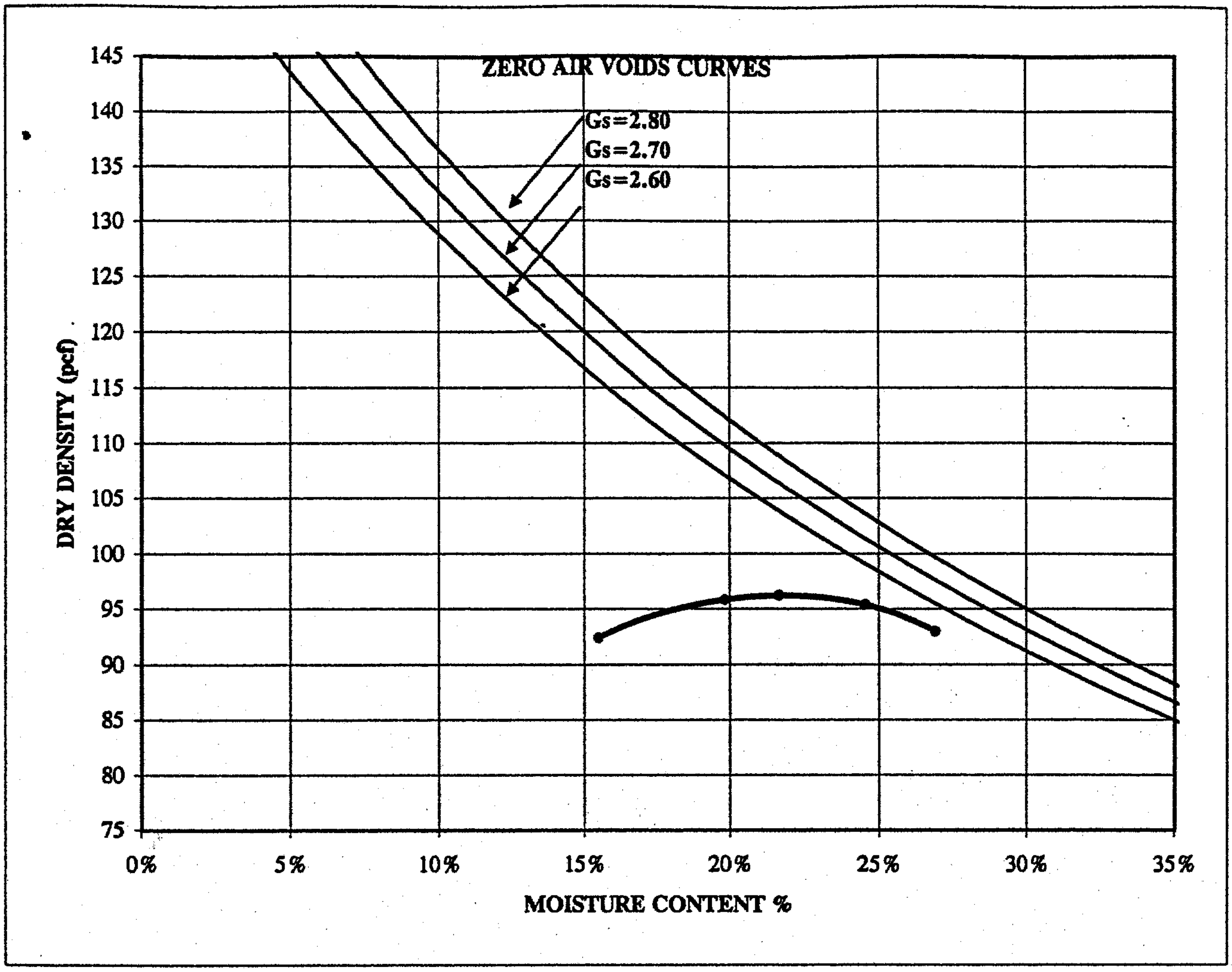
Weight of Oven Dry Sample (gm)	A			
Weight of Saturated-Surface-Dry (gm)	B			
Weight of Saturated Sample in Water (gm)	C			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

LL	47
PL	20
PI	27
MC	27.31%

AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	DH/TH
DATE	5/8/01
CHECK	
REVIEW	

MOISTURE / DRY DENSITY CURVE
D 698 METHOD A



MAXIMUM DRY DENSITY (pcf)	96.5	
OPTIMUM MOISTURE (%)	22.0	NO CORRECTION REQUIRED

SAMPLE ID	TP-1	-
SAMPLE TYPE	Bulk	
SAMPLE DEPTH	-	

LL	47
PL	20
PI	27

DESCRIPTION	Olive Brown, SILTY CLAY, little medium to fine sand.
USCS	CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DH/TH
DATE	5/8/01
CHECK	
REVIEW	

Golder Associates Inc.

FLOW PUMP #1

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**BOARD #**	10	**COMMENTS**	The sample was remolded to 96.0% of the Maximum Dry Density and OPTM + 2.6% (using ASTM D 698).
PROJECT NUMBER	013-3205	**CELL #**	10		
SAMPLE ID	TP-1 - - -	**Flow Pump Speed**	4		
SAMPLE TYPE	Bulk	**Technician**	PWM		

Sample Data, Initial

Height, inches	3.003	B-Value, f	0.97
Diameter, inches	2.790	Cell Pres.	85.0
Area, cm²	39.44	Bot. Pres.	80.0
Volume, cm³	300.85	Top Pres.	80.0
Mass, g	555.81	Tot. B.P.	80.0
Moisture Content, %	24.56	Head, max.	69.64
Dry Density, pcf	92.55	Head, min.	69.64
Spec. Gravity	2.716	Max. Grad.	9.11
Volume Solids, cm³	164.30	Min. Grad.	9.11
Volume Voids, cm³	136.56		
Void Ratio	0.83		
Saturation, %	80.2%		

Sample Data, Final

Height, inches	3.009
Diameter, inches	2.876
Area, cm²	41.91
Volume, cm³	320.33
Mass, g	594.34
Moisture Content, %	33.19
Dry Density, pcf	86.93
Volume Solids, cm³	164.30
Volume Voids, cm³	156.03
Void Ratio	0.95
Saturation, %	94.9%

WATER CONTENTS		Trimmings Initial	Sample Final
Wt Soil & Tare, i	g	555.81	644.64
Wt Soil & Tare, f	g	446.23	496.89
Wt Tare	g	0.00	51.74
Wt Moisture Lost	g	109.58	147.75
Wt Dry Soil	g	446.23	445.15
Water Content	%	24.56%	33.19%

DESCRIPTION

Olive Brown, SILTY CLAY, little medium to fine sand.

Flow Pump Rate: 2.90E-03 cm³/sec

USCS: CL

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
5/15/01	37026	9	0	18.7	0	0	0	0	0.99	69.64	9.11	7.9E-06
5/15/01	37026	9	5	18.7	5	5	300	300	0.99	69.64	9.11	7.9E-06
5/15/01	37026	9	10	18.7	5	10	300	600	0.99	69.64	9.11	7.9E-06
5/15/01	37026	9	15	18.7	5	15	300	900	0.99	69.64	9.11	7.9E-06 *
5/15/01	37026	9	20	18.7	5	20	300	1200	0.99	69.64	9.11	7.9E-06 *
5/15/01	37026	9	25	18.7	5	25	300	1500	0.99	69.64	9.11	7.9E-06 *
5/15/01	37026	9	30	18.7	5	30	300	1800	0.99	69.64	9.11	7.9E-06 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 7.9E-06 cm/sec **

DATE 5/15/01

CHECK

REVIEW

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: TP-2 - **SAMPLE DEPTH:**
SAMPLE TYPE: Bulk

SAMPLE PREPARATION

* Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION					NATURAL MOISTURE
Number of Blows				25	25				
Weight of Wet Soil & Tare (gm)	22.70	21.18	22.07	21.86	23.34		TRIAL 1	TRIAL 2	225.33
Weight of Dry Soil & Tare (gm)	20.79	19.60	20.25	16.72	17.79				184.32
Weight of Tare (gm)	11.42	11.81	11.44	4.29	4.33	BLOWS:	25	25	52.24
Weight of Water (gm)	1.91	1.58	1.82	5.14	5.55				41.01
Weight of Dry Soil (gm)	9.37	7.79	8.81	12.43	13.46	K VALUE:	1	1	132.08
Water Content %	20.38	20.28	20.66	41.35	41.23				31.05

PLASTIC LIMIT (PL): 20

LIQUID LIMIT (LL): 41

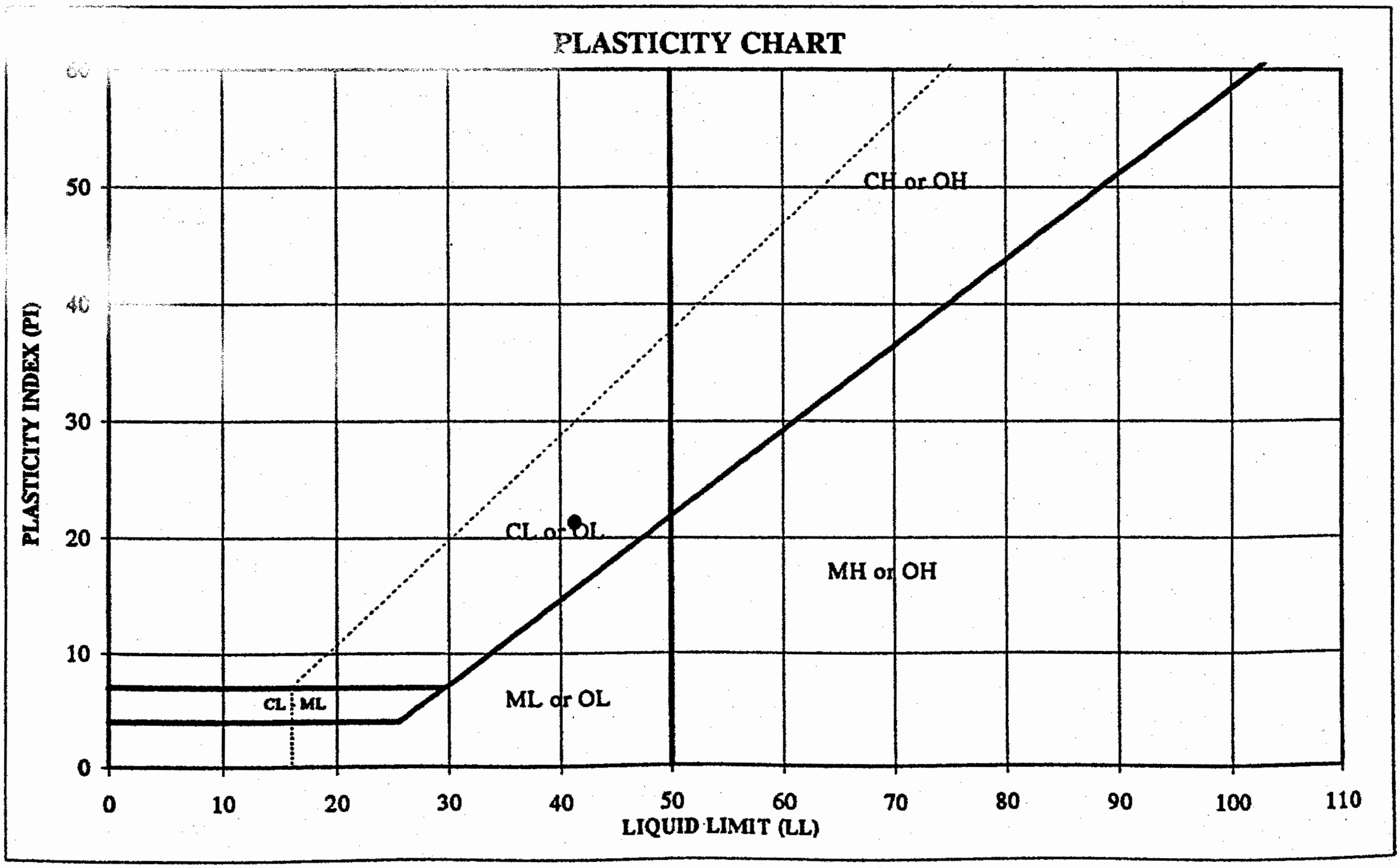
PLASTICITY INDEX (PI): 21

LIQUIDITY INDEX (LI): 0.50

NOTE:

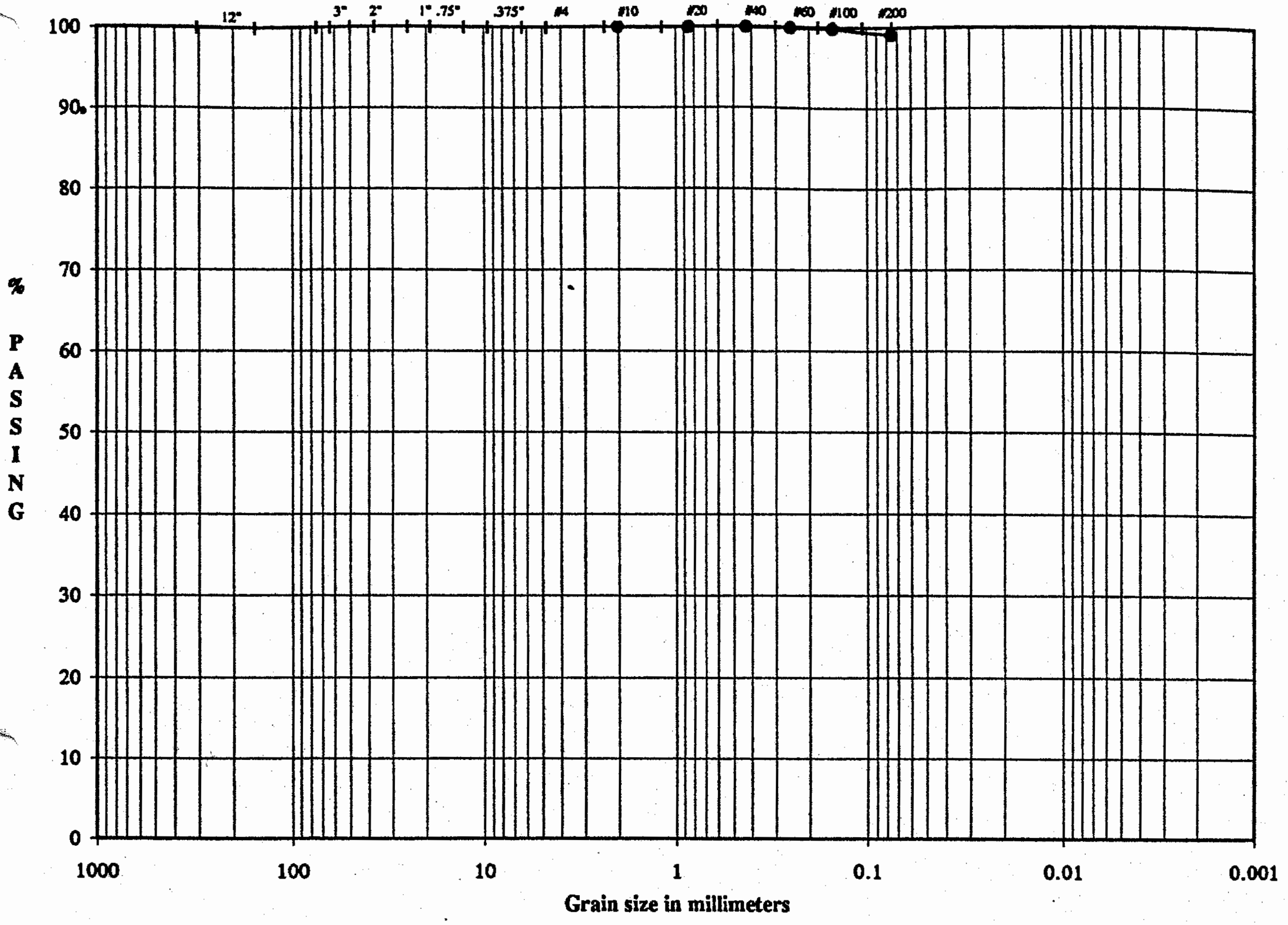
DESCRIPTION: Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS: CL



TECH: DR
DATE: 5/9/01
CHECK:
REVIEW:

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID TP-2
SAMPLE TYPE Bulk
SAMPLE DEPTH -

LL 41
PL 20
PI 21

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH DH/TJ
DATE 5/8/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

ROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	TP-2
ROJECT NO.	013-3205	**SAMPLE TYPE**	Bulk
REMARKS		**SAMPLE DEPTH**	-

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	225.33
Wt Dry Soil & Tare (gm)	(w2)	184.32
Weight of Tare (gm)	(w3)	52.24
Weight of Water (gm)	(w4=w1-w2)	41.01
Weight of Dry Soil (gm)	(w5=w2-w3)	132.08
Moisture Content (%)	(w4/w5)*100	31.05

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	44.49
Dry Soil & Tare (gm)	41.93
Tare Weight (gm)	3.21
Moisture Content (%)	6.61

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)	56.26
Tare Weight (gm)	0.00
(W6) Total Dry Weight (gm)	52.77

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) ((wt ret/w6)*100	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.02	0.02	0.04	99.96	#20	medium sand
#40	0.03	0.03	0.06	99.94	#40	fine sand
#60	0.07	0.07	0.13	99.87	#60	fine sand
#100	0.11	0.11	0.21	99.79	#100	fine sand
#200	0.46	0.46	0.87	99.13	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.06
% F SAND	0.81
% FINES	99.13
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	41
PL	20
PI	21
Gs	-

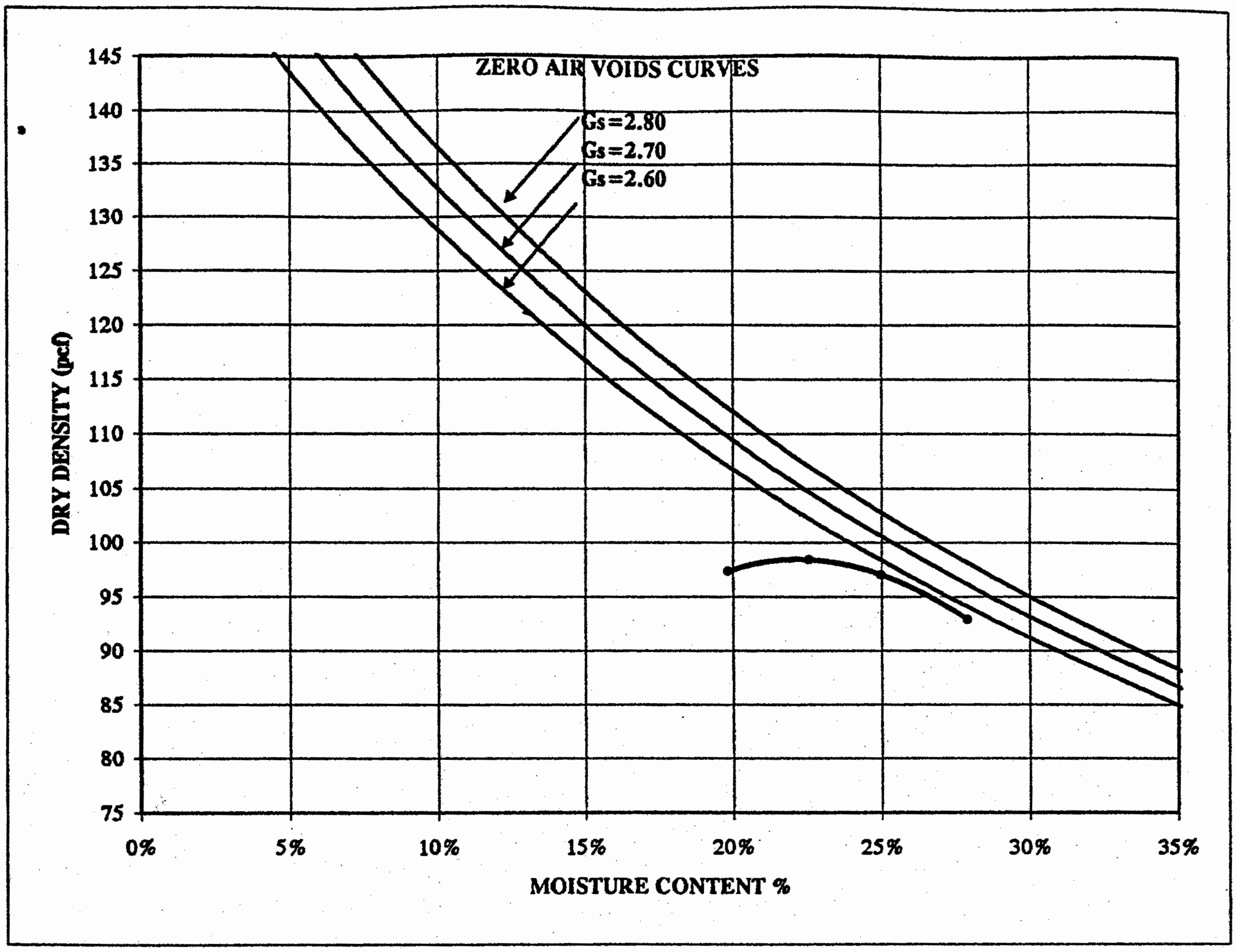
DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

TECH	DH/TJ
DATE	5/8/01
CHECK	
REVIEW	

Golder Associates Inc.

MOISTURE / DRY DENSITY CURVE
D 698 METHOD A



MAXIMUM DRY DENSITY (pcf)	98.5	
OPTIMUM MOISTURE (%)	22.5	NO CORRECTION REQUIRED

SAMPLE ID	TP-2	-
SAMPLE TYPE	Bulk	
SAMPLE DEPTH	-	

LL	41
PL	20
PI	21

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	TH
DATE	5/9/01
CHECK	
REVIEW	

Golder Associates Inc.

MOISTURE DENSITY CURVES
ASTM D 698 & 1557

PROJECT TITLE GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER 013-3205
SAMPLE IDENTITY TP-2 | - | -
SAMPLE TYPE Bulk

TEST TYPE D 698
PROCEDURE METHOD A

MOLD NUMBER 4
MOLD WEIGHT (gm) 2020.00
MOLD DIAMETER (in) 4.001
MOLD HEIGHT (in) 4.569
MOLD VOLUME (cu.ft) 0.0332

TYPE COMPACTOR Mechanical
PREPARATION Wet Method
TYPE PROCTOR STANDARD

5.5 -lbf. RAMMER WITH 12 INCH DROP

METHOD A: 20% OR LESS RETAINED ON #4
METHOD B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"
METHOD C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		COARSE FRACTION	TOTAL SAMPLE
Wt Tare & Soil	(W1)		225.33
Wt Tare & Soil	(W2)		184.32
Wt Tare	(W3)		52.24
Wt Moisture	(W4=W1-W2)	0.00	41.01
Wt Dry Soil	(W5=W2-W3)	0.00	132.08
Water Content (dec)	(wc=W4/W5)		0.3105
Water Content (%)	(W4/W5)*100		31.05%

TOTAL WEIGHT BEFORE PROCESSING AND PERCENT RETAINED

TOTAL WEIGHT, WET (COARSE & FINE)	25053.00
TOTAL WEIGHT, DRY (COARSE & FINE)	19117.22
WEIGHT RETAINED ON # 4 SIEVE (WET)	0.00
WEIGHT RETAINED ON 3/8" SIEVE (WET)	
WEIGHT RETAINED ON 3/4" SIEVE (WET)	
PERCENT RETAINED ON # 4 SIEVE (DRY)	0.00%
PERCENT RETAINED ON 3/8" SIEVE (DRY)	0.00%
PERCENT RETAINED ON 3/4" SIEVE (DRY)	0.00%

POINT RESULTS (FINE)		1	2	3	4	5	6	7
Wt. Soil & Mold	(W1)	3778.80	3839.30	3849.10	3811.90			
Weight of Mold	(W2)	2020.00	2020.00	2020.00	2020.00			
Wt. Of Wet Soil	(W3=W1-W2)	1758.80	1819.30	1829.10	1791.90			
Wet Density, wd (pcf)	(W3/453.6*Vm)	116.64	120.65	121.30	118.83			
WATER CONTENTS								
Wt Tare & Soil	(W4)	1124.51	1091.58	876.63	877.91			
Wt Tare & Soil	(W5)	952.49	905.93	718.28	704.94			
Wt Tare	(W6)	85.30	84.39	85.24	85.15			
Wt Moisture	(W7=W4-W5)	172.02	185.65	158.35	172.97			
Wt Dry Soil	(W8=W5-W6)	867.19	821.54	633.04	619.79			
Water Content (%)	(W7/W8)*100	19.84%	22.60%	25.01%	27.91%			
Dry Density (pcf)	(wd/(1+wc))	97.3	98.4	97.0	92.9			

MAXIMUM DRY DENSITY (pcf) 98.5
OPTIMUM MOISTURE CONTENT (%) 22.5
Corrected Maximum Dry Density (pcf)
Corrected Optimum Moisture (%)

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS CL

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127-88

Weight of Oven Dry Sample (gm)	A			
Weight of Saturated-Surface-Dry (gm)	B			
Weight of Saturated Sample in Water (gm)	C			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

LL	41
PL	20
PI	21
MC	31.05%

AVERAGE ABSORPTION
AVERAGE BULK SPECIFIC GRAVITY

TECH TH
DATE 5/9/01
CHECK
REVIEW

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			
PROJECT NUMBER	013-3205			
SAMPLE ID	TP-2 -	-	-	
SAMPLE TYPE	Bulk			

BOARD #	8
CELL #	8
Flow Pump Speed	12
Technician	PWM

COMMENTS The sample was remolded to 94.9% of the Maximum Dry Density and OPTM + 5.8% (using ASTM D 698).

Sample Data, Initial

Height, inches	3.012	B-Value, f	0.99
Diameter, inches	2.790	Cell Pres.	85.0
Area, cm²	39.44	Bot. Pres.	80.0
Volume, cm³	301.75	Top Pres.	80.0
Mass, g	579.56	Tot. B.P.	80.0
Moisture Content, %	28.25	Head, max.	107.62
Dry Density, pcf	93.45	Head, min.	107.62
Spec. Gravity	2.721	Max. Grad.	14.08
Volume Solids, cm³	166.07	Min. Grad.	14.08
Volume Voids, cm³	135.68		
Void Ratio	0.82		
Saturation, %	94.1%		

Sample Data, Final

Height, inches	3.010
Diameter, inches	2.789
Area, cm²	39.41
Volume, cm³	301.34
Mass, g	585.30
Moisture Content, %	29.52
Dry Density, pcf	93.57
Volume Solids, cm³	166.07
Volume Voids, cm³	135.27
Void Ratio	0.81
Saturation, %	98.6%

WATER CONTENTS		Trimmings Initial	Sample Final
Wt Soil & Tare, i	g	579.56	636.89
Wt Soil & Tare, f	g	451.89	503.58
Wt Tare	g	0.00	52.05
Wt Moisture Lost	g	127.67	133.31
Wt Dry Soil	g	451.89	451.53
Water Content	%	28.25%	29.52%

DESCRIPTION

Olive Brown, SILTY CLAY, trace medium to fine sand.

Flow Pump Rate 6.30E-06 cm³/sec

USCS CL

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
5/14/01	37025	15	15	20.1	0	0	0	0	1.53	107.62	14.08	1.1E-08
5/14/01	37025	15	20	20.1	5	5	300	300	1.53	107.62	14.08	1.1E-08
5/14/01	37025	15	25	20.1	5	10	300	600	1.53	107.62	14.08	1.1E-08
5/14/01	37025	15	30	20.1	5	15	300	900	1.53	107.62	14.08	1.1E-08 *
5/14/01	37025	15	35	20.1	5	20	300	1200	1.53	107.62	14.08	1.1E-08 *
5/14/01	37025	15	40	20.1	5	25	300	1500	1.53	107.62	14.08	1.1E-08 *
5/14/01	37025	15	45	20.1	5	30	300	1800	1.53	107.62	14.08	1.1E-08 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.1E-08 cm/sec **

DATE	5/14/01
CHECK	
REVIEW	

ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: TP-3 **SAMPLE DEPTH:**
SAMPLE TYPE: Bulk

SAMPLE PREPARATION

* Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				25	25	
Weight of Wet Soil & Tare (gm)	21.43	21.54	22.09	23.30	24.63	236.71
Weight of Dry Soil & Tare (gm)	19.80	19.88	20.39	18.23	19.19	202.34
Weight of Tare (gm)	11.45	11.41	11.42	4.25	4.34	51.56
Weight of Water (gm)	1.63	1.66	1.70	5.07	5.44	34.37
Weight of Dry Soil (gm)	8.35	8.47	8.97	13.98	14.85	150.78
Water Content %	19.52	19.60	18.95	36.27	36.63	22.79

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

PLASTIC LIMIT (PL) 19

LIQUID LIMIT (LL) 36

PLASTICITY INDEX (PI) 17

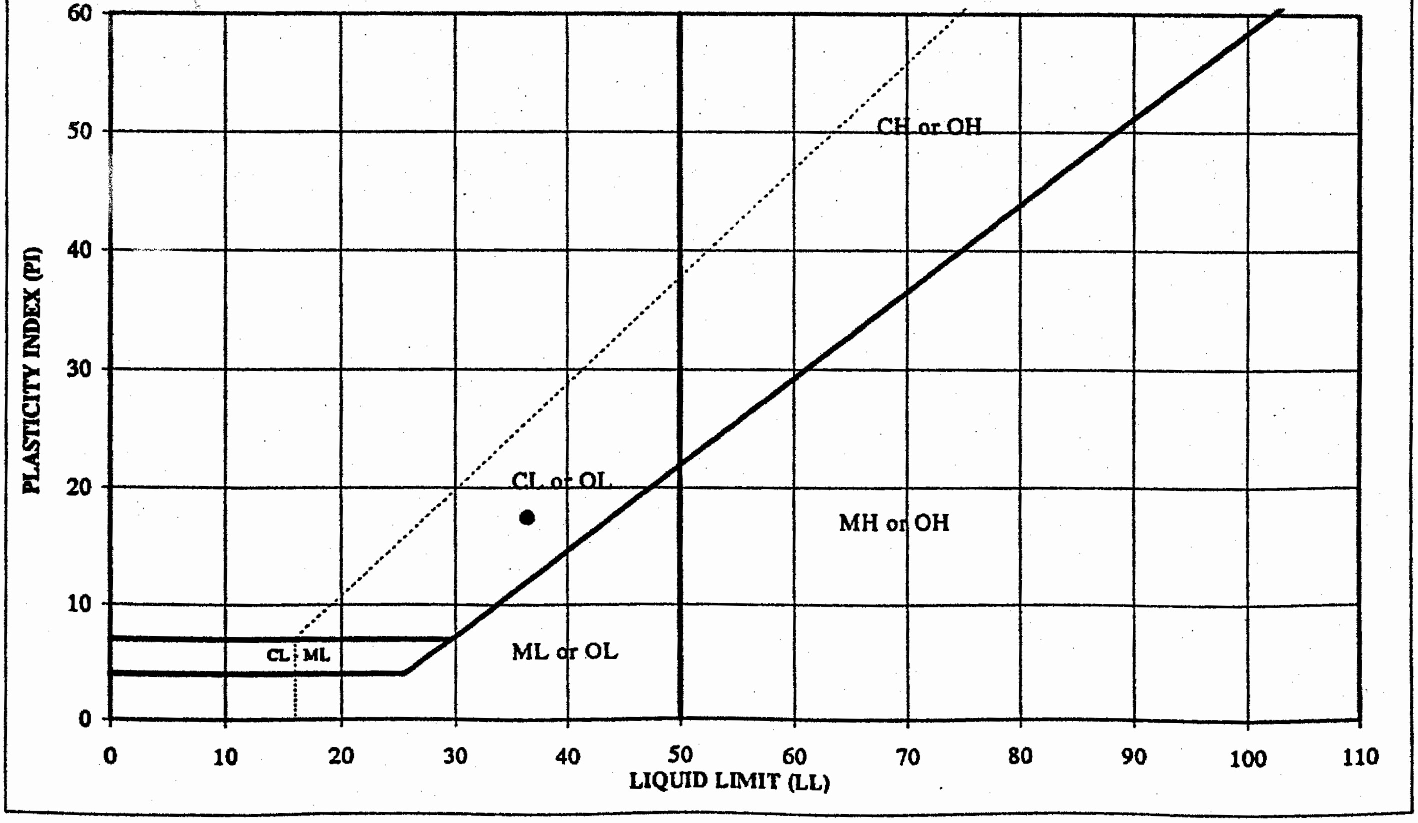
LIQUIDITY INDEX (LI) 0.20

NOTE:

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

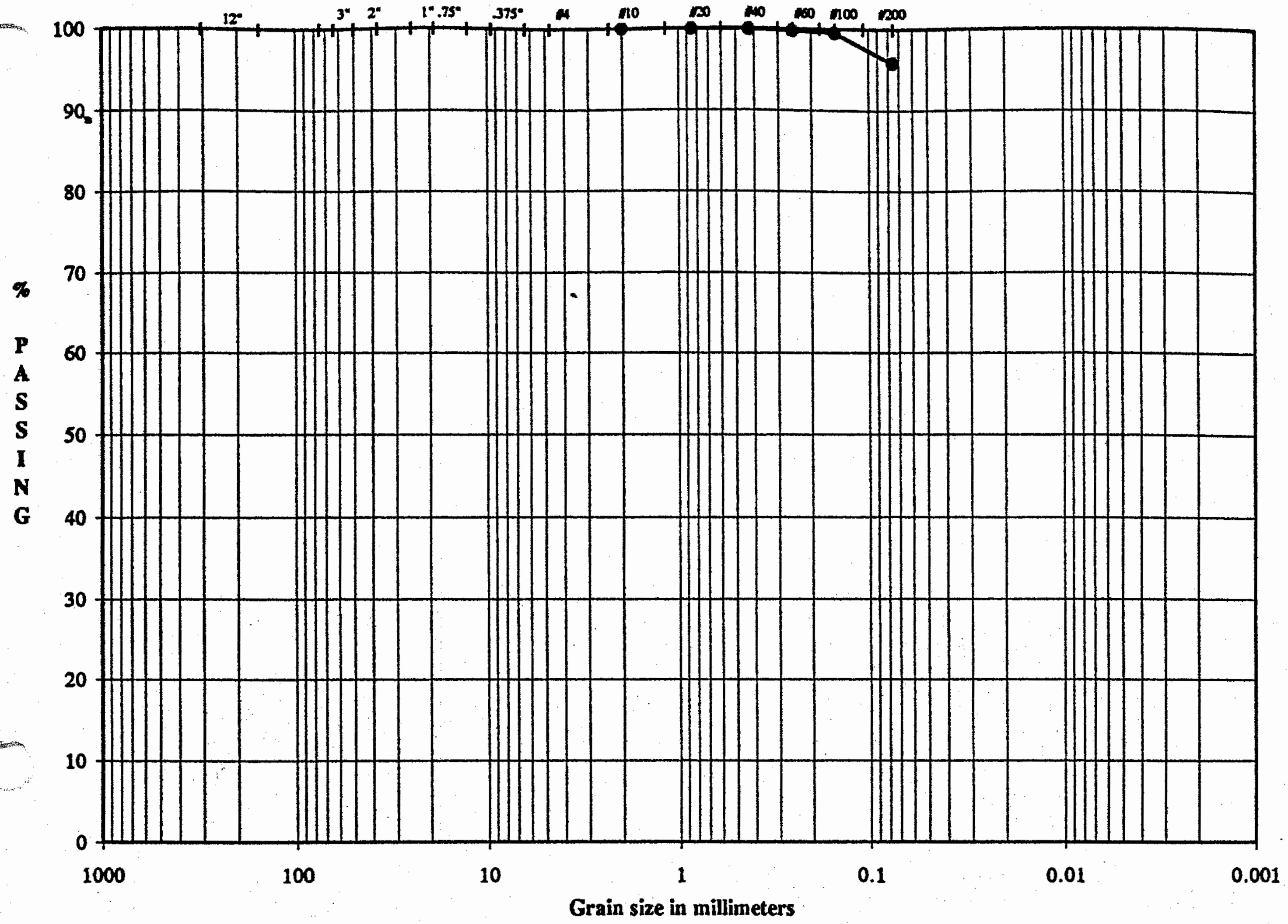
USCS CL

PLASTICITY CHART



TECH	DR
DATE	5/10/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	TP-3
SAMPLE TYPE	Bulk
SAMPLE DEPTH	-

LL	36
PL	19
PI	17

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DH/TJ
DATE	5/8/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	TP-3
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bulk
REMARKS		**SAMPLE DEPTH**	-

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	236.71
Wt Dry Soil & Tare (gm)	(w2)	202.34
Weight of Tare (gm)	(w3)	51.56
Weight of Water (gm)	(w4=w1-w2)	34.37
Weight of Dry Soil (gm)	(w5=w2-w3)	150.78
Moisture Content (%)	(w4/w5)*100	22.79

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	42.47
Dry Soil & Tare (gm)	41.75
Tare Weight (gm)	3.17
Moisture Content (%)	1.87

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)	54.94
Tare Weight (gm)	0.00
(W6) Total Dry Weight (gm)	53.93

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) ((wt ret/w6)*100	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.03	0.03	0.06	99.94	#20	medium sand
#40	0.08	0.08	0.15	99.85	#40	fine sand
#60	0.15	0.15	0.28	99.72	#60	fine sand
#100	0.26	0.26	0.48	99.52	#100	fine sand
#200	2.22	2.22	4.12	95.88	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.15
% F SAND	3.97
% FINES	95.88
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

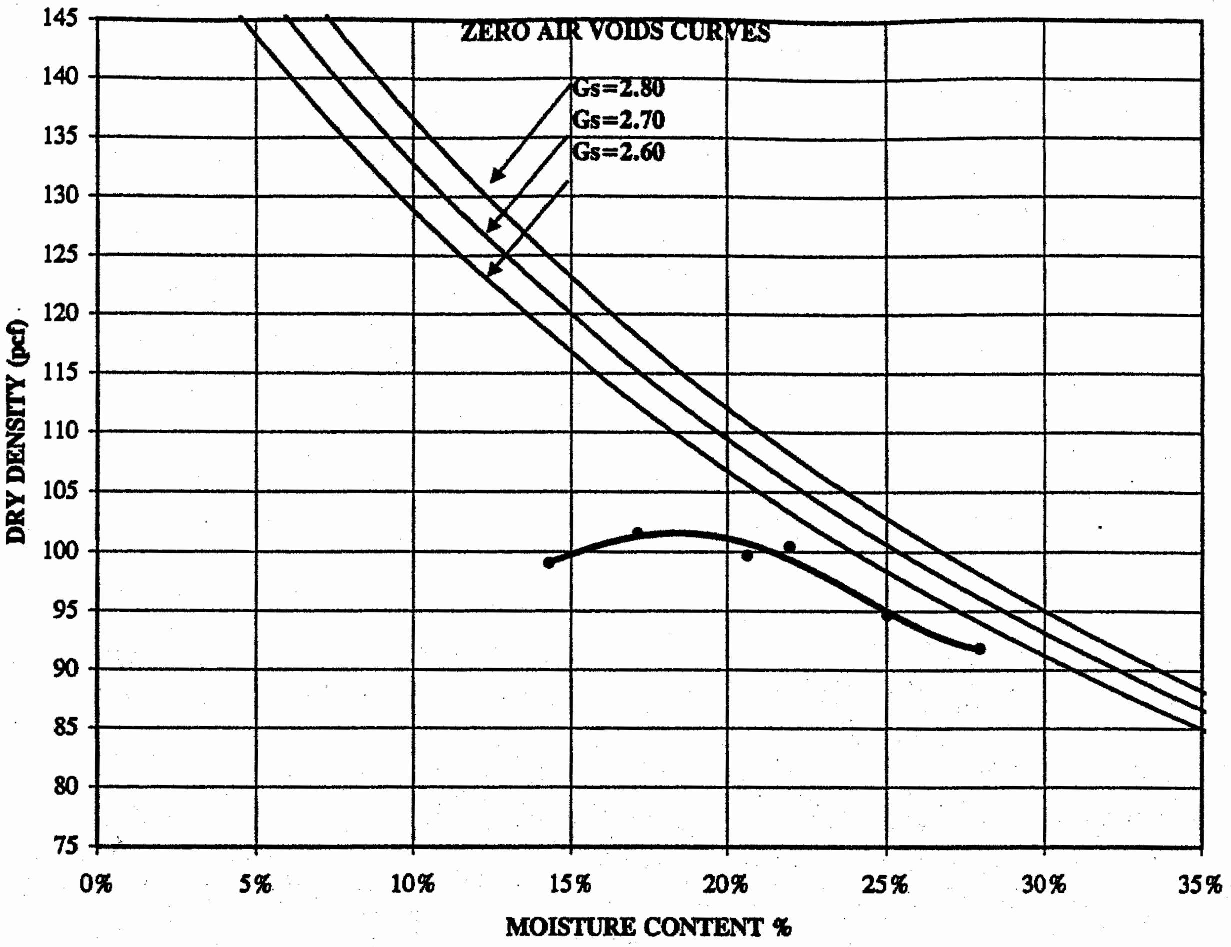
LL	36
PL	19
PI	17
Gs	-

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

TECH	DH/TJ
DATE	5/8/01
CHECK	
REVIEW	

MOISTURE / DRY DENSITY CURVE
D 698 METHOD A



MAXIMUM DRY DENSITY (pcf)	102.0	
OPTIMUM MOISTURE (%)	18.0	NO CORRECTION REQUIRED

SAMPLE ID	TP-3	-
SAMPLE TYPE	Bulk	
SAMPLE DEPTH	-	

LL	36
PL	19
PI	17

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DH/TH
DATE	5/8/01
CHECK	
REVIEW	

MOISTURE DENSITY CURVES
ASTM D 698 & 1557

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			**TEST TYPE**	D 698
PROJECT NUMBER	013-3205			**PROCEDURE**	METHOD A
SAMPLE IDENTITY	TP-3	-	-		
SAMPLE TYPE	Bulk				

MOLD NUMBER	4
MOLD WEIGHT (gm)	2020.00
MOLD DIAMETER (in)	4.001
MOLD HEIGHT (in)	4.569
MOLD VOLUME (cu.ft)	0.0332

TYPE COMPACTOR Mechanical

PREPARATION Wet Method

TYPE PROCTOR STANDARD

5.5 -lbf. RAMMER WITH 12 INCH DROP

METHOD A: 20% OR LESS RETAINED ON #4

METHOD B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

METHOD C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil	(W1)		236.71
Wt Tare & Soil	(W2)		202.34
Wt Tare	(W3)		51.56
Wt Moisture	(W4=W1-W2)	0.00	34.37
Wt Dry Soil	(W5=W2-W3)	0.00	150.78
Water Content (dec)	(wc=W4/W5)		0.2279
Water Content (%)	(W4/W5)*100		22.79%

TOTAL WEIGHT BEFORE PROCESSING AND PERCENT RETAINED	
TOTAL WEIGHT, WET (COARSE & FINE)	21921.00
TOTAL WEIGHT, DRY (COARSE & FINE)	17851.73
WEIGHT RETAINED ON # 4 SIEVE (WET)	0.00
WEIGHT RETAINED ON 3/8" SIEVE (WET)	
WEIGHT RETAINED ON 3/4" SIEVE (WET)	
PERCENT RETAINED ON # 4 SIEVE (DRY)	0.00%
PERCENT RETAINED ON 3/8" SIEVE (DRY)	0.00%
PERCENT RETAINED ON 3/4" SIEVE (DRY)	0.00%

POINT RESULTS (FINE)		1	2	3	4	5	6	7
Wt. Soil & Mold	(W1)	3833.60	3867.10	3805.30	3791.30	3727.00	3813.50	
Weight of Mold	(W2)	2020.00	2020.00	2020.00	2020.00	2020.00	2020.00	
Wt. Of Wet Soil	(W3=W1-W2)	1813.60	1847.10	1785.30	1771.30	1707.00	1793.50	
Wet Density, wd (pcf)	(W3/453.6*Vm)	120.27	122.49	118.40	117.47	113.20	118.94	
WATER CONTENTS								
Wt Tare & Soil	(W4)	1924.06	1940.60	1882.95	1846.07	489.49	442.18	
Wt Tare & Soil	(W5)	1614.30	1610.15	1527.97	1466.96	442.63	394.12	
Wt Tare	(W6)	114.11	108.18	110.20	109.24	114.71	114.10	
Wt Moisture	(W7=W4-W5)	309.76	330.45	354.98	379.11	46.86	48.06	
Wt Dry Soil	(W8=W5-W6)	1500.19	1501.97	1417.77	1357.72	327.92	280.02	
Water Content (%)	(W7/W8)*100	20.65%	22.00%	25.04%	27.92%	14.29%	17.16%	
Dry Density (pcf)	(wd/(1+wc))	99.7	100.4	94.7	91.8	99.0	101.5	

MAXIMUM DRY DENSITY (pcf)	102.0
OPTIMUM MOISTURE CONTENT (%)	18.0
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127-88

Weight of Oven Dry Sample (gm)	A			
Weight of Saturated-Surface-Dry (gm)	B			
Weight of Saturated Sample in Water (gm)	C			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

LL	36
PL	19
PI	17
MC	22.79%

AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	DH/TH
DATE	5/8/01
CHECK	
REVIEW	

FLOW PUMP #1

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**BOARD #**	11
PROJECT NUMBER	013-3205	**CELL #**	11
SAMPLE ID	TP-3 - - -	**Flow Pump Speed**	10
SAMPLE TYPE	Bulk	**Technician**	PWM

COMMENTS The sample was remolded to 94.4% of the Maximum Dry Density and OPTM + 6.2% (using ASTM D 698).

Sample Data, Initial

Height, inches	2.998	**B-Value, f**	1.00
Diameter, inches	2.790	**Cell Pres.**	85.0
Area, cm²	39.44	**Bot. Pres.**	80.0
Volume, cm³	300.35	**Top Pres.**	80.0
Mass, g	580.04	**Tot. B.P.**	80.0
Moisture Content, %	25.18	**Head, max.**	115.36
Dry Density, pcf	96.27	**Head, min.**	115.36
Spec. Gravity	2.706	**Max. Grad.**	15.21
Volume Solids, cm³	171.23	**Min. Grad.**	15.21
Volume Voids, cm³	129.12		
Void Ratio	0.75		
Saturation, %	90.4%		

Sample Data, Final

Height, inches	2.985
Diameter, inches	2.777
Area, cm²	39.08
Volume, cm³	296.27
Mass, g	585.54
Moisture Content, %	26.37
Dry Density, pcf	97.59
Volume Solids, cm³	171.23
Volume Voids, cm³	125.04
Void Ratio	0.73
Saturation, %	97.7%

WATER CONTENTS		**Trimmings Initial**	**Sample Final**
Wt Soil & Tare, i	g	580.04	636.75
Wt Soil & Tare, f	g	463.36	514.66
Wt Tare	g	0.00	51.65
Wt Moisture Lost	g	116.68	122.09
Wt Dry Soil	g	463.36	463.01
Water Content	%	25.18%	26.37%

DESCRIPTION

Olive Brown, SILTY CLAY, trace medium to fine sand.

Flow Pump Rate 3.00E-05 cm³/sec

USCS CL

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
5/15/01	37026	11	0	19	0	0	0	0	1.64	115.36	15.21	5.2E-08
5/15/01	37026	11	5	19	5	5	300	300	1.64	115.36	15.21	5.2E-08
5/15/01	37026	11	10	19	5	10	300	600	1.64	115.36	15.21	5.2E-08
5/15/01	37026	11	15	19	5	15	300	900	1.64	115.36	15.21	5.2E-08 *
5/15/01	37026	11	20	19	5	20	300	1200	1.64	115.36	15.21	5.2E-08 *
5/15/01	37026	11	25	19	5	25	300	1500	1.64	115.36	15.21	5.2E-08 *
5/15/01	37026	11	30	19	5	30	300	1800	1.64	115.36	15.21	5.2E-08 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 5.2E-08 cm/sec **

DATE	5/15/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: TP-4 - **SAMPLE DEPTH:**
SAMPLE TYPE: Bulk

SAMPLE PREPARATION

- Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION					NATURAL MOISTURE
Number of Blows				25	25				
Weight of Wet Soil & Tare (gm)	22.29	22.10	21.80	22.97	21.72		TRIAL 1	TRIAL 2	257.11
Weight of Dry Soil & Tare (gm)	20.24	20.04	19.76	16.78	15.95				206.49
Weight of Tare (gm)	11.48	11.18	11.12	4.28	4.29	BLOWS:	25	25	52.15
Weight of Water (gm)	2.05	2.06	2.04	6.19	5.77				50.62
Weight of Dry Soil (gm)	8.76	8.86	8.64	12.50	11.66	K VALUE:	1	1	154.34
Water Content %	23.40	23.25	23.61	49.52	49.49				32.80

PLASTIC LIMIT (PL): 23

LIQUID LIMIT (LL): 50

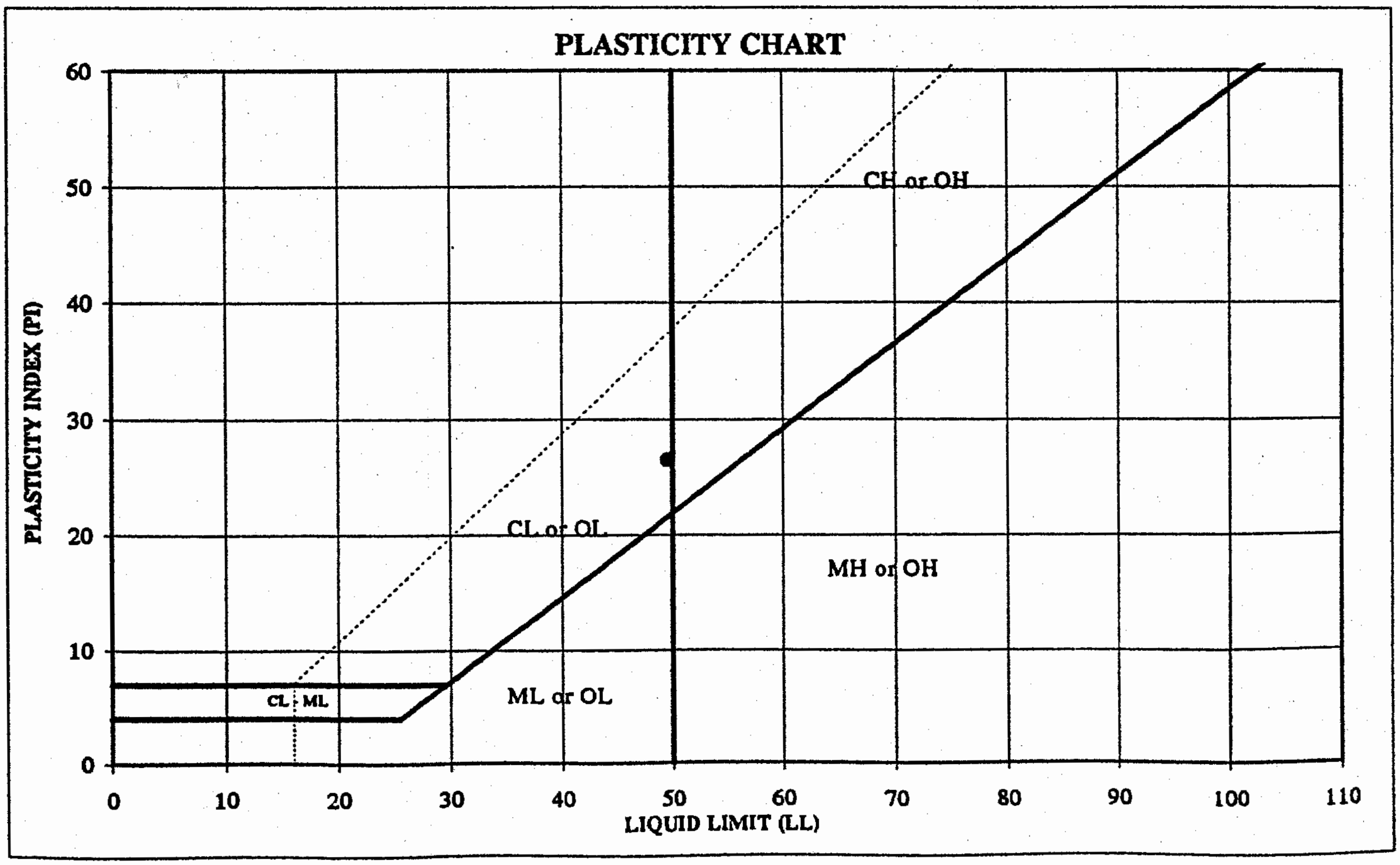
PLASTICITY INDEX (PI): 27

LIQUIDITY INDEX (LI): 0.35

NOTE:

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL



TECH	DR
DATE	5/10/01
CHECK	
REVIEW	

SHRINKAGE LIMIT TEST
ASTM METHOD 427

JOB NAME: GENESIS/PLUM POINT ENERGY/AR
JOB NUMBER: 013-3205

SAMPLE ID PPEA-TP-4
DEPTH -

Shrinkage Limit/ Shrinkage Ratio

wt. of coated dish + wet so	45.32
wt. of coated dish + dry soi	37.21
wt. of coated dish	23.56
wt. of soil, *Ws*	13.65
wt. of water, *Ww*	8.11
water content, *w* o%	59.41
Vol. of wet soil, Vo (cm3)	13.42
Vol. of dry soil, Vf (cm3)	7.52

Shrinkage Limit	16.21
Shrinkage Ratio	1.82

Wet soil pat volume

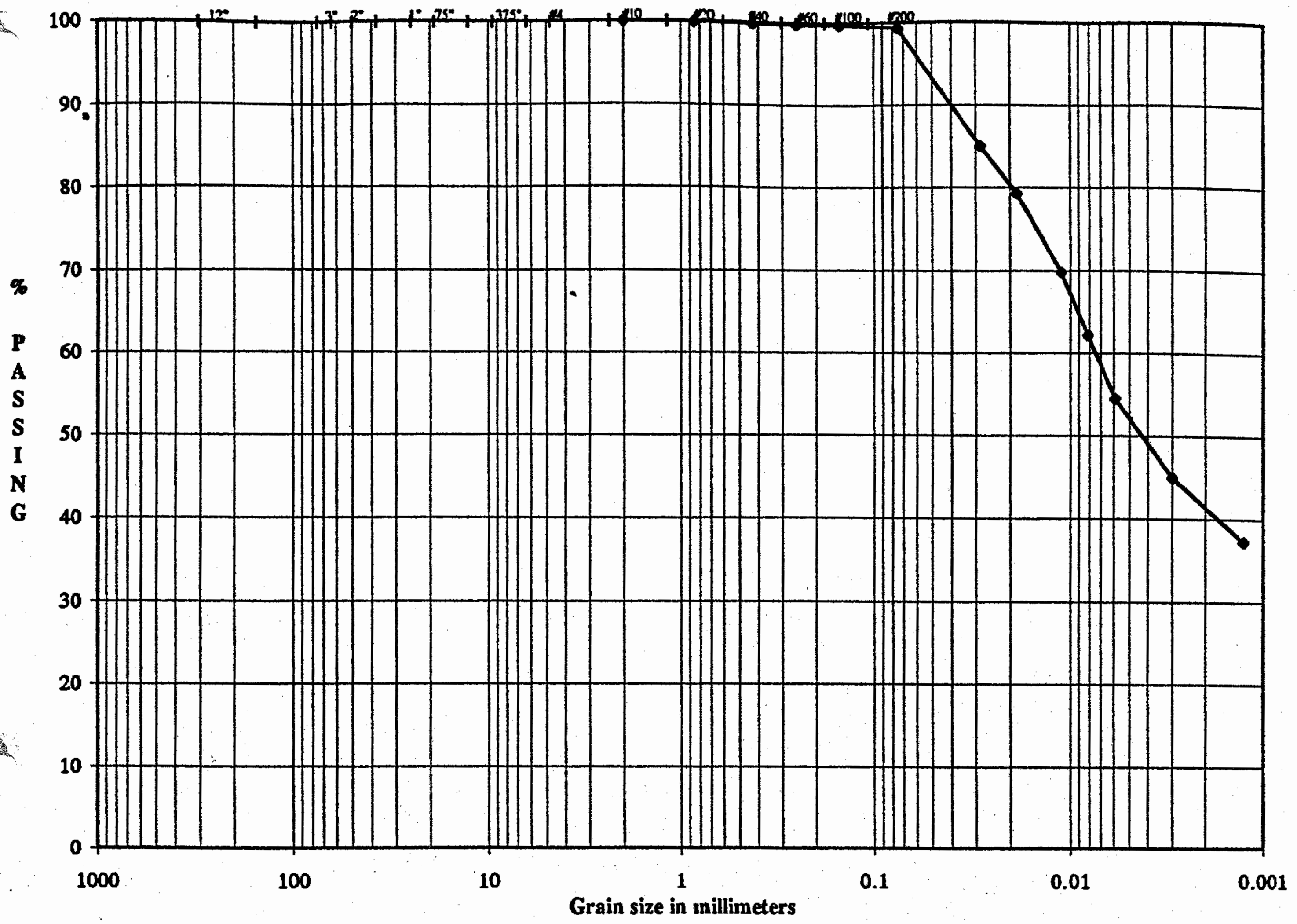
wt. of coated dish	23.61
wt. of coated dish + Hg	205.42
wt. of Hg	181.81
Vol. of dish	13.42

Dry soil pat volume

wt. of evap. dish	1152.90
wt. of evap. dish + Hg disp	1254.80
wt. of Hg displaced	101.90
Vol. of dry soil pat	7.52

DATE	5/22.01
TECH	NG
REVIEWED	MB

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID TP-4 -
SAMPLE TYPE Bulk
SAMPLE DEPTH -

LL 50
PL 23
PI 27

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH TJ
DATE 5/8/01
CHECK
REVIEW

Golder Associates Inc.

ASTM GRAIN SIZE ANALYSIS
ASTM C117, C136, D421, D422, D1140 and D2217

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	TP-4 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bulk
		SAMPLE DEPTH	-

AS RECEIVED WATER CONTENT

Tare No.		-
Wt. Wet Soil & Tare (gm)	(W1)	257.11
Wt. Dry Soil & Tare (gm)	(W2)	206.49
Weight of Tare (gm)	(W3)	52.15
Weight of Water (gm)	(W4=W1-W2)	50.62
Weight of Dry Soil (gm)	(W5=W2-W3)	154.34
Moisture Content (%)	(W4/W5)*100	32.80

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	49.80
Dry Soil & Tare (gm)	46.66
Tare Weight (gm)	3.21
Moisture Content (%)	7.23

Total Weight of Sample Used For Sieve Analysis Corrected For Hygroscopic Moisture

Weight + Tare, Before Separating On The #4 Sieve (gm)	931.23	
Tare Weight (gm)	218.82	
Total Weight (gm)	664.40	(W6)

Plus #4 Material Sieve

TARE WEIGHT 0.00

	(Wt+Tare)	(((Wt-Tare)/W6)*100)	%PASSING		
12.0"				12.0"	cobbles
3.0"				3.0"	coarse gravel
2.5"				2.5"	coarse gravel
2.0"				2.0"	coarse gravel
1.5"				1.5"	coarse gravel
1.0"				1.0"	coarse gravel
0.75"				0.75"	fine gravel
0.50"				0.50"	fine gravel
0.375"				0.375"	fine gravel
#4	0.00	0.0	100.0	#4	coarse sand

HYDROMETER ANALYSIS

Specific Gravity	(assumed)	2.650
Specific Gravity	(tested)	
Amount Dispersing Agent (ml)		125.00
Type Dispersion Device		Mechanical
Length of Dispersion Period		1 Minute

Weight of Sample Used For Hydrometer Test

Weight of Sample Wet or Dry (gm)	56.13
Calculated Dry Wt. used in test (gm)	52.35
Hydrometer Bulb Number	624378
% Pass #4 Sieve For Whole Sample	100.00

TARE WEIGHT 0.00

HYDROMETER BACKSIEVE (Percent Passing #10 - #200 Sieves)

	(Wt+Tare)	Cumul Wt. Retained	% PASSING		
#10	0.00	0.00	100.0	#10	medium sand
#20	0.03	0.03	99.9	#20	medium sand
#40	0.06	0.06	99.9	#40	fine sand
#60	0.09	0.09	99.8	#60	fine sand
#100	0.16	0.16	99.7	#100	fine sand
#200	0.36	0.36	99.3	#200	fines

HYDROMETER CALCULATIONS

DATE 5/9/01	TIME 9:55	ET (min)	READING R	TEMP T	TEMP.COR. K	HYD.COR. Cc	READING C	EFFECTIVE LENGTH	A
5/9/01	9:57	2.00	51.0	22.00	0.013	6.50	44.50	9.1	1.00
5/9/01	10:00	5.00	48.0	22.00	0.013	6.50	41.50	9.6	1.00
5/9/01	10:10	15.00	43.0	22.00	0.013	6.50	36.50	10.4	1.00
5/9/01	10:25	30.00	39.0	22.00	0.013	6.50	32.50	11.1	1.00
5/9/01	10:55	60.00	35.0	22.00	0.013	6.50	28.50	11.7	1.00
5/9/01	14:05	250.00	30.0	22.00	0.013	6.50	23.50	12.5	1.00
5/10/01	9:55	1440.00	26.0	22.00	0.013	6.50	19.50	13.2	1.00

GRAIN SIZE PERCENTAGES

Particle Diameter	% PASSING		
		% COBBLES	0.00
0.0284	85.0	% COARSE GRAVEL	0.00
0.0184	79.3	% FINE GRAVEL	0.00
0.0111	69.7	% COARSE SAND	0.00
0.0081	62.1	% MEDIUM SAND	0.11
0.0059	54.4	% FINE SAND	0.57
0.0030	44.9	% FINES	99.31
0.0013	37.3	% TOTAL SAMPLE	100.00

Description Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CH

50	LL
23	PL
27	PI

TECH	TJ
DATE	5/8/01
CHECK	
REVIEW	

Golder Associates Inc.

MOISTURE DENSITY CURVES
ASTM D 698 & 1557

PROJECT TITLE GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER 013-3205
SAMPLE IDENTITY TP-4 | - | -
SAMPLE TYPE Bulk

TEST TYPE D 698
PROCEDURE METHOD A

MOLD NUMBER 4
MOLD WEIGHT (gm) 2020.00
MOLD DIAMETER (in) 4.001
MOLD HEIGHT (in) 4.569
MOLD VOLUME (cu.ft) 0.0332

TYPE COMPACTOR Mechanical
PREPARATION Wet Method
TYPE PROCTOR STANDARD

5.5 -lbf. RAMMER WITH 12 INCH DROP

METHOD A: 20% OR LESS RETAINED ON #4
METHOD B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"
METHOD C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		COARSE FRACTION	TOTAL SAMPLE
Wt Tare & Soil	(W1)		257.11
Wt Tare & Soil	(W2)		206.49
Wt Tare	(W3)		52.15
Wt Moisture	(W4=W1-W2)	0.00	50.62
Wt Dry Soil	(W5=W2-W3)	0.00	154.34
Water Content (dec)	(wc=W4/W5)		0.3280
Water Content (%)	(W4/W5)*100		32.80%

TOTAL WEIGHT BEFORE PROCESSING AND PERCENT RETAINED	
TOTAL WEIGHT, WET (COARSE & FINE)	38406.00
TOTAL WEIGHT, DRY (COARSE & FINE)	28920.68
WEIGHT RETAINED ON # 4 SIEVE (WET)	0.00
WEIGHT RETAINED ON 3/8" SIEVE (WET)	
WEIGHT RETAINED ON 3/4" SIEVE (WET)	
PERCENT RETAINED ON # 4 SIEVE (DRY)	0.00%
PERCENT RETAINED ON 3/8" SIEVE (DRY)	0.00%
PERCENT RETAINED ON 3/4" SIEVE (DRY)	0.00%

POINT RESULTS (FINE)		1	2	3	4	5	6	7
Wt. Soil & Mold	(W1)	3760.70	3807.80	3807.30	3720.40			
Weight of Mold	(W2)	2020.00	2020.00	2020.00	2020.00			
Wt. Of Wet Soil	(W3=W1-W2)	1740.70	1787.80	1787.30	1700.40			
Wet Density, wd (pcf)	(W3/453.6*Vm)	115.44	118.56	118.53	112.76			
WATER CONTENTS								
Wt Tare & Soil	(W4)	1850.79	1157.80	1895.21	1809.37			
Wt Tare & Soil	(W5)	1523.28	934.78	1502.43	1525.73			
Wt Tare	(W6)	109.28	78.77	106.06	108.38			
Wt Moisture	(W7=W4-W5)	327.51	223.02	392.78	283.64			
Wt Dry Soil	(W8=W5-W6)	1414.00	856.01	1396.37	1417.35			
Water Content (%)	(W7/W8)*100	23.16%	26.05%	28.13%	20.01%			
Dry Density (pcf)	(wd/(1+wc))	93.7	94.1	92.5	94.0			

MAXIMUM DRY DENSITY (pcf)	94.5
OPTIMUM MOISTURE CONTENT (%)	25.0
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CH

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127-88

Weight of Oven Dry Sample (gm)	A			
Weight of Saturated-Surface-Dry (gm)	B			
Weight of Saturated Sample in Water (gm)	C			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

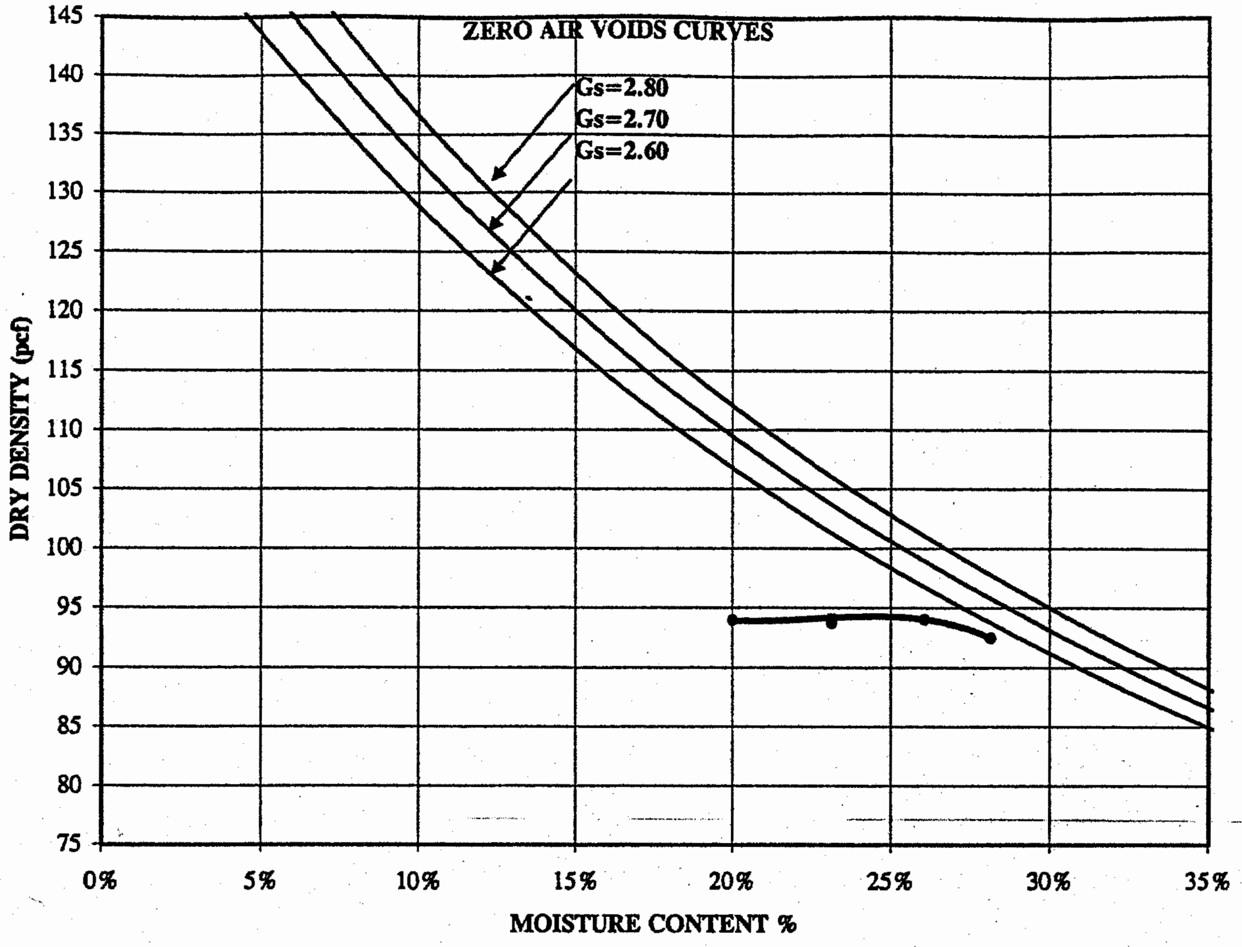
LL	50
PL	23
PI	27
MC	32.80%

AVERAGE ABSORPTION
AVERAGE BULK SPECIFIC GRAVITY

TECH TH
DATE 5/9/01
CHECK
REVIEW

Golder Associates Inc.

MOISTURE / DRY DENSITY CURVE
D 698 METHOD A



MAXIMUM DRY DENSITY (pcf)	94.5	
OPTIMUM MOISTURE (%)	25.0	NO CORRECTION REQUIRED

SAMPLE ID	TP-4 -
SAMPLE TYPE	Bulk
SAMPLE DEPTH	-

LL	50
PL	23
PI	27

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	TH
DATE	5/9/01
CHECK	
REVIEW	

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			BOARD #	10
PROJECT NUMBER	013-3205			CELL #	10
SAMPLE ID	TP-4	-	- -	Flow Pump Speed	8
SAMPLE TYPE	Bulk			Technician	PWM

COMMENTS: The sample was remolded to 94.1% of the Maximum Dry Density and OPTM + 4.9% (using ASTM D 698).

Sample Data, Initial

Height, inches	3.001	B-Value, f	1.00
Diameter, inches	2.790	Cell Pres.	85.0
Area, cm²	39.44	Bot. Pres.	80.0
Volume, cm³	300.65	Top Pres.	80.0
Mass, g	555.99	Tot. B.P.	80.0
Moisture Content, %	29.88	Head, max.	97.07
Dry Density, pcf	88.85	Head, min.	97.07
Spec. Gravity	2.719	Max. Grad.	12.55
Volume Solids, cm³	157.44	Min. Grad.	12.55
Volume Voids, cm³	143.21		
Void Ratio	0.91		
Saturation, %	89.3%		

Sample Data, Final

Height, inches	3.044
Diameter, inches	2.798
Area, cm²	39.67
Volume, cm³	306.71
Mass, g	578.68
Moisture Content, %	35.18
Dry Density, pcf	87.09
Volume Solids, cm³	157.44
Volume Voids, cm³	149.27
Void Ratio	0.95
Saturation, %	100.9%

WATER CONTENTS		Trimmings Initial	Sample Final
Wt Soil & Tare, i	g	555.99	621.36
Wt Soil & Tare, f	g	428.08	470.95
Wt Tare	g	0.00	43.42
Wt Moisture Lost	g	127.91	150.41
Wt Dry Soil	g	428.08	427.53
Water Content	%	29.88%	35.18%

DESCRIPTION

Olive Brown, SILTY CLAY, trace medium to fine sand.

Flow Pump Rate 1.40E-04 cm³/sec

USCS CH

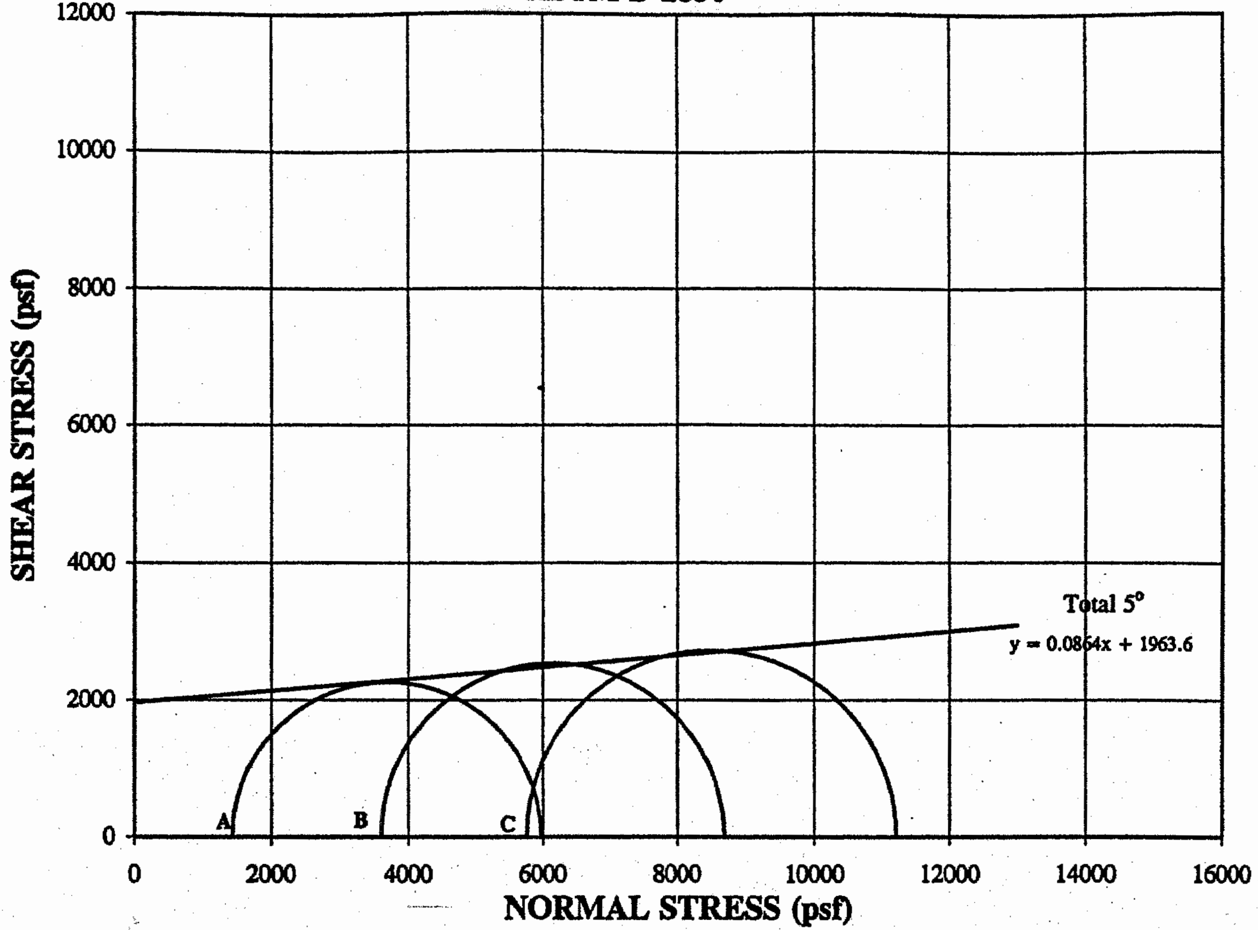
TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
5/14/01	37025	10	15	19	0	0	0	0	1.38	97.07	12.55	2.9E-07
5/14/01	37025	10	20	19	5	5	300	300	1.38	97.07	12.55	2.9E-07
5/14/01	37025	10	25	19	5	10	300	600	1.38	97.07	12.55	2.9E-07
5/14/01	37025	10	30	19	5	15	300	900	1.38	97.07	12.55	2.9E-07 *
5/14/01	37025	10	35	19	5	20	300	1200	1.38	97.07	12.55	2.9E-07 *
5/14/01	37025	10	40	19	5	25	300	1500	1.38	97.07	12.55	2.9E-07 *
5/14/01	37025	10	45	19	5	30	300	1800	1.38	97.07	12.55	2.9E-07 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.9E-07 cm/sec **

DATE 5/14/01
CHECK
REVIEW

UNCONSOLIDATED / UNDRAINED MOHR STRESS CIRCLES
ASTM D 2850



A (10 psi) B (25 psi) C (30 psi)

SAMPLE DESCRIPTION		Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CH	

TOTAL STRESS PARAMETERS	
ϕ =	5°
c =	1964 psf

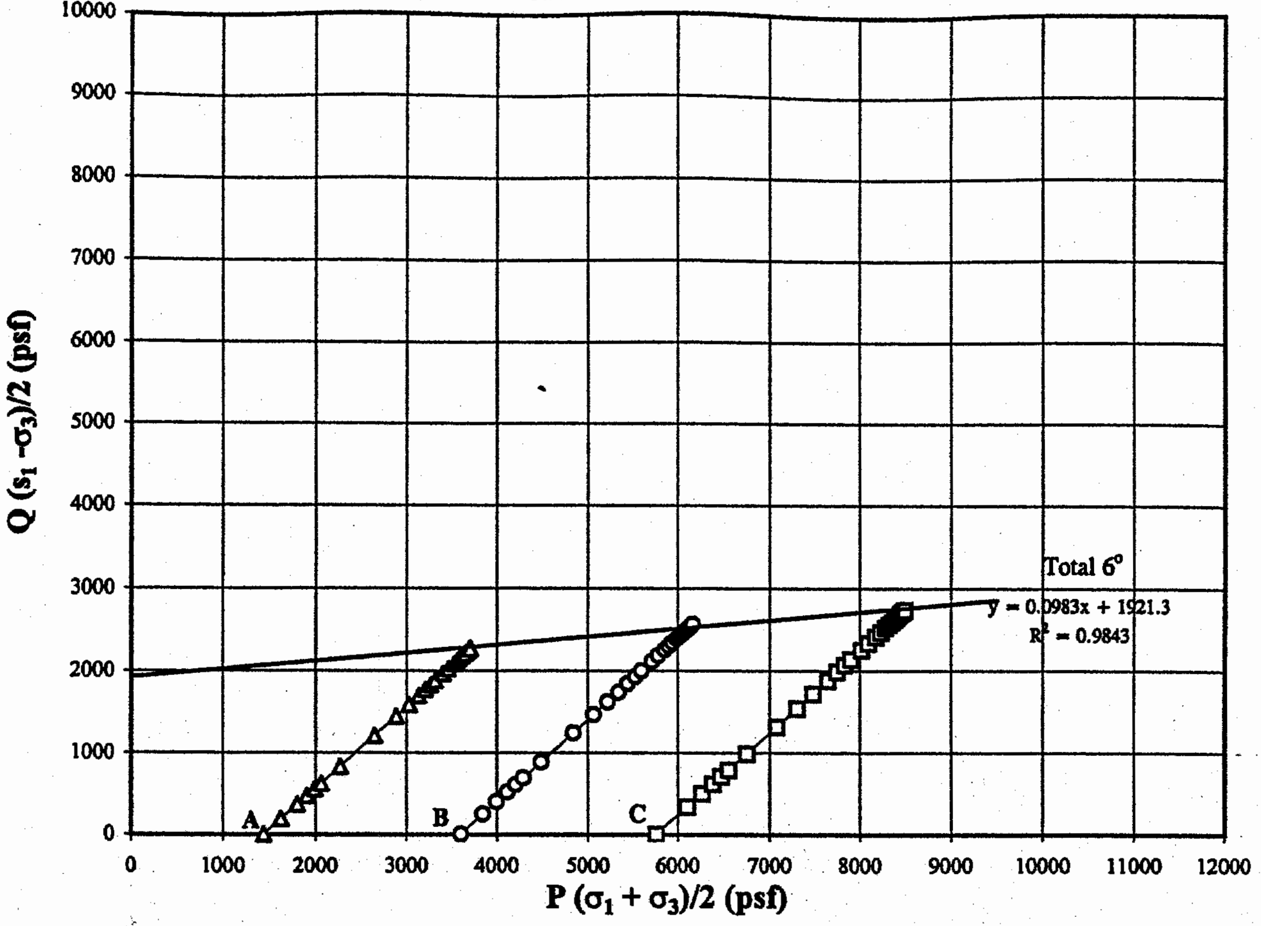
	A	B	C
CONFINING PRESSURE (psi)	10	25	40
CONFINING PRESSURE (psf)	1440	3600	5760
INITIAL DRY DENSITY (pcf)	90.0	90.0	90.1
INITIAL WATER CONTENT (%)	28.1	28.0	28.0

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	TP-4
SAMPLE TYPE	Bulk
COMMENTS	Sample was remolded to 95.2% of the Maximum Dry Density and OPTM + 3%.

SOIL PARAMETERS	
LL	50
PL	23
PI	27
Gs	2.72

TECH	DA
DATE	5/19/01
CHECK	
REVIEW	

UNCONSOLIDATED / UNDRAINED TRIAXIAL STRESS PATH
ASTM D 2850



A (10 psi) B (25 psi) C (40 psi)

SAMPLE DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CH

TOTAL STRESS PARAMETERS	
α =	6
a =	1921 psf

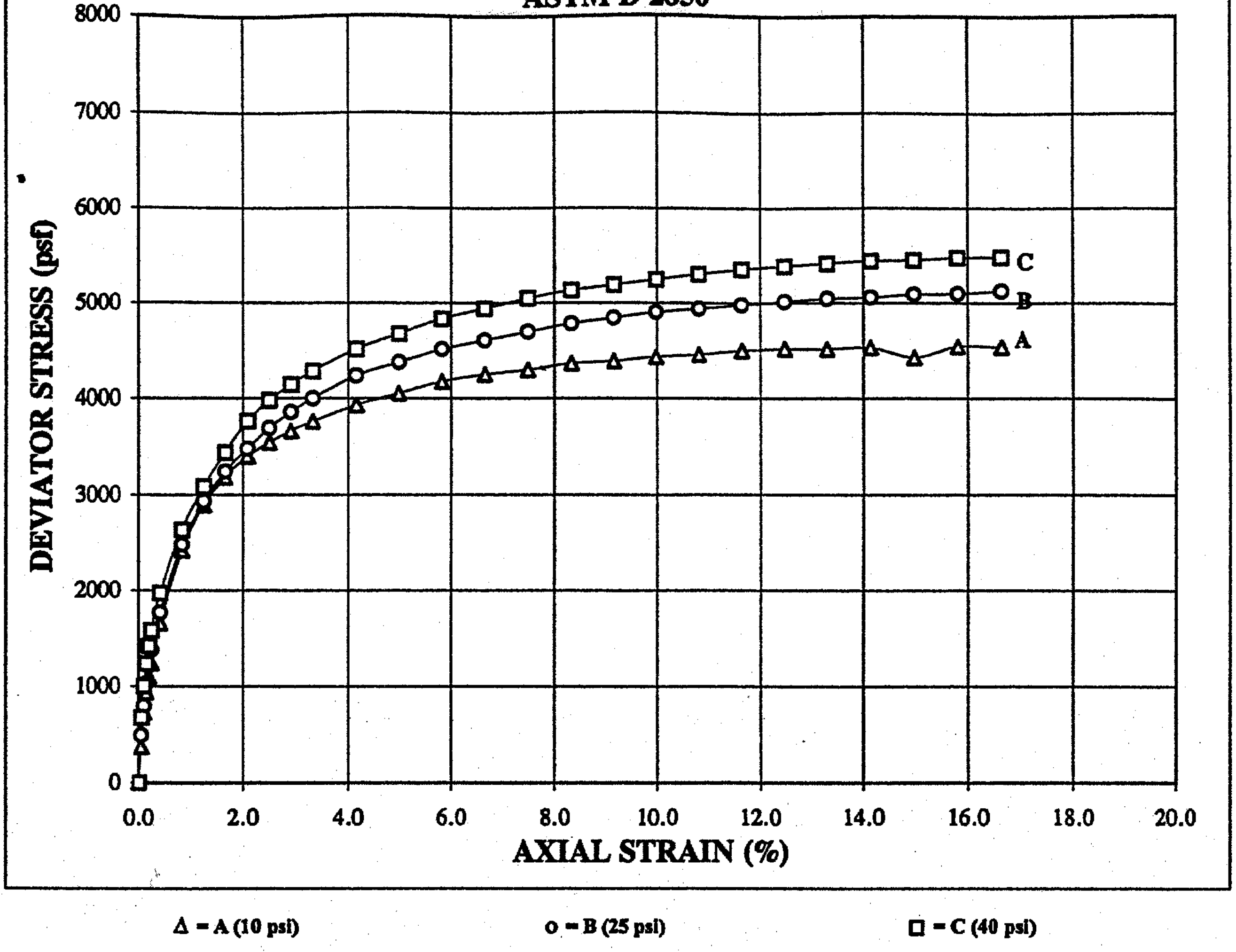
	A	B	C
CONFINING PRESSURE (psi)	10	25	40
CONFINING PRESSURE (psf)	1440	3600	5760
INITIAL DRY DENSITY (pcf)	90.0	90.0	90.1
INITIAL WATER CONTENT (%)	28.1	28.0	28.0

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	TP-4
SAMPLE TYPE	Bulk
COMMENTS	Sample was remolded to 95.2% of the Maximum Dry Density and OPTM + 3%.

SOIL PARAMETERS	
LL	50
PL	23
PI	27
Gs	2.72

TECH	DA
DATE	5/19/01
CHECK	
REVIEW	

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



SAMPLE DESCRIPTION		Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CH	

	A	B	C
CONFINING PRESSURE (psi)	10	25	40
CONFINING PRESSURE (psf)	1440	3600	5760
INITIAL DRY DENSITY (pcf)	90.0	90.0	90.1
INITIAL WATER CONTENT (%)	28.1	28.0	28.0
STRAIN RATE (%/min)	1.00	1.00	1.00

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	TP-4
SAMPLE TYPE	Bulk
COMMENTS	Sample was remolded to 95.2% of the Maximum Dry Density and OPTM + 3%.

SOIL PARAMETERS	
LL	50
PL	23
PI	27
Gs	2.72

TECH	DA
DATE	5/19/01
CHECK	
REVIEW	

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH OF SOILS
ASTM D 2850

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	TP-4
PROJECT NO.	013-3205	**SAMPLE DEPTH**	-

		CELL PRESSURE (psi)	10.0
MACHINE SPEED (in/min)	0.06	**SAMPLE PRESSURE (psi)**	0.0
STRAIN RATE (%/min)	1.00	**CONFINING PRESSURE, σ_3 (psi)**	10.0

INITIAL SAMPLE DATA

HEIGHT(in)	6.011	(cm)	15.268
DIAMETER(in)	2.790	(cm)	7.087
AREA(in^2)	6.11	(cm^2)	39.44
VOLUME(in^3)	36.75	(cm^3)	602.21
WEIGHT (g)	1111.89		
% MOISTURE	28.1		
SPECIFIC GRAVITY	2.719		
WET DENSITY (pcf)	115.3		
DRY DENSITY, (pcf) calc	90.0		
VOLUME OF SOLIDS (cm^3)	319.32		
VOLUME OF VOIDS (cm^3)	282.89		
VOID RATIO	0.886		
% SATURATION	86.1		

CORRECTED SAMPLE DATA

HEIGHT (in)	5.981
DIAMETER (in)	2.797
AREA (in^2)	6.14
VOLUME (in^3)	36.75

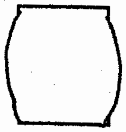
WATER CONTENT

WT SOIL & TARE, WET (g)	1195.15
WT SOIL & TARE, DRY(g)	951.74
WT TARE (g)	84.42
WT MOISTURE (g)	243.41
WT DRY SOIL (g)	867.32
% MOISTURE	28.06

TIME (min)	ACCUM. DEFLECT (inch)	AXIAL LOAD (lbs)	e % STRAIN (in/in)	CORRECTED AREA (in^2)	DEVIATOR STRESS (psf)	(σ_1) devstr+cp (psf)	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)
0.0	0.000	1	0.0	6.14	0.00	1440.00	1440.00	0.00
0.1	0.003	17	0.0	6.15	374.80	1814.80	1627.40	187.40
0.1	0.006	32	0.1	6.15	725.80	2165.80	1802.90	362.90
0.2	0.009	41	0.1	6.15	936.05	2376.05	1908.03	468.03
0.2	0.012	48	0.2	6.16	1099.31	2539.31	1989.66	549.66
0.3	0.015	54	0.2	6.16	1239.03	2679.03	2059.52	619.52
0.4	0.025	72	0.4	6.17	1657.07	3097.07	2268.53	828.53
0.8	0.050	105	0.8	6.20	2417.11	3857.11	2648.56	1208.56
1.3	0.075	126	1.2	6.22	2893.00	4333.00	2886.50	1446.50
1.7	0.100	139	1.7	6.25	3180.42	4620.42	3030.21	1590.21
2.1	0.125	149	2.1	6.27	3396.46	4836.46	3138.23	1698.23
2.5	0.150	156	2.5	6.30	3542.00	4982.00	3211.00	1771.00
2.9	0.175	162	2.9	6.33	3663.41	5103.41	3271.71	1831.71
3.3	0.200	167	3.3	6.36	3761.00	5201.00	3320.50	1880.50
4.2	0.250	176	4.2	6.41	3930.80	5370.80	3405.40	1965.40
5.0	0.300	183	5.0	6.47	4052.55	5492.55	3466.27	2026.27
5.8	0.350	190	5.8	6.52	4171.57	5611.57	3525.78	2085.78
6.7	0.400	195	6.7	6.58	4244.11	5684.11	3562.05	2122.05
7.5	0.450	199	7.5	6.64	4293.02	5733.02	3586.51	2146.51
8.3	0.500	204	8.3	6.70	4361.85	5801.85	3620.93	2180.93
9.2	0.550	207	9.1	6.76	4386.15	5826.15	3633.08	2193.08
10.0	0.600	211	10.0	6.83	4430.38	5870.38	3655.19	2215.19
10.8	0.650	214	10.8	6.89	4452.15	5892.15	3666.08	2226.08
11.7	0.700	218	11.6	6.95	4493.46	5933.46	3686.73	2246.73
12.5	0.750	221	12.5	7.02	4512.69	5952.69	3696.35	2256.35
13.3	0.800	223	13.3	7.09	4510.44	5950.44	3695.22	2255.22
14.2	0.850	226	14.1	7.16	4527.53	5967.53	3703.76	2263.76
15.0	0.900	229	15.0	7.23	4543.44	5983.44	3711.72	2271.72
15.8	0.950	231	15.8	7.30	4538.46	5978.46	3709.23	2269.23
16.7	1.000	233	16.6	7.37	4532.70	5972.70	3706.35	2266.35
					*NORMAL STRESS @ FAILURE	5983.44		

TIME TO FAILURE (min)	14.2
DEFLECTION @ FAILURE (in)	0.850
% STRAIN @ FAILURE	14.1

Failure Sketch



TECH	DA
DATE	5/19/01
CHECK	
REVIEW	

*** Failure based on the maximum deviator stress or 15% axial strain.**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH OF SOILS
ASTM D 2850

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	TP-4
PROJECT NO.	013-3205	**SAMPLE DEPTH**	-

		CELL PRESSURE (psi)	25.0
MACHINE SPEED (in/min)	0.06	**SAMPLE PRESSURE (psi)**	0.0
STRAIN RATE (%/min)	1.00	**CONFINING PRESSURE, σ_3 (psi)**	25.0

INITIAL SAMPLE DATA

HEIGHT(in)	6.012	(cm)	15.270
DIAMETER(in)	2.790	(cm)	7.087
AREA(in²)	6.11	(cm²)	39.44
VOLUME(in³)	36.76	(cm³)	602.31
WEIGHT (g)	1111.58		
% MOISTURE	28.0		
SPECIFIC GRAVITY	2.719		
WET DENSITY (pcf)	115.2		
DRY DENSITY, (pcf) calc	90.0		
VOLUME OF SOLIDS (cm³)	319.31		
VOLUME OF VOIDS (cm³)	283.00		
VOID RATIO	0.886		
% SATURATION	86.0		

CORRECTED SAMPLE DATA

HEIGHT (in)	5.964
DIAMETER (in)	2.801
AREA (in²)	6.16
VOLUME (in³)	36.76

WATER CONTENT

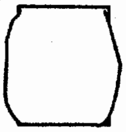
WT SOIL & TARE, WET (g	1195.23
WT SOIL & TARE, DRY(g)	952.18
WT TARE (g)	85.16
WT MOISTURE (g)	243.05
WT DRY SOIL (g)	867.02
% MOISTURE	28.03

TIME (min)	ACCUM. DEFLECT (inch)	AXIAL LOAD (lbs)	e % STRAIN (in/in)	CORRECTED AREA (in²)	DEVIATOR STRESS (psf)	(σ_1) devstr+cp (psf)	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)
0.0	0.000	5	0.0	6.16	0.00	3600.00	3600.00	0.00
0.1	0.003	26	0.0	6.17	490.44	4090.44	3845.22	245.22
0.1	0.006	39	0.1	6.17	793.65	4393.65	3996.82	396.82
0.2	0.009	49	0.1	6.17	1026.56	4626.56	4113.28	513.28
0.2	0.012	57	0.2	6.18	1212.60	4812.60	4206.30	606.30
0.3	0.015	64	0.2	6.18	1375.15	4975.15	4287.57	687.57
0.4	0.025	81	0.4	6.19	1768.43	5368.43	4484.21	884.21
0.8	0.050	112	0.8	6.21	2479.36	6079.36	4839.68	1239.68
1.3	0.075	132	1.2	6.24	2930.45	6530.45	5065.23	1465.23
1.7	0.100	146	1.7	6.27	3239.79	6839.79	5219.90	1619.90
2.1	0.125	157	2.1	6.29	3477.78	7077.78	5338.89	1738.89
2.5	0.150	167	2.5	6.32	3690.84	7290.84	5445.42	1845.42
2.9	0.175	175	2.9	6.35	3856.58	7456.58	5528.29	1928.29
3.3	0.200	182	3.3	6.37	3998.18	7598.18	5599.09	1999.09
4.2	0.250	194	4.2	6.43	4232.52	7832.52	5716.26	2116.26
5.0	0.300	202	5.0	6.49	4373.39	7973.39	5786.70	2186.70
5.8	0.350	210	5.8	6.54	4511.15	8111.15	5855.58	2255.58
6.7	0.400	216	6.7	6.60	4602.18	8202.18	5901.09	2301.09
7.5	0.450	222	7.5	6.66	4690.88	8290.88	5945.44	2345.44
8.3	0.500	228	8.3	6.72	4777.25	8377.25	5988.62	2388.62
9.2	0.550	233	9.1	6.78	4840.06	8440.06	6020.03	2420.03
10.0	0.600	238	10.0	6.85	4900.92	8500.92	6050.46	2450.46
10.8	0.650	242	10.8	6.91	4939.00	8539.00	6069.50	2469.50
11.7	0.700	246	11.6	6.97	4975.53	8575.53	6087.76	2487.76
12.5	0.750	250	12.5	7.04	5010.50	8610.50	6105.25	2505.25
13.3	0.800	254	13.3	7.11	5043.91	8643.91	6121.96	2521.96
14.2	0.850	257	14.1	7.18	5055.71	8655.71	6127.86	2527.86
15.0	0.900	261	15.0	7.25	5086.21	8686.21	6143.11	2543.11
15.8	0.950	264	15.8	7.32	5095.49	8695.49	6147.74	2547.74
16.7	1.000	268	16.6	7.39	5123.07	8723.07	6161.54	2561.54

***NORMAL STRESS @ FAILURE** 8686.21

TIME TO FAILURE (min)	15.0
DEFLECTION @ FAILURE (in)	0.900
% STRAIN @ FAILURE	15.0

Failure Sketch



TECH	DA
DATE	5/19/01
CHECK	
REVIEW	

* Failure based on the maximum deviator stress or 15% axial strain.

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH OF SOILS
ASTM D 2850

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	TP-4
PROJECT NO.	013-3205	SAMPLE DEPTH	-

ACHINE SPEED (in/min)	0.06	CELL PRESSURE (psi)	40.0
STRAIN RATE (%/min)	1.00	SAMPLE PRESSURE (psi)	0.0
		CONFINING PRESSURE, σ_3 (psi)	40.0

INITIAL SAMPLE DATA

HEIGHT(in)	6.014	(cm)	15.276
DIAMETER(in)	2.790	(cm)	7.087
AREA(in²)	6.11	(cm²)	39.44
VOLUME(in³)	36.77	(cm³)	602.51

WEIGHT (g)	1113.10
% MOISTURE	28.0
SPECIFIC GRAVITY	2.719
WET DENSITY (pcf)	115.3
DRY DENSITY, (pcf) calc	90.1
VOLUME OF SOLIDS (cm³)	319.78
VOLUME OF VOIDS (cm³)	282.73
VOID RATIO	0.884
% SATURATION	86.2

CORRECTED SAMPLE DATA

HEIGHT (in)	5.950
DIAMETER (in)	2.805
AREA (in²)	6.18
VOLUME (in³)	36.77

WATER CONTENT

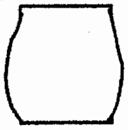
WT SOIL & TARE, WET (g)	1196.19
WT SOIL & TARE, DRY(g)	952.91
WT TARE (g)	84.60
WT MOISTURE (g)	243.28
WT DRY SOIL (g)	868.31
% MOISTURE	28.02

TIME (min)	ACCUM. DEFLECT (inch)	AXIAL LOAD (lbs)	e % STRAIN (in/in)	CORRECTED AREA (in²)	DEVIATOR STRESS (psf)	(σ_1) devstr+cp (psf)	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)
0.0	0.000	8	0.0	6.18	0.00	5760.00	5760.00	0.00
0.1	0.003	37	0.0	6.18	675.46	6435.46	6097.73	337.73
0.1	0.006	51	0.1	6.19	1001.04	6761.04	6260.52	500.52
0.2	0.009	61	0.1	6.19	1233.23	6993.23	6376.61	616.61
0.2	0.012	69	0.2	6.19	1418.67	7178.67	6469.33	709.33
0.3	0.015	76	0.2	6.19	1580.67	7340.67	6550.34	790.34
0.4	0.025	93	0.4	6.21	1972.55	7732.55	6746.27	986.27
0.8	0.050	122	0.8	6.23	2634.49	8394.49	7077.25	1317.25
1.3	0.075	142	1.2	6.26	3083.70	8843.70	7301.85	1541.85
1.7	0.100	158	1.7	6.28	3437.37	9197.37	7478.69	1718.69
2.1	0.125	173	2.1	6.31	3765.13	9525.13	7642.56	1882.56
2.5	0.150	183	2.5	6.34	3976.37	9736.37	7748.18	1988.18
2.9	0.175	191	2.9	6.36	4140.42	9900.42	7830.21	2070.21
3.3	0.200	198	3.3	6.39	4280.39	10040.39	7900.19	2140.19
4.2	0.250	210	4.2	6.45	4511.59	10271.59	8015.80	2255.80
5.0	0.300	219	5.0	6.50	4671.72	10431.72	8095.86	2335.86
5.8	0.350	228	5.8	6.56	4828.37	10588.37	8174.18	2414.18
6.7	0.400	235	6.7	6.62	4938.02	10698.02	8229.01	2469.01
7.5	0.450	242	7.5	6.68	5044.95	10804.95	8282.48	2522.48
8.3	0.500	248	8.3	6.74	5127.81	10887.81	8323.91	2563.91
9.2	0.550	253	9.1	6.80	5187.18	10947.18	8353.59	2593.59
10.0	0.600	258	10.0	6.86	5244.60	11004.60	8382.30	2622.30
10.8	0.650	263	10.8	6.93	5300.09	11060.09	8410.05	2650.05
11.7	0.700	268	11.6	6.99	5353.64	11113.64	8436.82	2676.82
12.5	0.750	272	12.5	7.06	5384.86	11144.86	8452.43	2692.43
13.3	0.800	276	13.3	7.13	5414.52	11174.52	8467.26	2707.26
14.2	0.850	280	14.1	7.20	5442.64	11202.64	8481.32	2721.32
15.0	0.900	283	15.0	7.27	5449.39	11209.39	8484.69	2724.69
15.8	0.950	287	15.8	7.34	5474.60	11234.60	8497.30	2737.30
16.7	1.000	290	16.6	7.41	5478.83	11238.83	8499.41	2739.41

*NORMAL STRESS @ FAILURE 11209.39

TIME TO FAILURE (min)	15.0
DEFLECTION @ FAILURE (in)	0.900
% STRAIN @ FAILURE	15.0

Failure Sketch

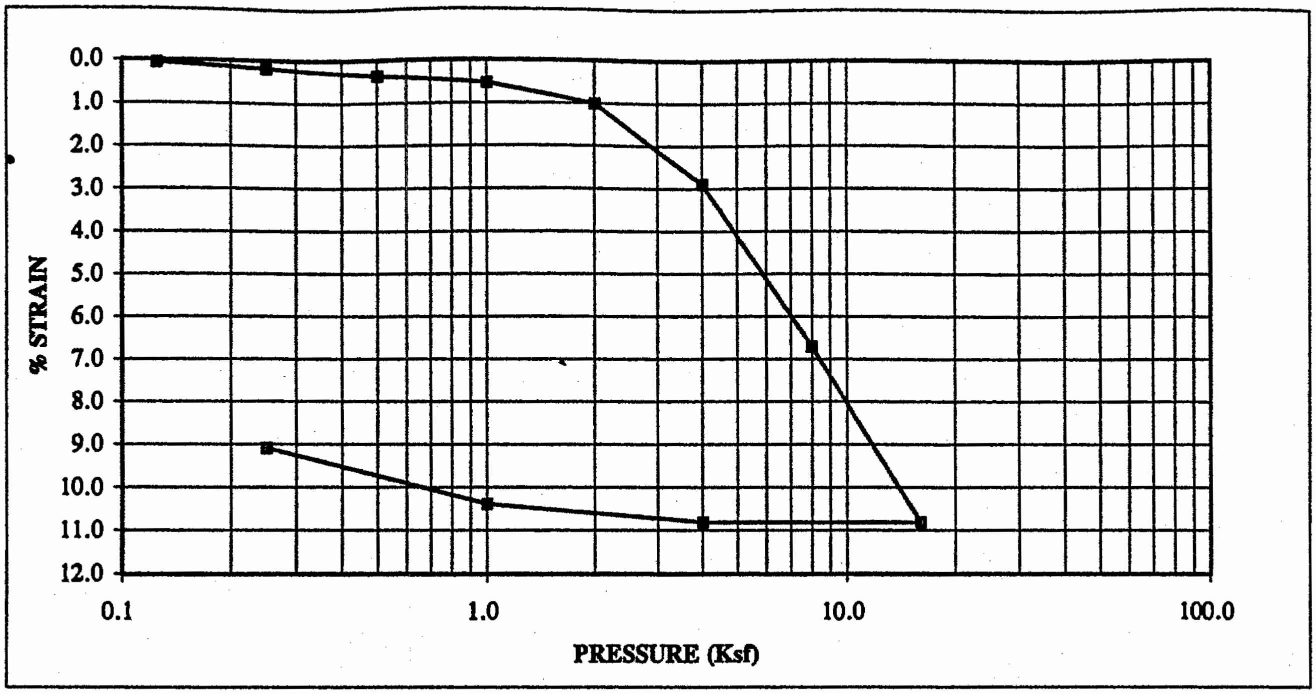


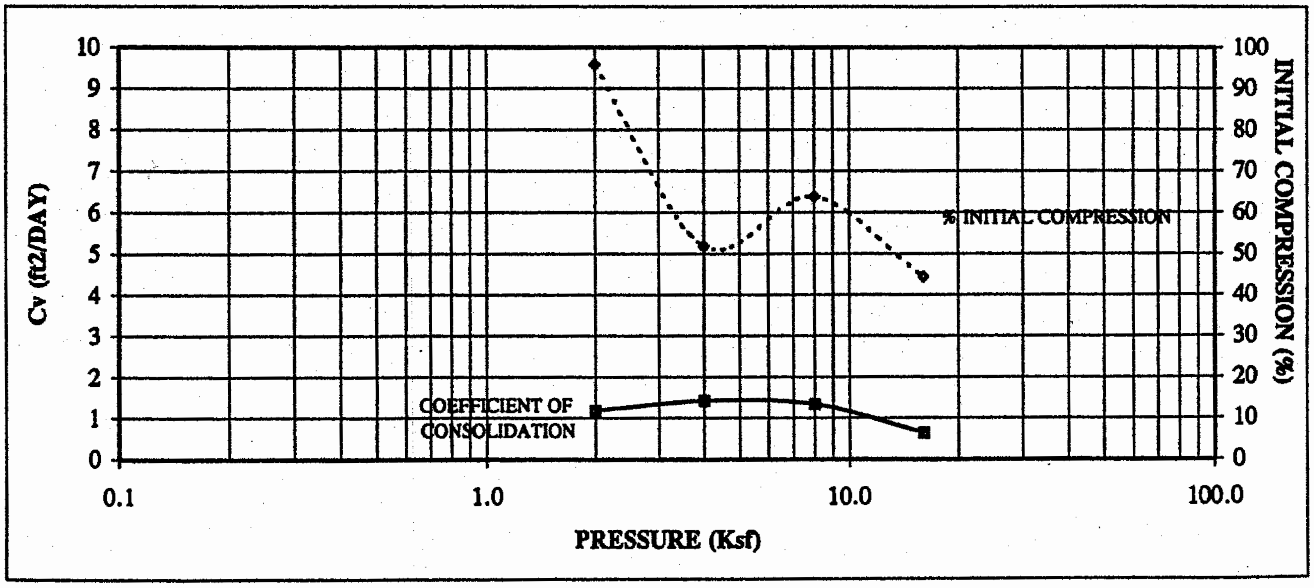
TECH	DA
DATE	5/10/01
CHECK	
REVIEW	

* Failure based on the maximum deviator stress or 15% axial strain.

Golder Associates Inc.

ONE - DIMENSIONAL CONSOLIDATION
ASTM D 2435





SAMPLE ID	TP - 4
SAMPLE TYPE	Bulk
SAMPLE DEPTH	-

LL	50
PL	23
PI	27
Gs	2.72

	Initial	Final
Dry Unit Weight (pcf)	89.9	98.1
Wet Unit Weight (pcf)	114.2	124.5
Moisture Content	27.1%	26.8%
Void Ratio	0.8873	0.7288
Degree of Saturation	83.0%	100.0%

DESCRIPTION: Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS: CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DH/PWM
DATE	5/9/01
CHECK	
REVIEW	

ONE-DIMENSIONAL CONSOLIDATION
ASTM D 2435

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: TP - 4 -
SAMPLE DEPTH: -
SAMPLE TYPE: Bulk

DESCRIPTION: Olive Brown, SILTY CLAY, trace medium to fine sand.
CLASSIFICATION: CH
CONSOLIDOMETER No.: 2

LL	50
PL	23
PI	27
Gs	2.719

Sample Data	Trimmings	Before Test	After Test
Tare plus wet soil, g	256.17	185.22	184.98
Tare plus dry soil, g	225.85	161.69	161.69
Tare, g	114.14	74.81	74.81
Water, g	30.32	23.53	23.29
Dry soil, g	111.71	86.88	86.88
Water Content	27.1%	27.1%	26.8%

Diameter (in)	2.500
Height of sample (in)	0.750
Area of sample (in^2)	4.909
Volume of sample (in^3)	3.682
Water Content (Avg) from Trimmings	27.1%
Sample Wt (wet, g)	110.41
Sample Wt (dry, g)	86.88
Water Wt (g)	23.53

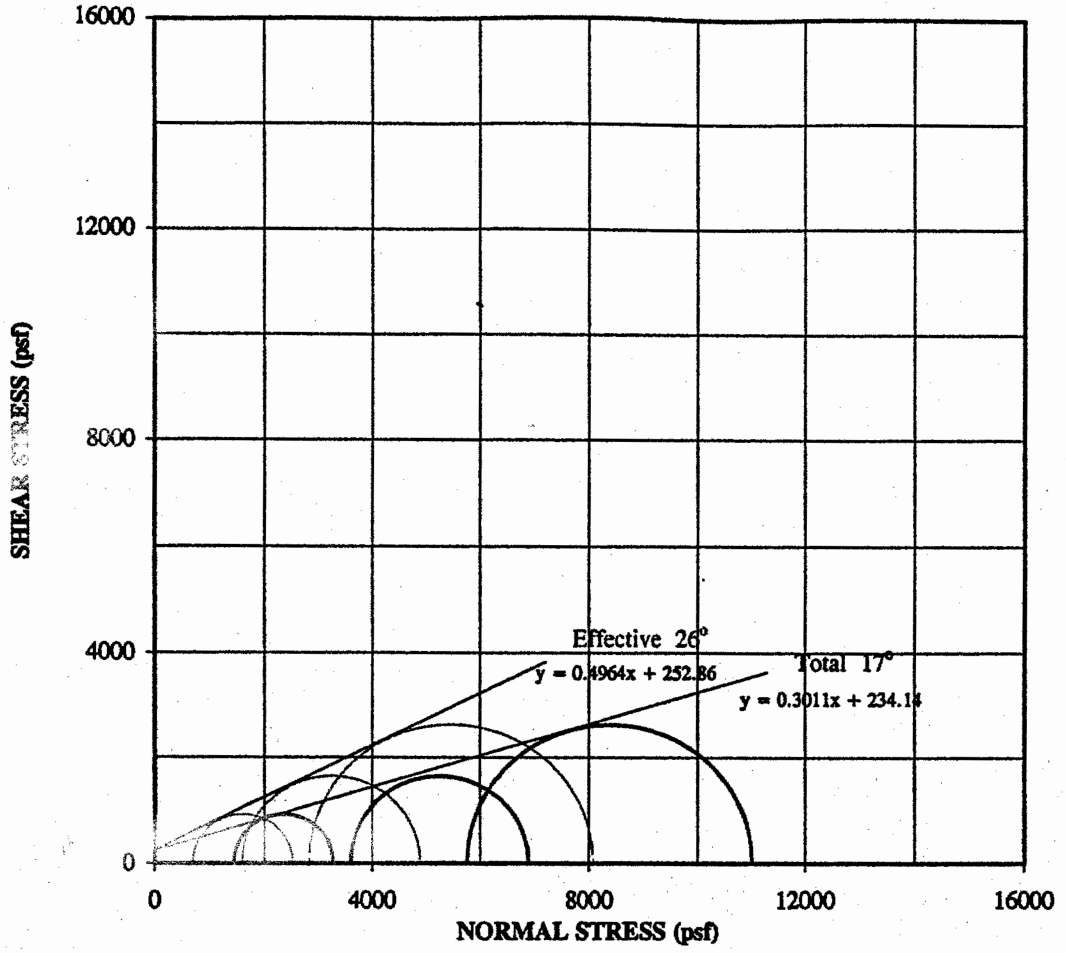
Sample Data	Initial	Final
Total Heights (in)	0.750	0.687
Height of solids (in)	0.397	0.397
Height of voids (in)	0.353	0.290
Height of water (in)	0.293	0.290
Void ratio	0.887	0.729
Degree of saturation	83.0%	100.0%
Dry unit wt (pcf)	89.9	98.1
Wet unit wt (pcf)	114.2	124.5

PRESSURE (ksf)	H100 DIAL READING	MACHINE / STONE CORR.	DIAL CHANGE (in)	FITTING TIME (sec) t90	SAMPLE HEIGHT (in)	HEIGHT OF VOIDS Hv	VOID RATIO e	CHANGE IN HEIGHT (accum)	STRAIN %	LENGTH OF DRAINAGE PATH (DOUBLE DRAINAGE) H (in)	H^2 (cm^2)	PERCENT INITIAL COMPRESSION	COEFFICIENT OF CONSOLIDATION (ft^2/day)
0.125	0.0015	0.0000	0.0000	-	0.750	0.3526	0.8873	0.0000	0.0	0.000	0.000	-	-
0.125	0.0022	0.0002	0.0005	-	0.750	0.3522	0.8862	0.0005	0.1	0.375	0.907	-	-
0.250	0.0032	0.0003	0.0014	-	0.749	0.3512	0.8837	0.0014	0.2	0.375	0.905	-	-
0.500	0.0049	0.0006	0.0028	-	0.747	0.3498	0.8803	0.0028	0.4	0.374	0.902	-	-
1.000	0.0068	0.0013	0.0040	-	0.746	0.3486	0.8773	0.0040	0.5	0.373	0.899	-	-
2.000	0.0113	0.0022	0.0076	60	0.742	0.3450	0.8682	0.0076	1.0	0.372	0.893	95.8	1.2
4.000	0.0267	0.0035	0.0217	49	0.728	0.3309	0.8327	0.0217	2.9	0.368	0.872	51.8	1.4
8.000	0.0569	0.0051	0.0503	49	0.700	0.3023	0.7606	0.0503	6.7	0.357	0.822	63.7	1.3
16.000	0.0896	0.0070	0.0811	94	0.669	0.2715	0.6832	0.0811	10.8	0.342	0.755	44.3	0.6
4.000	0.0892	0.0066	0.0811	-	0.669	0.2715	0.6832	0.0811	10.8	0.334	0.722	-	-
1.000	0.0807	0.0013	0.0779	-	0.672	0.2747	0.6913	0.0779	10.4	0.335	0.725	-	-
0.250	0.0700	0.0003	0.0682	-	0.682	0.2844	0.7157	0.0682	9.1	0.338	0.739	-	-

FINAL DIAL READING = 0.0630

TECH: DH/PWM
DATE: 5/9/01
CHECK:
REVIEW:

TRIAXIAL COMPRESSION TEST TOTAL AND EFFECTIVE MOHR CIRCLES - ASTM D 4767



*TOTAL STRENGTH PARAMETERS	
φ =	16.8°
C =	234.1 psf

*EFFECTIVE STRENGTH PARAMETERS	
φ' =	26.4°
C' =	252.4 psf

DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CH

LL	50
PL	23
PI	27
Gs	2.72

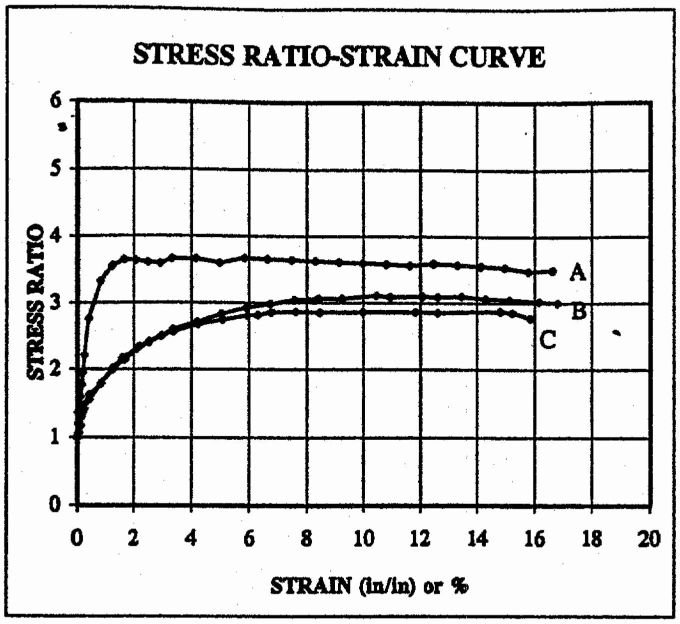
	A	B	C
EFFECTIVE CONSOLIDATION PRESS (psf)	1440	3600	5760
INITIAL DRY DENSITY (pcf)	90.1	90.1	89.5
INITIAL WATER CONTENT, %	27.9	27.6	28.8

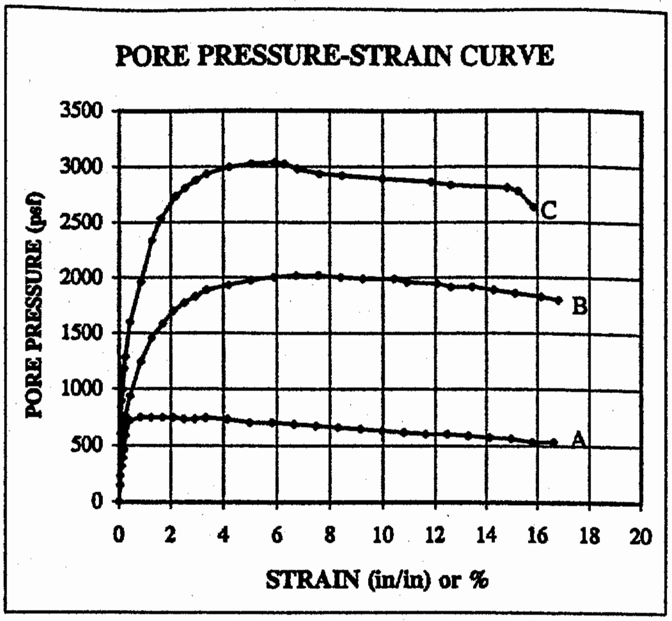
PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	TP - 4 -
SAMPLE TYPE	Bulk

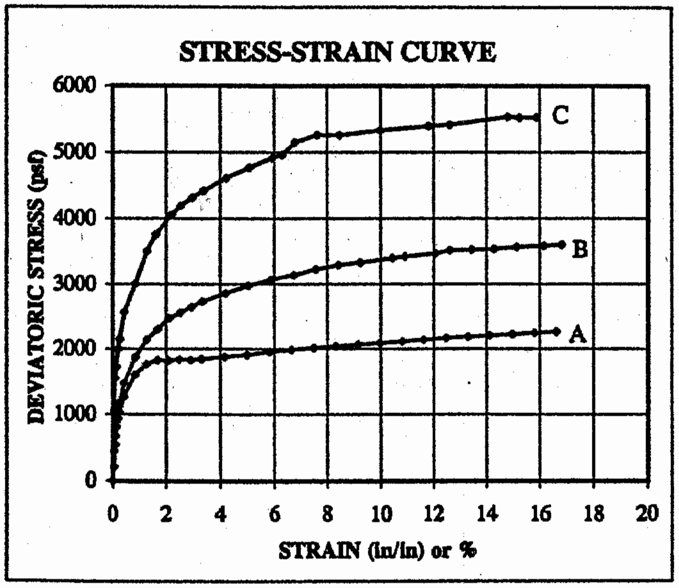
* Failure based on maximum effective stress ratio or 15% strain.

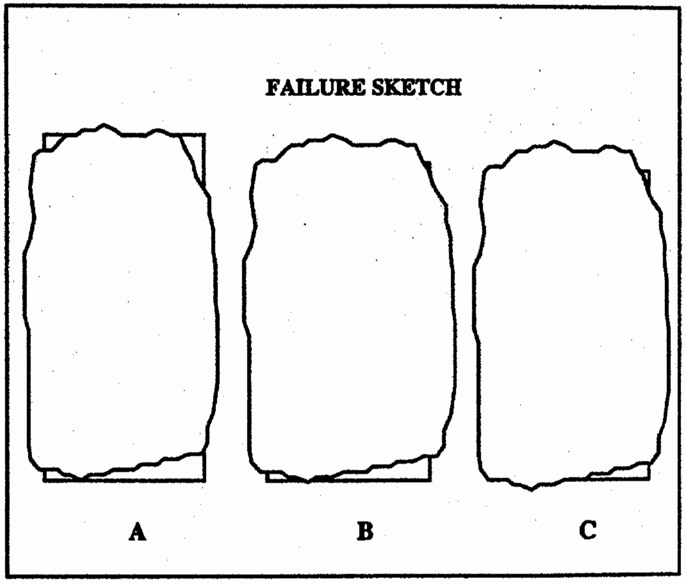
CHECKED	DA
REVIEWED	PWM

TRIAXIAL COMPRESSION TEST
CONSOLIDATED UNDRAINED WITH PORE PRESSURE









DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CH

LL	50
PL	23
PI	27
Gs	2.72

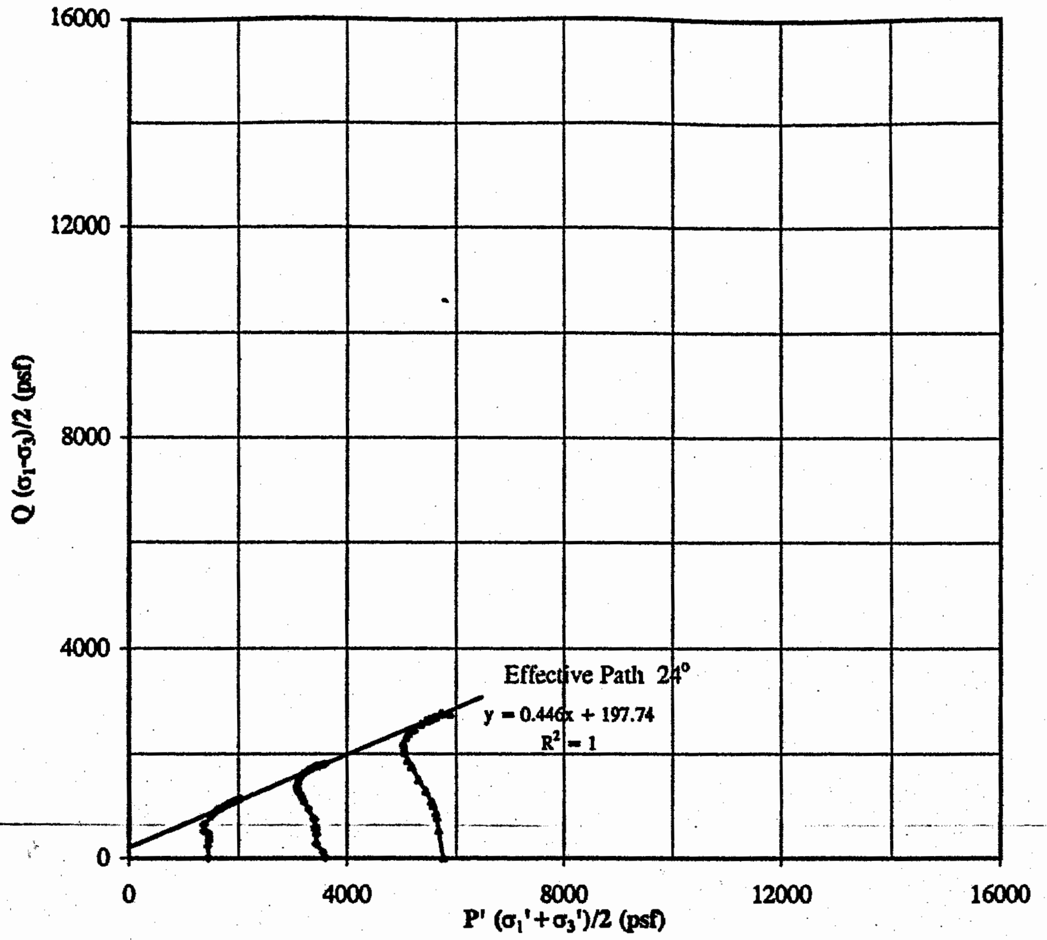
	A	B	C
EFFECTIVE CONSOLIDATION PRESS (psf)	1440	3600	5760
INITIAL DRY DENSITY (pcf)	90.1	90.1	89.5
INITIAL WATER CONTENT (%)	27.9	27.6	28.8
STRAIN RATE (%/min)	0.10	0.05	0.010

PROJECT NAME	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	TP - 4
SAMPLE TYPE	Bulk

NOTE: The sample was remolded to approximately 95% of the Max. Dry Density and OPTM + 3.0%.

CHECKED DA
REVIEWED

TRIAXIAL COMPRESSION TEST EFFECTIVE STRESS PATH
ASTM D 4767



*EFFECTIVE STRESS PARAMETERS	
α' =	24.0 °
a' =	197.7 psf

DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CH

LL	50
PL	23
PI	27
Gs	2.72

	A	B	C
EFFECTIVE CONSOLIDATION PRESS (psf)	1440	3600	5760
INITIAL DRY DENSITY (pcf)	90.1	90.1	89.5
INITIAL WATER CONTENT %	27.9	27.6	28.8

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	TP - 4
SAMPLE TYPE	Bulk

* Failure based on maximum effective stress ratio or 15% strain.

CHECKED	DA
REVIEWED	PWM

TRIAXIAL COMPRESSION TEST (ASTM D-47 NSOLIDATED UNDRAINED WITH PORE PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	TP - 4	-
SAMPLE TYPE	Bulk	
DEPTH INTERVAL	-	
MACHINE SPEED (in/min)	0.006	
STRAIN RATE (%/min)	0.10	
CELL PRESSURE (psi)	80.0	
SAMPLE PRESSURE (psi)	70.0	
EFF. CONSOLIDATION PRESSURE, σ_3 (psi)	10.0	
PRESSURE, σ_3 (psf)	1440.0	
FINAL "B" VALUE	0.99	
t_{50} (minutes)	3.74	

INITIAL SAMPLE DATA	cm	in	corrected
HEIGHT	15.273	6.013	6.013
DIAMETER	7.087	2.790	2.739
AREA	39.44	6.11	5.89
VOLUME	602.41	36.76	35.42
WEIGHT (g)	1113.10		1120.10
% MOISTURE	27.9		28.75
SPECIFIC GRAVITY	2.72		
MOIST DENSITY (pcf)	115.3		
DRY DENSITY, calc (pcf)	90.1		
VOLUME OF SOLIDS	319.97		
VOLUME OF VOIDS	282.44		
VOID RATIO	0.883		
SATURATION	86.1		

CORRECTED SAMPLE DATA	
DRY DENSITY, calc (pcf)	93.5
VOLUME OF SOLIDS	319.97
VOLUME OF VOIDS	260.44
VOID RATIO	0.814

WATER CONTENT (% MOISTURE)	
WT SOIL & TARE, MOIST (g)	1120.10
WT SOIL & TARE, DRY (g)	870.00
WT TARE (g)	0.00
WT MOISTURE (g)	250.10
WT DRY SOIL (g)	870.00
% MOISTURE	28.75

TIME (MIN)	ACCUM. DEFLECT. (inches)	AXIAL LOAD (lbs)	PORE PRESS. (psi)=U	PWP change DU (psf) (acc)	e % STRAIN (%)	(1-e)	CORR. AREA (in 2)	CORR. HEIGHT (in)	DEV. STRESS (psf)	SIGMA 1 devstr+cp (σ_1)	SIGMA 1 EFF. (σ_1-dU)	SIGMA 3 EFF. (σ_3-dU)	EFF.PRN STR RATIO (σ_1'/σ_3')	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)	(A)
0.0	0.000	17	70.8	0.0	0.00	1.00	5.89	6.013	0.0	1440.0	1440.0	1440.0	1.00	1440.0	0.0	0.00
0.5	0.003	35	72.4	230.4	0.05	1.00	5.89	6.010	439.8	1879.8	1649.4	1209.6	1.36	1429.5	219.9	0.52
1.0	0.006	44	73.0	316.8	0.10	1.00	5.90	6.007	659.4	2099.4	1782.6	1123.2	1.59	1452.9	329.7	0.48
1.5	0.009	50	73.5	388.8	0.15	1.00	5.90	6.004	805.5	2245.5	1856.7	1051.2	1.77	1454.0	402.8	0.48
2.0	0.012	55	74.0	460.8	0.20	1.00	5.90	6.001	927.1	2367.1	1906.3	979.2	1.95	1442.8	463.6	0.50
2.5	0.015	59	74.9	590.4	0.25	1.00	5.91	5.998	1024.2	2464.2	1873.8	849.6	2.21	1361.7	512.1	0.58
4.2	0.025	69	75.8	720.0	0.42	1.00	5.91	5.988	1265.9	2705.9	1985.9	720.0	2.76	1353.0	633.0	0.57
8.3	0.050	83	76.0	748.8	0.83	0.99	5.94	5.963	1600.1	3040.1	2291.3	691.2	3.31	1491.2	800.0	0.47
12.5	0.075	90	76.0	748.8	1.25	0.99	5.96	5.938	1762.4	3202.4	2453.6	691.2	3.55	1572.4	881.2	0.42
16.7	0.100	93	76.0	748.8	1.66	0.98	5.99	5.913	1827.1	3267.1	2518.3	691.2	3.64	1604.7	913.5	0.41
20.8	0.125	93	76.0	748.8	2.08	0.98	6.02	5.888	1819.3	3259.3	2510.5	691.2	3.63	1600.9	909.7	0.41
25.0	0.150	94	75.9	734.4	2.49	0.98	6.04	5.863	1835.4	3275.4	2541.0	705.6	3.60	1623.3	917.7	0.40
29.2	0.175	94	75.9	734.4	2.91	0.97	6.07	5.838	1827.6	3267.6	2533.2	705.6	3.59	1619.4	913.8	0.40
33.3	0.200	95	76.0	745.9	3.33	0.97	6.09	5.813	1843.4	3283.4	2537.5	694.1	3.66	1615.8	921.7	0.40
41.7	0.250	97	75.9	734.4	4.16	0.96	6.15	5.763	1874.4	3314.4	2580.0	705.6	3.66	1642.8	937.2	0.39
50.0	0.300	99	75.7	705.6	4.99	0.95	6.20	5.713	1904.6	3344.6	2639.0	734.4	3.59	1686.7	952.3	0.37
58.3	0.350	102	75.7	705.6	5.82	0.94	6.25	5.663	1957.0	3397.0	2691.4	734.4	3.66	1712.9	978.5	0.36
66.7	0.400	104	75.6	691.2	6.65	0.93	6.31	5.613	1985.4	3425.4	2734.2	748.8	3.65	1741.5	992.7	0.35
75.0	0.450	106	75.5	676.8	7.48	0.93	6.37	5.563	2012.9	3452.9	2776.1	763.2	3.64	1769.7	1006.5	0.34
83.3	0.500	108	75.4	662.4	8.32	0.92	6.42	5.513	2039.7	3479.7	2817.3	777.6	3.62	1797.4	1019.8	0.32
91.7	0.550	110	75.3	648.0	9.15	0.91	6.48	5.463	2065.6	3505.6	2857.6	792.0	3.61	1824.8	1032.8	0.31
100.0	0.600	112	75.2	633.6	9.98	0.90	6.54	5.413	2090.7	3530.7	2897.1	806.4	3.59	1851.8	1045.4	0.30
108.3	0.650	114	75.1	619.2	10.81	0.89	6.60	5.363	2115.0	3555.0	2935.8	820.8	3.58	1878.3	1057.5	0.29
116.7	0.700	116	75.0	604.8	11.64	0.88	6.67	5.313	2138.5	3578.5	2973.7	835.2	3.56	1904.4	1069.2	0.28
125.0	0.750	118	75.0	604.8	12.47	0.88	6.73	5.263	2161.2	3601.2	2996.4	835.2	3.59	1915.8	1080.6	0.28
133.3	0.800	120	74.9	590.4	13.30	0.87	6.79	5.213	2183.0	3623.0	3032.6	849.6	3.57	1941.1	1091.5	0.27
141.7	0.850	122	74.8	576.0	14.14	0.86	6.86	5.163	2204.1	3644.1	3068.1	864.0	3.55	1966.0	1102.0	0.26
150.0	0.900	124	74.7	561.6	14.97	0.85	6.93	5.113	2224.3	3664.3	3102.7	878.4	3.53	1990.5	1112.1	0.25
158.3	0.950	126	74.5	532.8	15.80	0.84	7.00	5.063	2243.7	3683.7	3150.9	907.2	3.47	2029.0	1121.8	0.24
166.7	1.000	128	74.5	532.8	16.63	0.83	7.07	5.013	2262.3	3702.3	3169.5	907.2	3.49	2038.4	1131.2	0.24

DU @ FAILURE	748.8	DEVIATORIC STRESS @ FAILURE	1827.1	EFFECTIVE PRINCIPLE STRESS RATIO @ FAILURE	3.64	TECH	NA/PWM
						DATE	6/7/01
						CHECKED	
						REVIEWED	

Golder Associates Inc.

TRIAXIAL COMPRESSION TEST (ASTM D-476 NSOLIDATED UNDRAINED WITH PORE PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	TP - 4	-
SAMPLE TYPE	Bulk	
DEPTH INTERVAL	-	
MACHINE SPEED (in/min)	0.003	
STRAIN RATE (%/min)	0.05	
CELL PRESSURE (psi)	95.0	
SAMPLE PRESSURE (psi)	70.0	
EFF. CONSOLIDATION		
PRESSURE, σ_3 (psi)	25.0	
PRESSURE, σ_3 (psf)	3600.0	
FINAL "B" VALUE	1.00	
t_{50} (minutes)	7.86	

INITIAL SAMPLE DATA	cm	in	corrected
HEIGHT	15.268	6.011	5.946
DIAMETER	7.087	2.790	2.684
AREA	39.44	6.11	5.66
VOLUME	602.21	36.75	33.64
WEIGHT (g)	1109.73		1117.73
% MOISTURE	27.6		28.47
SPECIFIC GRAVITY	2.72		
MOIST DENSITY (pcf)	115.0		
DRY DENSITY, calc (pcf)	90.1		
VOLUME OF SOLIDS	319.97		
VOLUME OF VOIDS	282.24		
VOID RATIO	0.882		
SATURATION	84.9		

CORRECTED SAMPLE DATA	
DRY DENSITY, calc (pcf)	98.5
VOLUME OF SOLIDS	319.97
VOLUME OF VOIDS	231.24
VOID RATIO	0.723

WATER CONTENT (% MOISTURE)	
WT SOIL & TARE, MOIST (g)	1117.73
WT SOIL & TARE, DRY (g)	870.00
WT TARE (g)	0.00
WT MOISTURE (g)	247.73
WT DRY SOIL (g)	870.00
% MOISTURE	28.47

TIME (MIN)	ACCUM. DEFLECT. (inches)	AXIAL LOAD (lbs)	PORE PRESS. (psi)=U	PWP change DU (psf) (acc)	e % STRAIN (%)	(1-e)	CORR. AREA (in 2)	CORR. HEIGHT (in)	DEV. STRESS (psf)	SIGMA 1 devstr+cp (σ_1)	SIGMA 1 EFF. (σ_1-dU)	SIGMA 3 EFF. (σ_3-dU)	EFF.PRN STR RATIO (σ_1'/σ_3')	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)	(A)
0.0	0.000	20	70.8	0.0	0.00	1.00	5.66	5.946	0.0	3600.0	3600.0	3600.0	1.00	3600.0	0.0	0.00
1.0	0.003	28	71.8	144.0	0.05	1.00	5.66	5.943	203.5	3803.5	3659.5	3456.0	1.06	3557.8	101.8	0.71
2.0	0.006	41	73.8	432.0	0.10	1.00	5.66	5.940	534.0	4134.0	3702.0	3168.0	1.17	3435.0	267.0	0.81
3.0	0.009	55	75.0	604.8	0.15	1.00	5.67	5.937	889.6	4489.6	3884.8	2995.2	1.30	3440.0	444.8	0.68
4.0	0.012	62	75.7	705.6	0.20	1.00	5.67	5.934	1067.0	4667.0	3961.4	2894.4	1.37	3427.9	533.5	0.66
5.0	0.015	66	76.1	763.2	0.25	1.00	5.67	5.931	1168.0	4768.0	4004.8	2836.8	1.41	3420.8	584.0	0.65
8.3	0.025	78	77.3	936.0	0.42	1.00	5.68	5.921	1470.2	5070.2	4134.2	2664.0	1.55	3399.1	735.1	0.64
16.7	0.050	94	79.4	1238.4	0.84	0.99	5.71	5.896	1867.8	5467.8	4229.4	2361.6	1.79	3295.5	933.9	0.66
25.0	0.075	105	80.9	1454.4	1.26	0.99	5.73	5.871	2136.4	5736.4	4282.0	2145.6	2.00	3213.8	1068.2	0.68
33.3	0.100	112	81.8	1584.0	1.68	0.98	5.75	5.846	2302.5	5902.5	4318.5	2016.0	2.14	3167.2	1151.2	0.69
41.7	0.125	119	82.6	1699.2	2.10	0.98	5.78	5.821	2467.1	6067.1	4367.9	1900.8	2.30	3134.3	1233.5	0.69
50.0	0.150	123	83.1	1771.2	2.52	0.97	5.80	5.796	2555.7	6155.7	4384.5	1828.8	2.40	3106.7	1277.9	0.69
58.3	0.175	127	83.5	1828.8	2.94	0.97	5.83	5.771	2643.5	6243.5	4414.7	1771.2	2.49	3093.0	1321.8	0.69
66.7	0.200	131	83.9	1886.4	3.36	0.97	5.85	5.746	2730.5	6330.5	4444.1	1713.6	2.59	3078.8	1365.2	0.69
83.3	0.250	137	84.2	1929.6	4.20	0.96	5.91	5.696	2853.0	6453.0	4523.4	1670.4	2.71	3096.9	1426.5	0.68
100.0	0.300	143	84.5	1972.8	5.05	0.95	5.96	5.646	2973.0	6573.0	4600.2	1627.2	2.83	3113.7	1486.5	0.66
116.7	0.350	148	84.7	2001.6	5.89	0.94	6.01	5.596	3066.5	6666.5	4664.9	1598.4	2.92	3131.6	1533.2	0.65
133.3	0.400	152	84.8	2016.0	6.73	0.93	6.07	5.546	3134.0	6734.0	4718.0	1584.0	2.98	3151.0	1567.0	0.64
150.0	0.450	157	84.8	2016.0	7.57	0.92	6.12	5.496	3223.4	6823.4	4807.4	1584.0	3.03	3195.7	1611.7	0.63
166.7	0.500	161	84.7	2001.6	8.41	0.92	6.18	5.446	3287.3	6887.3	4885.7	1598.4	3.06	3242.1	1643.7	0.61
183.3	0.550	164	84.6	1987.2	9.25	0.91	6.23	5.396	3326.5	6926.5	4939.3	1612.8	3.06	3276.0	1663.2	0.60
207.0	0.621	169	84.6	1987.2	10.44	0.90	6.32	5.325	3396.7	6996.7	5009.5	1612.8	3.11	3311.1	1698.3	0.59
216.7	0.650	171	84.4	1958.4	10.93	0.89	6.35	5.296	3423.5	7023.5	5065.1	1641.6	3.09	3353.4	1711.8	0.57
239.3	0.718	175	84.3	1944.0	12.08	0.88	6.43	5.228	3469.1	7069.1	5125.1	1656.0	3.09	3390.5	1734.5	0.56
250.0	0.750	178	84.1	1915.2	12.61	0.87	6.47	5.196	3514.6	7114.6	5199.4	1684.8	3.09	3442.1	1757.3	0.54
266.7	0.800	180	84.1	1915.2	13.45	0.87	6.54	5.146	3524.8	7124.8	5209.6	1684.8	3.09	3447.2	1762.4	0.54
283.3	0.850	182	83.9	1886.4	14.30	0.86	6.60	5.096	3534.2	7134.2	5247.8	1713.6	3.06	3480.7	1767.1	0.53
300.0	0.900	185	83.7	1857.6	15.14	0.85	6.67	5.046	3564.3	7164.3	5306.7	1742.4	3.05	3524.6	1782.2	0.52
320.3	0.961	188	83.5	1828.8	16.16	0.84	6.75	4.985	3585.3	7185.3	5356.5	1771.2	3.02	3563.8	1792.6	0.51
333.3	1.000	190	83.3	1800.0	16.82	0.83	6.80	4.946	3599.6	7199.6	5399.6	1800.0	3.00	3599.8	1799.8	0.50

DU @ FAILURE	2001.6	DEVIATORIC STRESS @ FAILURE	3287.3	EFFECTIVE PRINCIPLE STRESS RATIO @ FAILURE	3.06	TECH	NA/PWM
						DATE	6/7/01
						CHECKED	
						REVIEWED	

TRIAXIAL COMPRESSION TEST (ASTM D-47 NSOLIDATED UNDRAINED WITH PORE PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	TP - 4	-
SAMPLE TYPE	Bulk	
DEPTH INTERVAL	-	
MACHINE SPEED (in/min)	0.0006	
STRAIN RATE (%/min)	0.010	
CELL PRESSURE (psi)	110.0	
SAMPLE PRESSURE (psi)	70.0	
EFF. CONSOLIDATION		
PRESSURE, σ_3 (psi)	40.0	
PRESSURE, σ_3 (psf)	5760.0	
FINAL "B" VALUE	0.98	
t_{50} (minutes)	28.27	

INITIAL SAMPLE DATA	cm	in	corrected
HEIGHT	15.270	6.012	5.907
DIAMETER	7.087	2.790	2.710
AREA	39.44	6.11	5.77
VOLUME	602.31	36.76	34.07
WEIGHT (g)	1112.57		1102.57
% MOISTURE	28.8		27.61
SPECIFIC GRAVITY	2.72		
MOIST DENSITY (pcf)	115.3		
DRY DENSITY, calc (pcf)	89.5		
VOLUME OF SOLIDS	317.76		
VOLUME OF VOIDS	284.54		
VOID RATIO	0.895		
SATURATION	87.4		

CORRECTED SAMPLE DATA	
DRY DENSITY, calc (pcf)	96.6
VOLUME OF SOLIDS	317.76
VOLUME OF VOIDS	240.54
VOID RATIO	0.757

WATER CONTENT (% MOISTURE)	
WT SOIL & TARE, MOIST (g)	1102.57
WT SOIL & TARE, DRY (g)	864.00
WT TARE (g)	0.00
WT MOISTURE (g)	238.57
WT DRY SOIL (g)	864.00
% MOISTURE	27.61

TIME (MIN)	ACCUM. DEFLECT. (inches)	AXIAL LOAD (lbs)	PORE PRESS. (psi)=U	PWP change DU (psf) (acc)	e % STRAIN (%)	(1-e)	CORR. AREA (in 2)	CORR. HEIGHT (in)	DEV. STRESS (psf)	SIGMA 1 devstr+cp (σ_1)	SIGMA 1 EFF. (σ_1-dU)	SIGMA 3 EFF. (σ_3-dU)	EFF.PRN STR RATIO (σ_1'/σ_3')	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)	(A)
0.0	0.000	25	70.5	0.0	0.00	1.00	5.77	5.907	0.0	5760.0	5760.0	5760.0	1.00	5760.0	0.0	0
5.0	0.003	67	74.7	604.8	0.05	1.00	5.77	5.904	1048.1	6808.1	6203.3	5155.2	1.20	5679.2	524.0	0.58
10.0	0.006	87	76.7	892.8	0.10	1.00	5.77	5.901	1546.3	7306.3	6413.5	4867.2	1.32	5640.4	773.2	0.58
15.0	0.009	94	77.4	993.6	0.15	1.00	5.78	5.898	1720.1	7480.1	6486.5	4766.4	1.36	5626.4	860.0	0.58
20.0	0.012	105	78.7	1180.8	0.20	1.00	5.78	5.895	1993.3	7753.3	6572.5	4579.2	1.44	5575.8	996.6	0.59
25.0	0.015	111	79.4	1281.6	0.25	1.00	5.78	5.892	2141.7	7901.7	6620.1	4478.4	1.48	5549.2	1070.8	0.60
41.7	0.025	128	81.6	1598.4	0.42	1.00	5.79	5.882	2560.7	8320.7	6722.3	4161.6	1.62	5441.9	1280.3	0.62
83.3	0.050	146	84.1	1958.4	0.85	0.99	5.82	5.857	2995.4	8755.4	6797.0	3801.6	1.79	5299.3	1497.7	0.65
125.0	0.075	167	86.7	2332.8	1.27	0.99	5.84	5.832	3500.2	9260.2	6927.4	3427.2	2.02	5177.3	1750.1	0.67
158.3	0.095	178	88.1	2534.4	1.61	0.98	5.86	5.812	3758.4	9518.4	6984.0	3225.6	2.17	5104.8	1879.2	0.67
216.7	0.130	191	89.5	2736.0	2.20	0.98	5.90	5.777	4053.2	9813.2	7077.2	3024.0	2.34	5050.6	2026.6	0.68
250.0	0.150	197	90.0	2808.0	2.54	0.97	5.92	5.757	4185.2	9945.2	7137.2	2952.0	2.42	5044.6	2092.6	0.67
291.7	0.175	203	90.5	2880.0	2.96	0.97	5.94	5.732	4312.4	10072.4	7192.4	2880.0	2.50	5036.2	2156.2	0.67
333.3	0.200	208	90.9	2937.6	3.39	0.97	5.97	5.707	4414.2	10174.2	7236.6	2822.4	2.56	5029.5	2207.1	0.67
416.7	0.250	218	91.3	2995.2	4.23	0.96	6.02	5.657	4614.6	10374.6	7379.4	2764.8	2.67	5072.1	2307.3	0.65
500.0	0.300	226	91.5	3024.0	5.08	0.95	6.08	5.607	4763.4	10523.4	7499.4	2736.0	2.74	5117.7	2381.7	0.63
583.3	0.350	234	91.6	3038.4	5.93	0.94	6.13	5.557	4908.8	10668.8	7630.4	2721.6	2.80	5176.0	2454.4	0.62
620.0	0.372	237	91.5	3024.0	6.30	0.94	6.16	5.535	4959.6	10719.6	7695.6	2736.0	2.81	5215.8	2479.8	0.61
666.7	0.400	246	91.2	2980.8	6.77	0.93	6.19	5.507	5144.0	10904.0	7923.2	2779.2	2.85	5351.2	2572.0	0.58
750.0	0.450	253	90.9	2937.6	7.62	0.92	6.24	5.457	5258.7	11018.7	8081.1	2822.4	2.86	5451.8	2629.4	0.56
833.3	0.500	255	90.8	2923.2	8.46	0.92	6.30	5.407	5256.2	11016.2	8093.0	2836.8	2.85	5464.9	2628.1	0.56
983.3	0.590	262	90.6	2894.4	9.99	0.90	6.41	5.317	5326.0	11086.0	8191.6	2865.6	2.86	5528.6	2663.0	0.54
1166.7	0.700	270	90.4	2865.6	11.85	0.88	6.54	5.207	5391.9	11151.9	8286.3	2894.4	2.86	5590.4	2696.0	0.53
1241.7	0.745	273	90.2	2836.8	12.61	0.87	6.60	5.162	5410.8	11170.8	8334.0	2923.2	2.85	5628.6	2705.4	0.52
1458.3	0.875	285	90.0	2808.0	14.81	0.85	6.77	5.032	5529.7	11289.7	8481.7	2952.0	2.87	5716.9	2764.9	0.51
1500.0	0.900	286	89.8	2779.2	15.24	0.85	6.80	5.007	5523.4	11283.4	8504.2	2980.8	2.85	5742.5	2761.7	0.50
1561.7	0.937	288	88.8	2635.2	15.86	0.84	6.86	4.970	5524.6	11284.6	8649.4	3124.8	2.77	5887.1	2762.3	0.48

DU @ FAILURE: 2937.6

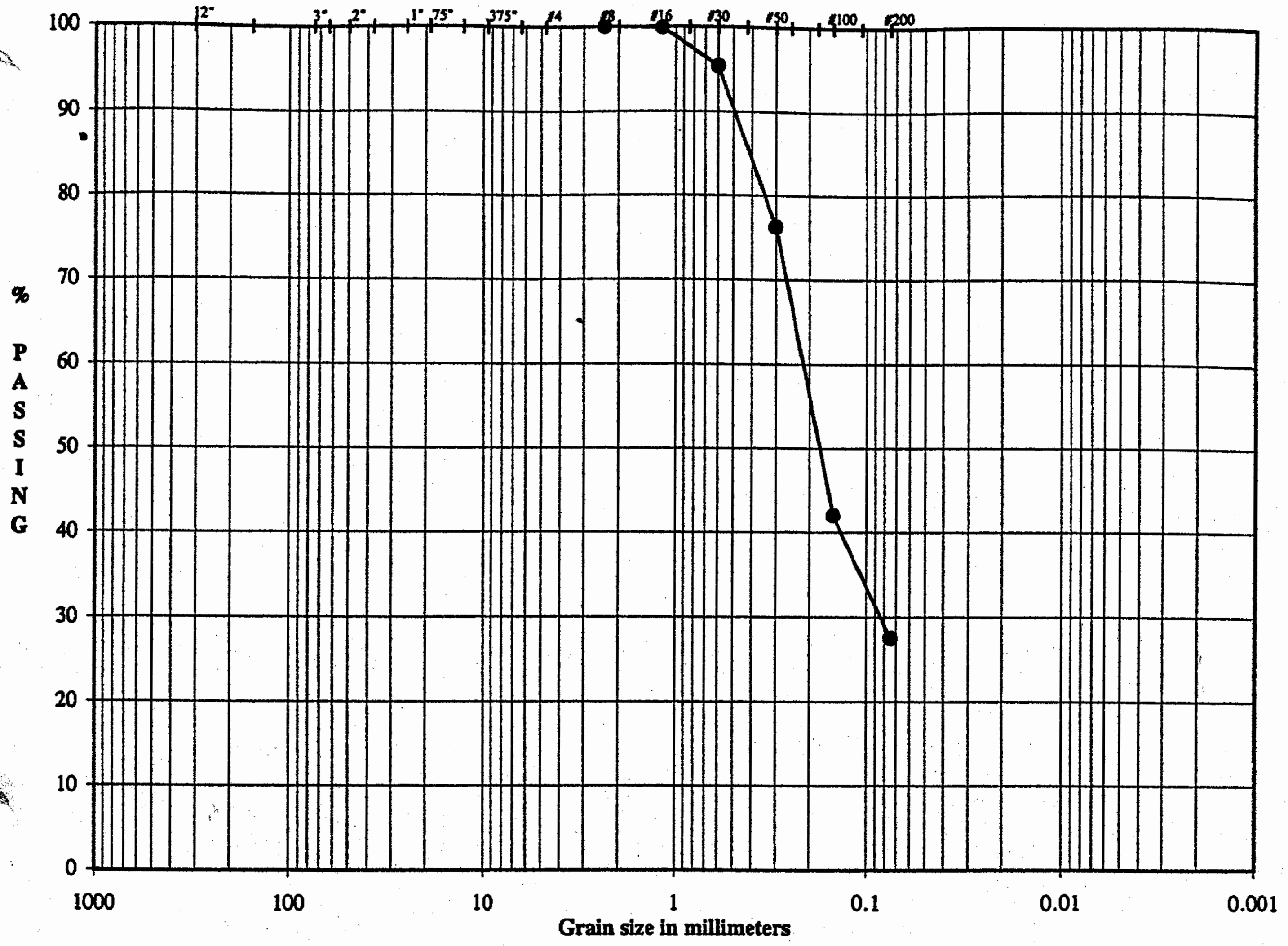
DEVIATORIC STRESS @ FAILURE: 5258.7

EFFECTIVE PRINCIPLE STRESS RATIO @ FAILURE: 2.86

TECH	NA/PWM
DATE	6/7/01
CHECKED	
REVIEWED	

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	TP-5	**LL**	-
SAMPLE TYPE	Bulk	**PL**	-
SAMPLE DEPTH	-	**PI**	-

DESCRIPTION Brown, FINE TO MEDIUM SAND, some clayey silt.

USCS (SM)

Cu = D60/D10 = 0.51/0.19 = 2.68 < 6

Cc = D30^2/(D60*D10) = 0.33^2/(0.51*0.19) = 1.12 > 1

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	PWM/TJ
DATE	5/18/01
CHECK	
REVIEW	PWM

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	TP-5 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bulk
REMARKS		**SAMPLE DEPTH**	-

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	
Wt Dry Soil & Tare (gm)	(w2)	
Weight of Tare (gm)	(w3)	
Weight of Water (gm)	(w4=w1-w2)	
Weight of Dry Soil (gm)	(w5=w2-w3)	
Moisture Content (%)	(w4/w5)*100	

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	356.77
	Tare Weight (gm)	84.41
(W6)	Total Dry Weight (gm)	272.36

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#8	0.00	0.00	0.00	100.00	#8	coarse sand
#16	0.28	0.28	0.10	99.90	#16	medium sand
#30	12.55	12.55	4.61	95.39	#30	medium sand
#50	64.63	64.63	23.73	76.27	#50	fine sand
#100	157.94	157.94	57.99	42.01	#100	fine sand
#200	197.27	197.27	72.43	27.57	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.02
% M SAND	14.10
% F SAND	58.31
% FINES	27.57
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, FINE TO MEDIUM SAND, some clayey silt.

USCS (SM)

TECH	PWM/TJ
DATE	5/18/01
CHECK	
REVIEW	

CONSTANT HEAD PERMEABILITY TEST
ASTM D 2434

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	TP-5	-
PROJECT NUMBER	013-3205	**SAMPLE TYPE**	Bulk	
REMARKS	-	**SAMPLE DEPTH**	-	

	TIME IN SECONDS	VOLUME (ml)	TEMP. °C	Q (ml/sec)	
1.	600	30	21.0	0.05	
2.	600	30	21.0	0.05	*
3.	600	30	21.0	0.05	*
4.	600	31	21.0	0.05	*

INITIAL UNIT WEIGHT DETERMINATION

APPARATUS & WET SAMPLE (g):	7435.0
APPARATUS WEIGHT (g):	3612.1
WET SAMPLE WEIGHT (g):	3822.9
SAMPLE LENGTH (in):	11.9
SAMPLE DIAMETER (in):	4.0
SAMPLE AREA (in²):	12.57
SAMPLE AREA (cm²):	81.07
SAMPLE VOLUME (in³):	149.16
SAMPLE VOLUME (ft³):	0.086
WET DENSITY IN (pcf):	97.6
DRY DENSITY IN (pcf):	89.1

INITIAL MOISTURE CONTENT

WET SAMPLE & TARE (g):	324.70
DRY SAMPLE & TARE (g):	300.75
WEIGHT OF TARE (g):	51.64
WEIGHT OF WATER (g):	23.95
DRY SAMPLE WEIGHT (g):	249.11
MOISTURE CONTENT (%):	9.61

FINAL DIMENSIONS

SAMPLE LENGTH (in):	11.8
SAMPLE DIAMETER (in):	4.0
AVERAGE Q VALUE (ml/sec):	0.05
AVERAGE TEMP (°C):	21.0
TEMPERATURE CORRECTION:	0.976
HEAD OF WATER (in):	5.7
HYDRAULIC GRADIENT (i):	0.48

K VALUE CORRECTED FOR 20 DEGREES C = 1.3E-03 cm/sec

TECH	TH
DATE	5/9/01
CHECK	
REVIEW	PVM

CARBONATE CONTENT
ASTM D 4373

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
REMARKS	-

SAMPLE ID	**TP - 5**	-	-
SPECIMEN NUMBER	$CaCO_3$ %	$CaCO_3$ %	$CaCO_3$ %
1	0	-	-
2	0	-	-
AVERAGE	0	-	-

SAMPLE ID	-	-	-
SPECIMEN NUMBER	$CaCO_3$ %	$CaCO_3$ %	$CaCO_3$ %
1	-	-	-
2	-	-	-
AVERAGE	-	-	-

SAMPLE ID	-	-	-
SPECIMEN NUMBER	$CaCO_3$ %	$CaCO_3$ %	$CaCO_3$ %
1	-	-	-
2	-	-	-
AVERAGE	-	-	-

SAMPLE ID	-	-	-
SPECIMEN NUMBER	$CaCO_3$ %	$CaCO_3$ %	$CaCO_3$ %
1	-	-	-
2	-	-	-
AVERAGE	-	-	-

TECH TJ
DATE 5/15/01
CHECK
REVIEW

MAY 2001

013-3205

GENESIS/PLUM POINT ENERGY/AR
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classification	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %		Moisture %	Dry (lb/cuft)		
B-1	UD	3.0-5.0'	CL	29.1	45	26	19	0.16	100.0	98.2	-	-	-	2.66	29.1	84.4	1.4E-04	U
B-4	UD	3.0-5.0'	CL	33.8	41	21	20	0.63	100.0	99.4	-	-	-	2.67	33.8	86.8	6.9E-08	U
B-7	UD	3.0-5.0'	CL	31.9	44	23	21	0.42	100.0	99.4	-	-	-	2.69	31.9	80.1	6.7E-04	U,C
B-10	UD	3.0-5.0'	ML	30.6	NP	NP	NP	NP	100.0	98.9	37.0	-	-	-	30.6	87.3	6.8E-07	-
B-21	UD	4.0-5.0'	CH	38.8	58	23	35	0.45	100.0	96.6	-	-	-	2.70	38.8	77.7	1.1E-04	T
B-26	UD	3.0-5.0'	CL	19.2	26	16	10	0.35	99.5	57.4	-	-	-	-	19.2	91.1	2.6E-04	U
B-29	UD	4.0-5.0'	CL	23.3	38	19	19	0.23	100.0	74.1	-	-	-	2.68	23.3	101.0	7.8E-08	-
B-33	UD	3.0-5.0'	SC	10.4	22	13	9	-0.34	100.0	21.0	-	-	-	2.65	-	-	-	-
B-41	UD	3.0-5.0'	CL	35.4	45	21	24	0.60	100.0	95.0	43.0	-	-	2.67	-	-	-	T
B-43	UD	3.0-5.0'	CL	34.3	44	21	23	0.59	100.0	99.0	-	-	-	2.67	34.3	85.1	1.0E-06	U
B-44	UD	3.0-5.0'	CL	30.5	44	21	23	0.42	100.0	98.8	-	-	-	2.68	30.5	83.2	2.0E-04	T
B-51	UD	3.0-5.0'	CH	35.7	61	31	30	0.16	100.0	95.4	-	-	-	2.68	35.7	84.9	3.7E-08	U,C
B-54	UD	7.0-10.0'	CH	44.2	74	26	48	0.39	100.0	98.0	-	-	-	2.69	48.3	71.7	2.6E-07	T
B-55	UD	3.0-5.0'	CL	32.4	33	23	10	0.96	100.0	93.7	-	-	-	2.68	32.4	89.1	4.1E-07	U

ABBREVIATIONS:
LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES:
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME:	GENESIS/PLUM POINT ENERGY/AR		
PROJECT NUMBER:	013-3205		
SAMPLE ID:	B-1 -	**SAMPLE DEPTH:**	3.0 -5.0'
SAMPLE TYPE:	UD		

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				28	28	
Weight of Wet Soil & Tare (gm)	22.08	20.40	18.91	22.39	20.61	350.75
Weight of Dry Soil & Tare (gm)	19.92	18.49	17.36	16.84	15.65	271.71
Weight of Tare (gm)	11.70	11.23	11.38	4.28	4.34	0.00
Weight of Water (gm)	2.16	1.91	1.55	5.55	4.96	79.04
Weight of Dry Soil (gm)	8.22	7.26	5.98	12.56	11.31	271.71
Water Content %	26.28	26.31	25.92	44.19	43.85	29.09

	TRIAL 1	TRIAL 2
BLOWS:	28	28
K VALUE:	1.014	1.014

PLASTIC LIMIT (PL): 26

LIQUID LIMIT (LL): 45

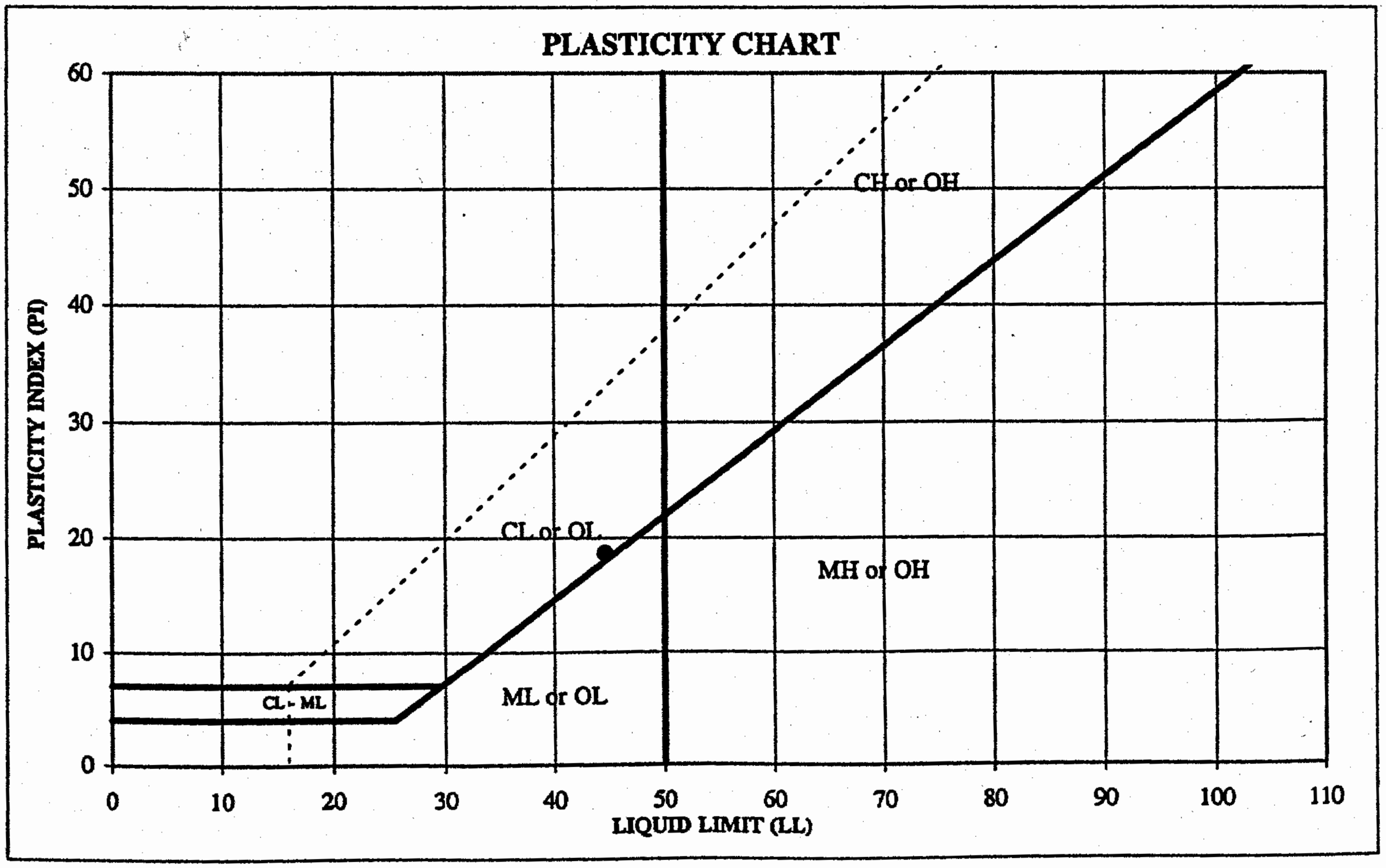
PLASTICITY INDEX (PI): 19

LIQUIDITY INDEX (LI): 0.16

NOTE:

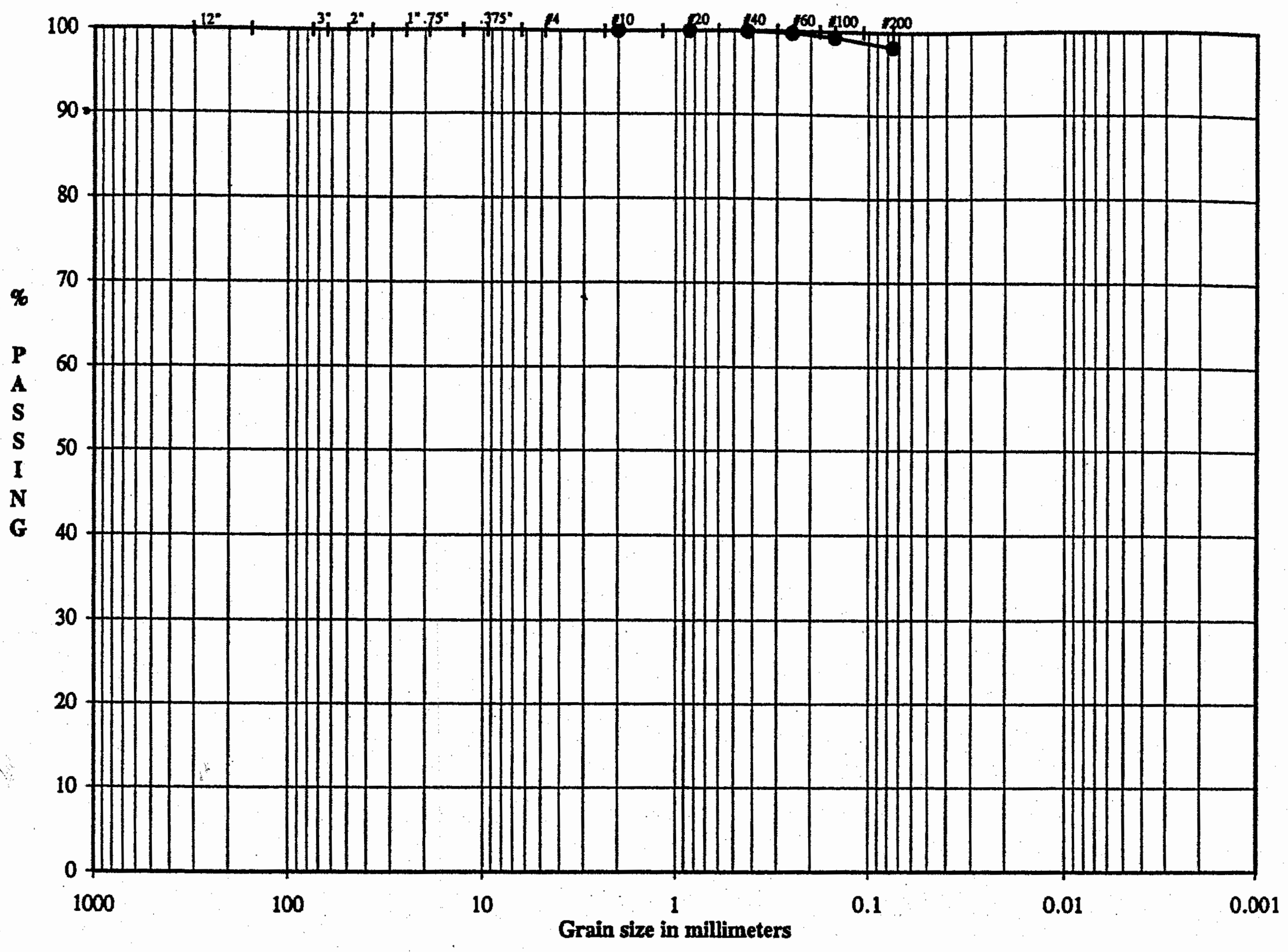
DESCRIPTION: Dark Olive Brown, SILTY CLAY, trace fine sand.

USCS: CL



TECH: DH
DATE: 5/3/01
CHECK:
REVIEW:

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-1		**LL**	45
SAMPLE TYPE	UD		**PL**	26
SAMPLE DEPTH	3.0 - 5.0'		**PI**	19

DESCRIPTION Dark Olive Brown, SILTY CLAY, trace fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	TJ
DATE	5/2/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-1 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	350.75
Wt Dry Soil & Tare (gm)	(w2)	271.71
Weight of Tare (gm)	(w3)	0.00
Weight of Water (gm)	(w4=w1-w2)	79.04
Weight of Dry Soil (gm)	(w5=w2-w3)	271.71
Moisture Content (%)	(w4/w5)*100	29.09

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	128.50
	Tare Weight (gm)	51.95
(W6)	Total Dry Weight (gm)	76.55

SIEVE ANALYSIS

Tare Weight
0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.03	0.03	0.04	99.96	#20	medium sand
#40	0.08	0.08	0.10	99.90	#40	fine sand
#60	0.22	0.22	0.29	99.71	#60	fine sand
#100	0.52	0.52	0.68	99.32	#100	fine sand
#200	1.36	1.36	1.78	98.22	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.10
% F SAND	1.67
% FINES	98.22
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	45
PL	26
PI	19
Gs	2.658

DESCRIPTION Dark Olive Brown, SILTY CLAY, trace fine sand.

USCS CL

TECH	TJ
DATE	5/2/01
CHECK	
REVIEW	

FLEXIBLE WALL TRIAXIAL PERMEABILITY
ASTM D 5084
METHOD C, FALLING HEAD W/INCREASING TAILWATER PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR		**Using Pipettes Only**	NO		**COMMENTS**
PROJECT NUMBER	013-3205		**Using Pipettes & Burrettes**	YES		
SAMPLE ID	B-1	3.0 - 5.0'	**BOARD#** 8	**TECH**	KBG	
SAMPLE TYPE	UD		**CELL #** 8	**DATE**	5/2/01	

Sample Data, Initial				**Sample Data, Final**	
Height, inches	1.957			Height, inches	1.952
Diameter, inches	2.824	B-Value,f	1.00	Diameter, inches	2.824
Area, cm^2	40.41	Cell Pres	85.00	Area, cm^2	40.41
Volume, cm^3	200.87	Bot. Pres.	80.50	Volume, cm^3	200.35
Mass, g	350.75	Top Pres.	80.00	Mass, g	366.92
Moisture Content, %	29.09	Head, cm	35.17	Moisture Content %	35.04
Dry Density, pcf	84.41	Max. Grad.	11.86	Dry Density, pcf	84.62
Spec. Gravity	2.658	Min. Grad.	9.06	Saturation	97.0%
Volume Solids, cm^3	102.22	Max. E.S.	5.00	Inflow Volume per (1 cc)	5.40
Volume Voids, cm^3	98.65	Min. E.S.	4.50	Outflow Volume per (1 cc)	5.40
Void Ratio	0.97				
Saturation	80.1%				

Water Contents	**Initial**	**Final**
Wt soil&tare, i	350.75	418.68
Wt soil&tare, f	271.71	323.53
Wt Tare	0.00	52.01
Wt Moisture Lost	79.04	95.15
Wt Dry Soil	271.71	271.52
Water Content	29.09%	35.04%

DESCRIPTION Dark Olive Brown, SILTY CLAY, trace fine sand.

USCS CL

TIME FUNCTION			READINGS			TIME IN MINUTES & SECONDS						VOLUME		PERMEABILITY
DATE	HOUR	MIN	Inflow (cc)	Outflow (cc)	Temp.	dt (min)	dt (sec)	dt, acc (sec)	Head (cm)	(H1/H2) (inc.)	Gradient	Inflow (cc)	Outflow (cc)	@ 20 Degrees C (cm/sec)
5/2/01	9	52	0.00	25.00	19.5	0.0	0	0	58.79		11.86	0.00	0.00	0.0
5/2/01	9	53	1.10	23.90	19.5	1.0	60	60	56.70	1.04	11.44	5.94	5.94	1.66E-04
5/2/01	9	54	2.10	22.90	19.5	1.0	60	120	54.79	1.03	11.05	5.40	5.40	1.56E-04
5/2/01	9	55	2.90	22.00	19.5	1.0	60	180	53.18	1.03	10.73	4.32	4.86	1.37E-04
5/2/01	9	56	3.80	21.20	19.5	1.0	60	240	51.56	1.03	10.40	4.86	4.32	1.41E-04
5/2/01	9	57	4.50	20.50	19.5	1.0	60	300	50.23	1.03	10.13	3.78	3.78	1.20E-04
5/2/01	9	58	5.30	19.70	19.5	1.0	60	360	48.71	1.03	9.82	4.32	4.32	1.41E-04 *
5/2/01	9	59	5.90	19.00	19.5	1.0	60	420	47.47	1.03	9.57	3.24	3.78	1.17E-04 *
5/2/01	10	0	6.50	18.40	19.5	1.0	60	480	46.33	1.02	9.34	3.24	3.24	1.11E-04 *
5/2/01	10	1	7.20	17.60	19.5	1.0	60	540	44.90	1.03	9.06	3.78	4.32	1.43E-04 *

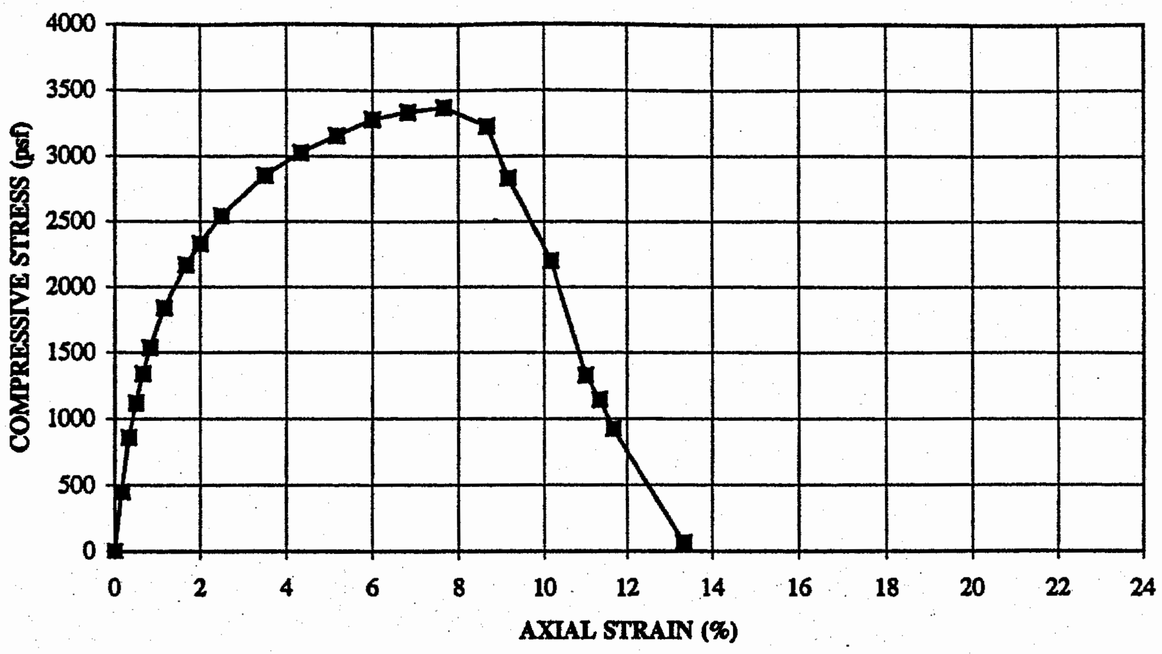
Inflow Rate	0.072000
Outflow Rate	0.074000
Outflow/Inflow Ratio	1.03

PERMEABILTIY REPORTED AS 1.4E-04 cm/sec

DATE	5/2/01
CHECK	DA
REVIEW	

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

UNCONFINED COMPRESSIVE STRENGTH OF SOILS
STRESS-STRAIN - ASTM D 2166



DESCRIPTION	LL	PL	PI	SAMPLE ID
Dark Olive Brown, SILTY CLAY, trace medium to fine sand.	45	26	19	B - 1
	SAMPLE TYPE		UD	3.0 - 5.0'

USCS	CL

SAMPLE DATA

Wet Density (pcf)	116.7
Dry Density (pcf)	90.4
Moisture Content	29.1%

TIME TO FAILURE (min)	7.7
STRAIN @ FAILURE (%)	7.7
TYPE OF FAILURE	SHEAR

UNCONFINED COMPRESSIVE STRENGTH (psf)	3370.7
SHEAR STRENGTH (psf)	1685.3

013-3205
GENESIS/PLUM POINT ENERGY/AR

TECH	DA
DATE	5/3/01
CHECK	DA
REVIEW	

UNCONFINED COMPRESSIVE STRENGTH OF SOILS

ASTM D 2166

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B - 1
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

SAMPLE DATA

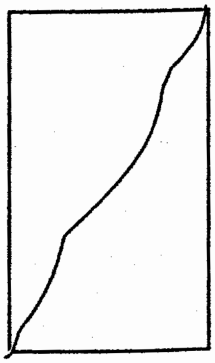
Height (in)	6.000
Diameter (in)	2.817
Height/Diameter Ratio	2.13
Area (in^2)	6.23
Volume (ft^3)	0.0216
Weight (gm)	1146.36
Wet Density (pcf)	116.73
Dry Density (pcf)	90.42
Machine Speed (in/min)	0.06
Strain rate (%/min)	1.00

WATER CONTENT	BEFORE SHEAR (entire)	AFTER SHEAR (partial)
Tare No.	SQ-8	SQ-8
Wt. Wet Soil & Tare (gm)	1146.36	350.75
Wt. Dry Soil & Tare (gm)	888.02	271.71
Wt. Tare (gm)	0.00	0.00
Wt. Moisture (gm)	258.34	79.04
Wt. Dry Soil (gm)	888.02	271.71
Moisture (%)	29.09%	29.09%

TIME (min)	DEFLECT (inch)	FORCE (lbs)	% STRAIN (in/in)	Ac (in^2)	COMPRESSIVE STRESS (psf)	(psi)
0.0	0.000	0	0.00	6.23	0.00	0.00
0.2	0.010	20	0.17	6.24	449.79	3.12
0.3	0.020	37	0.33	6.25	861.23	5.98
0.5	0.030	49	0.50	6.26	1119.57	7.77
0.7	0.040	58	0.67	6.27	1340.32	9.31
0.8	0.050	67	0.83	6.28	1537.40	10.68
1.2	0.070	81	1.17	6.31	1838.22	12.77
1.7	0.100	95	1.67	6.34	2167.45	15.05
2.0	0.120	103	2.00	6.36	2332.18	16.20
2.5	0.150	113	2.50	6.39	2545.55	17.68
3.5	0.210	128	3.50	6.46	2853.89	19.82
4.3	0.260	137	4.33	6.51	3028.17	21.03
5.2	0.310	144	5.17	6.57	3155.17	21.91
6.0	0.360	151	6.00	6.63	3279.47	22.77
6.8	0.410	155	6.83	6.69	3336.50	23.17
7.7	0.460	158	7.67	6.75	3370.66	23.41
8.7	0.520	153	8.67	6.82	3228.64	22.42
9.2	0.550	135	9.17	6.86	2833.21	19.68
10.2	0.610	106	10.17	6.94	2200.10	15.28
11.0	0.660	65	11.00	7.00	1330.43	9.24
11.3	0.680	56	11.33	7.03	1143.13	7.94
11.7	0.700	45	11.67	7.06	926.57	6.43
13.3	0.800	3	13.33	7.19	65.08	0.45
				UNCONFINED COMPRESSIVE STRENGTH	3370.66	23.41
				SHEAR STRENGTH	1685.33	11.70

TIME TO FAILURE (min)	7.67
STRAIN @ FAILURE (%)	7.67
TYPE OF FAILURE	SHEAR

FAILURE SKETCH



Description Dark Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

LL	45
PL	26
PI	19

TECH	DA
DATE	5/3/01
CHECK	DA
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-4 - **SAMPLE DEPTH:** 3.0 - 5.0'
SAMPLE TYPE: UD

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION	
Number of Blows				25	25
Weight of Wet Soil & Tare (gm)	21.06	23.13	20.13	23.12	21.49
Weight of Dry Soil & Tare (gm)	19.44	21.11	18.61	17.66	16.54
Weight of Tare (gm)	11.72	11.85	11.48	4.31	4.29
Weight of Water (gm)	1.62	2.02	1.52	5.46	4.95
Weight of Dry Soil (gm)	7.72	9.26	7.13	13.35	12.25
Water Content %	20.98	21.81	21.32	40.90	40.41

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

NATURAL MOISTURE
510.63
381.54
0.00
129.09
381.54
33.83

PLASTIC LIMIT (PL): 21

LIQUID LIMIT (LL): 41

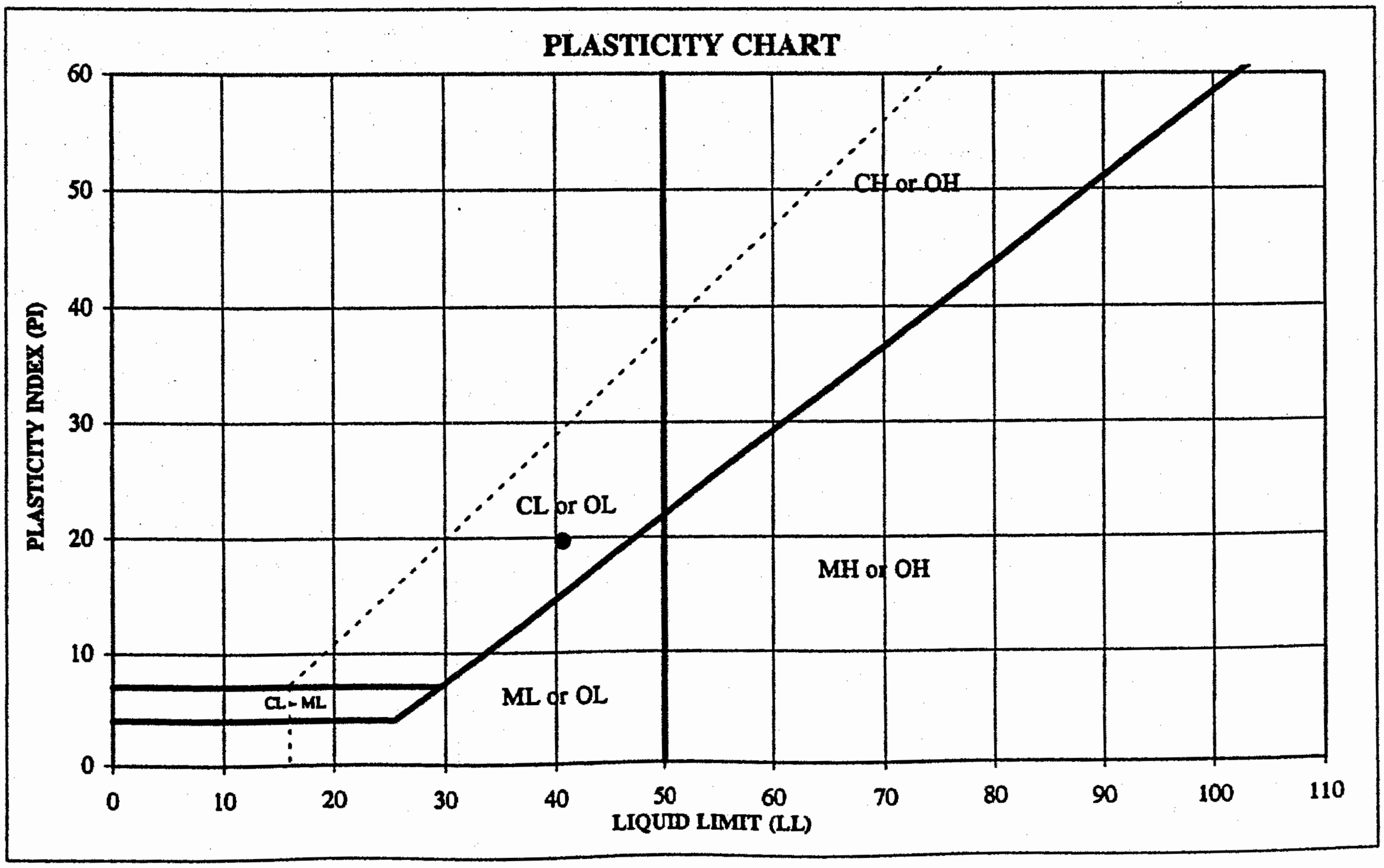
PLASTICITY INDEX (PI): 20

LIQUIDITY INDEX (LI): 0.63

NOTE:

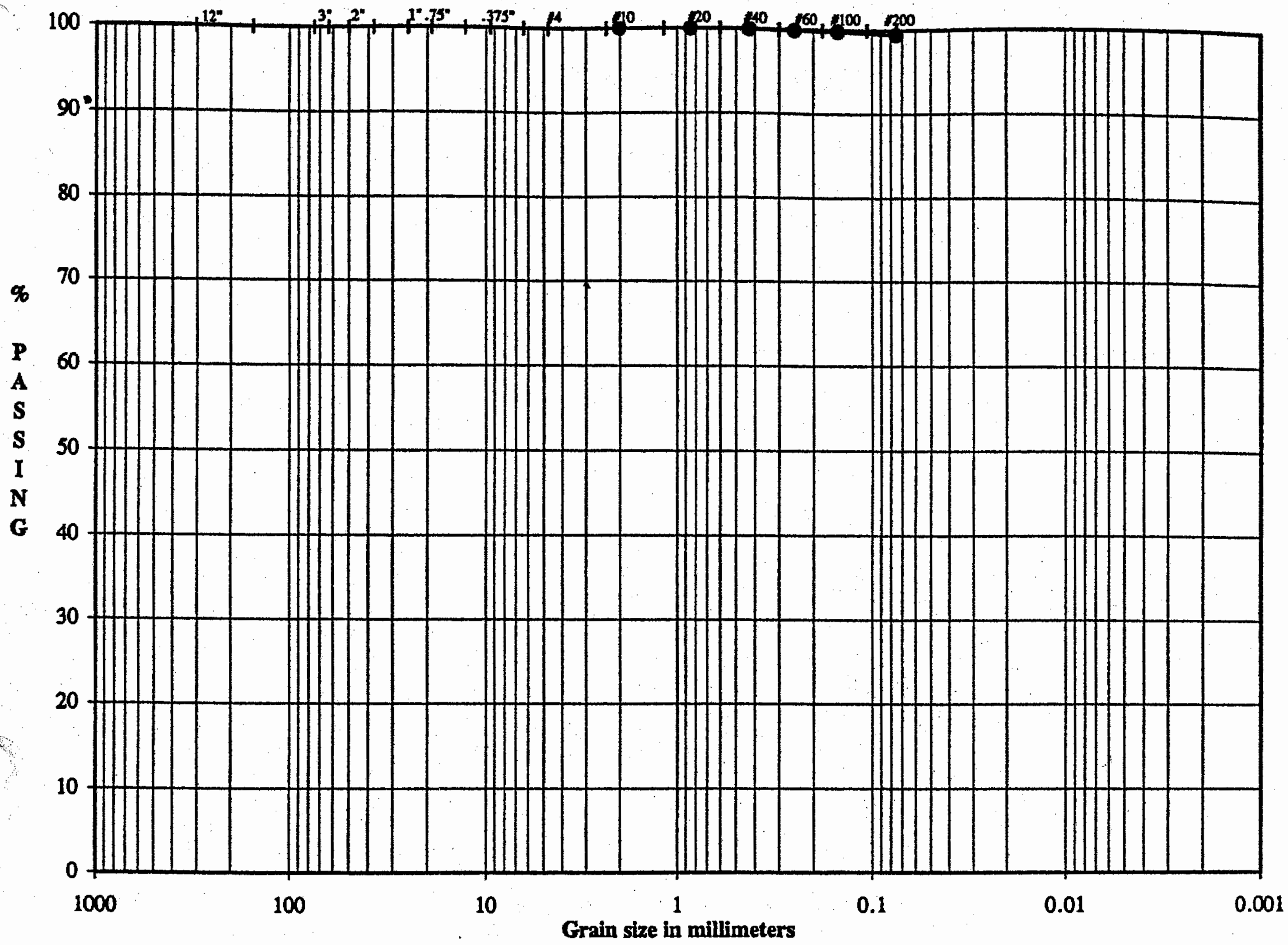
DESCRIPTION: Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS: CL



TECH: DR
DATE: 5/9/01
CHECK:
REVIEW:

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-4
SAMPLE TYPE	UD
SAMPLE DEPTH	3.0 - 5.0'

LL	41
PL	21
PI	20

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DA
DATE	5/3/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-4 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	510.63
Wt Dry Soil & Tare (gm)	(w2)	381.54
Weight of Tare (gm)	(w3)	0.00
Weight of Water (gm)	(w4=w1-w2)	129.09
Weight of Dry Soil (gm)	(w5=w2-w3)	381.54
Moisture Content (%)	(w4/w5)*100	33.83

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	324.79
	Tare Weight (gm)	84.66
(W6)	Total Dry Weight (gm)	240.13

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.05	0.05	0.02	99.98	#20	medium sand
#40	0.13	0.13	0.05	99.95	#40	fine sand
#60	0.30	0.30	0.12	99.88	#60	fine sand
#100	0.50	0.50	0.21	99.79	#100	fine sand
#200	1.35	1.35	0.56	99.44	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.05
% F SAND	0.51
% FINES	99.44
% TOTAL	100.00

Descriptive Terms	
trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	41
PL	21
PI	20
Gs	2.673

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

TECH	DA
DATE	5/3/01
CHECK	Hm
REVIEW	PWM

FLOW PUMP #1

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR				BOARD #	9
PROJECT NUMBER	013-3205				CELL #	9
SAMPLE ID	B-4	-	-	3.0 - 5.0'	Flow Pump Speed	9
SAMPLE TYPE	UD				Technician	KBG

COMMENTS

Sample Data, Initial

Height, inches	2.581	B-Value, f	1.00
Diameter, inches	2.873	Cell Pres.	85.0
Area, cm²	41.82	Bot. Pres.	80.0
Volume, cm^3	274.19	Top Pres.	80.0
Mass, g	510.63	Tot. B.P.	80.0
Moisture Content, %	33.83	Head, max.	128.02
Dry Density, pcf	86.83	Head, min.	128.02
Spec. Gravity	2.673	Max. Grad.	19.74
Volume Solids, cm^3	142.73	Min. Grad.	19.74
Volume Voids, cm^3	131.46		
Void Ratio	0.92		
Saturation, %	98.2%		

Sample Data, Final

Height, inches	2.553
Diameter, inches	2.846
Area, cm²	41.04
Volume, cm^3	266.14
Mass, g	507.91
Moisture Content, %	33.12
Dry Density, pcf	89.46
Volume Solids, cm^3	142.73
Volume Voids, cm^3	123.42
Void Ratio	0.86
Saturation, %	102.4%

WATER CONTENTS		Trimmings Initial	Sample Final
Wt Soil & Tare, i	g	510.63	558.85
Wt Soil & Tare, f	g	381.54	432.51
Wt Tare	g	0.00	51.06
Wt Moisture Lost	g	129.09	126.34
Wt Dry Soil	g	381.54	381.45
Water Content	%	33.83%	33.12%

DESCRIPTION

Olive Brown, SILTY CLAY, trace medium to fine sand.

Flow Pump Rate 5.70E-05 cm^3/sec

USCS CL

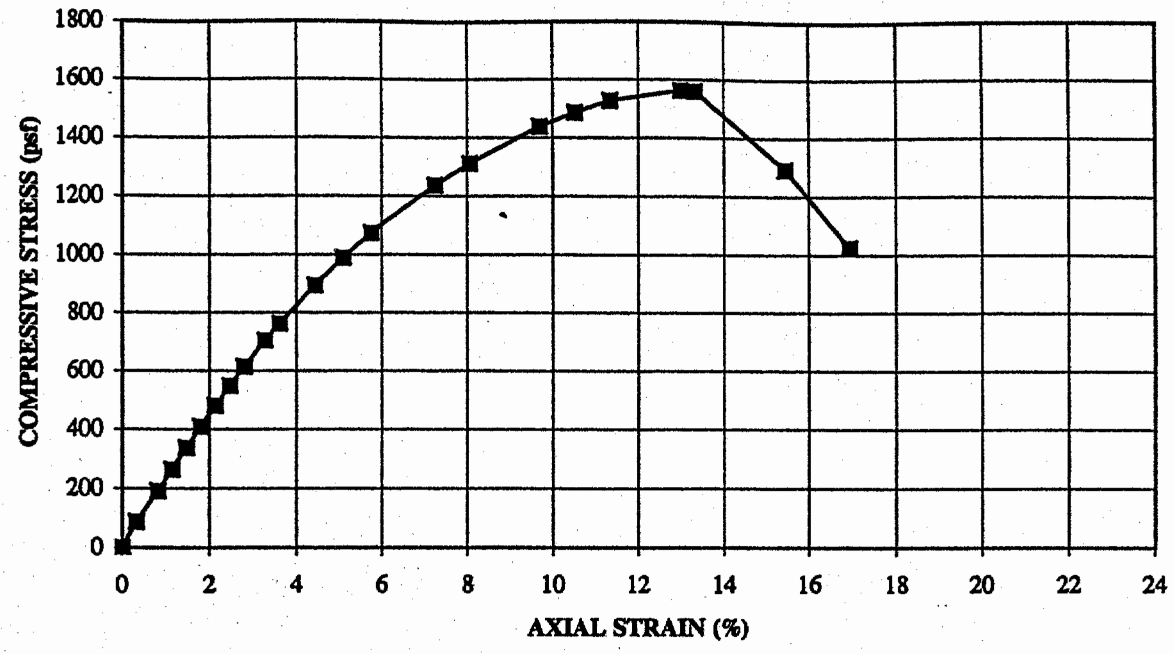
TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
5/4/01	37015	15	30	20.9	0	0	0	0	1.82	128.02	19.74	6.9E-08
5/4/01	37015	15	35	20.9	5	5	300	300	1.82	128.02	19.74	6.9E-08
5/4/01	37015	15	40	20.9	5	10	300	600	1.82	128.02	19.74	6.9E-08
5/4/01	37015	15	45	20.9	5	15	300	900	1.82	128.02	19.74	6.9E-08 *
5/4/01	37015	15	50	20.9	5	20	300	1200	1.82	128.02	19.74	6.9E-08 *
5/4/01	37015	15	55	20.9	5	25	300	1500	1.82	128.02	19.74	6.9E-08 *
5/4/01	37015	16	0	20.9	5	30	300	1800	1.82	128.02	19.74	6.9E-08 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 6.9E-08 cm/sec **

DATE 5/4/01
CHECK
REVIEW

UNCONFINED COMPRESSIVE STRENGTH OF SOILS
STRESS-STRAIN - ASTM D 2166



DESCRIPTION	LL	PL	PI	SAMPLE ID
Olive Brown, SILTY CLAY, trace medium to fine sand.	41	21	20	B - 4
	SAMPLE TYPE		UD	3.0 - 5.0'

USCS	CL

SAMPLE DATA

Wet Density (pcf)	118.2	TIME TO FAILURE (min)	13.2
Dry Density (pcf)	88.3	STRAIN @ FAILURE (%)	13.0
Moisture Content	33.8%	TYPE OF FAILURE	SHEAR

UNCONFINED COMPRESSIVE STRENGTH (psf)	1562.7
SHEAR STRENGTH (psf)	781.4

013-3205
GENESIS/PLUM POINT ENERGY/AR

TECH	DA
DATE	5/3/01
CHECK	DA
REVIEW	lwM

UNCONFINED COMPRESSIVE STRENGTH OF SOILS
ASTM D 2166

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B - 4
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

SAMPLE DATA

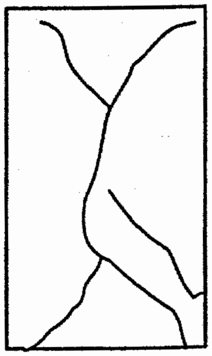
Height (in)	6.081
Diameter (in)	2.852
Height/Diameter Ratio	2.13
Area (in^2)	6.39
Volume (ft^3)	0.0225
Weight (gm)	1205.46
Wet Density (pcf)	118.16
Dry Density (pcf)	88.29
Machine Speed (in/min)	0.06
Strain rate (%/min)	0.99

WATER CONTENT	BEFORE SHEAR (entire)	AFTER SHEAR (partial)
Tare No.	SQ-8	-
Wt. Wet Soil & Tare (gm)	1205.46	510.63
Wt. Dry Soil & Tare (gm)	900.71	381.54
Wt. Tare (gm)	0.00	0.00
Wt. Moisture (gm)	304.75	129.09
Wt. Dry Soil (gm)	900.71	381.54
Moisture (%)	33.83%	33.83%

TIME (min)	DEFLECT (inch)	FORCE (lbs)	% STRAIN (in/in)	Ac (in^2)	COMPRESSIVE STRESS (psf)	COMPRESSIVE STRESS (psi)
0.0	0.000	0	0.00	6.39	0.00	0.00
0.3	0.020	4	0.33	6.41	86.84	0.60
0.8	0.050	9	0.82	6.44	190.83	1.33
1.2	0.070	12	1.15	6.46	262.59	1.82
1.5	0.090	15	1.48	6.48	336.23	2.33
1.8	0.110	18	1.81	6.51	409.41	2.84
2.2	0.130	22	2.14	6.53	480.24	3.33
2.5	0.150	25	2.47	6.55	548.32	3.81
2.8	0.170	28	2.79	6.57	614.61	4.27
3.3	0.199	32	3.27	6.60	704.69	4.89
3.7	0.220	35	3.62	6.63	762.30	5.29
4.5	0.270	42	4.44	6.69	895.16	6.22
5.2	0.310	46	5.10	6.73	988.32	6.86
5.8	0.350	50	5.75	6.78	1072.76	7.45
7.3	0.440	59	7.23	6.89	1237.22	8.59
8.2	0.490	63	8.06	6.95	1311.89	9.11
9.8	0.590	71	9.70	7.07	1438.20	9.99
10.7	0.640	74	10.52	7.14	1485.73	10.32
11.5	0.690	76	11.35	7.21	1526.75	10.60
13.2	0.790	80	12.99	7.34	1562.72	10.85
13.5	0.810	80	13.32	7.37	1560.49	10.84
15.7	0.940	68	15.46	7.56	1293.32	8.98
17.2	1.030	55	16.94	7.69	1024.38	7.11
				UNCONFINED COMPRESSIVE STRENGTH	1562.72	10.85
				SHEAR STRENGTH	781.36	5.43

TIME TO FAILURE (min)	13.20
STRAIN @ FAILURE (%)	12.99
TYPE OF FAILURE	SHEAR

FAILURE SKETCH



Description Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

LL	41
PL	21
PI	20

TECH	DA
DATE	5/3/01
CHECK	DA
REVIEW	

Golder Associates Inc.

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-7 - **SAMPLE DEPTH:** 3.0 - 5.0'
SAMPLE TYPE: UD

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION				NATURAL MOISTURE
Number of Blows				31	25	19	16	
Weight of Wet Soil & Tare (gm)	22.22	21.89	22.23	21.96	22.98	22.93	22.73	341.72
Weight of Dry Soil & Tare (gm)	20.24	19.86	20.20	17.37	17.22	17.81	16.77	259.17
Weight of Tare (gm)	11.73	11.01	11.40	6.64	4.29	6.73	4.31	0.00
Weight of Water (gm)	1.98	2.03	2.03	4.59	5.76	5.12	5.96	82.55
Weight of Dry Soil (gm)	8.51	8.85	8.80	10.73	12.93	11.08	12.46	259.17
Water Content %	23.27	22.94	23.07	42.78	44.55	46.21	47.83	31.85

PLASTIC LIMIT (PL): 23

LIQUID LIMIT (LL): 44

PLASTICITY INDEX (PI): 21

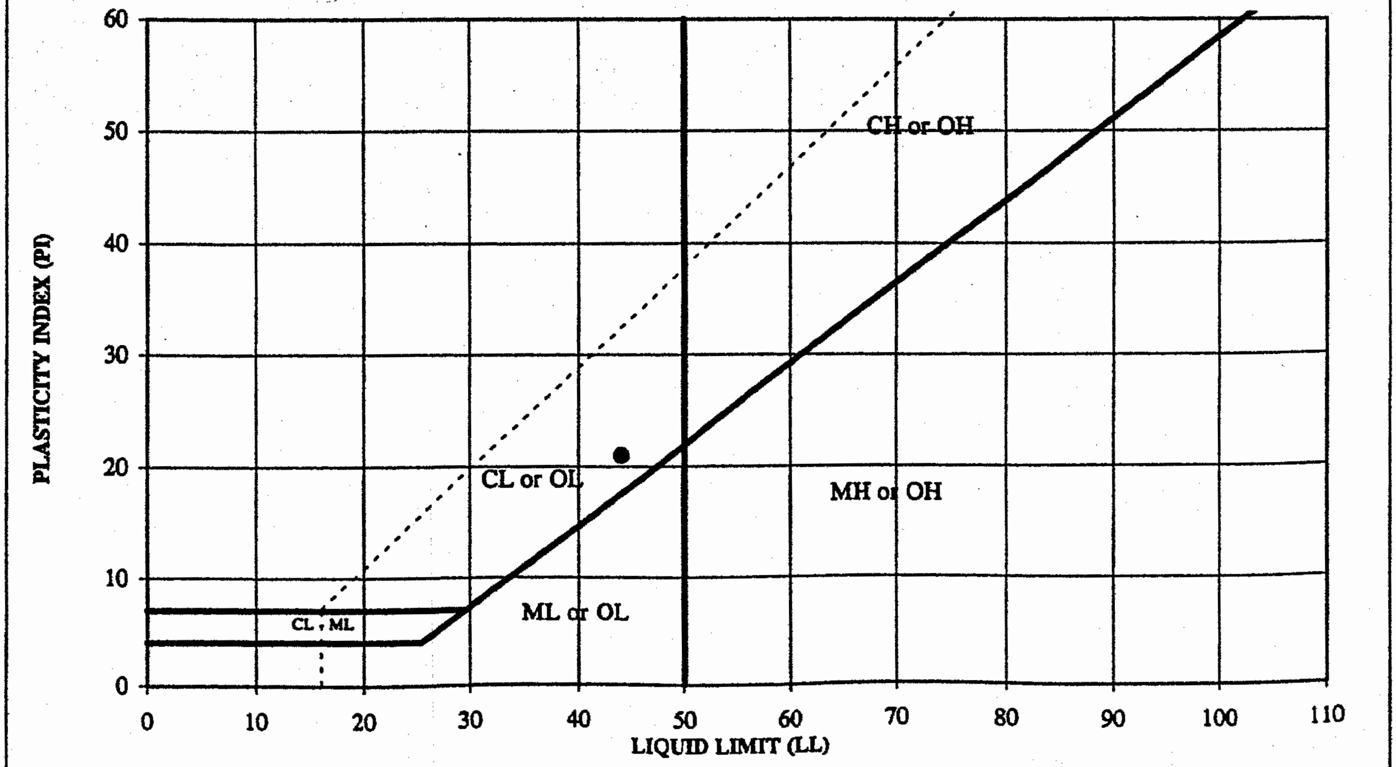
LIQUIDITY INDEX (LI): 0.42

NOTE:

DESCRIPTION: Brown, SILTY CLAY, trace medium to fine sand.

USCS: CL

PLASTICITY CHART



TECH: DR/TJ
DATE: 5/18/01
CHECK:
REVIEW:

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-7 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	341.72
Wt Dry Soil & Tare (gm)	(w2)	259.17
Weight of Tare (gm)	(w3)	0.00
Weight of Water (gm)	(w4=w1-w2)	82.55
Weight of Dry Soil (gm)	(w5=w2-w3)	259.17
Moisture Content (%)	(w4/w5)*100	31.85

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	254.70
	Tare Weight (gm)	108.09
(W6)	Total Dry Weight (gm)	146.61

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10					#10	medium sand
#20	0.00	0.00	0.00	100.00	#20	medium sand
#40	0.07	0.07	0.05	99.95	#40	fine sand
#60	0.15	0.15	0.10	99.90	#60	fine sand
#100	0.36	0.36	0.25	99.75	#100	fine sand
#200	0.89	0.89	0.61	99.39	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.05
% F SAND	0.56
% FINES	99.39
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

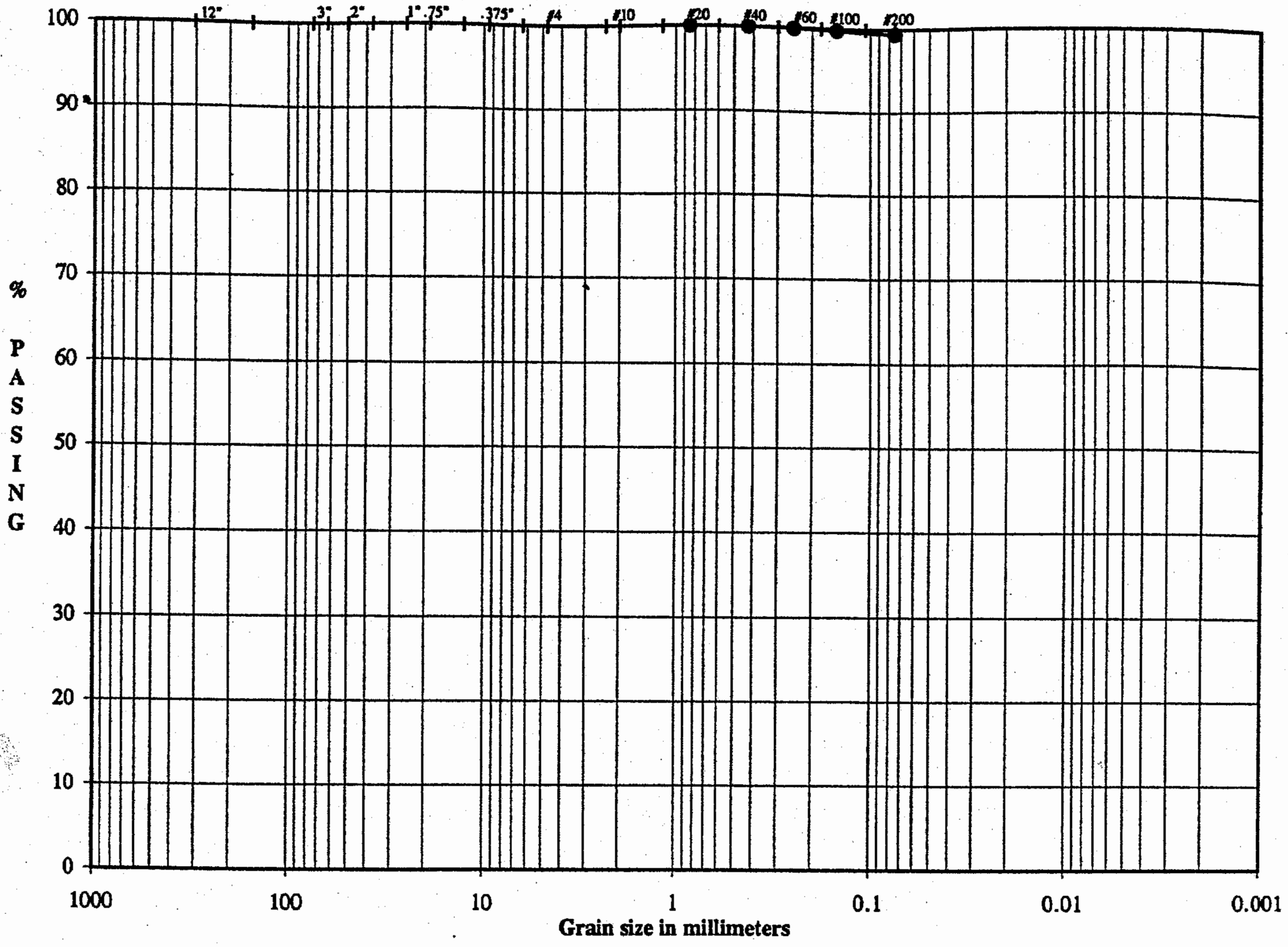
LL	44
PL	23
PI	21
Gs	-

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

TECH	DA/NA
DATE	5/15/01
CHECK	TMM
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-7
SAMPLE TYPE	UD
SAMPLE DEPTH	3.0 - 5.0'

LL	44
PL	23
PI	21

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DA/NA
DATE	5/15/01
CHECK	
REVIEW	

FLEXIBLE WALL TRIAXIAL PERMEABILITY
ASTM D 5084
METHOD C, FALLING HEAD W/INCREASING TAILWATER PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			Using Pipettes Only	YES
PROJECT NUMBER	013-3205			Using Pipettes & Burrettes	NO
SAMPLE ID	B-7	3.0 -5.0'	BOARD# 10	TECH	DA
SAMPLE TYPE	UD		CELL # 10	DATE	5/17/01

COMMENTS

Sample Data, Initial

Height, inches	1.946
Diameter, inches	2.840
Area, cm^2	40.87
Volume, cm^3	202.01
Mass, g	341.72
Moisture Content, %	31.85
Dry Density, pcf	80.06
Spec. Gravity	2.693
Volume Solids, cm^3	96.23
Volume Voids, cm^3	105.77
Void Ratio	1.10
Saturation	78.0%

B-Value,f	0.99
Cell Pres	85.00
Bot. Pres.	80.50
Top Pres.	80.00
Head, cm	35.17
Max. Grad.	11.99
Min. Grad.	4.25
Max. E.S.	5.00
Min. E.S.	4.50

Sample Data, Final

Height, inches	1.925
Diameter, inches	2.842
Area, cm^2	40.93
Volume, cm^3	200.11
Mass, g	356.16
Moisture Content %	37.43
Dry Density, pcf	80.82
Saturation	93.4%
Inflow Volume per (1 cc)	1.00
Outflow Volume per (1 cc)	1.00

Water Contents	Initial Trimmings	Final Partial Sample
Wt soil&tare, i	341.72	397.09
Wt soil&tare, f	259.17	300.23
Wt Tare	0.00	41.42
Wt Moisture Lost	82.55	96.86
Wt Dry Soil	259.17	258.81
Water Content	31.85%	37.43%

DESCRIPTION: Brown, SILTY CLAY, trace medium to fine sand.

USCS: CL

TIME FUNCTION			READINGS			TIME IN MINUTES & SECONDS						VOLUME		PERMEABILITY
DATE	HOUR	MIN	Inflow (cc)	Outflow (cc)	Temp.	dt (min)	dt (sec)	dt, acc (sec)	Head (cm)	(H1/H2) (inc.)	Gradient	Inflow (cc)	Outflow (cc)	@ 20 Degrees C (cm/sec)
5/17/01	11	17	0.00	25.00	19.4	0.0	0	0	58.62		11.99	0.00	0.00	0.0
5/17/01	11	17	4.80	20.00	19.4	0.3	15	15	49.62	1.18	10.15	4.80	5.00	6.37E-04
5/17/01	11	18	9.10	15.80	19.4	0.3	15	30	41.82	1.19	8.55	4.30	4.20	6.54E-04
5/17/01	11	18	12.50	12.40	19.4	0.3	15	45	35.58	1.18	7.28	3.40	3.40	6.18E-04 *
5/17/01	11	18	15.60	9.30	19.4	0.3	15	60	29.88	1.19	6.11	3.10	3.10	6.67E-04 *
5/17/01	11	18	18.20	6.50	19.4	0.3	15	75	24.93	1.20	5.10	2.60	2.80	6.94E-04 *
5/17/01	11	19	20.60	4.40	19.4	0.3	15	90	20.80	1.20	4.25	2.40	2.10	6.93E-04 *

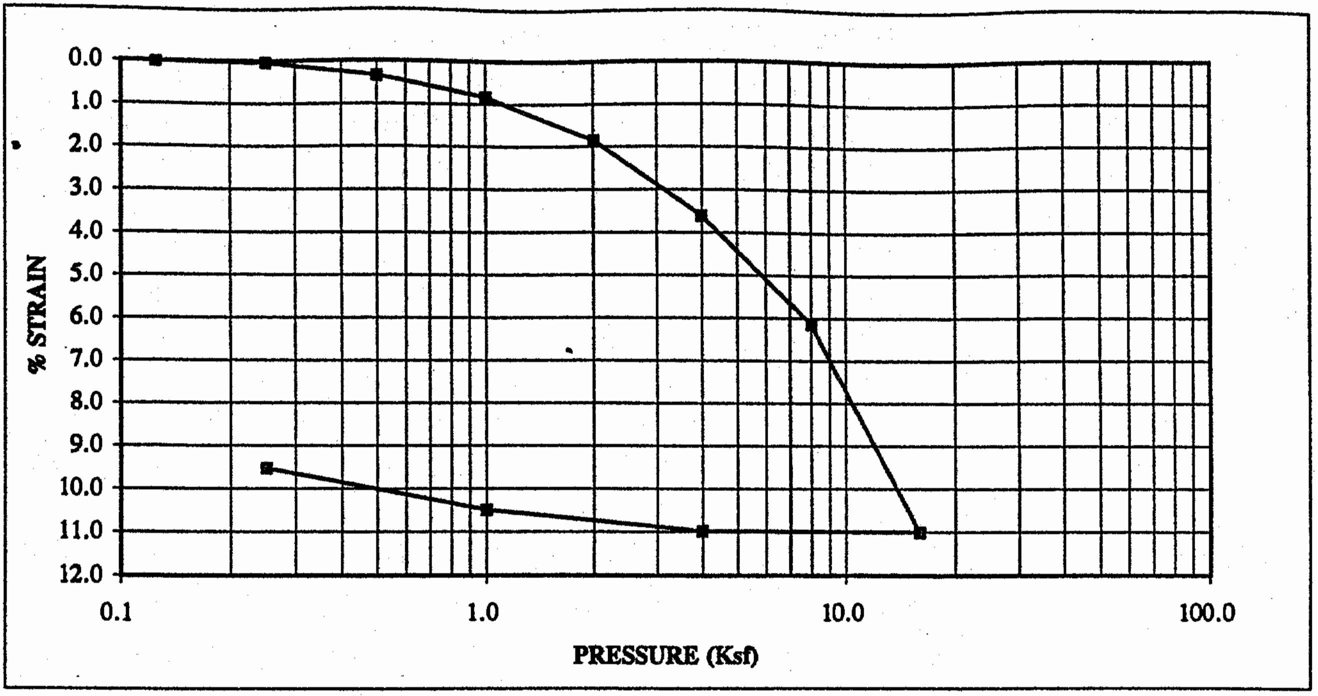
Inflow Rate	0.228889
Outflow Rate	0.228889
Outflow/Inflow Ratio	1.00

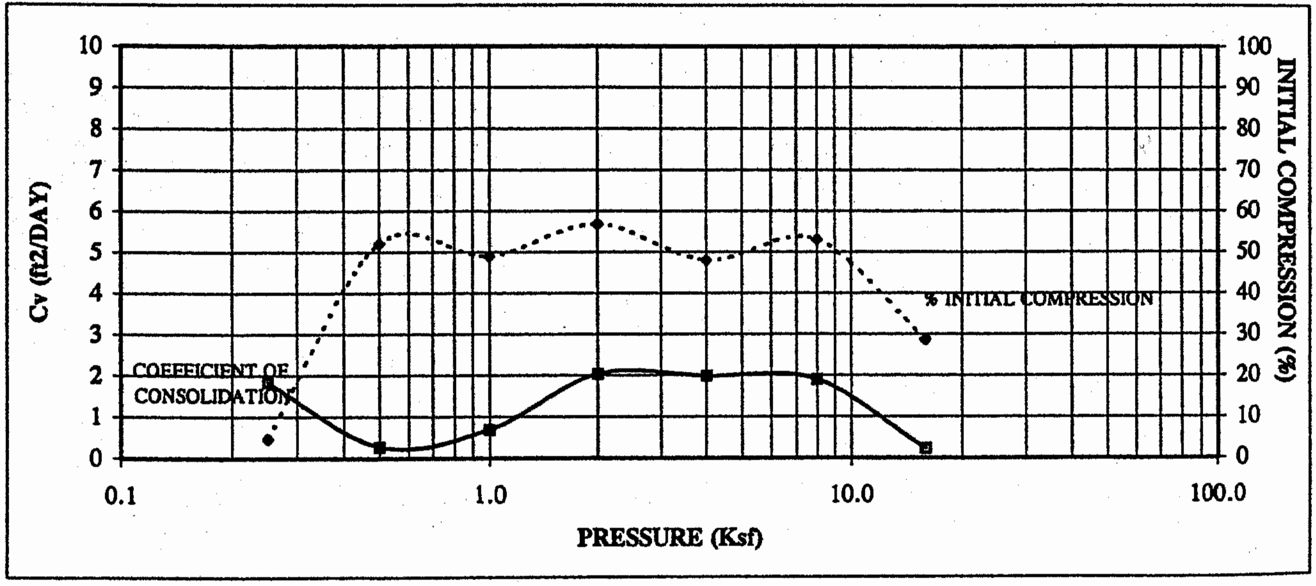
PERMEABILTIY REPORTED AS 6.7E-04 cm/sec

DATE 5/17/01
CHECK
REVIEW

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

ONE - DIMENSIONAL CONSOLIDATION
ASTM D 2435





SAMPLE ID	B-7
SAMPLE TYPE	UD
SAMPLE DEPTH	3.0 - 5.0'

LL	44
PL	23
PI	21
Gs	2.69

	Initial	Final
Dry Unit Weight (pcf)	86.6	94.2
Wet Unit Weight (pcf)	114.1	121.2
Moisture Content	31.8%	28.7%
Void Ratio	0.9408	0.7845
Degree of Saturation	91.0%	98.4%

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH DH/PWM
DATE 5/9/01
CHECK
REVIEW

ONE-DIMENSIONAL CONSOLIDATION
ASTM D 2435

PROJECT NAME	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	B-7 -
SAMPLE DEPTH	3.0 - 5.0'
SAMPLE TYPE	UD

DESCRIPTION	Brown, SILTY CLAY, trace medium to fine sand.
CLASSIFICATION	CL
CONSOLIDOMETER No.	1

LL	44
PL	23
PI	21
Gs	2.693

Sample Data	Trimmings	Before Test	After Test
Tare plus wet soil, g	341.72	184.35	181.75
Tare plus dry soil, g	259.17	157.92	157.92
Tare, g	0.00	74.8	74.8
Water, g	82.55	26.43	23.83
Dry soil, g	259.17	83.12	83.12
Water Content	31.9%	31.8%	28.7%

Diameter (in)	2.500
Height of sample (in)	0.745
Area of sample (in^2)	4.909
Volume of sample (in^3)	3.657
Water Content (Avg) from Trimmings	31.8%
Sample Wt (wet, g)	109.55
Sample Wt (dry, g)	83.12
Water Wt (g)	26.43

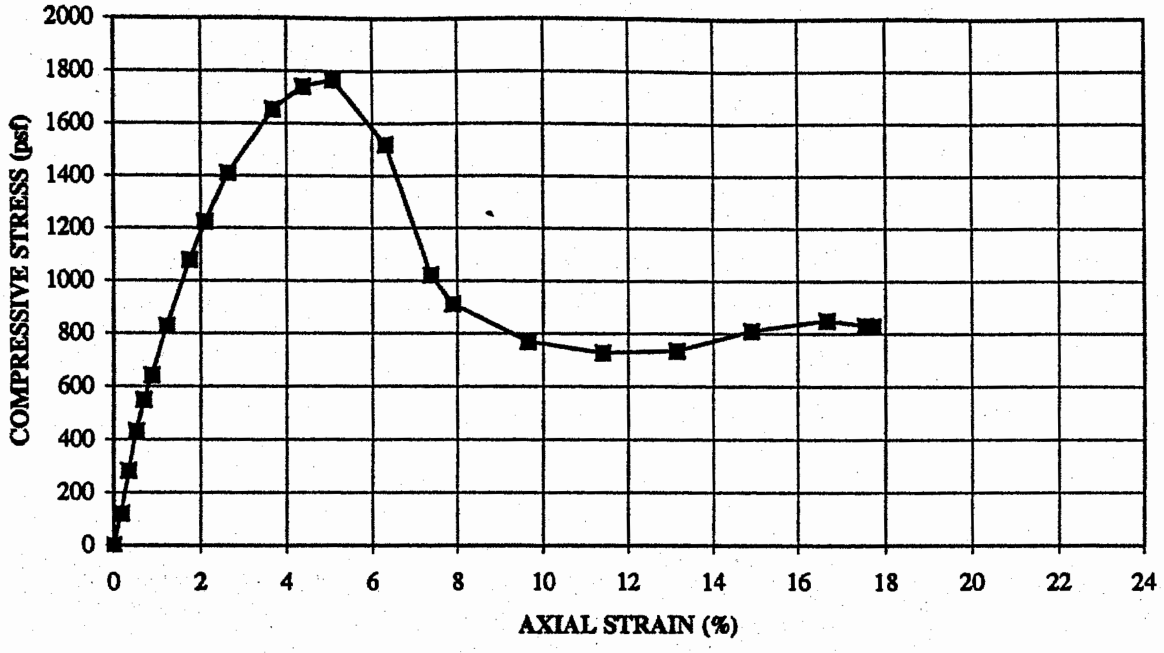
Sample Data	Initial	Final
Total Heights (in)	0.745	0.685
Height of solids (in)	0.384	0.384
Height of voids (in)	0.361	0.301
Height of water (in)	0.329	0.296
Void ratio	0.941	0.785
Degree of saturation	91.0%	98.4%
Dry unit wt (pcf)	86.6	94.2
Wet unit wt (pcf)	114.1	121.2

PRESSURE (ksf)	H100 DIAL READING	MACHINE / STONE CORR.	DIAL CHANGE (in)	FITTING TIME (sec) t90	SAMPLE HEIGHT (in)	HEIGHT OF VOIDS Hv	VOID RATIO e	CHANGE IN HEIGHT (accum)	STRAIN %	LENGTH OF DRAINAGE PATH (DOUBLE DRAINAGE) H (in)	H^2 (cm^2)	PERCENT INITIAL COMPRESSION	COEFFICIENT OF CONSOLIDATION (ft^2/day)
0.125	0.0009	0.0000	0.0000	-	0.745	0.3611	0.9408	0.0000	0.0	0.000	0.000	-	-
0.125	0.0011	0.0002	0.0000	-	0.745	0.3611	0.9408	0.0000	0.0	0.372	0.895	-	-
0.250	0.0015	0.0003	0.0003	38	0.745	0.3608	0.9399	0.0003	0.0	0.372	0.895	4.5	1.8
0.500	0.0041	0.0006	0.0026	264	0.742	0.3585	0.9340	0.0026	0.4	0.372	0.892	51.9	0.3
1.000	0.0084	0.0013	0.0062	101	0.739	0.3549	0.9246	0.0062	0.8	0.370	0.885	48.9	0.7
2.000	0.0169	0.0022	0.0138	34	0.731	0.3473	0.9049	0.0138	1.9	0.367	0.871	56.8	2.0
4.000	0.0314	0.0035	0.0270	34	0.718	0.3342	0.8706	0.0270	3.6	0.362	0.847	47.9	2.0
8.000	0.0518	0.0051	0.0458	34	0.699	0.3154	0.8216	0.0458	6.1	0.354	0.810	53.0	1.9
16.000	0.0899	0.0070	0.0820	265	0.663	0.2792	0.7272	0.0820	11.0	0.341	0.748	28.7	0.2
4.000	0.0887	0.0060	0.0818	-	0.663	0.2793	0.7277	0.0818	11.0	0.332	0.709	-	-
1.000	0.0804	0.0013	0.0782	-	0.667	0.2830	0.7372	0.0782	10.5	0.333	0.713	-	-
0.250	0.0722	0.0003	0.0710	-	0.674	0.2901	0.7559	0.0710	9.5	0.335	0.725	-	-

FINAL DIAL READING = 0.0600

TECH	DH/PWM
DATE	5/9/01
CHECK	
REVIEW	

UNCONFINED COMPRESSIVE STRENGTH OF SOILS
STRESS-STRAIN - ASTM D 2166



DESCRIPTION	LL	PL	PI	SAMPLE ID
Brown, SILTY CLAY, trace medium to fine sand.	44	23	21	B - 7
	SAMPLE TYPE		UD	3.0 - 5.0'

USCS	CL

SAMPLE DATA

Wet Density (pcf)	116.7
Dry Density (pcf)	89.2
Moisture Content	30.9%

TIME TO FAILURE (min)	4.8
STRAIN @ FAILURE (%)	5.1
TYPE OF FAILURE	SHEAR

UNCONFINED COMPRESSIVE STRENGTH (psf)	1766.2
SHEAR STRENGTH (psf)	883.1

013-3205
GENESIS/PLUM POINT ENERGY/AR

TECH	DA
DATE	5/16/01
CHECK	
REVIEW	

UNCONFINED COMPRESSIVE STRENGTH OF SOILS

ASTM D 2166

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B - 7
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

SAMPLE DATA

Height (in)	5.700
Diameter (in)	2.863
Height/Diameter Ratio	1.99
Area (in^2)	6.44
Volume (ft^3)	0.0212
Weight (gm)	1124.61
Wet Density (pcf)	116.70
Dry Density (pcf)	89.16
Machine Speed (in/min)	0.06
Strain rate (%/min)	1.05

WATER CONTENT

	BEFORE SHEAR (entire)	AFTER SHEAR (partial)
Tare No.	SQ-8	-
Wt. Wet Soil & Tare (gm)	1124.61	242.41
Wt. Dry Soil & Tare (gm)	859.19	197.44
Wt. Tare (gm)	0.00	51.87
Wt. Moisture (gm)	265.42	44.97
Wt. Dry Soil (gm)	859.19	145.57
Moisture (%)	30.89%	30.89%

TIME (min)	DEFLECT (inch)	FORCE (lbs)	% STRAIN (in/in)	Ac (in²)	COMPRESSIVE STRESS (psf)	COMPRESSIVE STRESS (psi)
0.0	0.000	0	0.00	6.44	0.00	0.00
0.2	0.010	5	0.18	6.45	120.58	0.84
0.3	0.020	13	0.35	6.46	282.41	1.96
0.5	0.030	19	0.53	6.47	431.66	3.00
0.7	0.040	25	0.70	6.48	549.06	3.81
0.8	0.050	29	0.88	6.49	640.77	4.45
1.2	0.070	37	1.23	6.52	826.30	5.74
1.7	0.100	49	1.75	6.55	1078.35	7.49
2.0	0.120	56	2.11	6.58	1223.84	8.50
2.5	0.150	65	2.63	6.61	1409.57	9.79
3.5	0.210	77	3.68	6.68	1653.94	11.49
4.2	0.250	81	4.39	6.73	1740.05	12.08
4.8	0.290	83	5.09	6.78	1766.24	12.27
6.0	0.360	73	6.32	6.87	1519.27	10.55
7.0	0.420	49	7.37	6.95	1021.50	7.09
7.5	0.450	44	7.89	6.99	910.62	6.32
9.2	0.550	38	9.65	7.13	767.99	5.33
10.8	0.650	37	11.40	7.27	726.71	5.05
12.5	0.750	38	13.16	7.41	734.26	5.10
14.2	0.850	42	14.91	7.57	808.84	5.62
15.8	0.950	46	16.67	7.73	849.20	5.90
16.7	1.000	45	17.54	7.81	830.73	5.77
16.8	1.010	45	17.72	7.82	828.03	5.75
				UNCONFINED COMPRESSIVE STRENGTH	1766.24	12.27
				SHEAR STRENGTH	883.12	6.13

TIME TO FAILURE (min)	4.83
STRAIN @ FAILURE (%)	5.09
TYPE OF FAILURE	SHEAR

FAILURE SKETCH

Description Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

LL	44
PL	23
PI	21

TECH	DA
DATE	5/16/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-10
SAMPLE TYPE: UD
SAMPLE DEPTH: 3.0 - 5.0'

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				15	15	
Weight of Wet Soil & Tare (gm)	26.46	25.69	24.95	22.94	26.50	551.85
Weight of Dry Soil & Tare (gm)	23.43	22.82	22.24	19.21	22.19	422.66
Weight of Tare (gm)	11.33	11.45	11.43	4.31	4.21	0.00
Weight of Water (gm)	3.03	2.87	2.71	3.73	4.31	129.19
Weight of Dry Soil (gm)	12.10	11.37	10.81	14.90	17.98	422.66
Water Content %	25.04	25.24	25.07	25.03	23.97	30.57

PLASTIC LIMIT (PL): NP

LIQUID LIMIT (LL): NP

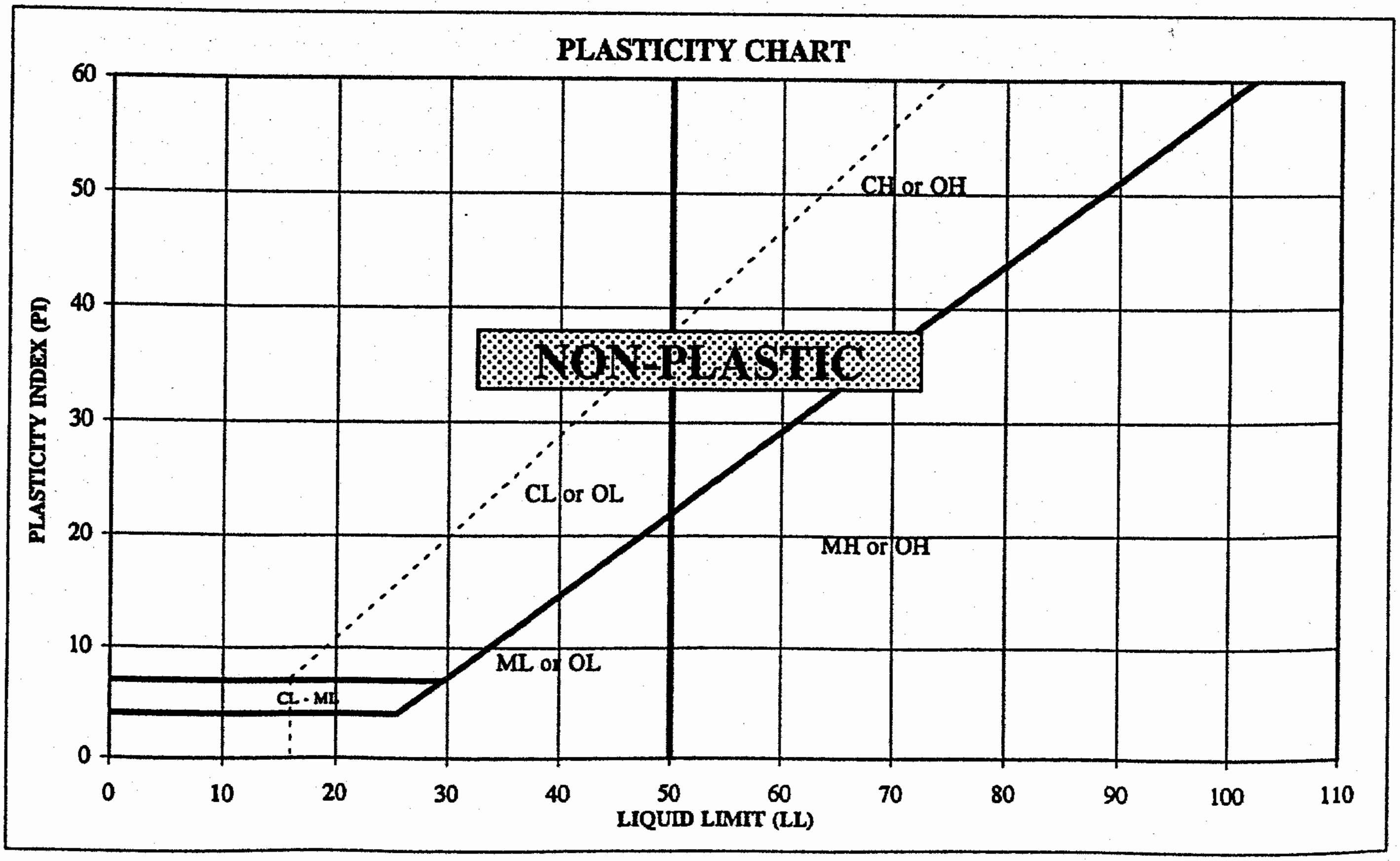
PLASTICITY INDEX (PI): NP

LIQUIDITY INDEX (LI): NP

NOTE:

DESCRIPTION: Olive Brown, CLAYEY SILT, trace fine sand.

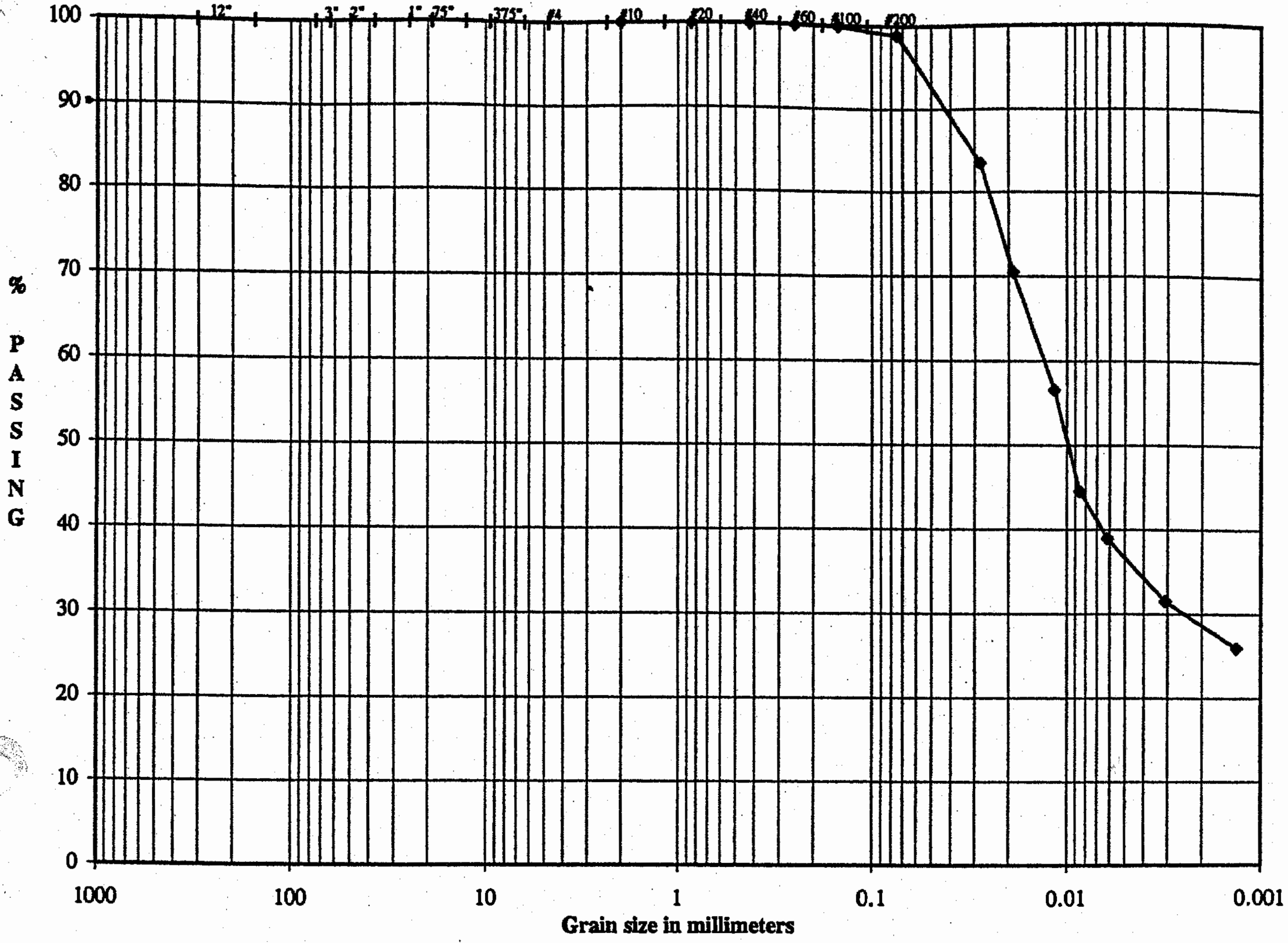
USCS: ML



TECH: DH
DATE: 5/3/01
CHECK:
REVIEW:

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID B-10 -
SAMPLE TYPE UD
SAMPLE DEPTH 3.0 - 5.0'

LL NP
PL NP
PI NP

DESCRIPTION Olive Brown, CLAYEY SILT, trace fine sand.

USCS ML

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH SW
DATE 5/7/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM C117, C136, D421, D422, D1140 and D2217

ROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B-10	-
. ROJECT NO.	013-3205	SAMPLE TYPE	UD	
		SAMPLE DEPTH	3.0 - 5.0'	

AS RECEIVED WATER CONTENT

Tare No.		-
Wt. Wet Soil & Tare (gm)	(W1)	551.85
Wt. Dry Soil & Tare (gm)	(W2)	422.66
Weight of Tare (gm)	(W3)	0.00
Weight of Water (gm)	(W4=W1-W2)	129.19
Weight of Dry Soil (gm)	(W5=W2-W3)	422.66
Moisture Content (%)	(W4/W5)*100	30.57

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	42.45
Dry Soil & Tare (gm)	42.40
Tare Weight (gm)	3.17
Moisture Content (%)	0.13

Total Weight of Sample Used For Sieve Analysis Corrected For Hygroscopic Moisture

Weight + Tare, Before Separating On The #4 Sieve (gm)	268.40	
Tare Weight (gm)	43.17	
Total Weight (gm)	224.94	(W6)

Plus #4 Material Sieve

TARE WEIGHT 0.00

	(Wt+Tare)	(((Wt-Tare)/W6)*100)	%PASSING		
12.0"				12.0"	cobbles
3.0"				3.0"	coarse gravel
2.5"				2.5"	coarse gravel
2.0"				2.0"	coarse gravel
1.5"				1.5"	coarse gravel
1.0"				1.0"	coarse gravel
0.75"				0.75"	fine gravel
0.50"				0.50"	fine gravel
0.375"				0.375"	fine gravel
#4				#4	coarse sand

HYDROMETER ANALYSIS

Specific Gravity	(assumed)	2.650
Specific Gravity	(tested)	
ount Dispersing Agent (ml)		125.00
e Dispersion Device		Mechanical
Length of Dispersion Period		1 Minute

Weight of Sample Used For Hydrometer Test

Weight of Sample Wet or Dry (gm)	54.01
Calculated Dry Wt. used in test (gm)	53.94
Hydrometer Bulb Number	624378
% Pass #4 Sieve For Whole Sample	100.00

TARE WEIGHT 0.00

HYDROMETER BACKSIEVE (Percent Passing #10 - #200 Sieves)

	(Wt+Tare)	Cumul Wt. Retained	% PASSING		
#10				#10	medium sand
#20	0.01	0.01	100.0	#20	medium sand
#40	0.03	0.03	99.9	#40	fine sand
#60	0.05	0.05	99.9	#60	fine sand
#100	0.08	0.08	99.9	#100	fine sand
#200	0.61	0.61	98.9	#200	fines

HYDROMETER CALCULATIONS

DATE 5/14/01	TIME 9:45	ET (min)	READING R	TEMP T	TEMP.COR. K	HYD.COR. Cc	READING C	EFFECTIVE LENGTH	A
5/14/01	9:47	2.00	50.0	22.00	0.013	5.00	45.00	8.9	1.00
5/14/01	9:50	5.00	43.0	22.00	0.013	5.00	38.00	10.1	1.00
5/14/01	10:00	15.00	35.5	22.00	0.013	5.00	30.50	11.4	1.00
5/14/01	10:15	30.00	29.0	22.00	0.013	5.00	24.00	12.4	1.00
5/14/01	10:45	60.00	26.0	22.00	0.013	5.00	21.00	12.9	1.00
5/14/01	13:55	250.00	22.0	22.00	0.013	5.00	17.00	13.5	1.00
5/15/01	9:45	1440.00	19.0	21.50	0.014	5.00	14.00	14.0	1.00

GRAIN SIZE PERCENTAGES

Particle Diameter	% PASSING		
		% COBBLES	0.00
0.0281	83.4	% COARSE GRAVEL	0.00
0.0189	70.4	% FINE GRAVEL	0.00
0.0116	56.5	% COARSE SAND	0.00
0.0086	44.5	% MEDIUM SAND	0.06
0.0062	38.9	% FINE SAND	1.08
0.0031	31.5	% FINES	98.87
0.0013	26.0	% TOTAL SAMPLE	100.00

Description Olive Brown, CLAYEY SILT, trace fine sand.

USCS ML

NP	LL
NP	PL
NP	PI

TECH	SW
DATE	5/7/01
CHECK	
REVIEW	

FLOW PUMP #1

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			
PROJECT NUMBER	013-3205			
SAMPLE ID	B-10 -	-	3.0 - 5.0'	
SAMPLE TYPE	UD			

BOARD #	6
CELL #	6
Flow Pump Speed	8
Technician	KBG

COMMENTS

Sample Data, Initial

Height, inches	2.930	**B-Value, f**	0.98
Diameter, inches	2.831	**Cell Pres.**	85.0
Area, cm^2	40.61	**Bot. Pres.**	80.0
Volume, cm^3	302.23	**Top Pres.**	80.0
Mass, g	551.85	**Tot. B.P.**	80.0
Moisture Content, %	30.57	**Head, max.**	37.28
Dry Density, pcf	87.26	**Head, min.**	37.28
Spec. Gravity (assumed)	2.650	**Max. Grad.**	4.98
Volume Solids, cm^3	159.49	**Min. Grad.**	4.98
Volume Voids, cm^3	142.74		
Void Ratio	0.89		
Saturation, %	90.5%		

Sample Data, Final

Height, inches	2.945
Diameter, inches	2.853
Area, cm^2	41.24
Volume, cm^3	308.52
Mass, g	561.68
Moisture Content, %	32.89
Dry Density, pcf	85.49
Volume Solids, cm^3	159.49
Volume Voids, cm^3	149.02
Void Ratio	0.93
Saturation, %	93.3%

WATER CONTENTS		**Trimmings Initial**	**Sample Final**
Wt Soil & Tare, i	**g**	551.85	604.63
Wt Soil & Tare, f	**g**	422.66	465.65
Wt Tare	**g**	0.00	43.13
Wt Moisture Lost	**g**	129.19	138.98
Wt Dry Soil	**g**	422.66	422.52
Water Content	**%**	30.57%	32.89%

DESCRIPTION

Olive Brown, CLAYEY SILT, trace fine sand.

Flow Pump Rate 1.40E-04 cm^3/sec

USCS ML

TIME FUNCTIONS, SECONDS								dP				
DATE	**DAY**	**HOUR**	**MIN**	**TEMP (°C)**	**dt (min)**	**dt,acc (min)**	**dt (sec)**	**dt,acc (sec)**	**Reading (psi)**	**Head (cm)**	**Gradient**	**Permeability (cm/sec)**
5/2/01	37013	15	0	20.2	0	0	0	0	0.53	37.28	4.98	6.8E-07
5/2/01	37013	15	5	20.2	5	5	300	300	0.53	37.28	4.98	6.8E-07
5/2/01	37013	15	10	20.2	5	10	300	600	0.53	37.28	4.98	6.8E-07
5/2/01	37013	15	15	20.2	5	15	300	900	0.53	37.28	4.98	6.8E-07 *
5/2/01	37013	15	20	20.2	5	20	300	1200	0.53	37.28	4.98	6.8E-07 *
5/2/01	37013	15	25	20.2	5	25	300	1500	0.53	37.28	4.98	6.8E-07 *
5/2/01	37013	15	30	20.2	5	30	300	1800	0.53	37.28	4.98	6.8E-07 *

***TRANSCRIBED FROM ORIGINAL DATA SHEETS**

PERMEABILITY REPORTED AS ** 6.8E-07 **cm/sec ****

DATE	5/2/01
CHECK	DA
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-21 - **SAMPLE DEPTH:** 4.0 - 5.0'
SAMPLE TYPE: UD

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				25	25	
Weight of Wet Soil & Tare (gm)	21.26	21.60	21.42	21.43	23.40	539.46
Weight of Dry Soil & Tare (gm)	19.43	19.68	19.52	15.14	17.26	388.80
Weight of Tare (gm)	11.46	11.38	11.34	4.33	6.63	0.00
Weight of Water (gm)	1.83	1.92	1.90	6.29	6.14	150.66
Weight of Dry Soil (gm)	7.97	8.30	8.18	10.81	10.63	388.80
Water Content %	22.96	23.13	23.23	58.19	57.76	38.75

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

PLASTIC LIMIT (PL) 23

LIQUID LIMIT (LL) 58

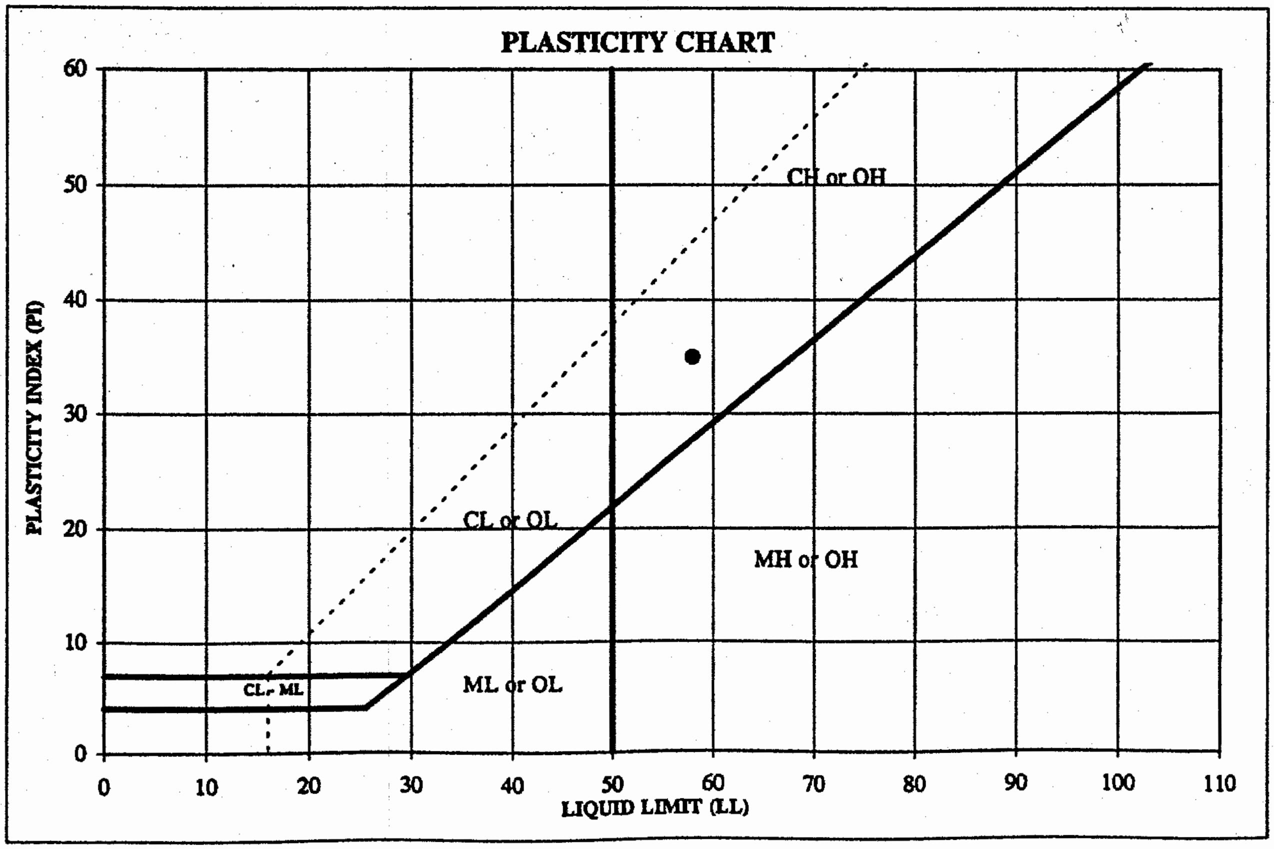
PLASTICITY INDEX (PI) 35

LIQUIDITY INDEX (LI) 0.45

NOTE:

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

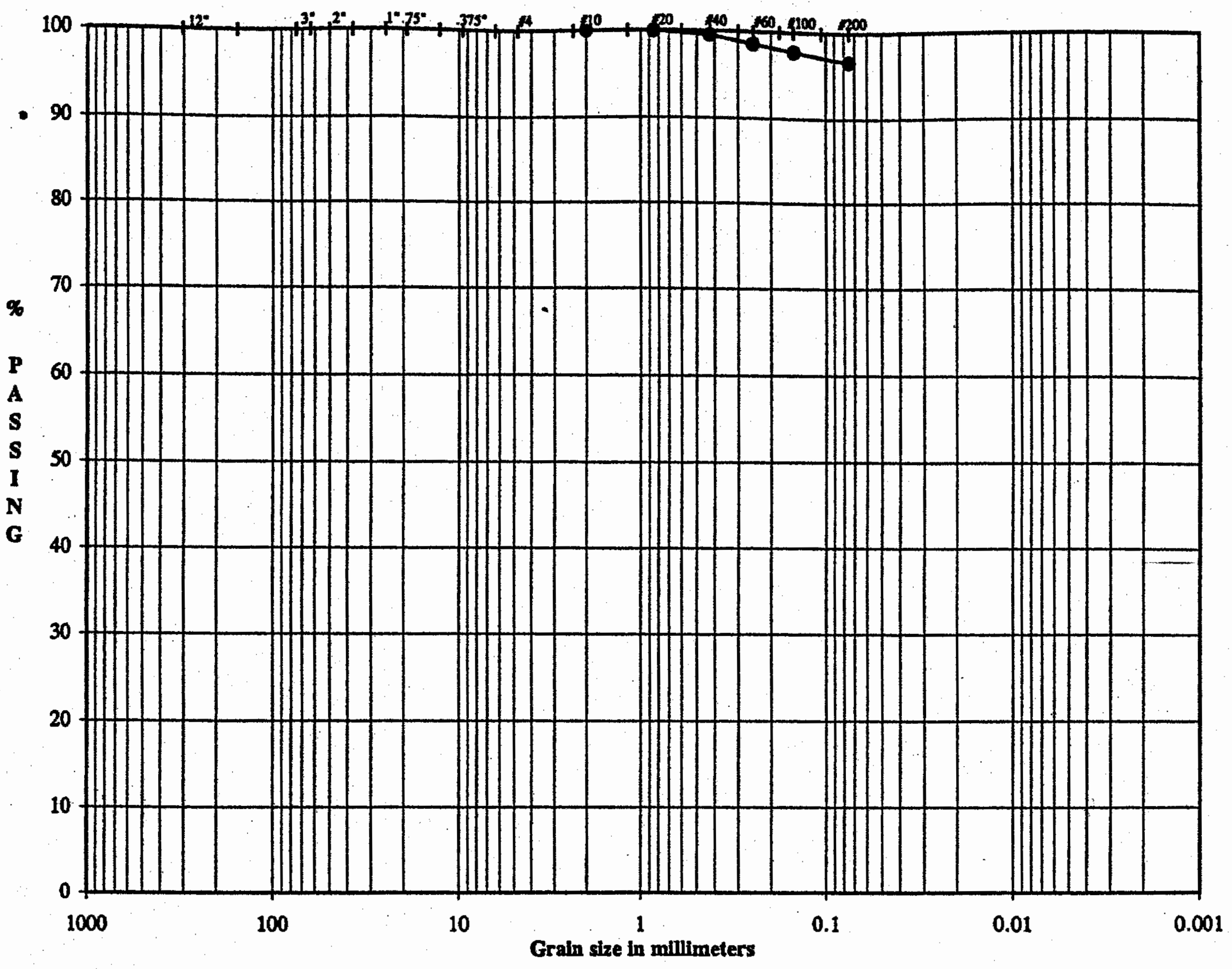
USCS CH



TECH DR
DATE 5/8/01
CHECK
REVIEW

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-21
SAMPLE TYPE	UD
SAMPLE DEPTH	4.0 - 5.0'

LL	58
PL	23
PI	35

DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DA
DATE	5/3/01
CHECK	
REVIEW	

FLEXIBLE WALL TRIAXIAL PERMEABILITY
ASTM D 5084
METHOD C, FALLING HEAD W/INCREASING TAILWATER PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR				**Using Pipettes Only**	NO
PROJECT NUMBER	013-3205				**Pipettes & Burrettes**	YES
SAMPLE ID	B-21	4.0 - 5.0'	**BOARD#**	6	**TECH**	KBG
SAMPLE TYPE	UD		**CELL #**	6	**DATE**	5/4/01

COMMENTS

Sample Data, Initial

Height, inches	2.965
Diameter, inches	2.861
Area, cm^2	41.48
Volume, cm^3	312.36
Mass, g	539.46
Moisture Content, %	38.75
Dry Density, pcf	77.67
Spec. Gravity	2.704
Volume Solids, cm^3	143.79
Volume Voids, cm^3	168.57
Void Ratio	1.17
Saturation	89.4%

B-Value,f	0.98
Cell Pres	85.00
Bot. Pres.	82.00
Top Pres.	80.00
Head, cm	140.68
Max. Grad.	22.19
Min. Grad.	17.66
Max. E.S.	5.00
Min. E.S.	3.00

Sample Data, Final

Height, inches	2.954
Diameter, inches	2.838
Area, cm^2	40.81
Volume, cm^3	306.21
Mass, g	546.24
Moisture Content %	40.49
Dry Density, pcf	79.23
Saturation	96.9%
Inflow Volume per (1 cc)	4.10
Outflow Volume per (1 cc)	4.10

Water Contents	**Initial**	**Final**
Wt soil&tare, i	539.46	602.28
Wt soil&tare, f	388.80	444.95
Wt Tare	0.00	56.43
Wt Moisture Lost	150.66	157.33
Wt Dry Soil	388.80	388.52
Water Content	38.75%	40.49%

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CH

TIME FUNCTION			READINGS			TIME IN MINUTES & SECONDS						VOLUME		PERMEABILITY
DATE	HOUR	MIN	Inflow (cc)	Outflow (cc)	Temp.	dt (min)	dt (sec)	dt, acc (sec)	Head (cm)	(H1/H2) (inc.)	Gradient	Inflow (cc)	Outflow (cc)	@ 20 Degrees C (cm/sec)
5/4/01	8	26	0.00	25.00	19.8	0.0	0	0	166.51		22.19	0.00	0.00	0.0
5/4/01	8	27	2.70	23.00	19.8	1.0	60	60	161.85	1.03	21.57	11.07	8.20	2.22E-04
5/4/01	8	28	5.50	20.70	19.8	1.0	60	120	156.79	1.03	20.90	11.48	9.43	2.49E-04
5/4/01	8	29	6.90	19.70	19.8	1.0	60	180	154.42	1.02	20.58	5.74	4.10	1.20E-04
5/4/01	8	30	8.80	18.20	19.8	1.0	60	240	151.04	1.02	20.13	7.79	6.15	1.73E-04
5/4/01	8	31	10.40	16.90	19.8	1.0	60	300	148.17	1.02	19.75	6.56	5.33	1.51E-04
5/4/01	8	32	12.00	15.50	19.8	1.0	60	360	145.19	1.02	19.35	6.56	5.74	1.59E-04
5/4/01	8	33	13.50	14.40	19.8	1.0	60	420	142.61	1.02	19.01	6.15	4.51	1.40E-04
5/4/01	8	34	14.70	13.40	19.8	1.0	60	480	140.43	1.02	18.72	4.92	4.10	1.21E-04
5/4/01	8	35	15.90	12.50	19.8	1.0	60	540	138.34	1.02	18.44	4.92	3.69	1.17E-04
5/4/01	8	36	17.10	11.50	19.8	1.0	60	600	136.16	1.02	18.15	4.92	4.10	1.25E-04
5/4/01	8	37	18.20	10.70	19.8	1.0	60	660	134.28	1.01	17.90	4.51	3.28	1.09E-04
5/4/01	8	38	19.20	9.90	19.8	1.0	60	720	132.49	1.01	17.66	4.10	3.28	1.05E-04

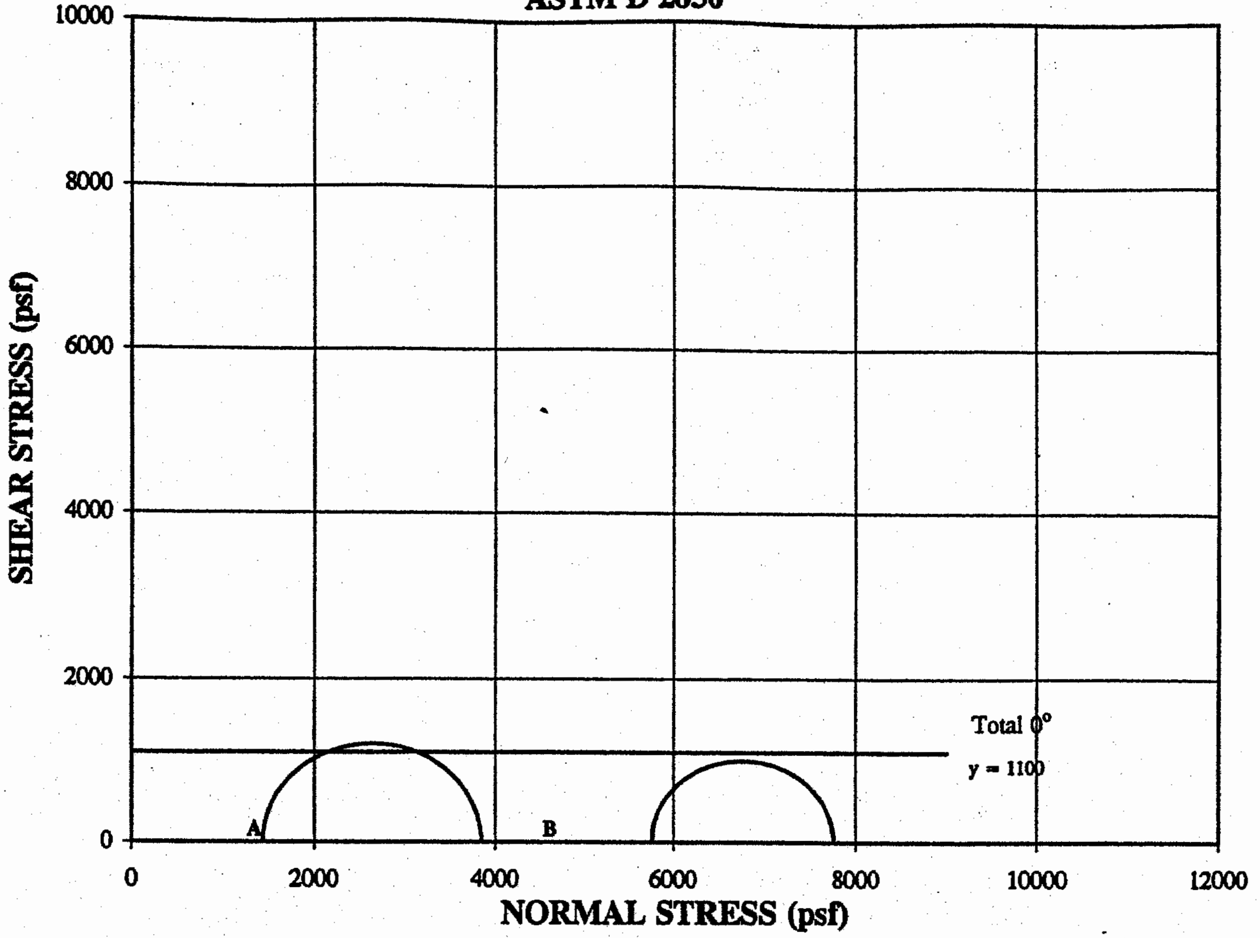
Inflow Rate	0.109333
Outflow Rate	0.085986
Outflow/Inflow Ratio	0.79

PERMEABILTIY REPORTED AS 1.1E-04 cm/sec

DATE	5/4/01
CHECK	DA
REVIEW	

***TRANSCRIBED FROM ORIGINAL DATA SHEETS**

UNCONSOLIDATED / UNDRAINED MOHR STRESS CIRCLES
ASTM D 2850



A (10 psi) **B (40 psi)**

SAMPLE DESCRIPTION		Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CH	

TOTAL STRESS PARAMETERS	
ϕ =	0°
c =	1100 psf

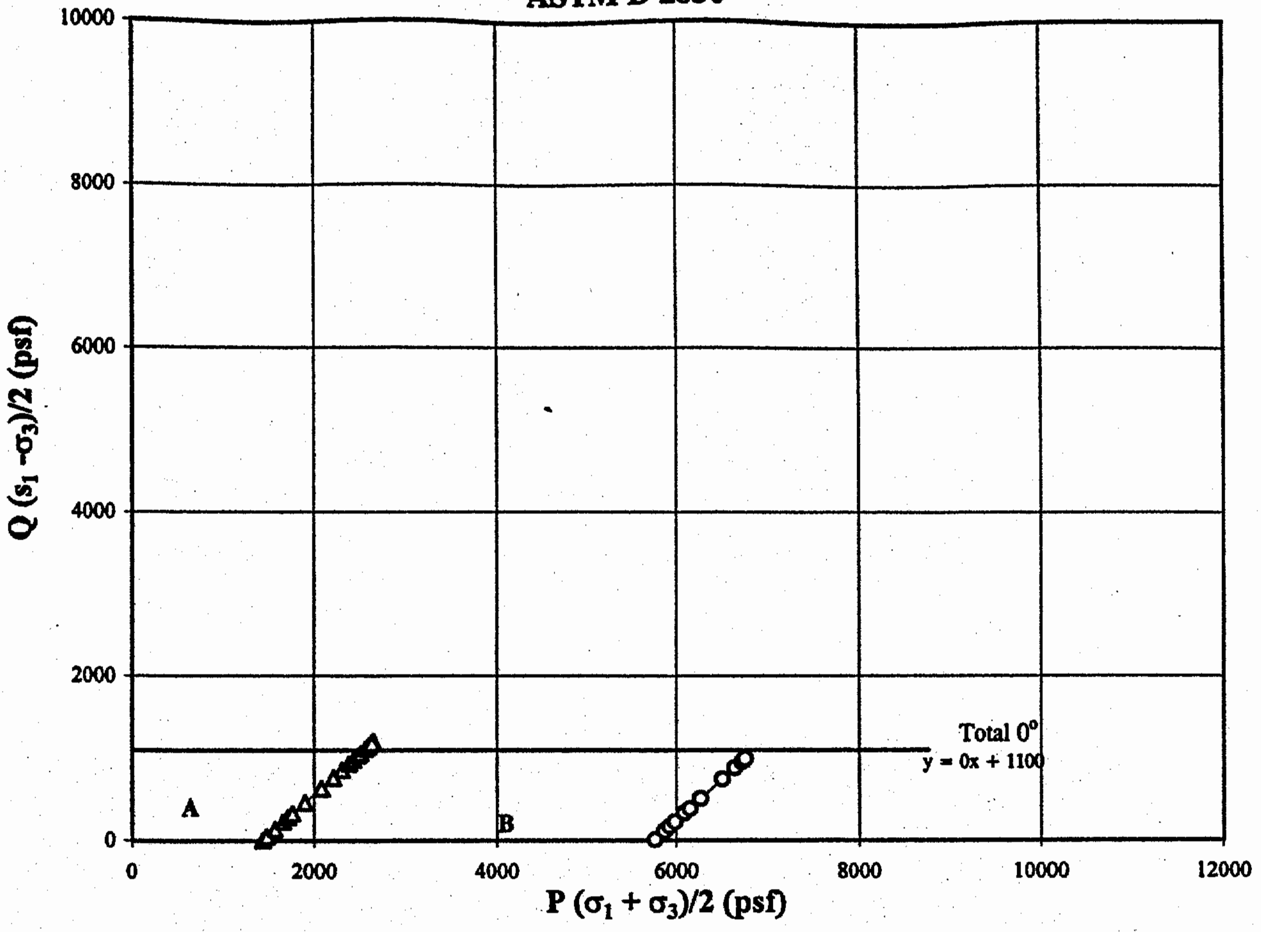
	A	B	C
CONFINING PRESSURE (psi)	10	40	
CONFINING PRESSURE (psf)	1440	5760	
INITIAL DRY DENSITY (pcf)	86.6	79.1	
INITIAL WATER CONTENT (%)	32.9	38.8	

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B-21	4.0 - 5.0'
SAMPLE TYPE	UD	
COMMENTS		

SOIL PARAMETERS	
LL	58
PL	23
PI	35
Gs	2.70

TECH	DA
DATE	5/3/01
CHECK	DA
REVIEW	

UNCONSOLIDATED / UNDRAINED TRIAXIAL STRESS PATH
ASTM D 2850



A (10 psi) **B (40 psi)**

SAMPLE DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CH

TOTAL STRESS PARAMETERS	
α =	0
a =	1100 psf

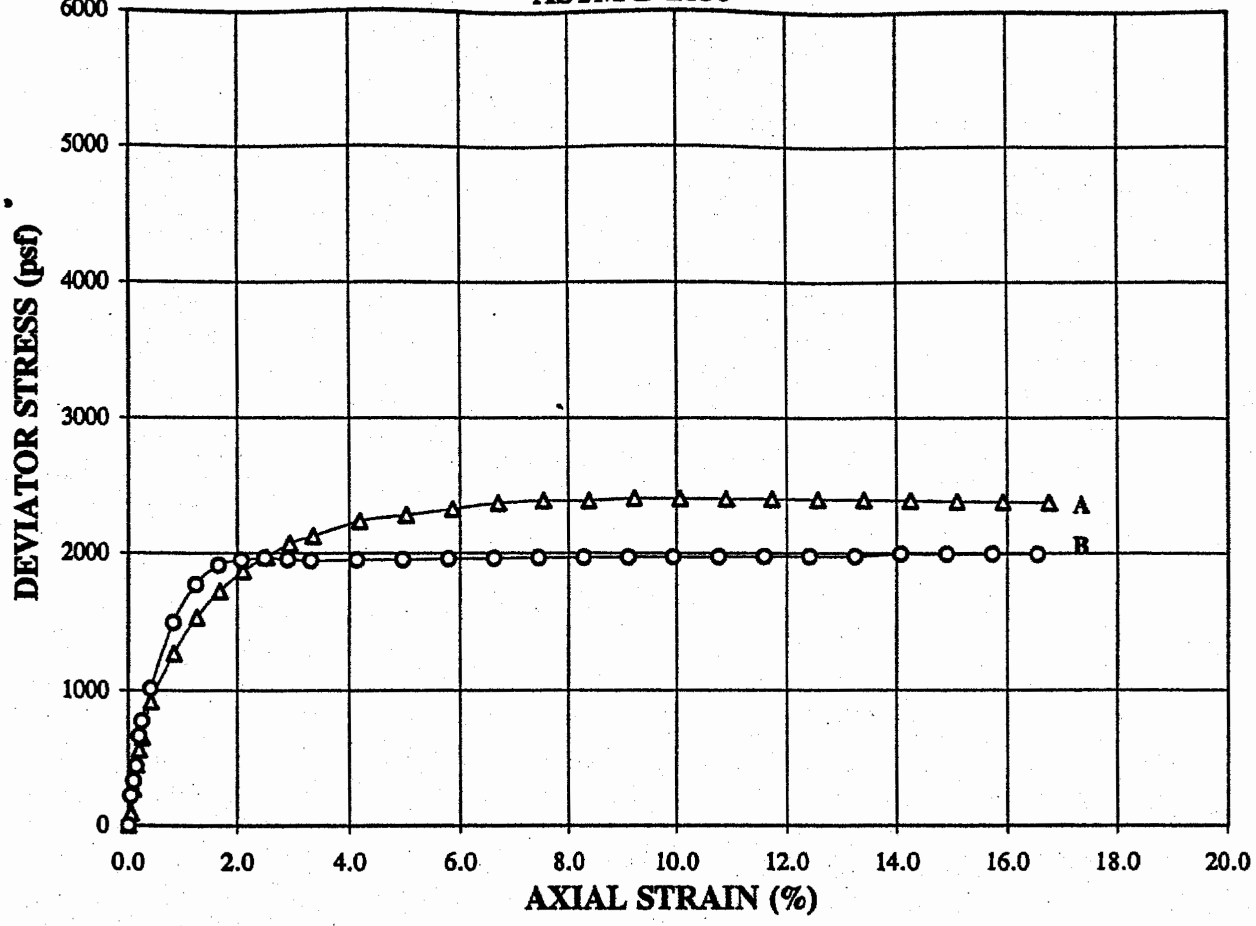
	A	B	C
CONFINING PRESSURE (psi)	10	40	
CONFINING PRESSURE (psf)	1440	5760	
INITIAL DRY DENSITY (pcf)	86.6	79.1	
INITIAL WATER CONTENT (%)	32.9	38.8	

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B-21	4.0 - 5.0'
SAMPLE TYPE	UD	
COMMENTS		

SOIL PARAMETERS	
LL	58
PL	23
PI	35
Gs	2.70

TECH	DA
DATE	5/3/01
CHECK	DA
REVIEW	

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



Δ = A (10 psi) o = B (40 psi)

SAMPLE DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.	
USCS	CH	

	A	B	C
CONFINING PRESSURE (psi)	10	40	
CONFINING PRESSURE (psf)	1440	5760	
INITIAL DRY DENSITY (pcf)	86.6	79.1	
INITIAL WATER CONTENT (%)	32.9	38.8	
STRAIN RATE (%/min)	1.01	0.99	

PROJECT TITLE GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER 013-3205
SAMPLE ID B-21 4.0 - 5.0'
SAMPLE TYPE UD
COMMENTS

SOIL PARAMETERS	
LL	58
PL	23
PI	35
Gs	2.70

TECH DA
DATE 5/3/01
CHECK DA
REVIEW PWM

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH OF SOILS
ASTM D 2850

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-21
PROJECT NO.	013-3205	**SAMPLE DEPTH**	4.0 - 5.0'

IACHINE SPEED (in/min)	0.06	**CELL PRESSURE (psi)**	10.0
STRAIN RATE (%/min)	1.01	**SAMPLE PRESSURE (psi)**	0.0
		CONFINING PRESSURE, σ_3 (psi)	10.0

INITIAL SAMPLE DATA

HEIGHT(in)	5.964		(cm)	15.149
DIAMETER(in)	2.856		(cm)	7.254
AREA(in²)	6.41		(cm²)	41.33
VOLUME(in³)	38.21		(cm³)	626.10
WEIGHT (g)		1155.14		
% MOISTURE		32.9		
SPECIFIC GRAVITY		2.704		
WET DENSITY (pcf)		115.2		
DRY DENSITY, (pcf) calc		86.6		
VOLUME OF SOLIDS (cm³)		321.35		
VOLUME OF VOIDS (cm³)		304.76		
VOID RATIO		0.948		
% SATURATION		93.9		

CORRECTED SAMPLE DATA

HEIGHT (in)	5.953
DIAMETER (in)	2.859
AREA (in²)	6.42
VOLUME (in³)	38.21

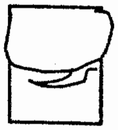
WATER CONTENT

WT SOIL & TARE, WET (g	1233.56
WT SOIL & TARE, DRY(g)	947.87
WT TARE (g)	80.81
WT MOISTURE (g)	285.69
WT DRY SOIL (g)	867.06
% MOISTURE	32.95

TIME (min)	ACCUM. DEFLECT (inch)	AXIAL LOAD (lbs)	e % STRAIN (in/in)	CORRECTED AREA (in²)	DEVIATOR STRESS (psf)	(σ_1) devstr+cp (psf)	$(\sigma_1'+\sigma_3')$ / 2 (P)	$(\sigma_1-\sigma_3)$ / 2 (Q)
0.0	0.000	0	0.0	6.42	0.00	1440.00	1440.00	0.00
0.1	0.003	4	0.1	6.42	89.70	1529.70	1484.85	44.85
0.1	0.006	12	0.1	6.42	268.97	1708.97	1574.48	134.48
0.2	0.009	20	0.2	6.43	448.05	1888.05	1664.03	224.03
0.2	0.012	25	0.2	6.43	559.78	1999.78	1719.89	279.89
0.3	0.015	29	0.3	6.43	649.02	2089.02	1764.51	324.51
0.4	0.025	41	0.4	6.45	916.04	2356.04	1898.02	458.02
0.8	0.050	57	0.8	6.47	1268.16	2708.16	2074.08	634.08
1.3	0.075	69	1.3	6.50	1528.65	2968.65	2204.32	764.32
1.7	0.100	78	1.7	6.53	1720.70	3160.70	2300.35	860.35
2.1	0.125	85	2.1	6.56	1867.13	3307.13	2373.56	933.56
2.5	0.150	90	2.5	6.58	1968.50	3408.50	2424.25	984.25
2.9	0.175	95	2.9	6.61	2068.92	3508.92	2474.46	1034.46
3.3	0.200	98	3.4	6.64	2125.04	3565.04	2502.52	1062.52
4.2	0.250	104	4.2	6.70	2235.58	3675.58	2557.79	1117.79
5.0	0.300	107	5.0	6.76	2279.94	3719.94	2579.97	1139.97
5.8	0.350	110	5.9	6.82	2323.17	3763.17	2601.59	1161.59
6.7	0.400	113	6.7	6.88	2365.28	3805.28	2622.64	1182.64
7.5	0.450	115	7.5	6.94	2385.51	3825.51	2632.76	1192.76
8.3	0.500	116	8.4	7.01	2384.44	3824.44	2632.22	1192.22
9.2	0.550	118	9.2	7.07	2403.35	3843.35	2641.68	1201.68
10.0	0.600	119	10.1	7.14	2401.33	3841.33	2640.67	1200.67
10.8	0.650	120	10.9	7.20	2398.94	3838.94	2639.47	1199.47
11.7	0.700	121	11.7	7.27	2396.17	3836.17	2638.09	1198.09
12.5	0.750	122	12.6	7.34	2393.03	3833.03	2636.51	1196.51
13.3	0.800	123	13.4	7.41	2389.51	3829.51	2634.75	1194.75
14.2	0.850	124	14.3	7.48	2385.61	3825.61	2632.80	1192.80
15.0	0.900	125	15.1	7.56	2381.34	3821.34	2630.67	1190.67
15.8	0.950	126	15.9	7.63	2376.69	3816.69	2628.34	1188.34
16.7	1.000	127	16.8	7.71	2371.66	3811.66	2625.83	1185.83
					*NORMAL STRESS @ FAILURE	3843.35		

TIME TO FAILURE (min)	9.2
DEFLECTION @ FAILURE (in)	0.550
% STRAIN @ FAILURE	9.2

Failure Sketch



TECH	DA
DATE	5/3/01
CHECK	DA
REVIEW	PWM

*** Failure based on the maximum deviator stress or 15% axial strain.**

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH OF SOILS
ASTM D 2850

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-21
PROJECT NO.	013-3205	**SAMPLE DEPTH**	4.0 - 5.0'

ACHINE SPEED (in/min)	0.06	**CELL PRESSURE (psi)**	40.0
STRAIN RATE (%/min)	0.99	**SAMPLE PRESSURE (psi)**	0.0
		CONFINING PRESSURE, σ_3 (psi)	40.0

INITIAL SAMPLE DATA

HEIGHT(in)	6.038	(cm)	15.337
DIAMETER(in)	2.866	(cm)	7.280
AREA(in²)	6.45	(cm²)	41.62
VOLUME(in³)	38.95	(cm³)	638.32
WEIGHT (g)	1121.94		
% MOISTURE	38.8		
SPECIFIC GRAVITY	2.704		
WET DENSITY (pcf)	109.7		
DRY DENSITY, (pcf) calc	79.1		
VOLUME OF SOLIDS (cm³)	299.05		
VOLUME OF VOIDS (cm³)	339.26		
VOID RATIO	1.134		
% SATURATION	92.4		

CORRECTED SAMPLE DATA

HEIGHT (in)	5.978
DIAMETER (in)	2.880
AREA (in²)	6.52
VOLUME (in³)	38.95

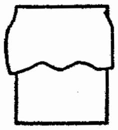
WATER CONTENT

WT SOIL & TARE, WET (g	1173.35
WT SOIL & TARE, DRY(g)	861.02
WT TARE (g)	55.08
WT MOISTURE (g)	312.33
WT DRY SOIL (g)	805.94
% MOISTURE	38.75

TIME (min)	ACCUM. DEFLECT (inch)	AXIAL LOAD (lbs)	e % STRAIN (in/in)	CORRECTED AREA (in²)	DEVIATOR STRESS (psf)	(σ_1) devstr+cp (psf)	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)
0.0	0.000	0	0.0	6.52	0.00	5760.00	5760.00	0.00
0.1	0.003	10	0.0	6.52	220.89	5980.89	5870.44	110.44
0.1	0.006	15	0.1	6.52	331.16	6091.16	5925.58	165.58
0.2	0.009	20	0.1	6.53	441.33	6201.33	5980.67	220.67
0.2	0.012	30	0.2	6.53	661.67	6421.67	6090.83	330.83
0.3	0.015	35	0.2	6.53	771.56	6531.56	6145.78	385.78
0.4	0.025	46	0.4	6.54	1012.37	6772.37	6266.18	506.18
0.8	0.050	68	0.8	6.57	1490.32	7250.32	6505.16	745.16
1.3	0.075	81	1.2	6.60	1767.83	7527.83	6643.91	883.91
1.7	0.100	88	1.7	6.63	1912.55	7672.55	6716.27	956.27
2.1	0.125	90	2.1	6.65	1947.78	7707.78	6733.89	973.89
2.5	0.150	91	2.5	6.68	1961.10	7721.10	6740.55	980.55
2.9	0.175	91	2.9	6.71	1952.77	7712.77	6736.39	976.39
3.3	0.200	91	3.3	6.74	1944.44	7704.44	6732.22	972.22
4.2	0.250	92	4.1	6.80	1948.98	7708.98	6734.49	974.49
5.0	0.300	93	5.0	6.86	1953.14	7713.14	6736.57	976.57
5.8	0.350	94	5.8	6.92	1956.94	7716.94	6738.47	978.47
6.7	0.400	95	6.6	6.98	1960.37	7720.37	6740.19	980.19
7.5	0.450	96	7.5	7.04	1963.44	7723.44	6741.72	981.72
8.3	0.500	97	8.3	7.10	1966.14	7726.14	6743.07	983.07
9.2	0.550	98	9.1	7.17	1968.48	7728.48	6744.24	984.24
10.0	0.600	99	9.9	7.23	1970.45	7730.45	6745.22	985.22
10.8	0.650	100	10.8	7.30	1972.05	7732.05	6746.02	986.02
11.7	0.700	101	11.6	7.37	1973.29	7733.29	6746.64	986.64
12.5	0.750	102	12.4	7.44	1974.16	7734.16	6747.08	987.08
13.3	0.800	103	13.2	7.51	1974.66	7734.66	6747.33	987.33
14.2	0.850	105	14.1	7.58	1993.79	7753.79	6756.89	996.89
15.0	0.900	106	14.9	7.66	1993.38	7753.38	6756.69	996.69
15.8	0.950	107	15.7	7.73	1992.60	7752.60	6756.30	996.30
16.7	1.000	108	16.6	7.81	1991.46	7751.46	6755.73	995.73
					*NORMAL STRESS @ FAILURE	7753.79		

TIME TO FAILURE (min)	15.0
DEFLECTION @ FAILURE (in)	0.900
% STRAIN @ FAILURE	14.9

Failure Sketch



TECH	DA
DATE	5/3/01
CHECK	DA
REVIEW	

*** Failure based on the maximum deviator stress or 15% axial strain.**

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-26 **SAMPLE DEPTH:** 3.0 - 5.0'
SAMPLE TYPE: UD

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION				NATURAL MOISTURE
Number of Blows				34	25	18	15	
Weight of Wet Soil & Tare (gm)	20.66	22.27	21.52	26.71	25.44	24.96	24.27	525.91
Weight of Dry Soil & Tare (gm)	19.48	20.74	20.11	22.72	21.06	20.55	19.97	441.21
Weight of Tare (gm)	11.75	11.09	11.24	6.64	4.18	4.28	4.33	0.00
Weight of Water (gm)	1.18	1.53	1.41	3.99	4.38	4.41	4.30	84.70
Weight of Dry Soil (gm)	7.73	9.65	8.87	16.08	16.88	16.27	15.64	441.21
Water Content %	15.27	15.85	15.90	24.81	25.95	27.11	27.49	19.20

PLASTIC LIMIT (PL): 16

LIQUID LIMIT (LL): 26

PLASTICITY INDEX (PI): 10

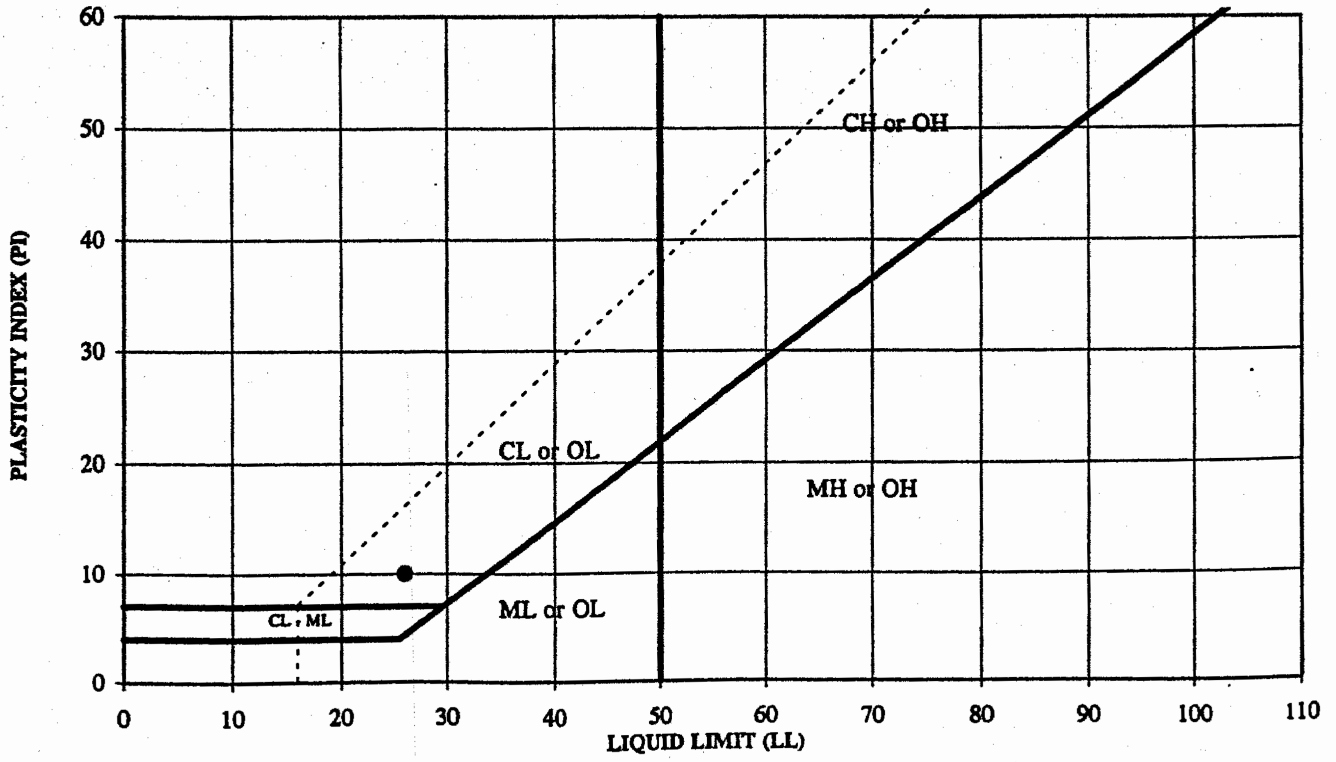
LIQUIDITY INDEX (LI): 0.35

NOTE:

DESCRIPTION: Brown, SILTY CLAY, and medium to fine sand, trace fine gravel.

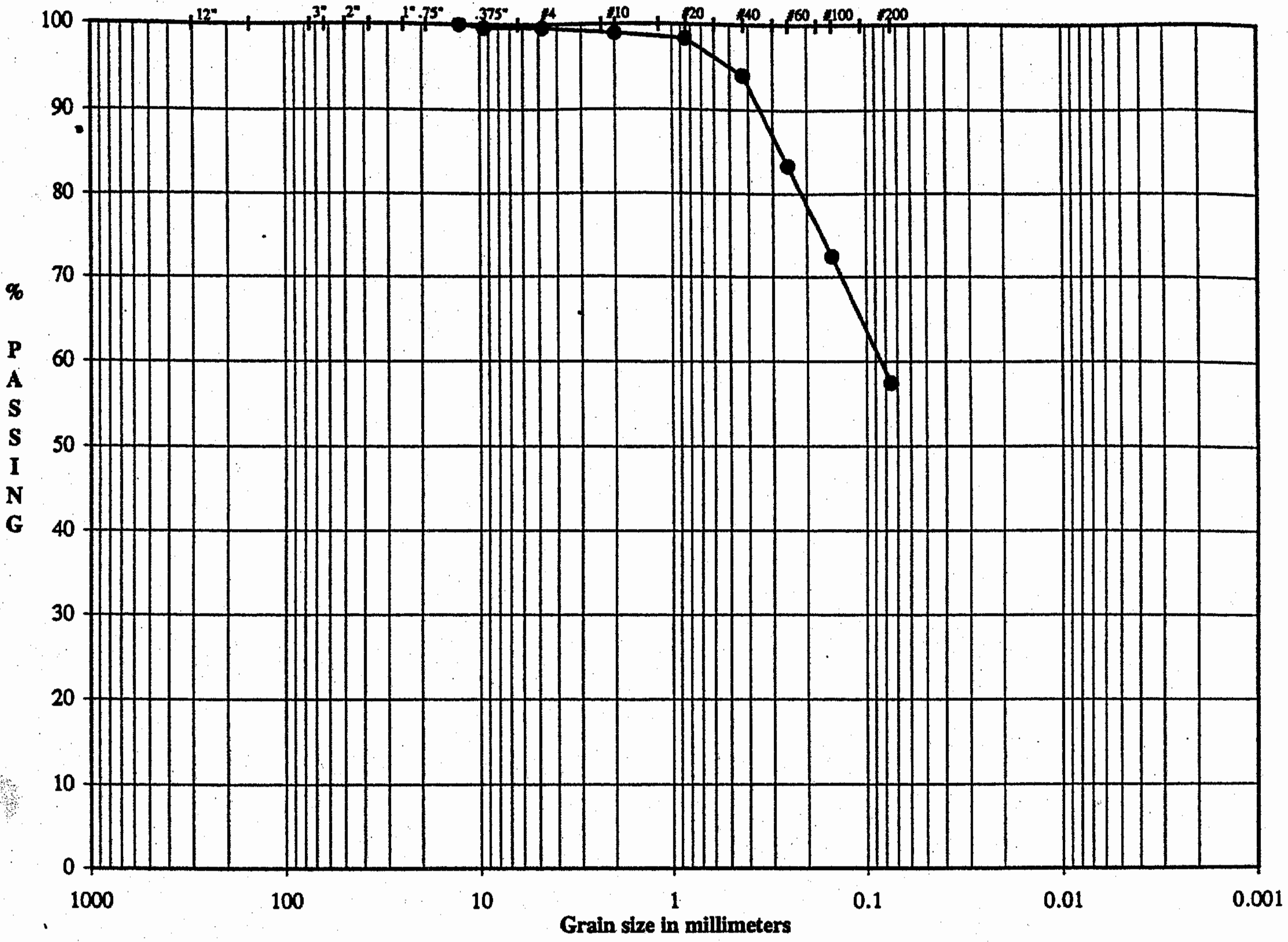
USCS: CL

PLASTICITY CHART



TECH 5/20/01
DATE TJ
CHECK
REVIEW

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-26
SAMPLE TYPE	UD
SAMPLE DEPTH	3.0 - 5.0'

LL	26
PL	16
PI	10

DESCRIPTION Brown, SILTY CLAY, and medium to fine sand, trace fine gravel.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DA/NA
DATE	5/15/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NO.	013-3205
REMARKS	

SAMPLE ID	B-26	-
SAMPLE TYPE	UD	
SAMPLE DEPTH	3.0 - 5.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	525.91
Wt Dry Soil & Tare (gm)	(w2)	441.21
Weight of Tare (gm)	(w3)	0.00
Weight of Water (gm)	(w4=w1-w2)	84.70
Weight of Dry Soil (gm)	(w5=w2-w3)	441.21
Moisture Content (%)	(w4/w5)*100	19.20

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	354.95
	Tare Weight (gm)	85.55
(W6)	Total Dry Weight (gm)	269.40

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"	0.00	0.00	0.00	100.00	0.50"	fine gravel
0.375"	1.08	1.08	0.40	99.60	0.375"	fine gravel
#4	1.26	1.26	0.47	99.53	#4	coarse sand
#10	2.95	2.95	1.10	98.90	#10	medium sand
#20	4.51	4.51	1.67	98.33	#20	medium sand
#40	16.05	16.05	5.96	94.04	#40	fine sand
#60	44.95	44.95	16.69	83.31	#60	fine sand
#100	74.28	74.28	27.57	72.43	#100	fine sand
#200	114.69	114.69	42.57	57.43	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.47
% C SAND	0.63
% M SAND	4.86
% F SAND	36.61
% FINES	57.43
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	26
PL	16
PI	10
Gs	-

DESCRIPTION Brown, SILTY CLAY, and medium to fine sand, trace fine gravel.

USCS CL

TECH	DA/NA
DATE	5/15/01
CHECK	✓
REVIEW	PWM

FLEXIBLE WALL TRIAXIAL PERMEABILITY
ASTM D 5084
METHOD C, FALLING HEAD W/INCREASING TAILWATER PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			Using Pipettes Only	YES	**COMMENTS**
PROJECT NUMBER	013-3205			Using Pipettes & Burrettes	NO	
SAMPLE ID	B-26	3.0 -5.0'	BOARD#	11	TECH	DA
SAMPLE TYPE	UD		CELL #	11	DATE	5/17/01

Sample Data, Initial

Height, inches	2.950
Diameter, inches	2.821
Area, cm^2	40.32
Volume, cm^3	302.15
Mass, g	525.91
Moisture Content, %	19.20
Dry Density, pcf	91.12
Spec. Gravity	2.650
Volume Solids, cm^3	166.50
Volume Voids, cm^3	135.65
Void Ratio	0.81
Saturation	62.4%

B-Value,f	0.95
Cell Pres	85.00
Bot. Pres.	80.50
Top Pres.	80.00
Head, cm	35.17
Max. Grad.	7.71
Min. Grad.	4.74
Max. E.S.	5.00
Min. E.S.	4.50

Sample Data, Final

Height, inches	2.962
Diameter, inches	2.823
Area, cm^2	40.38
Volume, cm^3	303.81
Mass, g	565.24
Moisture Content %	28.11
Dry Density, pcf	90.62
Saturation	90.3%
Inflow Volume per (1 cc)	1.00
Outflow Volume per (1 cc	1.00

Water Contents	Initial Trimmings	Final Partial Sample
Wt soil&tare, i	525.91	616.25
Wt soil&tare, f	441.21	492.32
Wt Tare	0.00	51.45
Wt Moisture Lost	84.70	123.93
Wt Dry Soil	441.21	440.87
Water Content	19.20%	28.11%

DESCRIPTION Brown, SILTY CLAY, and medium to fine sand, trace fine gravel.

USCS CL

TIME FUNCTION			READINGS			TIME IN MINUTES & SECONDS						VOLUME		PERMEABILITY
DATE	HOUR	MIN	Inflow (cc)	Outflow (cc)	Temp.	dt (min)	dt (sec)	dt, acc (sec)	Head (cm)	(H1/H2) (inc.)	Gradient	Inflow (cc)	Outflow (cc)	@ 20 Degrees C (cm/sec)
5/17/01	11	23	0.00	25.00	19.4	0.0	0	0	58.00		7.71	0.00	0.00	0.0
5/17/01	11	23	1.20	23.80	19.4	0.3	15	15	55.81	1.04	7.42	1.20	1.20	2.40E-04
5/17/01	11	24	2.40	22.60	19.4	0.3	15	30	53.62	1.04	7.13	1.20	1.20	2.49E-04
5/17/01	11	24	3.60	21.60	19.4	0.3	15	45	51.62	1.04	6.86	1.20	1.00	2.38E-04
5/17/01	11	24	4.70	20.40	19.4	0.3	15	60	49.52	1.04	6.58	1.10	1.20	2.59E-04
5/17/01	11	24	5.80	19.40	19.4	0.3	15	75	47.61	1.04	6.33	1.10	1.00	2.46E-04
5/17/01	11	25	6.80	18.40	19.4	0.3	15	90	45.78	1.04	6.09	1.00	1.00	2.43E-04
5/17/01	11	25	7.80	17.40	19.4	0.3	15	105	43.96	1.04	5.84	1.00	1.00	2.53E-04
5/17/01	11	25	8.80	16.40	19.4	0.3	15	120	42.13	1.04	5.60	1.00	1.00	2.64E-04
5/17/01	11	25	9.70	15.50	19.4	0.3	15	135	40.49	1.04	5.38	0.90	0.90	2.48E-04 *
5/17/01	11	26	10.60	14.60	19.4	0.3	15	150	38.85	1.04	5.16	0.90	0.90	2.58E-04 *
5/17/01	11	26	11.50	13.70	19.4	0.3	15	165	37.21	1.04	4.95	0.90	0.90	2.69E-04 *
5/17/01	11	26	12.40	12.90	19.4	0.3	15	180	35.66	1.04	4.74	0.90	0.80	2.65E-04 *

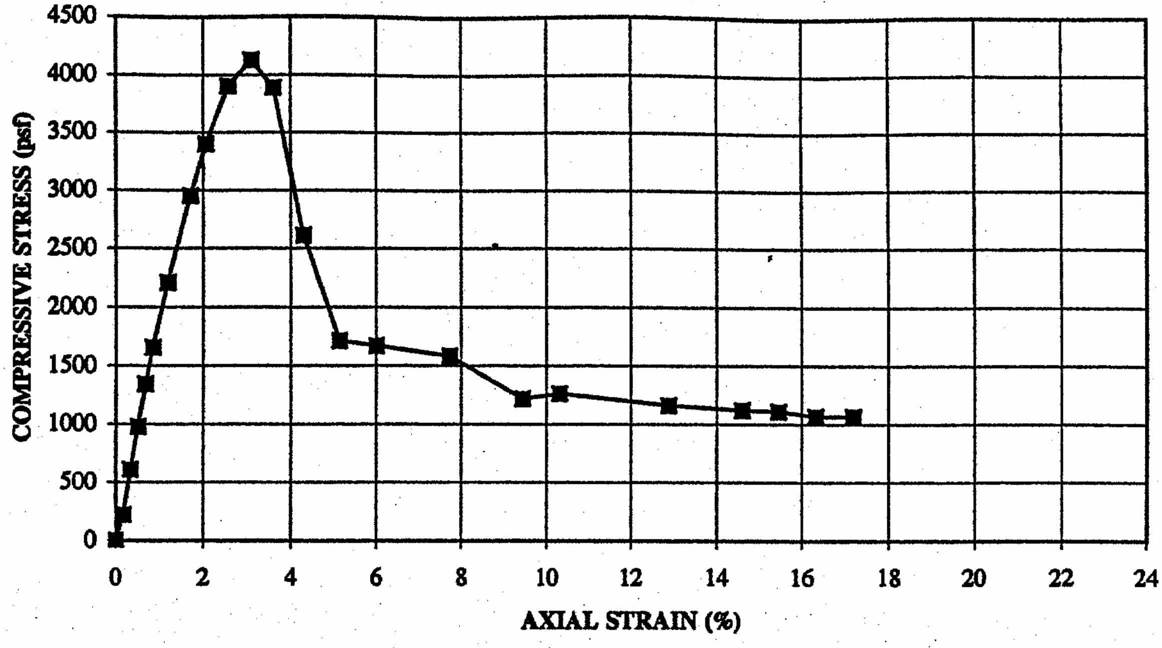
Inflow Rate	0.068889
Outflow Rate	0.067222
Outflow/Inflow Ratio	0.98

PERMEABILTIY REPORTED AS 2.6E-04 cm/sec

DATE 5/17/01
CHECK
REVIEW

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

UNCONFINED COMPRESSIVE STRENGTH OF SOILS
STRESS-STRAIN - ASTM D 2166



DESCRIPTION	LL	PL	PI	SAMPLE ID
Brown, SILTY CLAY, and medium to fine sand, trace fine gravel.	26	16	10	B - 26
	SAMPLE TYPE		UD	3.0 - 5.0'

USCS	CL

SAMPLE DATA

Wet Density (pcf)	124.9
Dry Density (pcf)	111.6
Moisture Content	12.0%

TIME TO FAILURE (min)	3.0
STRAIN @ FAILURE (%)	3.1
TYPE OF FAILURE	SHEAR

UNCONFINED COMPRESSIVE STRENGTH (psf)	4125.6
SHEAR STRENGTH (psf)	2062.8

013-3205
GENESIS/PLUM POINT ENERGY/AR

TECH	DA
DATE	5/16/01
CHECK	
REVIEW	

UNCONFINED COMPRESSIVE STRENGTH OF SOILS
ASTM D 2166

ROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B - 26
ROJECT NO.	013-3205	SAMPLE TYPE	UD
REMARKS		SAMPLE DEPTH	3.0 - 5.0'

SAMPLE DATA

Height (in)	5.822
Diameter (in)	2.850
Height/Diameter Ratio	2.04
Area (in^2)	6.38
Volume (ft^3)	0.0215
Weight (gm)	1218.71
Wet Density (pcf)	124.95
Dry Density (pcf)	111.61
Machine Speed (in/min)	0.06
Strain rate (%/min)	1.03

WATER CONTENT	BEFORE SHEAR (entire)	AFTER SHEAR (partial)
Tare No.	SQ-8	-
Wt. Wet Soil & Tare (gm)	1218.71	311.36
Wt. Dry Soil & Tare (gm)	1088.58	283.63
Wt. Tare (gm)	0.00	51.66
Wt. Moisture (gm)	130.13	27.73
Wt. Dry Soil (gm)	1088.58	231.97
Moisture (%)	11.95%	11.95%

TIME (min)	DEFLECT (inch)	FORCE (lbs)	% STRAIN (in/in)	Ac (in^2)	COMPRESSIVE STRESS (psf)	(psi)
0.0	0.000	0	0.00	6.38	0.00	0.00
0.2	0.010	10	0.17	6.39	218.80	1.52
0.3	0.020	27	0.34	6.40	610.52	4.24
0.5	0.030	44	0.52	6.41	978.42	6.79
0.7	0.040	60	0.69	6.42	1341.47	9.32
0.8	0.050	74	0.86	6.43	1656.03	11.50
1.2	0.070	99	1.20	6.46	2207.83	15.33
1.7	0.100	133	1.72	6.49	2950.60	20.49
2.0	0.120	154	2.06	6.51	3399.46	23.61
2.5	0.150	178	2.58	6.55	3903.42	27.11
3.0	0.180	189	3.09	6.58	4125.62	28.65
3.5	0.210	179	3.61	6.62	3891.54	27.02
4.2	0.250	121	4.29	6.67	2610.99	18.13
5.0	0.300	80	5.14	6.73	1716.34	11.92
5.8	0.350	79	6.01	6.79	1671.80	11.61
7.5	0.450	76	7.73	6.91	1585.15	11.01
9.2	0.550	60	9.45	7.04	1217.65	8.46
10.0	0.600	62	10.31	7.11	1260.96	8.76
12.5	0.750	59	12.88	7.32	1160.25	8.06
14.2	0.850	58	14.60	7.47	1120.43	7.78
15.0	0.900	58	15.46	7.55	1107.99	7.69
15.8	0.950	56	16.32	7.62	1065.75	7.40
16.7	1.000	57	17.18	7.70	1065.66	7.40
				UNCONFINED COMPRESSIVE STRENGTH	4125.62	28.65
				SHEAR STRENGTH	2062.81	14.33

TIME TO FAILURE (min)	3.00
STRAIN @ FAILURE (%)	3.09
TYPE OF FAILURE	SHEAR

FAILURE SKETCH

Description: Brown, SILTY CLAY, and medium to fine sand, trace fine gravel.

USCS: CL

LL	26
PL	16
PI	10

TECH	DA
DATE	5/16/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-29 **SAMPLE DEPTH:** 4.0 - 5.0'
SAMPLE TYPE: UD

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION				NATURAL MOISTURE
Number of Blows				33	25	20	16	
Weight of Wet Soil & Tare (gm)	22.55	22.05	21.83	23.05	25.32	25.94	23.26	626.74
Weight of Dry Soil & Tare (gm)	20.85	20.31	20.20	18.07	20.18	20.51	17.79	508.16
Weight of Tare (gm)	11.88	11.47	11.38	4.28	6.73	6.65	4.29	0.00
Weight of Water (gm)	1.70	1.74	1.63	4.98	5.14	5.43	5.47	118.58
Weight of Dry Soil (gm)	8.97	8.84	8.82	13.79	13.45	13.86	13.50	508.16
Water Content %	18.95	19.68	18.48	36.11	38.22	39.18	40.52	23.34

PLASTIC LIMIT (PL): 19

LIQUID LIMIT (LL): 38

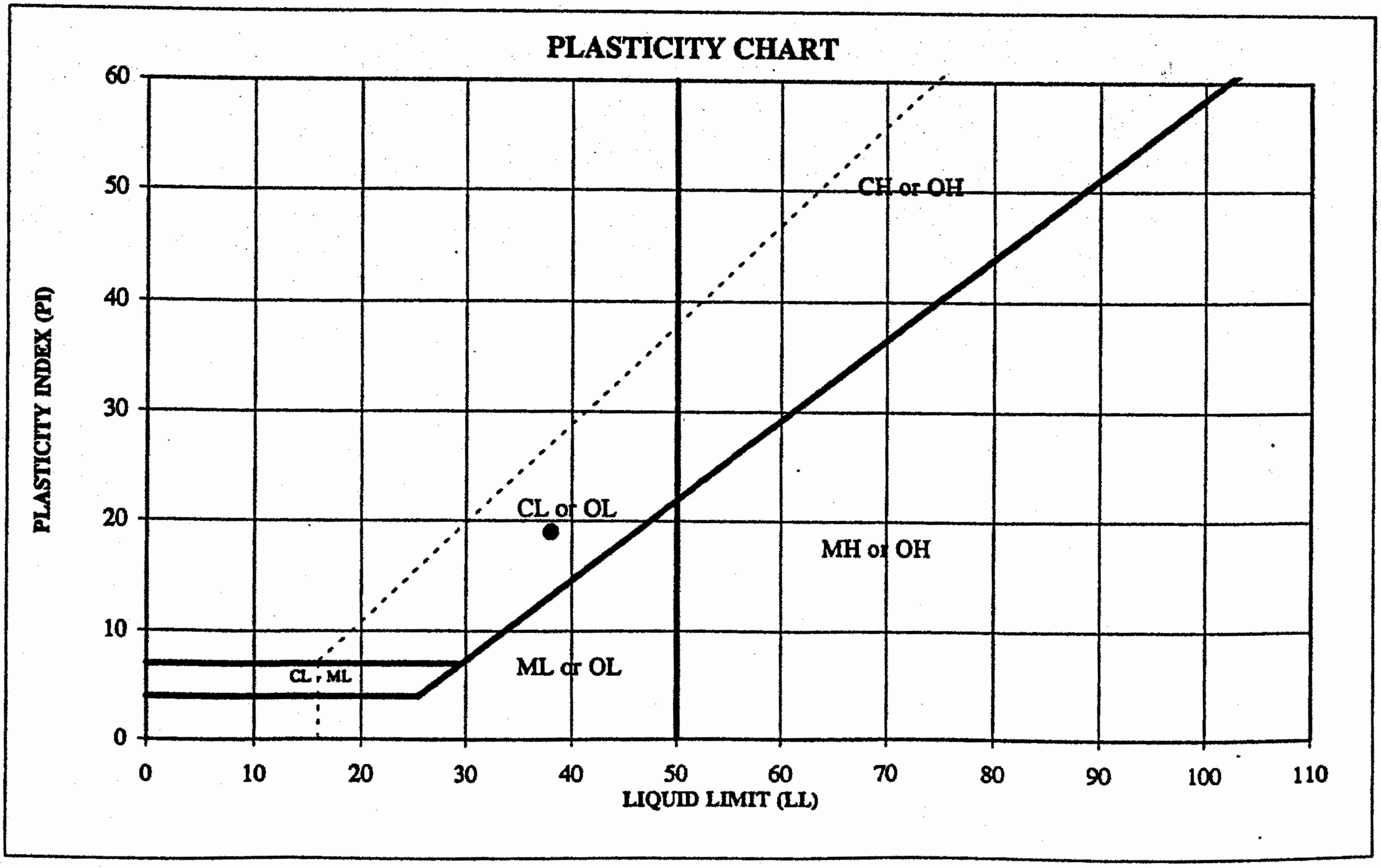
PLASTICITY INDEX (PI): 19

LIQUIDITY INDEX (LI): 0.23

NOTE:

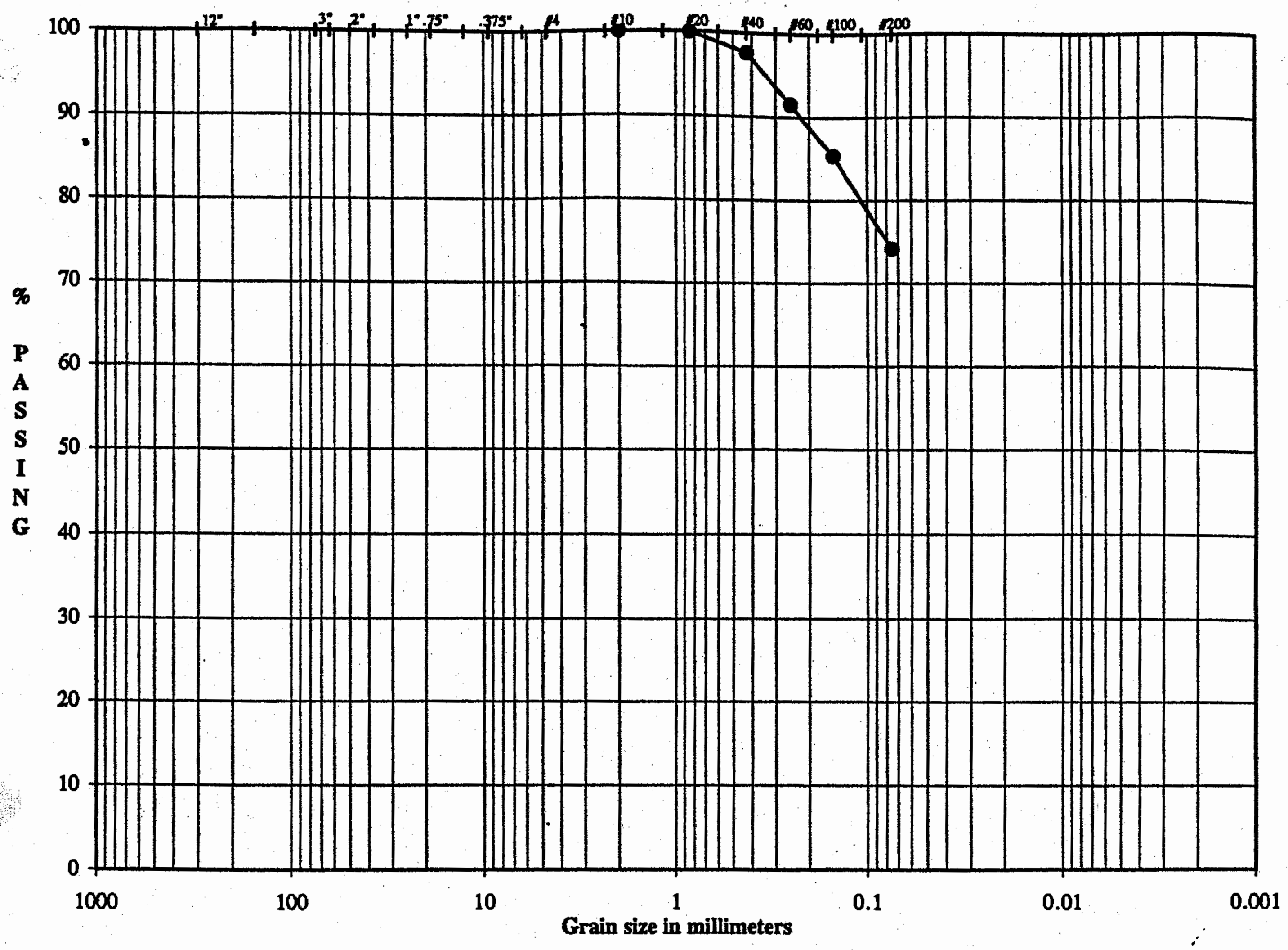
DESCRIPTION: Brown, SILTY CLAY, some fine sand.

USCS: CL



TECH: DR/TJ
DATE: 5/18/01
CHECK:
REVIEW:

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-29
SAMPLE TYPE	UD
SAMPLE DEPTH	4.0 - 5.0'

LL	38
PL	19
PI	19

DESCRIPTION Brown, SILTY CLAY, some fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DA/NA
DATE	5/16/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NO.	013-3205
REMARKS	

SAMPLE ID	B-29	-
SAMPLE TYPE	UD	
SAMPLE DEPTH	4.0 - 5.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	626.74
Wt Dry Soil & Tare (gm)	(w2)	508.16
Weight of Tare (gm)	(w3)	0.00
Weight of Water (gm)	(w4=w1-w2)	118.58
Weight of Dry Soil (gm)	(w5=w2-w3)	508.16
Moisture Content (%)	(w4/w5)*100	23.34

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	338.54
	Tare Weight (gm)	86.37
(W6)	Total Dry Weight (gm)	252.17

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.14	0.14	0.06	99.94	#20	medium sand
#40	6.07	6.07	2.41	97.59	#40	fine sand
#60	21.45	21.45	8.51	91.49	#60	fine sand
#100	36.92	36.92	14.64	85.36	#100	fine sand
#200	65.21	65.21	25.86	74.14	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	2.41
% F SAND	23.45
% FINES	74.14
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

\> 10% mostly coarse (c)
\> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
\> 10% equal amounts each (c-f)

LL	38
PL	19
PI	19
Gs	2.683

DESCRIPTION Brown, SILTY CLAY, some fine sand.

USCS CL

TECH	DA/NA
DATE	5/16/01
CHECK	
REVIEW	

FLOW PUMP #1

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			**BOARD #**	8	**COMMENTS**
PROJECT NUMBER	013-3205			**CELL #**	8	
SAMPLE ID	B-29 -	-	4.0 -5.0'	**Flow Pump Speed**	9	
SAMPLE TYPE	UD			**Technician**	DA	

Sample Data, Initial

Height, inches	2.959	**B-Value, f**	1.00
Diameter, inches	2.871	**Cell Pres.**	85.0
Area, cm²	41.77	**Bot. Pres.**	80.0
Volume, cm³	313.91	**Top Pres.**	80.0
Mass, g	626.74	**Tot. B.P.**	80.0
Moisture Content, %	23.34	**Head, max.**	133.65
Dry Density, pcf	101.01	**Head, min.**	133.65
Spec. Gravity	2.683	**Max. Grad.**	17.70
Volume Solids, cm³	189.40	**Min. Grad.**	17.70
Volume Voids, cm³	124.51		
Void Ratio	0.66		
Saturation, %	95.2%		

Sample Data, Final

Height, inches	2.973
Diameter, inches	2.882
Area, cm²	42.09
Volume, cm³	317.81
Mass, g	632.81
Moisture Content, %	24.53
Dry Density, pcf	99.77
Volume Solids, cm³	189.40
Volume Voids, cm³	128.42
Void Ratio	0.68
Saturation, %	97.1%

WATER CONTENTS		**Trimmings Initial**	**Sample Final**
Wt Soil & Tare, i	**g**	626.74	684.35
Wt Soil & Tare, f	**g**	508.16	559.77
Wt Tare	**g**	0.00	51.91
Wt Moisture Lost	**g**	118.58	124.58
Wt Dry Soil	**g**	508.16	507.86
Water Content	**%**	23.34%	24.53%

DESCRIPTION

Brown, SILTY CLAY, some fine sand.

Flow Pump Rate 5.70E-05 cm³/sec

USCS CL

TIME FUNCTIONS, SECONDS								**dP**				
DATE	**DAY**	**HOUR**	**MIN**	**TEMP (°C)**	**dt (min)**	**dt,acc (min)**	**dt (sec)**	**dt,acc (sec)**	**Reading (psi)**	**Head (cm)**	**Gradient**	**Permeability (cm/sec)**
5/17/01	37028	10	20	19.3	0	0	0	0	1.9	133.65	17.70	7.8E-08
5/17/01	37028	10	25	19.3	5	5	300	300	1.9	133.65	17.70	7.8E-08
5/17/01	37028	10	30	19.3	5	10	300	600	1.9	133.65	17.70	7.8E-08
5/17/01	37028	10	35	19.3	5	15	300	900	1.9	133.65	17.70	7.8E-08 *
5/17/01	37028	10	40	19.3	5	20	300	1200	1.9	133.65	17.70	7.8E-08 *
5/17/01	37028	10	45	19.3	5	25	300	1500	1.9	133.65	17.70	7.8E-08 *
5/17/01	37028	10	50	19.3	5	30	300	1800	1.9	133.65	17.70	7.8E-08 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 7.8E-08 cm/sec **

DATE 5/17/01

CHECK

REVIEW

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-33 - **SAMPLE DEPTH:** 3.0 - 5.0'
SAMPLE TYPE: UD

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION					NATURAL MOISTURE
Number of Blows				25	25				
Weight of Wet Soil & Tare (gm)	21.94	21.45	21.01	24.36	22.75		TRIAL 1	TRIAL 2	431.42
Weight of Dry Soil & Tare (gm)	20.70	20.23	19.85	20.84	19.46				397.96
Weight of Tare (gm)	11.39	11.00	11.21	4.37	4.30	BLOWS:	25	25	77.58
Weight of Water (gm)	1.24	1.22	1.16	3.52	3.29				33.46
Weight of Dry Soil (gm)	9.31	9.23	8.64	16.47	15.16	K VALUE:	1	1	320.38
Water Content %	13.32	13.22	13.43	21.37	21.70				10.44

PLASTIC LIMIT (PL): 13

LIQUID LIMIT (LL): 22

PLASTICITY INDEX (PI): 9

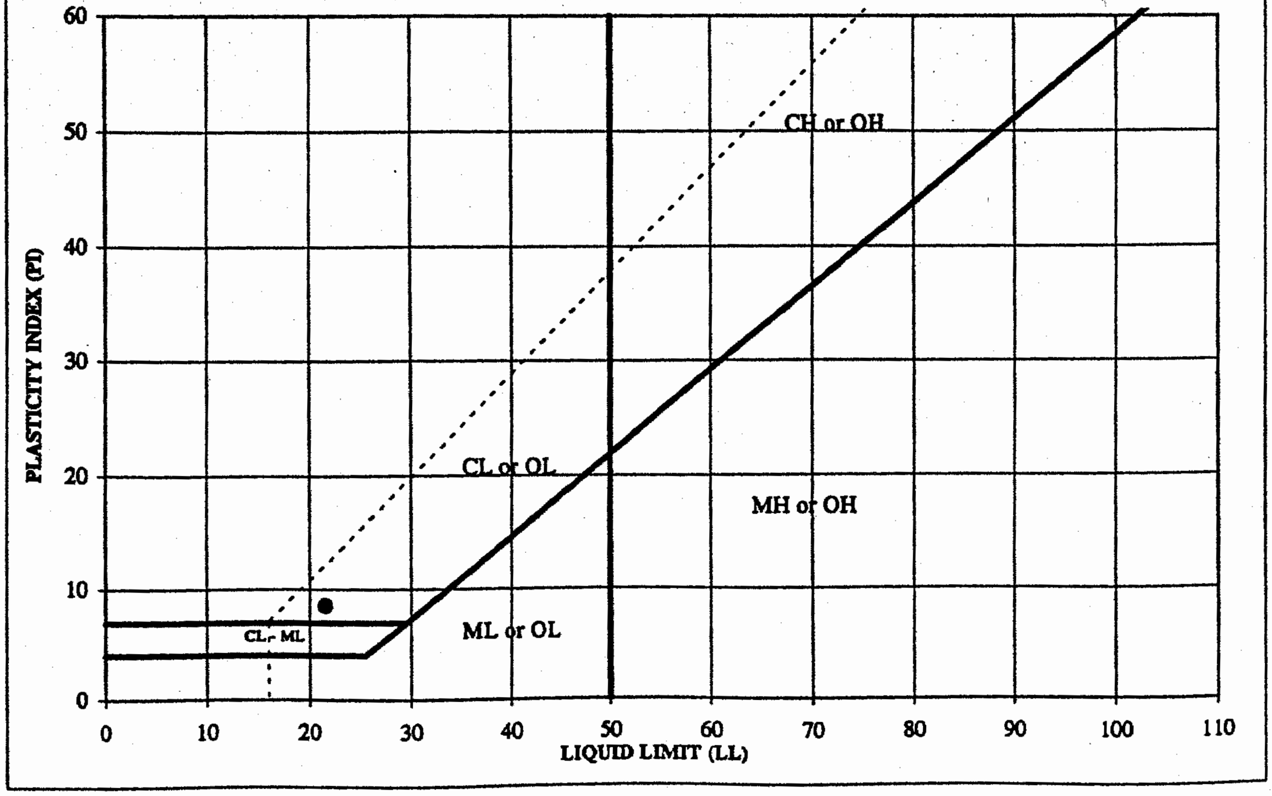
LIQUIDITY INDEX (LI): -0.34

NOTE:

DESCRIPTION: Olive Brown, MEDIUM TO FINE SAND, some silty clay.

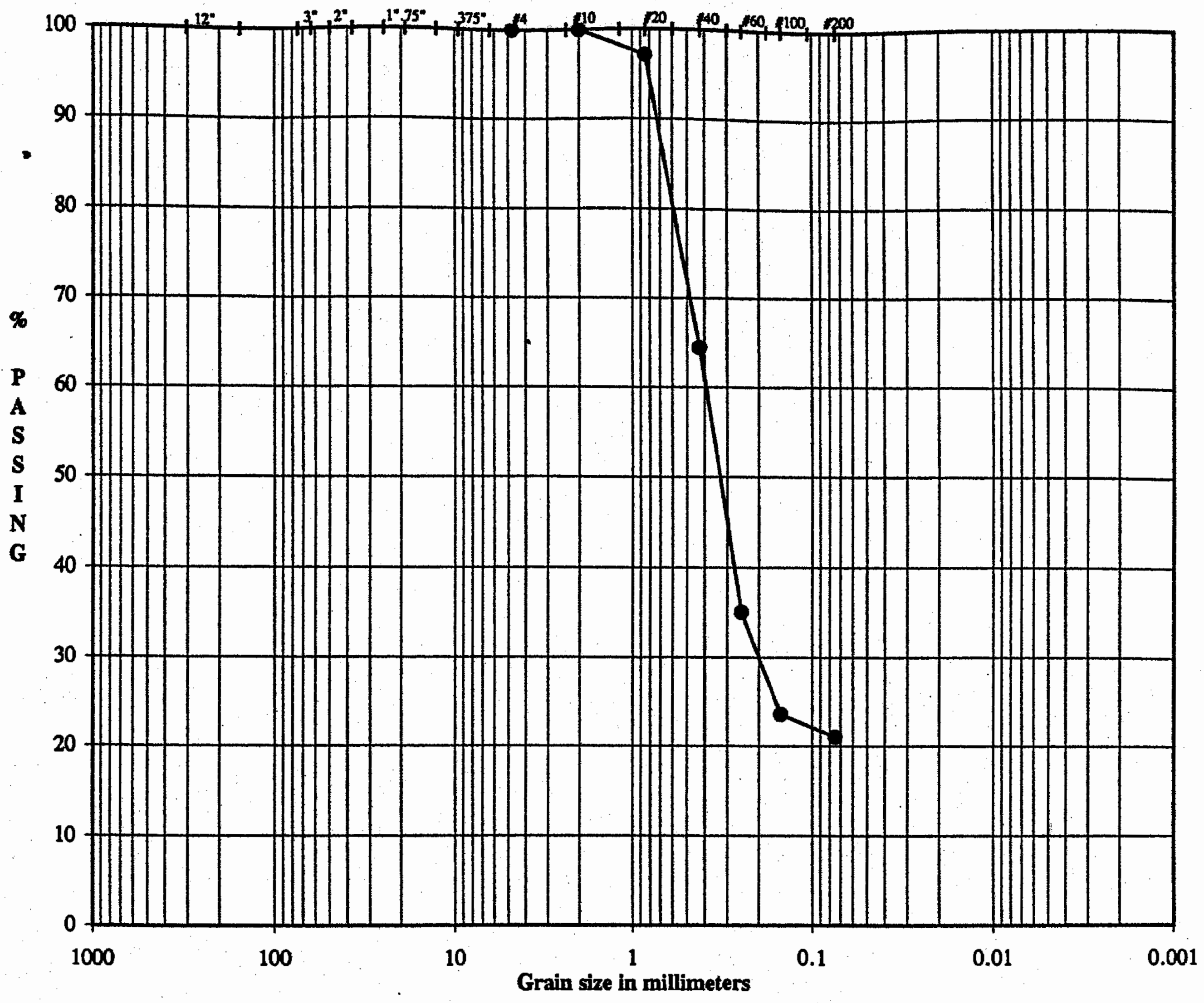
USCS: SC

PLASTICITY CHART



TECH	DR
DATE	5/9/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-33
SAMPLE TYPE	UD
SAMPLE DEPTH	3.0 - 5.0'

LL	22
PL	13
PI	9

DESCRIPTION Olive Brown, MEDIUM TO FINE SAND, some silty clay.

USCS SC

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DA
DATE	5/3/01
CHECK	
REVIEW	PwM

Golder Associates Inc.

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-33 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	431.42
Wt Dry Soil & Tare (gm)	(w2)	397.96
Weight of Tare (gm)	(w3)	77.58
Weight of Water (gm)	(w4=w1-w2)	33.46
Weight of Dry Soil (gm)	(w5=w2-w3)	320.38
Moisture Content (%)	(w4/w5)*100	10.44

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic M

Weight Of Sample (gm	397.96
Tare Weight (gm)	77.58
(W6) Total Dry Weight (gm)	320.38

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.21	0.21	0.07	99.93	#10	medium sand
#20	9.24	9.24	2.88	97.12	#20	medium sand
#40	114.00	114.00	35.58	64.42	#40	fine sand
#60	208.11	208.11	64.96	35.04	#60	fine sand
#100	244.86	244.86	76.43	23.57	#100	fine sand
#200	253.07	253.07	78.99	21.01	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.07
% M SAND	35.52
% F SAND	43.41
% FINES	21.01
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	22
PL	13
PI	9
Gs	-

DESCRIPTION Olive Brown, MEDIUM TO FINE SAND, some silty clay.

USCS SC

TECH	DA
DATE	5/3/01
CHECK	
REVIEW	

SPECIFIC GRAVITY OF SOILS
ASTM D-854
PYCNOMETER METHOD

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			
PROJECT NUMBE	013-3205	**SAMPLE ID**	B-33	-
		SAMPLE TYPE	UD	
TESTED FOR	PERM	**SAMPLE DEPTH**	3.0 - 5.0'	

HYGROSCOPIC MOISTURE OF MATERIAL PASSING THE #4 SIEVE

Weight Soil and Tare, Initial (gm)	(W1)	43.37
Weight Soil and Tare, Final (gm)	(W2)	43.22
Weight Of Tare (gm)	(W3)	3.23
Weight Of Moisture (gm)	(W4=W1-W2)	0.15
Weight Of Dry Soil (gm)	(W5=W2-W3)	39.99
Hygroscopic Moisture In (%)	(HM=(W4/W5)*100)	0.4%

AIR REMOVAL METHOD

VACUUM

Trial		1	2	3
Pycnometer Number		16		
Weight Pycnometer Empty (gm)	(Mf)	171.44		
Weight of Soil & Pycnometer (gm)		276.51		
Weight of Soil, Water & Pycnometer (gm)	(Mb)	734.87		
Observed Temperature (Tb), for (Mb) In Degrees C		23.0		
Observed Temperature (Ta), for (Ma) In Degrees C		22.50		
Weight of Pycnometer & Water (gm)	(Ma @ Ta)	669.70		
Relative Density of Water @ (Ta)		0.99768		
Relative Density of Water @ (Tx)		0.99757		
Correction Factor due to Temperature @Tx	(K)	0.9993		
Weight of Soil (gm)		105.07		
Weight of Dry Soil (gm)	(Mo)	104.68		
Weight of Pycnometer & Water (gm)	(Ma)	669.65		

SPECIFIC GRAVITY

G @ 20 degrees C = [Mo/(Mo+(Ma - Mb))]*(K)

1	2	3	Gs Average
2.651			2.651

Correction Values Due To Temperature

Temp. (C)	Rel. Density	Corr. (K)	Temp. (C)	Rel. Density	Corr. (K)
16.00	0.99897	1.0007	23.50	0.99745	0.9992
16.50	0.99889	1.0007	24.00	0.99732	0.9991
17.00	0.99880	1.0006	24.50	0.99720	0.9990
17.50	0.99871	1.0005	25.00	0.99707	0.9988
18.00	0.99862	1.0004	25.50	0.99694	0.9987
18.50	0.99853	1.0003	26.00	0.99681	0.9986
19.00	0.99843	1.0002	26.50	0.99668	0.9984
19.50	0.99833	1.0001	27.00	0.99654	0.9983
20.00	0.99823	1.0000	27.50	0.99640	0.9982
20.50	0.99812	0.9999	28.00	0.99626	0.9980
21.00	0.99802	0.9998	28.50	0.99612	0.9979
21.50	0.99791	0.9997	29.00	0.99597	0.9977
22.00	0.99780	0.9996	29.50	0.99582	0.9976
22.50	0.99768	0.9995	30.00	0.99567	0.9974
23.00	0.99757	0.9993			

TECH	KBG
DATE	5/4/01
CHECK	
REVIEW	

ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-41 - **SAMPLE DEPTH:** 3.0 - 5.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION			TRIAL 1	TRIAL 2	NATURAL MOISTURE
Number of Blows				23	26				
Weight of Wet Soil & Tare (gm)	21.53	22.09	21.14	14.33	16.09				274.27
Weight of Dry Soil & Tare (gm)	19.76	20.22	19.47	11.22	13.14				224.78
Weight of Tare (gm)	11.32	11.40	11.24	4.33	6.62	BLOWS:	23	26	84.81
Weight of Water (gm)	1.77	1.87	1.67	3.11	2.95				49.49
Weight of Dry Soil (gm)	8.44	8.82	8.23	6.89	6.52	K VALUE:	0.99	1.005	139.97
Water Content %	20.97	21.20	20.29	45.14	45.25				35.36

PLASTIC LIMIT (PL) 21

LIQUID LIMIT (LL) 45

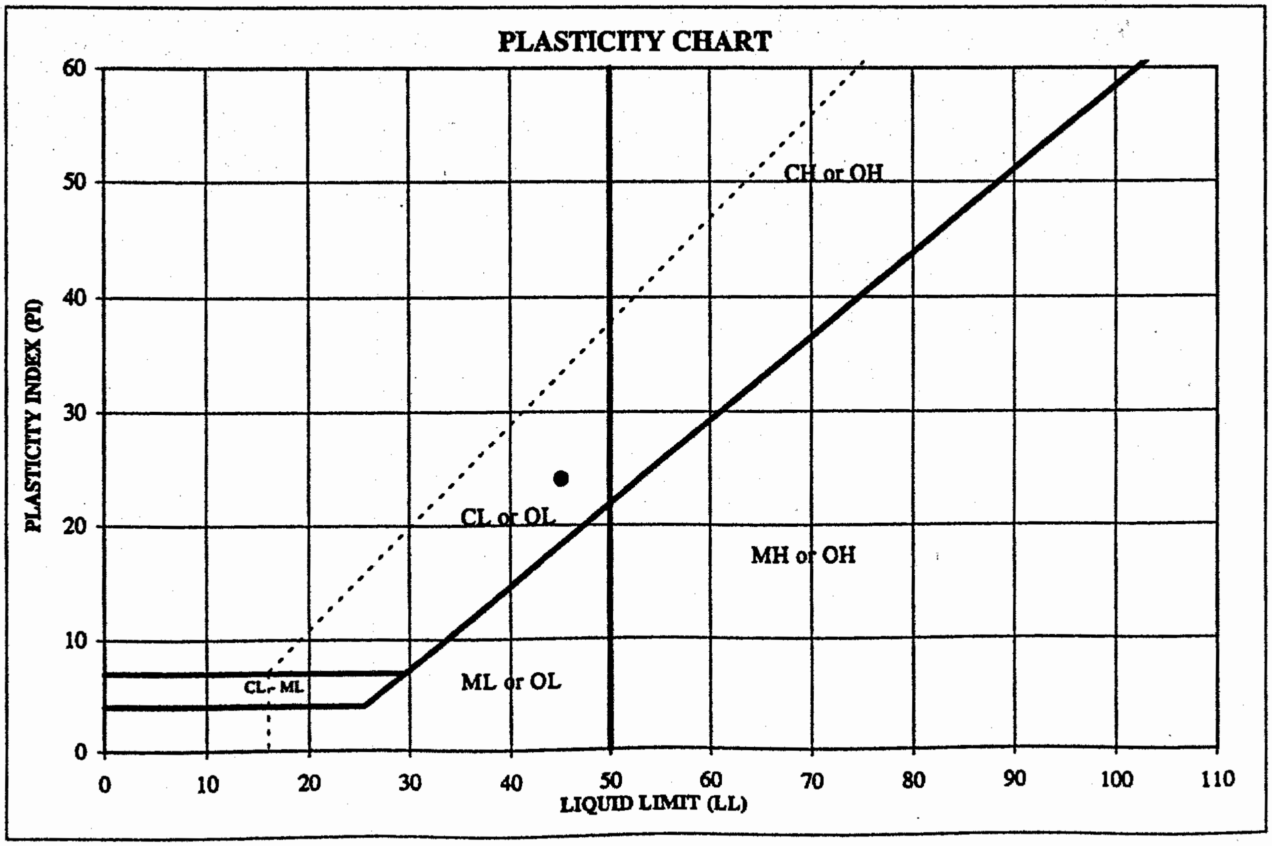
PLASTICITY INDEX (PI) 24

LIQUIDITY INDEX (LI) 0.60

NOTE:

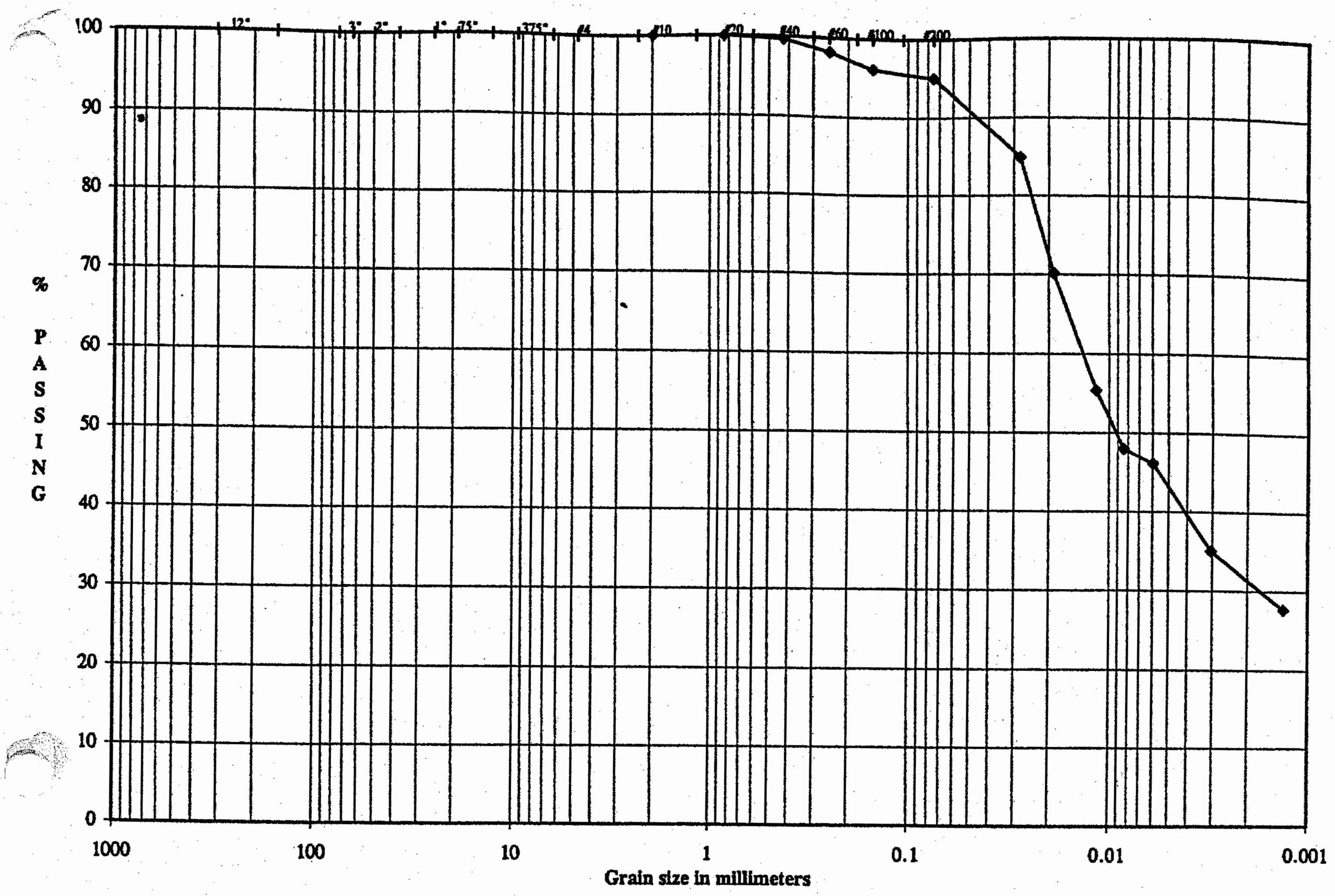
DESCRIPTION Brown, SILTY CLAY, trace fine sand.

USCS CL



TECH	DR
DATE	5/8/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-41	-
SAMPLE TYPE	UD	
SAMPLE DEPTH	3.0 - 5.0'	

LL	45
PL	21
PI	24

DESCRIPTION Brown, SILTY CLAY, trace fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC
DATE	5/16/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM C117, C136, D421, D422, D1140 and D2217

PR[illegible]CT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B-41 | -
[illegible]CT NO.	013-3205	SAMPLE TYPE	UD
		SAMPLE DEPTH	3.0 - 5.0'

AS RECEIVED WATER CONTENT

Tare No.		-
Wt. Wet Soil & Tare (gm)	(W1)	274.27
Wt. Dry Soil & Tare (gm)	(W2)	224.78
Weight of Tare (gm)	(W3)	84.81
Weight of Water (gm)	(W4=W1-W2)	49.49
Weight of Dry Soil (gm)	(W5=W2-W3)	139.97
Moisture Content (%)	(W4/W5)*100	35.36

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	50.20
Dry Soil & Tare (gm)	48.55
Tare Weight (gm)	3.21
Moisture Content (%)	3.64

Total Weight of Sample Used For Sieve Analysis Corrected For Hygroscopic Moisture

Weight + Tare, Before Separating On The #4 Sieve (gm)	717.90	
Tare Weight (gm)	234.15	
Total Weight (gm)	466.76	(W6)

Plus #4 Material Sieve

TARE WEIGHT 0.00

	(Wt+Tare)	(((Wt-Tare)/W6)*100)	%PASSING		
12.0"				12.0"	cobbles
3.0"				3.0"	coarse gravel
2.5"				2.5"	coarse gravel
2.0"				2.0"	coarse gravel
1.5"				1.5"	coarse gravel
1.0"				1.0"	coarse gravel
0.75"				0.75"	fine gravel
0.50"				0.50"	fine gravel
0.375"				0.375"	fine gravel
#4	0.00	0.0	100.0	#4	coarse sand

HYDROMETER ANALYSIS

Specific Gravity	(assumed)	2.650
Specific Gravity	(tested)	
Amount Dispersing Agent (ml)		125.00
T[illegible]persion Device		Mechanical
[illegible] Dispersion Period		1 Minute

Weight of Sample Used For Hydrometer Test

Weight of Sample Wet or Dry (gm)	56.15
Calculated Dry Wt. used in test (gm)	54.18
Hydrometer Bulb Number	624378
% Pass #4 Sieve For Whole Sample	100.00

TARE WEIGHT 0.00

HYDROMETER BACKSIEVE (Percent Passing #10 - #200 Sieves)

	(Wt+Tare)	Cumul Wt. Retained	% PASSING		
#10	0.00	0.00	100.0	#10	medium sand
#20	0.02	0.02	100.0	#20	medium sand
#40	0.20	0.20	99.6	#40	fine sand
#60	0.98	0.98	98.2	#60	fine sand
#100	2.09	2.09	96.1	#100	fine sand
#200	2.69	2.69	95.0	#200	fines

HYDROMETER CALCULATIONS

DATE 5/18/01	TIME 9:20	ET (min)	READING R	TEMP T	TEMP.COR. K	HYD.COR. Cc	READING C	EFFECTIVE LENGTH	A
5/18/01	9:22	2.00	51.0	22.00	0.013	5.00	46.00	8.8	1.00
5/18/01	9:25	5.00	43.0	22.00	0.013	5.00	38.00	10.1	1.00
5/18/01	9:35	15.00	35.0	22.00	0.013	5.00	30.00	11.4	1.00
5/18/01	9:50	30.00	31.0	22.00	0.013	5.00	26.00	12.0	1.00
5/18/01	10:20	60.00	30.0	22.00	0.013	5.00	25.00	12.2	1.00
5/18/01	13:30	250.00	24.0	22.00	0.013	5.00	19.00	13.2	1.00
5/19/01	9:20	1440.00	20.0	21.50	0.014	5.00	15.00	13.8	1.00

GRAIN SIZE PERCENTAGES

Particle Diameter	% PASSING		
0.0279	84.9	% COBBLES	0.00
0.0189	70.1	% COARSE GRAVEL	0.00
0.0116	55.4	% FINE GRAVEL	0.00
0.0084	48.0	% COARSE SAND	0.00
0.0060	46.1	% MEDIUM SAND	0.37
0.0031	35.1	% FINE SAND	4.60
0.0013	27.7	% FINES	95.03
		% TOTAL SAMPLE	100.00

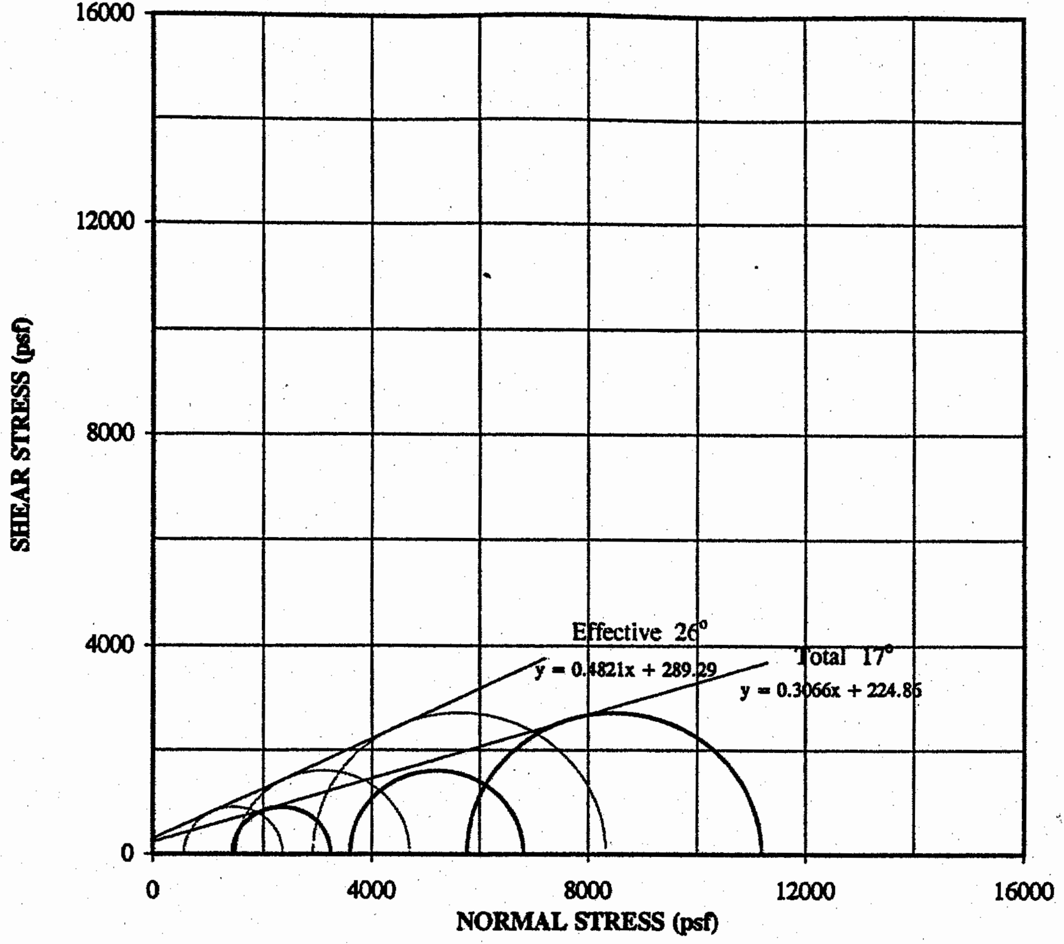
Description Brown, SILTY CLAY, trace fine sand.

USCS CL

45	LL
21	PL
24	PI

TECH	JC
DATE	5/16/01
CHECK	
REVIEW	

TRIAXIAL COMPRESSION TEST TOTAL AND EFFECTIVE MOHR CIRCLES - ASTM D 4767



*TOTAL STRENGTH PARAMETERS	
ϕ =	17.0°
C =	224.9 psf

*EFFECTIVE STRENGTH PARAMETERS	
ϕ' =	25.7°
C' =	289.3 psf

DESCRIPTION	Brown, SILTY CLAY, trace fine sand.
USCS	CL

LL	45
PL	21
PI	24
Gs	2.67

	A	B	C
EFFECTIVE CONSOLIDATION PRESS (psf)	1440	3600	5760
INITIAL DRY DENSITY (pcf)	81.6	83.8	86.5
INITIAL WATER CONTENT, %	37.1	35.4	33.4

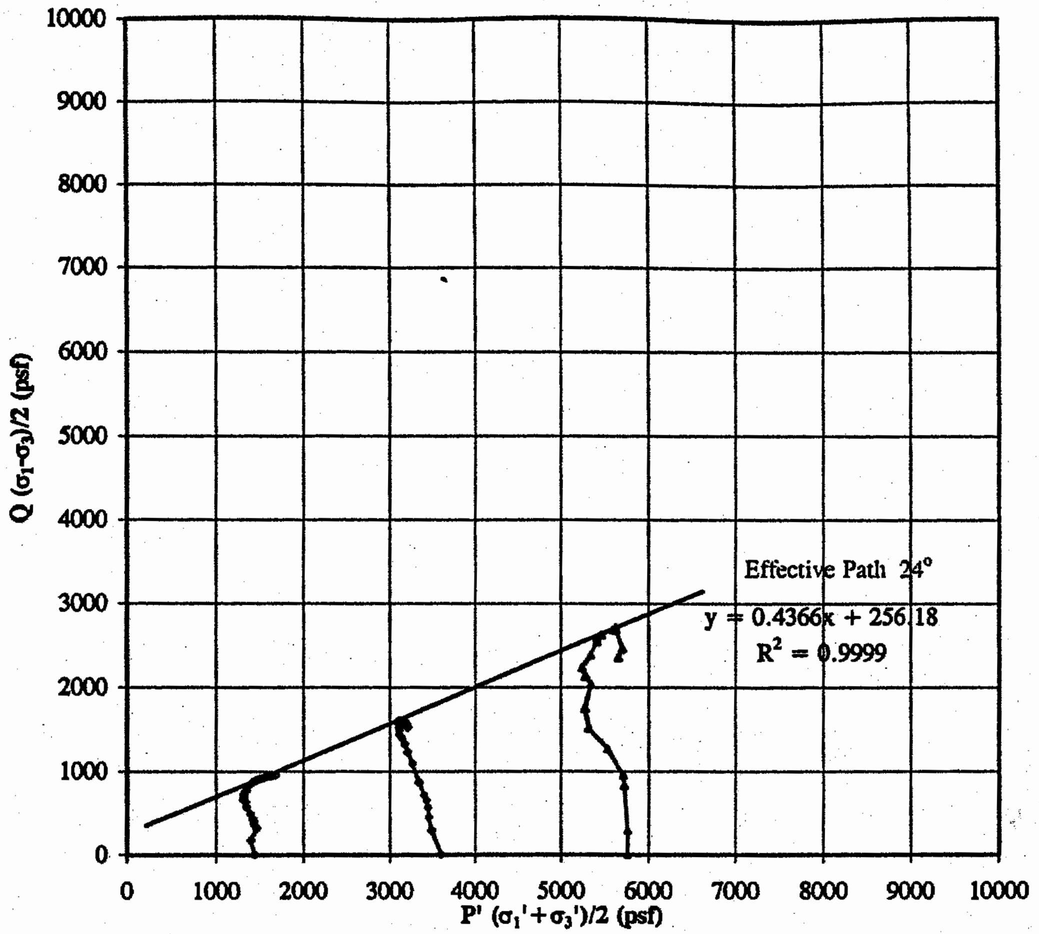
PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	B - 41 3.0 - 5.0'
SAMPLE TYPE	UD

* Failure based on maximum effective stress ratio or 15% strain.

CHECKED

REVIEWED

TRIAXIAL COMPRESSION TEST EFFECTIVE STRESS PATH
ASTM D 4767



*EFFECTIVE STRESS PARAMETERS	
α' =	23.6 °
a' =	256.2 psf

DESCRIPTION	Brown, SILTY CLAY, trace fine sand.
USCS	CL

LL	45
PL	21
PI	24
Gs	2.67

	A	B	C
EFFECTIVE CONSOLIDATION PRESS (psf)	1440	3600	5760
INITIAL DRY DENSITY (pcf)	81.6	83.8	86.5
INITIAL WATER CONTENT %	37.1	35.4	33.4

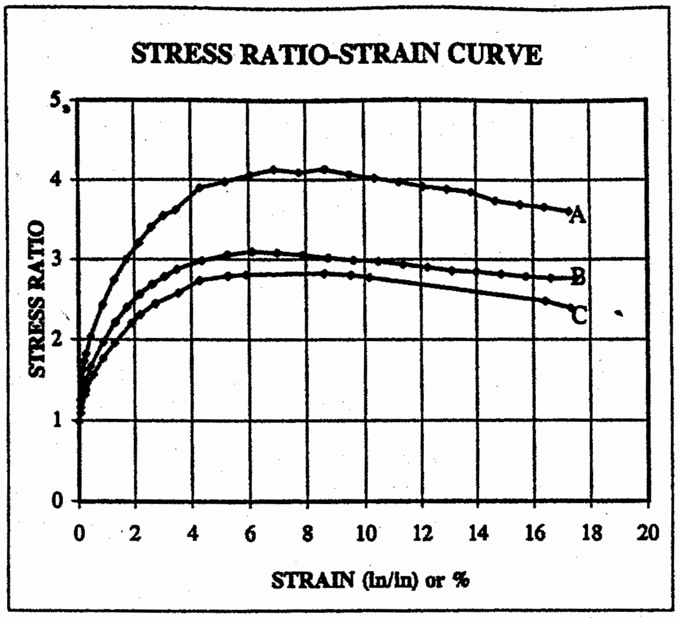
PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B - 41	3.0 - 5.0'
SAMPLE TYPE	UD	

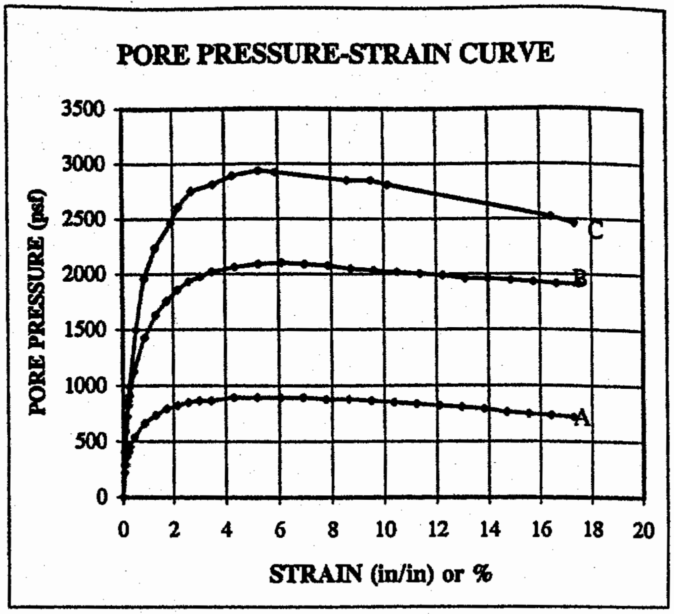
* Failure based on maximum effective stress ratio or 15% strain.

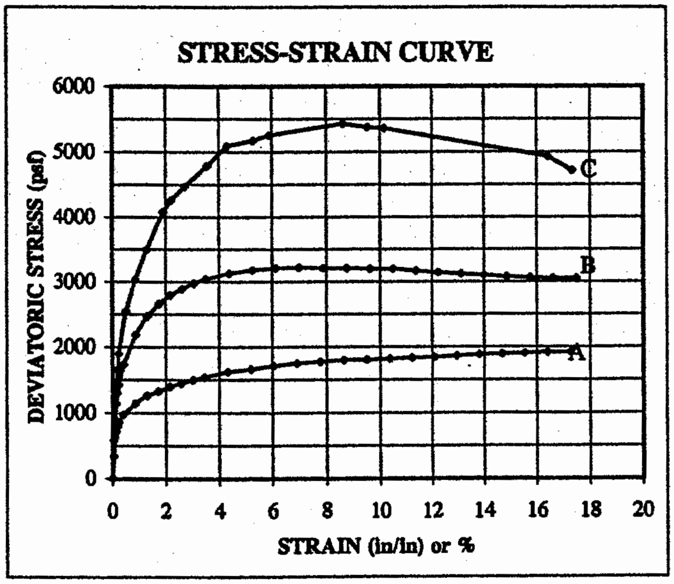
CHECKED	DA
REVIEWED	

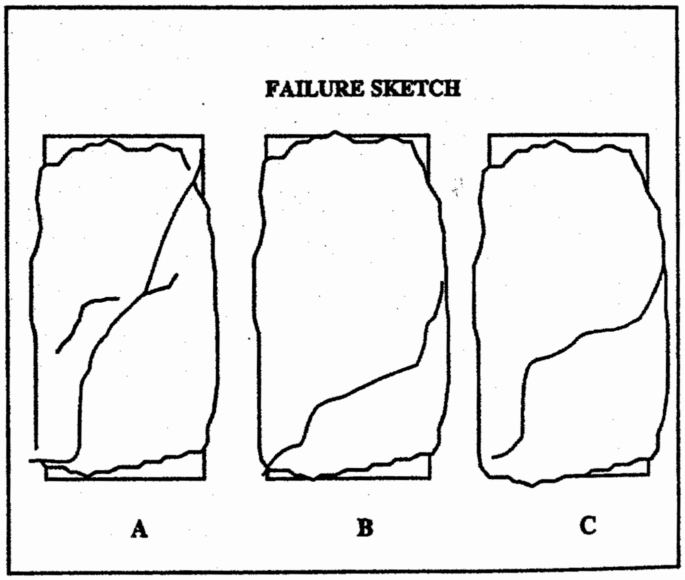
Golder Associates Inc.

TRIAXIAL COMPRESSION TEST
CONSOLIDATED UNDRAINED WITH PORE PRESSURE


STRESS RATIO-STRAIN CURVE


PORE PRESSURE-STRAIN CURVE


STRESS-STRAIN CURVE


FAILURE SKETCH

DESCRIPTION Brown, SILTY CLAY, trace fine sand.

USCS CL

LL	45
PL	21
PI	24
Gs	2.67

	A	B	C
EFFECTIVE CONSOLIDATION PRESS (psf)	1440	3600	5760
INITIAL DRY DENSITY (pcf)	81.6	83.8	86.5
INITIAL WATER CONTENT (%)	37.1	35.4	33.4
STRAIN RATE (%/min)	0.10	0.05	0.003

PROJECT NAME	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	B - 41 3.0 - 5.0'
SAMPLE TYPE	UD

CHECKED	DA
REVIEWED	PWM

TRIAXIAL COMPRESSION TEST (ASTM D-4767) OLIDATED UNDRAINED WITH PORE PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B - 41	-
SAMPLE TYPE	UD	
DEPTH INTERVAL	3.0 - 5.0'	
MACHINE SPEED (in/min)	0.006	
STRAIN RATE (%/min)	0.10	
CELL PRESSURE (psi)	80.0	
SAMPLE PRESSURE (psi)	70.0	
EFF. CONSOLIDATION		
PRESSURE, σ_3 (psi)	10.0	
PRESSURE, σ_3 (psf)	1440.0	
FINAL "B" VALUE	1.00	
t_{50} (minutes)	2.1	

INITIAL SAMPLE DATA	cm	in	corrected
HEIGHT	15.105	5.947	5.786
DIAMETER	7.221	2.843	2.792
AREA	40.96	6.35	6.12
VOLUME	618.65	37.75	35.43
WEIGHT (g)	1108.95		1090.95
% MOISTURE	37.1		34.92
SPECIFIC GRAVITY	2.67		
MOIST DENSITY (pcf)	111.9		
DRY DENSITY, calc (pcf)	81.6		
VOLUME OF SOLIDS	302.74		
VOLUME OF VOIDS	315.91		
VOID RATIO	1.043		
SATURATION	95.1		

CORRECTED SAMPLE DATA	
DRY DENSITY, calc (pcf)	86.9
VOLUME OF SOLIDS*	302.74
VOLUME OF VOIDS	277.91
VOID RATIO	0.918

WATER CONTENT (% MOISTURE)	
WT SOIL & TARE, MOIST (g)	1090.95
WT SOIL & TARE, DRY (g)	808.62
WT TARE (g)	0.00
WT MOISTURE (g)	282.33
WT DRY SOIL (g)	808.62
% MOISTURE	34.92

TIME (MIN)	ACCUM. DEFLECT. (inches)	AXIAL LOAD (lbs)	PORE PRESS. (psi)=U	PWP change DU (psf) (acc)	e % STRAIN (%)	(1-e)	CORR. AREA (in 2)	CORR. HEIGHT (in)	DEV. STRESS (psf)	SIGMA 1 devstr+cp (σ_1)	SIGMA 1 EFF. (σ_1-dU)	SIGMA 3 EFF. (σ_3-dU)	EFF.PRN STR RATIO (σ_1'/ σ_3')	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)	(A)
0.0	0.000	17	70.4	0.0	0.00	1.00	6.12	5.786	0.0	1440.0	1440.0	1440.0	1.00	1440.0	0.0	0.00
0.5	0.003	31	71.9	216.0	0.05	1.00	6.13	5.783	340.8	1780.8	1564.8	1224.0	1.28	1394.4	170.4	0.63
1.0	0.006	43	72.4	288.0	0.10	1.00	6.13	5.780	624.8	2064.8	1776.8	1152.0	1.54	1464.4	312.4	0.46
1.5	0.009	47	72.9	360.0	0.16	1.00	6.13	5.777	713.7	2153.7	1793.7	1080.0	1.66	1436.9	356.9	0.50
2.0	0.012	50	73.2	403.2	0.21	1.00	6.14	5.774	790.8	2230.8	1827.6	1036.8	1.76	1432.2	395.4	0.51
2.5	0.015	53	73.5	446.4	0.26	1.00	6.14	5.771	849.0	2289.0	1842.6	993.6	1.85	1418.1	424.5	0.53
4.2	0.025	58	74.1	532.8	0.43	1.00	6.15	5.761	971.6	2411.6	1878.8	907.2	2.07	1393.0	485.8	0.55
8.3	0.050	66	75.0	662.4	0.86	0.99	6.18	5.736	1142.2	2582.2	1919.8	777.6	2.47	1348.7	571.1	0.58
12.5	0.075	71	75.5	734.4	1.30	0.99	6.20	5.711	1260.3	2700.3	1965.9	705.6	2.79	1335.7	630.1	0.58
16.7	0.100	74	75.9	792.0	1.73	0.98	6.23	5.686	1324.1	2764.1	1972.1	648.0	3.04	1310.0	662.0	0.60
20.8	0.125	77	76.1	820.8	2.16	0.98	6.26	5.661	1394.2	2834.2	2013.4	619.2	3.25	1316.3	697.1	0.59
25.0	0.150	80	76.3	849.6	2.59	0.97	6.29	5.636	1447.6	2887.6	2038.0	590.4	3.45	1314.2	723.8	0.59
29.2	0.175	82	76.4	864.0	3.02	0.97	6.31	5.611	1498.2	2938.2	2074.2	576.0	3.60	1325.1	749.1	0.58
33.3	0.200	84	76.4	864.0	3.46	0.97	6.34	5.586	1539.2	2979.2	2115.2	576.0	3.67	1345.6	769.6	0.56
41.7	0.250	89	76.6	892.8	4.32	0.96	6.40	5.536	1617.6	3057.6	2164.8	547.2	3.96	1356.0	808.8	0.55
50.0	0.300	91	76.6	892.8	5.18	0.95	6.46	5.486	1661.0	3101.0	2208.2	547.2	4.04	1377.7	830.5	0.54
58.3	0.350	94	76.6	892.8	6.05	0.94	6.52	5.436	1709.9	3149.9	2257.1	547.2	4.12	1402.2	855.0	0.52
66.7	0.400	97	76.6	892.8	6.91	0.93	6.58	5.386	1748.9	3188.9	2296.1	547.2	4.20	1421.6	874.4	0.51
75.0	0.450	98	76.5	878.4	7.78	0.92	6.64	5.336	1773.9	3213.9	2335.5	561.6	4.16	1448.5	886.9	0.50
83.3	0.500	100	76.5	878.4	8.64	0.91	6.70	5.286	1795.9	3235.9	2357.5	561.6	4.20	1459.6	898.0	0.49
91.7	0.550	101	76.4	864.0	9.51	0.90	6.77	5.236	1802.3	3242.3	2378.3	576.0	4.13	1477.2	901.2	0.48
100.0	0.600	103	76.3	849.6	10.37	0.90	6.83	5.186	1818.8	3258.8	2409.2	590.4	4.08	1499.8	909.4	0.47
108.3	0.650	104	76.2	835.2	11.23	0.89	6.90	5.136	1832.6	3272.6	2437.4	604.8	4.03	1521.1	916.3	0.46
116.7	0.700	106	76.1	820.8	12.10	0.88	6.97	5.086	1841.6	3281.6	2460.8	619.2	3.97	1540.0	920.8	0.45
125.0	0.750	108	76.0	806.4	12.96	0.87	7.04	5.036	1862.4	3302.4	2496.0	633.6	3.94	1564.8	931.2	0.43
133.3	0.800	109	75.9	792.0	13.83	0.86	7.11	4.986	1880.4	3320.4	2528.4	648.0	3.90	1588.2	940.2	0.42
141.7	0.850	111	75.7	763.2	14.69	0.85	7.18	4.936	1889.6	3329.6	2566.4	676.8	3.79	1621.6	944.8	0.40
150.0	0.900	112	75.6	748.8	15.55	0.84	7.25	4.886	1900.3	3340.3	2591.5	691.2	3.75	1641.3	950.1	0.39
158.3	0.950	114	75.5	734.4	16.42	0.84	7.33	4.836	1914.2	3354.2	2619.8	705.6	3.71	1662.7	957.1	0.38
166.7	1.000	115	75.4	720.0	17.28	0.83	7.40	4.786	1913.9	3353.9	2633.9	720.0	3.66	1677.0	957.0	0.38

DU @ FAILURE	878.4	DEVIATORIC STRESS @ FAILURE	1795.9	EFFECTIVE PRINCIPLE STRESS RATIO @ FAILURE	4.20

TECH	NA/DA/PWM
DATE	5/21/01
CHECKED	DA
REVIEWED	PWM

TRIAXIAL COMPRESSION TEST (ASTM D-4767) C[illegible]OLIDATED UNDRAINED WITH PORE PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B - 41	-
SAMPLE TYPE	UD	
DEPTH INTERVAL	3.0 - 5.0'	
MACHINE SPEED (in/min)	0.003	
STRAIN RATE (%/min)	0.05	
CELL PRESSURE (psi)	95.0	
SAMPLE PRESSURE (psi)	70.0	
EFF. CONSOLIDATION		
PRESSURE, σ_3 (psi)	25.0	
PRESSURE, σ_3 (psf)	3600.0	
FINAL "B" VALUE	0.99	
t_{50} (minutes)	7.9	

INITIAL SAMPLE DATA	cm	in	corrected
HEIGHT	14.923	5.875	5.713
DIAMETER	7.257	2.857	2.787
AREA	41.36	6.41	6.10
VOLUME	617.19	37.66	34.86
WEIGHT (g)	1121.70		1094.70
% MOISTURE	35.4		32.15
SPECIFIC GRAVITY	2.67		
MOIST DENSITY (pcf)	113.4		
DRY DENSITY, calc (pcf)	83.8		
VOLUME OF SOLIDS	310.15		
VOLUME OF VOIDS	307.04		
VOID RATIO	0.990		
SATURATION	95.5		

CORRECTED SAMPLE DATA	
DRY DENSITY, calc (pcf)	90.5
VOLUME OF SOLIDS	310.15
VOLUME OF VOIDS	261.04
VOID RATIO	0.842

WATER CONTENT (% MOISTURE)	
WT SOIL & TARE, MOIST (g)	1094.70
WT SOIL & TARE, DRY (g)	828.40
WT TARE (g)	0.00
WT MOISTURE (g)	266.30
WT DRY SOIL (g)	828.40
% MOISTURE	32.15

TIME (MIN)	ACCUM. DEFLECT. (inches)	AXIAL LOAD (lbs)	PORE PRESS. (psi)=U	PWP change DU (psf) (acc)	e % STRAIN (%)	(1-e)	CORR. AREA (in 2)	CORR. HEIGHT (in)	DEV. STRESS (psf)	SIGMA 1 devstr+cp (σ_1)	SIGMA 1 EFF. (σ_1-dU)	SIGMA 3 EFF. (σ_3-dU)	EFF.PRN STR RATIO (σ_1'/σ_3')	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)	(A)
0.0	0.000	35	70.5	0.0	0.00	1.00	6.10	5.713	0.0	3600.0	3600.0	3600.0	1.00	3600.0	0.0	0.00
1.0	0.003	60	73.3	403.2	0.05	1.00	6.10	5.710	582.7	4182.7	3779.5	3196.8	1.18	3488.1	291.3	0.69
2.0	0.006	73	74.6	590.4	0.11	1.00	6.11	5.707	898.3	4498.3	3907.9	3009.6	1.30	3458.7	449.1	0.66
3.0	0.009	83	75.5	720.0	0.16	1.00	6.11	5.704	1133.5	4733.5	4013.5	2880.0	1.39	3446.7	566.7	0.64
4.0	0.012	90	76.2	820.8	0.21	1.00	6.11	5.701	1297.7	4897.7	4076.9	2779.2	1.47	3428.1	648.9	0.63
5.0	0.015	95	76.8	907.2	0.26	1.00	6.12	5.698	1421.8	5021.8	4114.6	2692.8	1.53	3403.7	710.9	0.64
8.3	0.025	109	78.3	1123.2	0.44	1.00	6.13	5.688	1734.2	5334.2	4211.0	2476.8	1.70	3343.9	867.1	0.65
16.7	0.050	128	80.4	1425.6	0.88	0.99	6.16	5.663	2180.4	5780.4	4354.8	2174.4	2.00	3264.6	1090.2	0.65
25.0	0.075	141	81.8	1627.2	1.31	0.99	6.18	5.638	2462.0	6062.0	4434.8	1972.8	2.25	3203.8	1231.0	0.66
33.3	0.100	150	82.7	1756.8	1.75	0.98	6.21	5.613	2655.1	6255.1	4498.3	1843.2	2.44	3170.8	1327.6	0.66
41.7	0.125	156	83.4	1857.6	2.19	0.98	6.24	5.588	2791.0	6391.0	4533.4	1742.4	2.60	3137.9	1395.5	0.67
50.0	0.150	160	83.9	1929.6	2.63	0.97	6.27	5.563	2882.0	6482.0	4552.4	1670.4	2.73	3111.4	1441.0	0.67
58.3	0.175	165	84.2	1972.8	3.06	0.97	6.29	5.538	2972.0	6572.0	4599.2	1627.2	2.83	3113.2	1486.0	0.66
66.7	0.200	168	84.5	2016.0	3.50	0.96	6.32	5.513	3038.3	6638.3	4622.3	1584.0	2.92	3103.1	1519.1	0.66
83.3	0.250	173	84.8	2059.2	4.38	0.96	6.38	5.463	3123.6	6723.6	4664.4	1540.8	3,03	3102.6	1561.8	0.66
100.0	0.300	177	85.0	2088.0	5.25	0.95	6.44	5.413	3175.5	6775.5	4687.5	1512.0	3.10	3099.7	1587.7	0.66
116.7	0.350	180	85.1	2102.4	6.13	0.94	6.50	5.363	3203.7	6803.7	4701.3	1497.6	3.14	3099.5	1601.9	0.66
133.3	0.400	181	85.0	2088.0	7.00	0.93	6.56	5.313	3213.4	6813.4	4725.4	1512.0	3.13	3118.7	1606.7	0.65
150.0	0.450	183	84.9	2073.6	7.88	0.92	6.62	5.263	3207.1	6807.1	4733.5	1526.4	3.10	3129.9	1603.5	0.65
166.7	0.500	184	84.7	2044.8	8.75	0.91	6.69	5.213	3206.7	6806.7	4761.9	1555.2	3.06	3158.6	1603.4	0.64
183.3	0.550	185	84.6	2030.4	9.63	0.90	6.75	5.163	3193.1	6793.1	4762.7	1569.6	3.03	3166.1	1596.5	0.64
200.0	0.600	186	84.5	2016.0	10.50	0.89	6.82	5.113	3193.8	6793.8	4777.8	1584.0	3.02	3180.9	1596.9	0.63
216.7	0.650	186	84.4	2001.6	11.38	0.89	6.88	5.063	3164.7	6764.7	4763.1	1598.4	2.98	3180.7	1582.3	0.63
233.3	0.700	186	84.3	1987.2	12.25	0.88	6.95	5.013	3135.5	6735.5	4748.3	1612.8	2.94	3180.5	1567.7	0.63
250.0	0.750	187	84.1	1958.4	13.13	0.87	7.02	4.963	3116.5	6716.5	4758.1	1641.6	2.90	3199.9	1558.3	0.63
266.7	0.800	188	84.1	1958.4	14.00	0.86	7.09	4.913	3095.3	6695.3	4736.9	1641.6	2.89	3189.2	1547.6	0.63
283.3	0.850	188	84.0	1944.0	14.88	0.85	7.17	4.863	3073.8	6673.8	4729.8	1656.0	2.86	3192.9	1536.9	0.63
300.0	0.900	189	83.9	1929.6	15.75	0.84	7.24	4.813	3058.1	6658.1	4728.5	1670.4	2.83	3199.5	1529.1	0.63
316.7	0.950	190	83.8	1915.2	16.63	0.83	7.32	4.763	3046.0	6646.0	4730.8	1684.8	2.81	3207.8	1523.0	0.63
333.3	1.000	191	83.8	1915.2	17.50	0.82	7.40	4.713	3043.3	6643.3	4728.1	1684.8	2.81	3206.4	1521.6	0.63

DU @ FAILURE	2102.4	DEVIATORIC STRESS @ FAILURE	3203.7	EFFECTIVE PRINCIPLE STRESS RATIO @ FAILURE	3.14	TECH	NA/DA/PWM
						DATE	5/21/01
						CHECKED	
						REVIEWED	

TRIAXIAL COMPRESSION TEST (ASTM D-4767) OLIDATED UNDRAINED WITH PORE PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B - 41	-
SAMPLE TYPE	UD	
DEPTH INTERVAL	3.0 - 5.0'	
MACHINE SPEED (in/min)	0.00016	
STRAIN RATE (%/min)	0.003	
CELL PRESSURE (psi)	110.0	
SAMPLE PRESSURE (psi)	70.0	
EFF. CONSOLIDATION		
PRESSURE, σ_3 (psi)	40.0	
PRESSURE, σ_3 (psf)	5760.0	
FINAL "B" VALUE	1.00	
t_{50} (minutes)	148	

INITIAL SAMPLE DATA	cm	in	corrected
HEIGHT	15.159	5.968	5.767
DIAMETER	7.239	2.850	2.761
AREA	41.16	6.38	5.99
VOLUME	623.89	38.07	34.53
WEIGHT (g)	1154.16		1109.16
% MOISTURE	33.4		28.18
SPECIFIC GRAVITY	2.67		
MOIST DENSITY (pcf)	115.4		
DRY DENSITY, calc (pcf)	86.5		
VOLUME OF SOLIDS	323.96		
VOLUME OF VOIDS	299.93		
VOID RATIO	0.926		
SATURATION	96.3		

CORRECTED SAMPLE DATA	
DRY DENSITY, calc (pcf)	95.4
VOLUME OF SOLIDS*	323.96
VOLUME OF VOIDS	241.93
VOID RATIO	0.747

WATER CONTENT (% MOISTURE)	
WT SOIL & TARE, MOIST (g)	1109.16
WT SOIL & TARE, DRY (g)	865.31
WT TARE (g)	0.00
WT MOISTURE (g)	243.85
WT DRY SOIL (g)	865.31
% MOISTURE	28.18

TIME (MIN)	ACCUM. DEFLECT. (inches)	AXIAL LOAD (lbs)	PORE PRESS. (psi)=U	PWP change DU (psf) (acc)	e % STRAIN (%)	(1-e)	CORR. AREA (in 2)	CORR. HEIGHT (in)	DEV. STRESS (psf)	SIGMA 1 devstr+cp (σ_1)	SIGMA 1 EFF. (σ_1-dU)	SIGMA 3 EFF. (σ_3-dU)	EFF.PRN STR RATIO (σ_1'/σ_3')	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)	(A)
0.0	0.000	25	70.5	0.0	0.00	1.00	5.99	5.767	0.0	5760.0	5760.0	5760.0	1.00	5760.0	0.0	0
18.8	0.003	49	72.5	288.0	0.05	1.00	5.99	5.764	576.9	6336.9	6048.9	5472.0	1.11	5760.4	288.4	0.50
75.0	0.012	94	76.5	864.0	0.21	1.00	6.00	5.755	1655.9	7415.9	6551.9	4896.0	1.34	5723.9	827.9	0.52
93.8	0.015	104	77.4	993.6	0.26	1.00	6.00	5.752	1894.9	7654.9	6661.3	4766.4	1.40	5713.8	947.4	0.52
187.5	0.030	131	80.9	1497.6	0.52	0.99	6.02	5.737	2535.8	8295.8	6798.2	4262.4	1.59	5530.3	1267.9	0.59
312.5	0.050	152	84.1	1958.4	0.87	0.99	6.04	5.717	3027.6	8787.6	6829.2	3801.6	1.80	5315.4	1513.8	0.65
468.8	0.075	172	86.0	2232.0	1.30	0.99	6.07	5.692	3489.1	9249.1	7017.1	3528.0	1.99	5272.5	1744.5	0.64
687.5	0.110	198	87.6	2462.4	1.91	0.98	6.10	5.657	4081.0	9841.0	7378.6	3297.6	2.24	5338.1	2040.5	0.60
800.0	0.128	206	88.6	2606.4	2.22	0.98	6.12	5.639	4256.1	10016.1	7409.7	3153.6	2.35	5281.6	2128.0	0.61
987.5	0.158	216	89.6	2750.4	2.74	0.97	6.16	5.609	4467.3	10227.3	7476.9	3009.6	2.48	5243.3	2233.7	0.62
1281.3	0.205	231	90.0	2808.0	3.55	0.96	6.21	5.562	4777.8	10537.8	7729.8	2952.0	2.62	5340.9	2388.9	0.59
1550.0	0.248	246	90.6	2894.4	4.30	0.96	6.26	5.519	5086.1	10846.1	7951.7	2865.6	2.77	5408.6	2543.0	0.57
1900.0	0.304	252	90.9	2937.6	5.27	0.95	6.32	5.463	5171.1	10931.1	7993.5	2822.4	2.83	5408.0	2585.6	0.57
2125.0	0.340	257	90.8	2923.2	5.90	0.94	6.36	5.427	5250.2	11010.2	8087.0	2836.8	2.85	5461.9	2625.1	0.56
3106.3	0.497	272	90.3	2851.2	8.62	0.91	6.55	5.270	5428.0	11188.0	8336.8	2908.8	2.87	5622.8	2714.0	0.53
3437.5	0.550	272	90.3	2851.2	9.54	0.90	6.62	5.217	5373.4	11133.4	8282.2	2908.8	2.85	5595.5	2686.7	0.53
3668.8	0.587	273	90.0	2808.0	10.18	0.90	6.67	5.180	5356.9	11116.9	8308.9	2952.0	2.81	5630.4	2678.4	0.52
5925.0	0.948	270	88.0	2520.0	16.44	0.84	7.17	4.819	4923.3	10683.3	8163.3	3240.0	2.52	5701.6	2461.6	0.51
6250.0	1.000	262	87.6	2462.4	17.34	0.83	7.24	4.767	4711.1	10471.1	8008.7	3297.6	2.43	5653.2	2355.6	0.52

DU @ FAILURE	2851.2	**DEVIATORIC STRESS @ FAILURE**	5428.0	**EFFECTIVE PRINCIPLE STRESS RATIO @ FAILURE**	2.87

TECH	NA/DA/PWM
DATE	5/21/01
CHECKED	DA
REVIEWED	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-43 - **SAMPLE DEPTH:** 3.0 - 5.0'
SAMPLE TYPE: UD

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION					NATURAL MOISTURE
Number of Blows				25	25				
Weight of Wet Soil & Tare (gm)	20.83	22.03	20.95	21.17	21.89		TRIAL 1	TRIAL 2	564.31
Weight of Dry Soil & Tare (gm)	19.20	20.16	19.28	15.99	16.52				420.21
Weight of Tare (gm)	11.25	11.31	11.28	4.26	4.27	BLOWS:	25	25	0.00
Weight of Water (gm)	1.63	1.87	1.67	5.18	5.37				144.10
Weight of Dry Soil (gm)	7.95	8.85	8.00	11.73	12.25	K VALUE:	1	1	420.21
Water Content %	20.50	21.13	20.88	44.16	43.84				34.29

PLASTIC LIMIT (PL): 21

LIQUID LIMIT (LL): 44

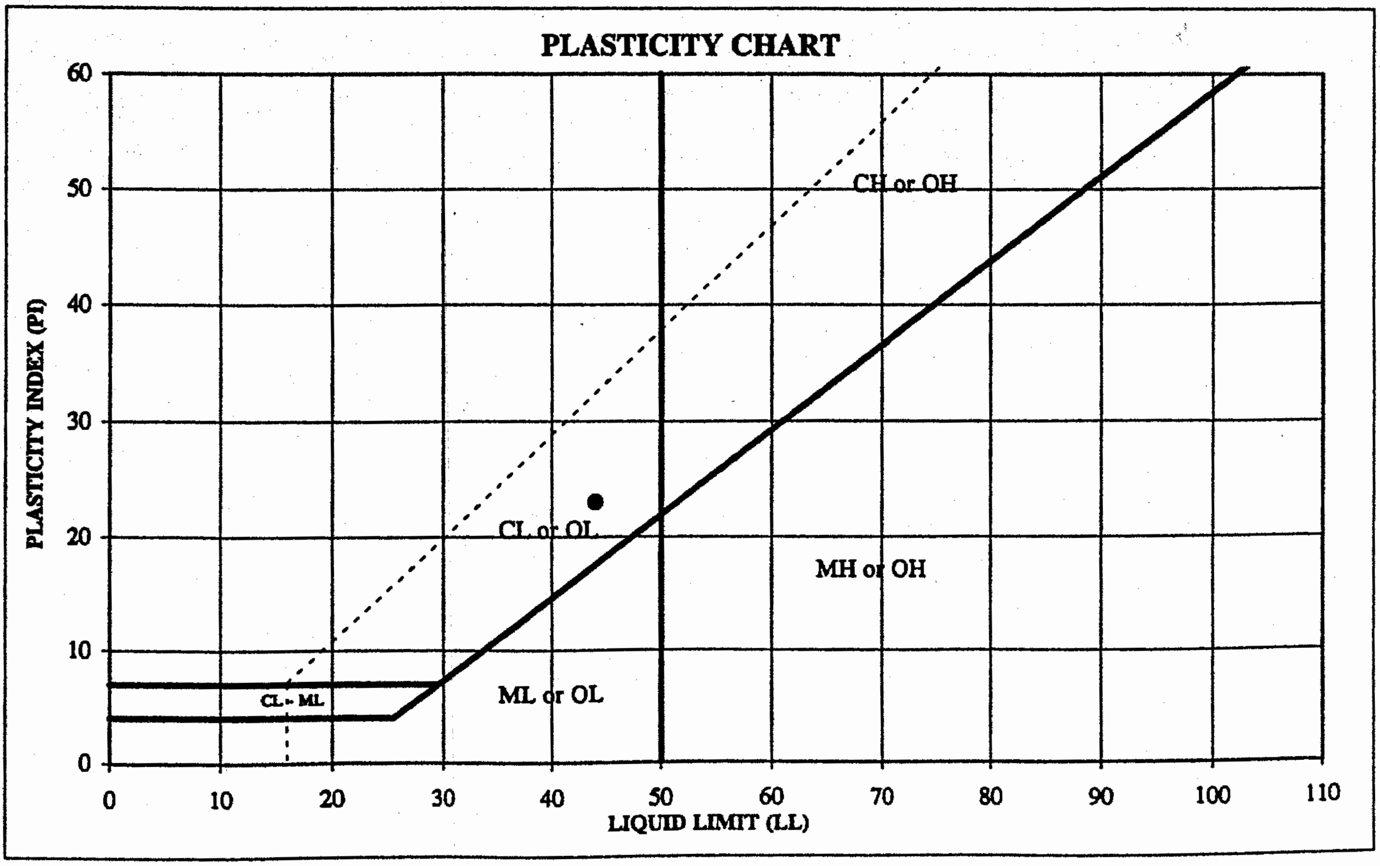
PLASTICITY INDEX (PI): 23

LIQUIDITY INDEX (LI): 0.59

NOTE:

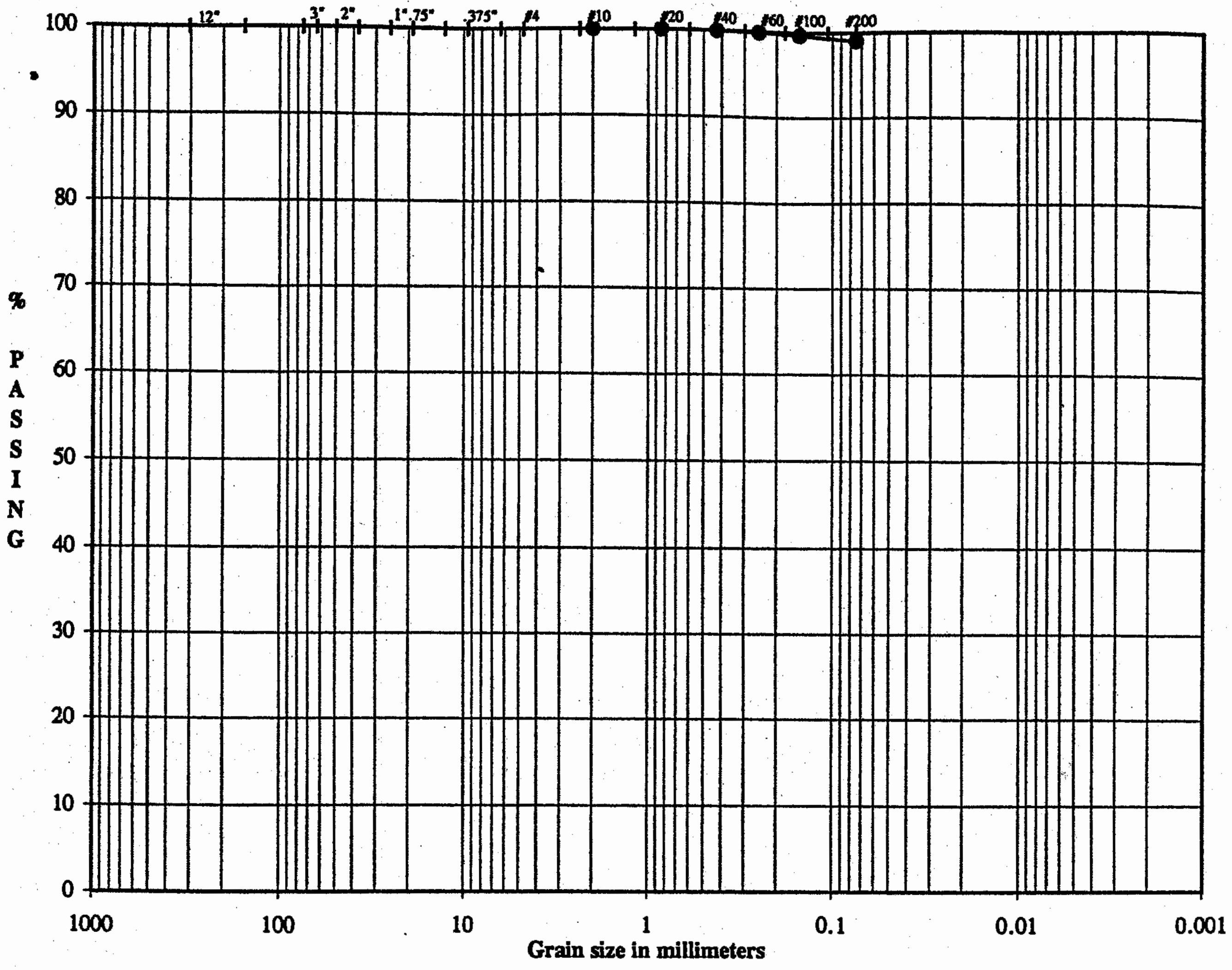
DESCRIPTION: Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS: CL



TECH: DR
DATE: 5/9/01
CHECK:
REVIEW:

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID B-43
SAMPLE TYPE UD
SAMPLE DEPTH 3.0 - 5.0'

LL 44
PL 21
PI 23

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH SW
DATE 5/7/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-43 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	564.31
Wt Dry Soil & Tare (gm)	(w2)	420.21
Weight of Tare (gm)	(w3)	0.00
Weight of Water (gm)	(w4=w1-w2)	144.10
Weight of Dry Soil (gm)	(w5=w2-w3)	420.21
Moisture Content (%)	(w4/w5)*100	34.29

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Mc

	Weight Of Sample (gm	471.41
	Tare Weight (gm)	115.43
(W6)	Total Dry Weight (gm)	355.98

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.03	0.03	0.01	99.99	#20	medium sand
#40	0.15	0.15	0.04	99.96	#40	fine sand
#60	0.43	0.43	0.12	99.88	#60	fine sand
#100	1.20	1.20	0.34	99.66	#100	fine sand
#200	3.47	3.47	0.97	99.03	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.04
% F SAND	0.93
% FINES	99.03
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	44
PL	21
PI	23
Gs	2.671

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

TECH	SW
DATE	5/7/01
CHECK	
REVIEW	

FLOW PUMP #1

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			**BOARD #**	8
PROJECT NUMBER	013-3205			**CELL #**	8
SAMPLE ID	B-43 -	-	3.0 -5.0'	**Flow Pump Speed**	6
SAMPLE TYPE	UD			**Technician**	KBG

COMMENTS

Sample Data, Initial

Height, inches	2.962	B-Value, f	0.98
Diameter, inches	2.843	Cell Pres.	85.0
Area, cm²	40.96	Bot. Pres.	80.0
Volume, cm³	308.13	Top Pres.	80.0
Mass, g	564.31	Tot. B.P.	80.0
Moisture Content, %	34.29	Head, max.	104.81
Dry Density, pcf	85.10	Head, min.	104.81
Spec. Gravity	2.671	Max. Grad.	14.13
Volume Solids, cm³	157.30	Min. Grad.	14.13
Volume Voids, cm³	150.83		
Void Ratio	0.96		
Saturation, %	95.5%		

Sample Data, Final

Height, inches	2.920
Diameter, inches	2.849
Area, cm²	41.13
Volume, cm³	305.04
Mass, g	563.96
Moisture Content, %	34.21
Dry Density, pcf	85.96
Volume Solids, cm³	157.30
Volume Voids, cm³	147.74
Void Ratio	0.94
Saturation, %	97.3%

		Trimmings	Sample
WATER CONTENTS		Initial	Final
Wt Soil & Tare, i	g	564.31	614.67
Wt Soil & Tare, f	g	420.21	470.98
Wt Tare	g	0.00	50.95
Wt Moisture Lost	g	144.10	143.69
Wt Dry Soil	g	420.21	420.03
Water Content	%	34.29%	34.21%

DESCRIPTION

Olive Brown, SILTY CLAY, trace medium to fine sand.

Flow Pump Rate 5.90E-04 cm³/sec

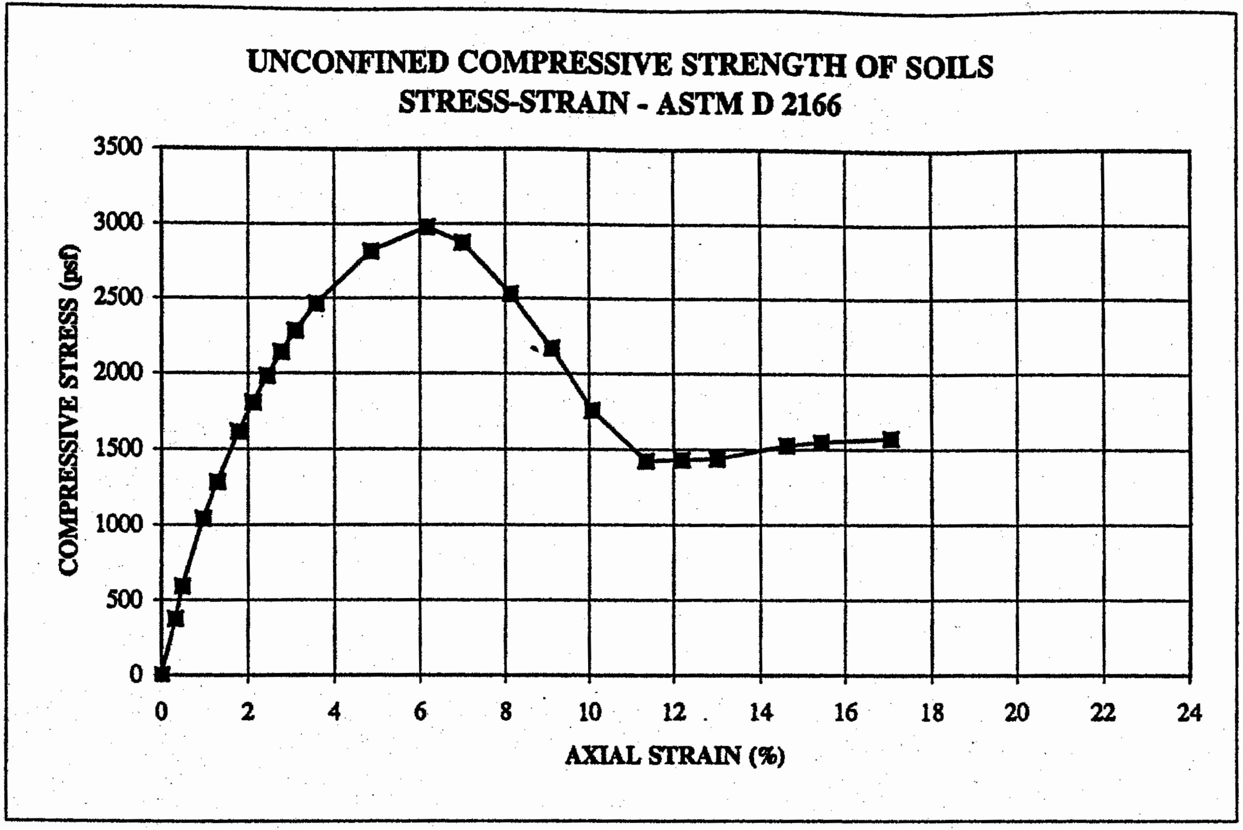
USCS CL

TIME FUNCTIONS, SECONDS								dP				
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)
5/3/01	37014	12	20	20	0	0	0	0	1.49	104.81	14.13	1.0E-06
5/3/01	37014	12	25	20	5	5	300	300	1.49	104.81	14.13	1.0E-06
5/3/01	37014	12	30	20	5	10	300	600	1.49	104.81	14.13	1.0E-06
5/3/01	37014	12	35	20	5	15	300	900	1.49	104.81	14.13	1.0E-06 *
5/3/01	37014	12	40	20	5	20	300	1200	1.49	104.81	14.13	1.0E-06 *
5/3/01	37014	12	45	20	5	25	300	1500	1.49	104.81	14.13	1.0E-06 *
5/3/01	37014	12	50	20	5	30	300	1800	1.49	104.81	14.13	1.0E-06 *

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 1.0E-06 cm/sec **

DATE 5/3/01
CHECK
REVIEW



DESCRIPTION	LL	PL	PI	SAMPLE ID
Olive Brown, SILTY CLAY, trace medium to fine sand.	44	21	23	B - 43
	SAMPLE TYPE		UD	3.0 - 5.0'

USCS	CL

SAMPLE DATA

Wet Density (pcf)	118.1
Dry Density (pcf)	87.9
Moisture Content	34.3%

TIME TO FAILURE (min)	6.3
STRAIN @ FAILURE (%)	6.2
TYPE OF FAILURE	SHEAR

UNCONFINED COMPRESSIVE STRENGTH (psf)	2978.2
SHEAR STRENGTH (psf)	1489.1

013-3205
GENESIS/PLUM POINT ENERGY/AR

TECH	DA
DATE	5/3/01
CHECK	DA
REVIEW	

UNCONFINED COMPRESSIVE STRENGTH OF SOILS

ASTM D 2166

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B - 43
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

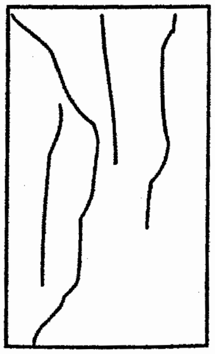
SAMPLE DATA	
Height (in)	6.153
Diameter (in)	2.868
Height/Diameter Ratio	2.15
Area (in^2)	6.46
Volume (ft^3)	0.0230
Weight (gm)	1232.38
Wet Density (pcf)	118.06
Dry Density (pcf)	87.91
Machine Speed (in/min)	0.06
Strain rate (%/min)	0.98

WATER CONTENT	**BEFORE SHEAR (entire)**	**AFTER SHEAR (partial)**
Tare No.	SQ-8	-
Wt. Wet Soil & Tare (gm)	1232.38	564.31
Wt. Dry Soil & Tare (gm)	917.68	420.21
Wt. Tare (gm)	0.00	0.00
Wt. Moisture (gm)	314.70	144.10
Wt. Dry Soil (gm)	917.68	420.21
Moisture (%)	34.29%	34.29%

TIME (min)	DEFLECT (inch)	FORCE (lbs)	% STRAIN (in/in)	Ac (in²)	COMPRESSIVE STRESS (psf)	COMPRESSIVE STRESS (psi)
0.0	0.000	0	0.00	6.46	0.00	0.00
0.3	0.020	17	0.32	6.48	375.71	2.61
0.5	0.030	27	0.49	6.49	592.48	4.11
1.0	0.060	47	0.97	6.52	1041.19	7.23
1.3	0.080	58	1.30	6.55	1283.97	8.92
1.8	0.110	74	1.79	6.58	1614.32	11.21
2.2	0.130	83	2.11	6.60	1806.45	12.54
2.5	0.150	91	2.44	6.62	1983.12	13.77
2.8	0.170	99	2.76	6.64	2140.16	14.86
3.2	0.190	106	3.09	6.67	2283.36	15.86
3.7	0.220	115	3.57	6.70	2463.17	17.11
5.0	0.299	133	4.86	6.79	2816.30	19.56
6.3	0.380	142	6.17	6.89	2978.15	20.68
7.2	0.430	139	6.99	6.95	2873.57	19.96
8.3	0.500	124	8.12	7.03	2529.19	17.56
9.3	0.560	107	9.10	7.11	2168.02	15.06
10.3	0.620	88	10.07	7.18	1756.90	12.20
11.7	0.699	72	11.36	7.29	1424.75	9.89
12.5	0.750	73	12.19	7.36	1431.42	9.94
13.3	0.800	74	13.00	7.43	1436.40	9.98
15.0	0.900	80	14.63	7.57	1525.46	10.59
15.8	0.950	82	15.44	7.64	1548.45	10.75
17.5	1.050	85	17.06	7.79	1570.79	10.91
				UNCONFINED COMPRESSIVE STRENGTH	2978.15	20.68
				SHEAR STRENGTH	1489.08	10.34

TIME TO FAILURE (min)	6.33
STRAIN @ FAILURE (%)	6.17
TYPE OF FAILURE	SHEAR

FAILURE SKETCH



Description	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CL

LL	44
PL	21
PI	23

TECH	DA
DATE	5/3/01
CHECK	DA
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-44 - **SAMPLE DEPTH:** 3.0 - 5.0'
SAMPLE TYPE: UD

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				25	25	
Weight of Wet Soil & Tare (gm)	22.33	22.60	21.54	23.38	23.40	357.09
Weight of Dry Soil & Tare (gm)	20.38	20.72	19.70	17.52	18.33	273.56
Weight of Tare (gm)	11.06	11.70	10.81	4.25	6.70	0.00
Weight of Water (gm)	1.95	1.88	1.84	5.86	5.07	83.53
Weight of Dry Soil (gm)	9.32	9.02	8.89	13.27	11.63	273.56
Water Content %	20.92	20.84	20.70	44.16	43.59	30.54

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

PLASTIC LIMIT (PL): 21

LIQUID LIMIT (LL): 44

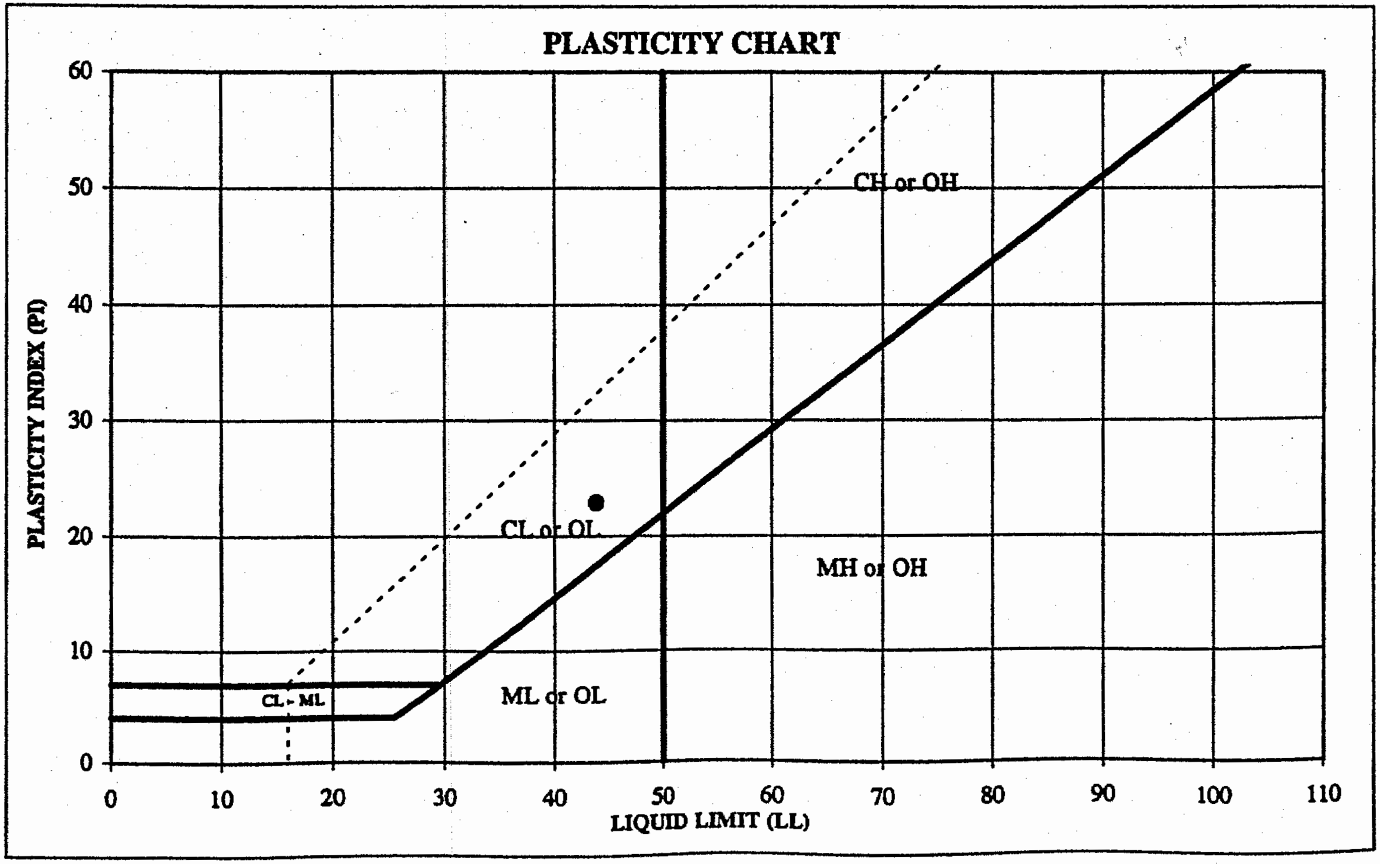
PLASTICITY INDEX (PI): 23

LIQUIDITY INDEX (LI): 0.42

NOTE:

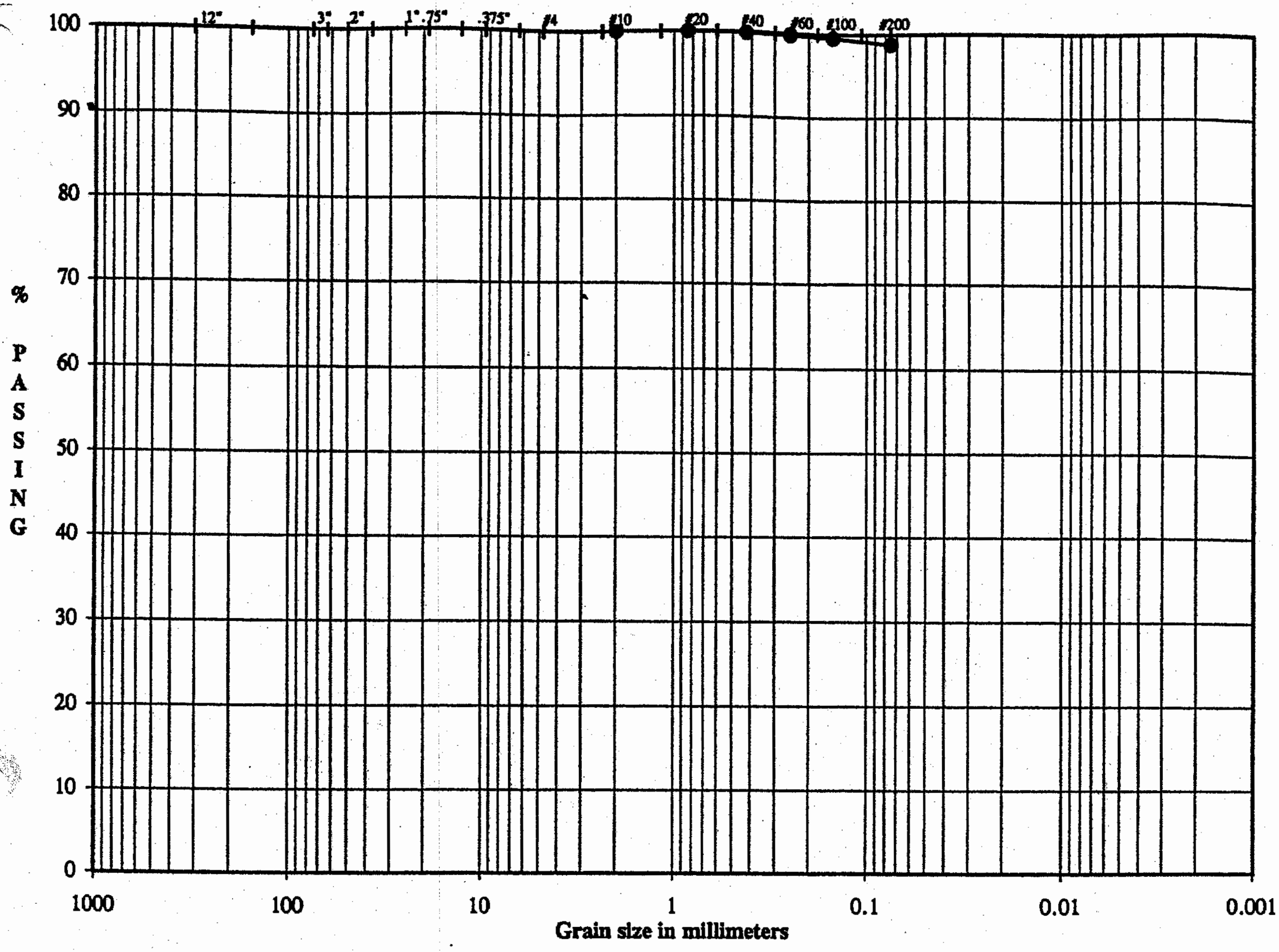
DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL



TECH	TJ
DATE	3/8/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-44
SAMPLE TYPE	UD
SAMPLE DEPTH	3.0 - 5.0'

LL	44
PL	21
PI	23

DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DA/JC
DATE	5/2/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B-44 | -
PROJECT NO.	013-3205	SAMPLE TYPE	UD
REMARKS		SAMPLE DEPTH	3.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	357.09
Wt Dry Soil & Tare (gm)	(w2)	273.56
Weight of Tare (gm)	(w3)	0.00
Weight of Water (gm)	(w4=w1-w2)	83.53
Weight of Dry Soil (gm)	(w5=w2-w3)	273.56
Moisture Content (%)	(w4/w5)*100	30.54

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	421.34
	Tare Weight (gm)	84.99
(W6)	Total Dry Weight (gm)	336.35

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.07	0.07	0.02	99.98	#20	medium sand
#40	0.30	0.30	0.09	99.91	#40	fine sand
#60	0.72	0.72	0.21	99.79	#60	fine sand
#100	1.51	1.51	0.45	99.55	#100	fine sand
#200	3.99	3.99	1.19	98.81	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.09
% F SAND	1.10
% FINES	98.81
% TOTAL	100.00

Descriptive Terms	
trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	44
PL	21
PI	23
Gs	2.679

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

TECH	DA/JC
DATE	5/2/01
CHECK	
REVIEW	

Golder Associates Inc.

FLEXIBLE WALL TRIAXIAL PERMEABILITY
ASTM D 5084
METHOD C, FALLING HEAD W/INCREASING TAILWATER PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			**Using Pipettes Only**	NO	**COMMENTS**	
PROJECT NUMBER	013-3205			**Using Pipettes & Burrettes**	YES		
SAMPLE ID	B-44	3.0 - 5.0'	**BOARD#** 7	**TECH**	KBG		
SAMPLE TYPE	Bulk		**CELL #** 7	**DATE**	5/2/01		

Sample Data, Initial				**Sample Data, Final**	
Height, inches	1.952			Height, inches	1.962
Diameter, inches	2.857	B-Value,f	0.97	Diameter, inches	2.826
Area, cm^2	41.36	Cell Pres	85.00	Area, cm^2	40.47
Volume, cm^3	205.06	Bot. Pres.	80.50	Volume, cm^3	201.67
Mass, g	357.09	Top Pres.	80.00	Mass, g	368.78
Moisture Content, %	30.54	Head, cm	35.17	Moisture Content %	34.81
Dry Density, pcf	83.24	Max. Grad.	11.65	Dry Density, pcf	84.64
Spec. Gravity	2.676	Min. Grad.	7.71	Saturation	95.8%
Volume Solids, cm^3	102.23	Max. E.S.	5.00	Inflow Volume per (1 cc)	5.10
Volume Voids, cm^3	102.84	Min. E.S.	4.50	Outflow Volume per (1 cc)	5.10
Void Ratio	1.01				
Saturation	81.2%				

Water Contents	**Initial**	**Final**
Wt soil&tare, i	357.09	419.54
Wt soil&tare, f	273.56	324.42
Wt Tare	0.00	51.16
Wt Moisture Lost	83.53	95.12
Wt Dry Soil	273.56	273.26
Water Content	30.54%	34.81%

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

TIME FUNCTION			READINGS			TIME IN MINUTES & SECONDS						VOLUME		PERMEABILITY
DATE	HOUR	MIN	Inflow (cc)	Outflow (cc)	Temp.	dt (min)	dt (sec)	dt, acc (sec)	Head (cm)	(H1/H2) (inc.)	Gradient	Inflow (cc)	Outflow (cc)	@ 20 Degrees C (cm/sec)
5/2/01	11	10	0.00	25.00	19.7	0.0	0	0	58.07		11.65	0.00	0.00	0.0
5/2/01	11	11	1.60	23.60	19.7	1.0	60	60	55.34	1.05	11.11	8.16	7.14	2.14E-04
5/2/01	11	12	3.00	22.30	19.7	1.0	60	120	52.89	1.05	10.61	7.14	6.63	2.02E-04
5/2/01	11	13	4.30	21.00	19.7	1.0	60	180	50.52	1.05	10.14	6.63	6.63	2.03E-04
5/2/01	11	14	5.50	19.80	19.7	1.0	60	240	48.34	1.05	9.70	6.12	6.12	1.96E-04
5/2/01	11	15	6.90	18.70	19.7	1.0	60	300	46.06	1.05	9.24	7.14	5.61	2.14E-04
5/2/01	11	16	8.00	17.70	19.7	1.0	60	360	44.15	1.04	8.86	5.61	5.10	1.88E-04 *
5/2/01	11	17	9.10	16.50	19.7	1.0	60	420	42.06	1.05	8.44	5.61	6.12	2.16E-04 *
5/2/01	11	18	10.20	15.70	19.7	1.0	60	480	40.33	1.04	8.09	5.61	4.08	1.87E-04 *
5/2/01	11	19	11.30	14.70	19.7	1.0	60	540	38.42	1.05	7.71	5.61	5.10	2.16E-04 *

Inflow Rate	0.106722
Outflow Rate	0.097278
Outflow/Inflow Ratio	0.91

PERMEABILTIY REPORTED AS 2.0E-04 cm/sec

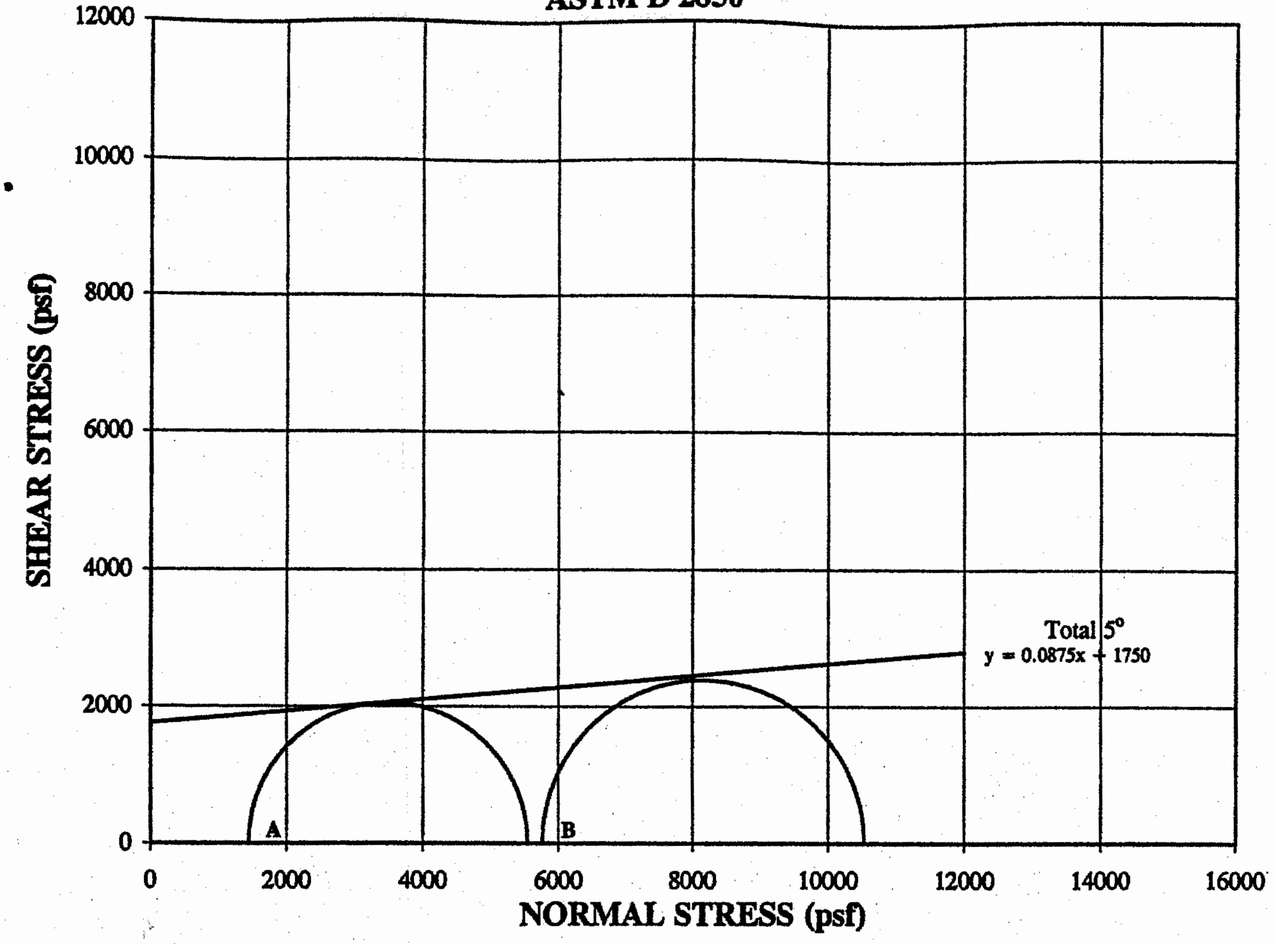
DATE 5/2/01

CHECK DA

REVIEW

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

UNCONSOLIDATED / UNDRAINED MOHR STRESS CIRCLES
ASTM D 2850



A (10 psi) **B (40 psi)**

SAMPLE DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CL

TOTAL STRESS PARAMETERS	
ϕ =	5°
c =	1750 psf

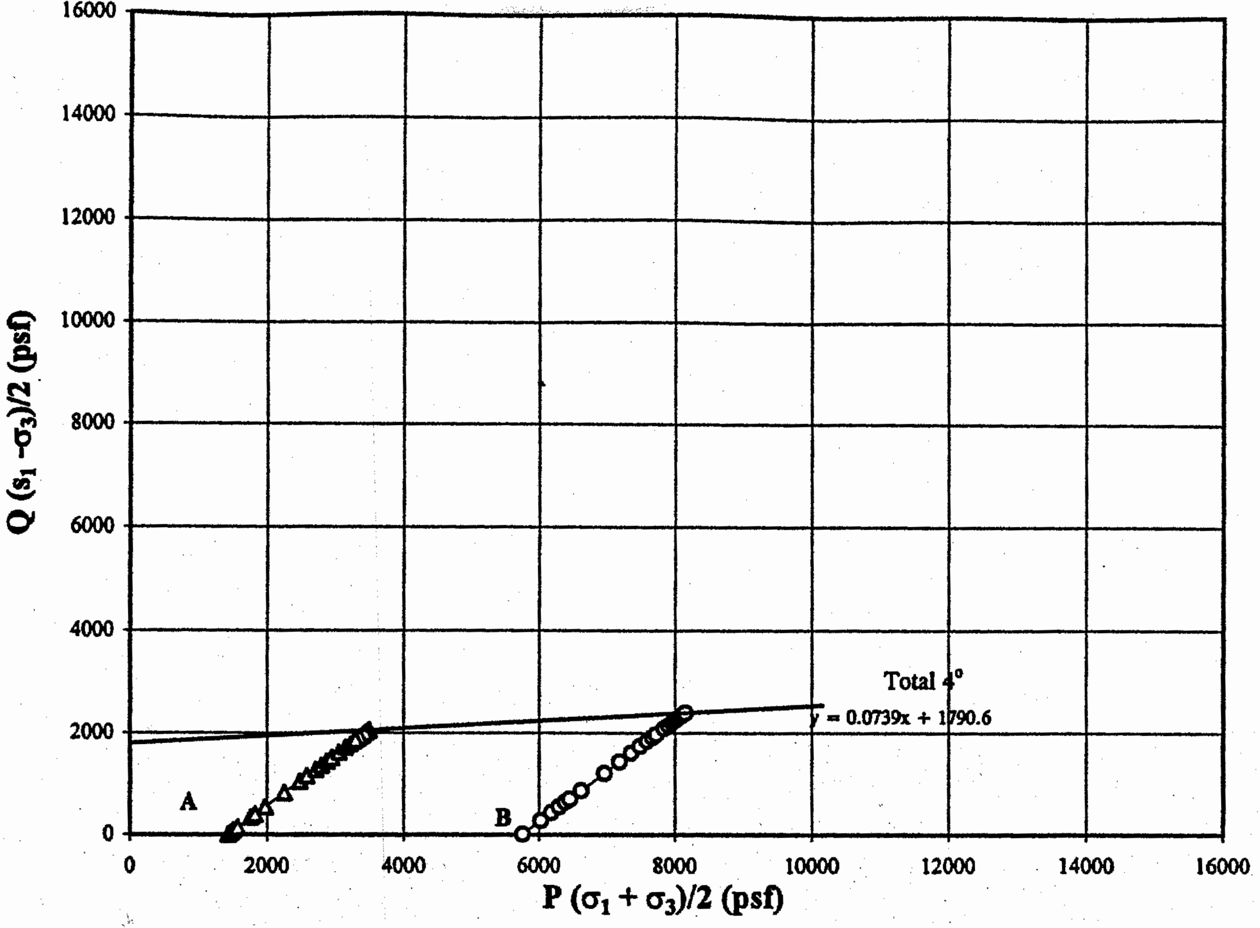
	A	B	C
CONFINING PRESSURE (psi)	10	40	
CONFINING PRESSURE (psf)	1440	5760	
INITIAL DRY DENSITY (pcf)	96.6	91.3	
INITIAL WATER CONTENT (%)	25.9	24.6	

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B-44	3.0 - 5.0'
SAMPLE TYPE	UD	
COMMENTS		

SOIL PARAMETERS	
LL	44
PL	21
PI	23
Gs	2.68

TECH	DA
DATE	5/1/01
CHECK	DA
REVIEW	

UNCONSOLIDATED / UNDRAINED TRIAXIAL STRESS PATH
ASTM D 2850



A (10 psi) B (40 psi)

SAMPLE DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CL

TOTAL STRESS PARAMETERS	
α =	4
a =	1790.6 psf

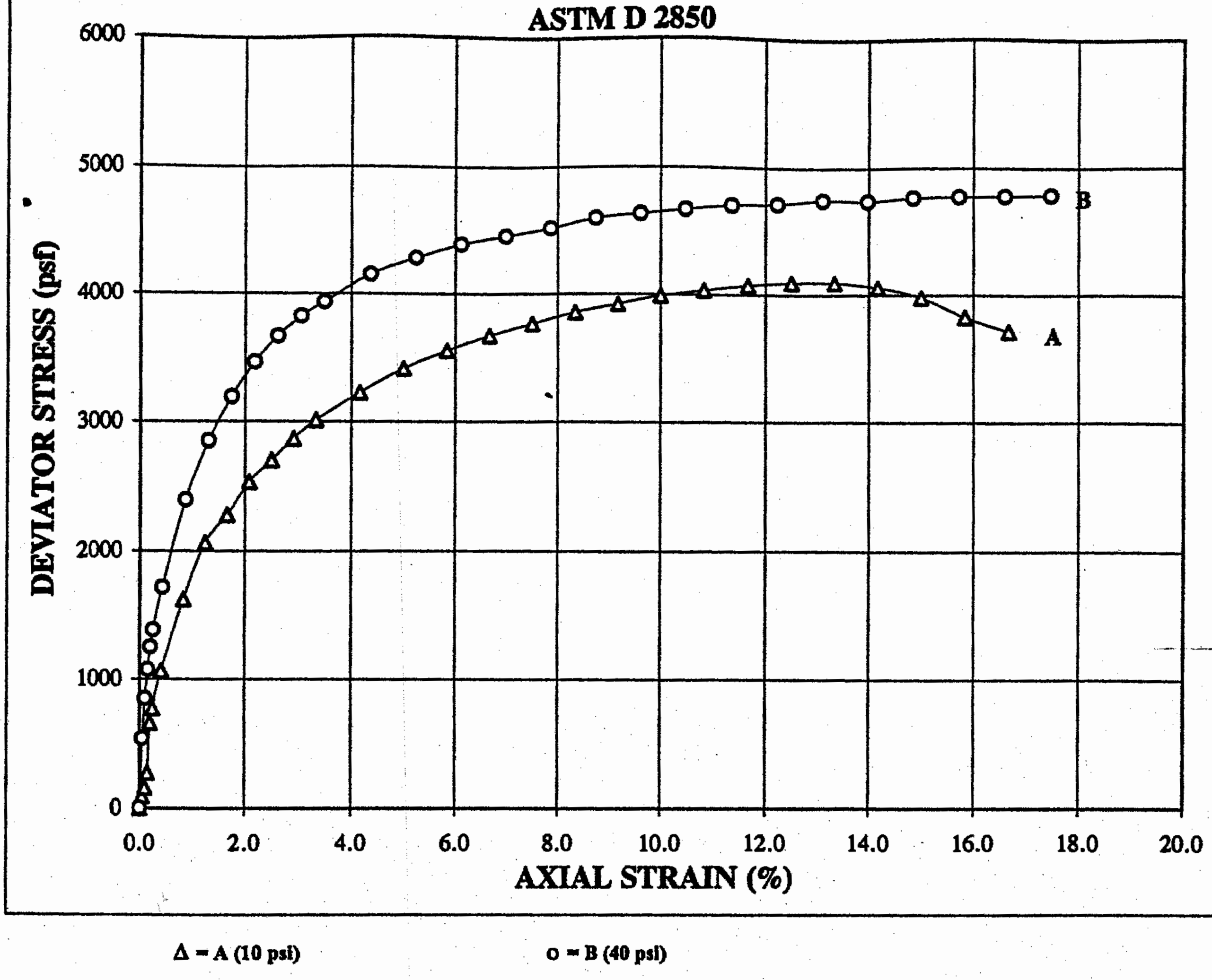
	A	B	C
CONFINING PRESSURE (psi)	10	40	
CONFINING PRESSURE (psf)	1440	5760	
INITIAL DRY DENSITY (pcf)	96.6	91.3	
INITIAL WATER CONTENT (%)	25.9	24.6	

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B-44	3.0 - 5.0'
SAMPLE TYPE	UD	
COMMENTS		

SOIL PARAMETERS	
LL	44
PL	21
PI	23
Gs	2.68

TECH	DA
DATE	5/1/01
CHECK	Dg
REVIEW	

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



SAMPLE DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.
USCS	CL

	A	B	C
CONFINING PRESSURE (psi)	10	40	
CONFINING PRESSURE (psf)	1440	5760	
INITIAL DRY DENSITY (pcf)	96.6	91.3	
INITIAL WATER CONTENT (%)	25.9	24.6	
STRAIN RATE (%/min)	1.00	1.05	

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B-44	3.0 - 5.0'
SAMPLE TYPE	UD	
COMMENTS		

SOIL PARAMETERS	
LL	44
PL	21
PI	23
Gs	2.68

TECH	DA
DATE	5/1/01
CHECK	DA
REVIEW	

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH OF SOILS
ASTM D 2850

PROJECT TITLE GENESIS/PLUM POINT ENERGY/AR
PROJECT NO. 013-3205

SAMPLE ID B-44
SAMPLE DEPTH 3.0 - 5.0'

MACHINE SPEED (in/min) 0.06
STRAIN RATE (%/min) 1.00

CELL PRESSURE (psi) 10.0
SAMPLE PRESSURE (psi) 0.0
CONFINING PRESSURE, σ_3 (psi) 10.0

INITIAL SAMPLE DATA

HEIGHT(in)	5.999	(cm)	15.237
DIAMETER(in)	2.838	(cm)	7.209
AREA(in²)	6.33	(cm²)	40.81
VOLUME(in³)	37.95	(cm³)	621.86
WEIGHT (g)	1211.75		
% MOISTURE	25.9		
SPECIFIC GRAVITY	2.676		
WET DENSITY (pcf)	121.6		
DRY DENSITY, (pcf) calc	96.6		
VOLUME OF SOLIDS (cm³)	359.64		
VOLUME OF VOIDS (cm³)	262.23		
VOID RATIO	0.729		
% SATURATION	95.1		

CORRECTED SAMPLE DATA

HEIGHT (in)	5.989
DIAMETER (in)	2.840
AREA (in²)	6.34
VOLUME (in³)	37.95

WATER CONTENT

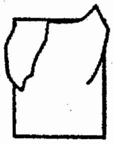
WT SOIL & TARE, WET (g	1296.17
WT SOIL & TARE, DRY(g)	1047.13
WT TARE (g)	85.69
WT MOISTURE (g)	249.04
WT DRY SOIL (g)	961.44
% MOISTURE	25.90

TIME (min)	ACCUM. DEFLECT (inch)	AXIAL LOAD (lbs)	e % STRAIN (in/in)	CORRECTED AREA (in²)	DEVIATOR STRESS (psf)	(σ_1) devstr+cp (psf)	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)
0.0	0.000	8	0.0	6.34	0.00	1440.00	1440.00	0.00
0.1	0.003	12	0.1	6.34	90.86	1530.86	1485.43	45.43
0.1	0.006	15	0.1	6.34	158.92	1598.92	1519.46	79.46
0.2	0.009	20	0.2	6.35	272.30	1712.30	1576.15	136.15
0.2	0.012	37	0.2	6.35	657.74	2097.74	1768.87	328.87
0.3	0.015	42	0.3	6.35	770.75	2210.75	1825.38	385.38
0.4	0.025	55	0.4	6.36	1063.67	2503.67	1971.84	531.84
0.8	0.050	80	0.8	6.39	1622.64	3062.64	2251.32	811.32
1.3	0.075	100	1.3	6.42	2064.65	3504.65	2472.33	1032.33
1.7	0.100	110	1.7	6.44	2279.41	3719.41	2579.71	1139.71
2.1	0.125	122	2.1	6.47	2536.78	3976.78	2708.39	1268.39
2.5	0.150	130	2.5	6.50	2703.25	4143.25	2791.62	1351.62
2.9	0.175	138	2.9	6.53	2868.20	4308.20	2874.10	1434.10
3.3	0.200	145	3.3	6.55	3009.66	4449.66	2944.83	1504.83
4.2	0.250	156	4.2	6.61	3223.28	4663.28	3051.64	1611.64
5.0	0.300	166	5.0	6.67	3411.14	4851.14	3145.57	1705.57
5.8	0.350	174	5.8	6.73	3552.42	4992.42	3216.21	1776.21
6.7	0.400	181	6.7	6.79	3669.45	5109.45	3274.73	1834.73
7.5	0.450	187	7.5	6.85	3762.81	5202.81	3321.40	1881.40
8.3	0.500	193	8.3	6.91	3853.89	5293.89	3366.95	1926.95
9.2	0.550	198	9.2	6.98	3922.07	5362.07	3401.03	1961.03
10.0	0.600	203	10.0	7.04	3988.34	5428.34	3434.17	1994.17
10.8	0.650	207	10.8	7.11	4032.46	5472.46	3456.23	2016.23
11.7	0.700	211	11.7	7.17	4075.06	5515.06	3477.53	2037.53
12.5	0.750	214	12.5	7.24	4096.27	5536.27	3488.13	2048.13
13.3	0.800	216	13.3	7.31	4096.64	5536.64	3488.32	2048.32
14.2	0.850	216	14.2	7.38	4057.24	5497.24	3468.62	2028.62
15.0	0.900	214	15.0	7.45	3979.21	5419.21	3429.60	1989.60
15.8	0.950	208	15.8	7.53	3825.43	5265.43	3352.71	1912.71
16.7	1.000	204	16.7	7.60	3711.79	5151.79	3295.90	1855.90

*NORMAL STRESS @ FAILURE 5536.64

TIME TO FAILURE (min) 13.3
DEFLECTION @ FAILURE (in) 0.800
% STRAIN @ FAILURE 13.3

Failure Sketch



TECH DA
DATE 5/1/01
CHECK DA
REVIEW PWM

* Failure based on the maximum deviator stress or 15% axial strain.

Golder Associates Inc.

UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH OF SOILS
ASTM D 2850

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-44
PROJECT NO.	013-3205	**SAMPLE DEPTH**	3.0 - 5.0'

MACHINE SPEED (in/min)	0.06
STRAIN RATE (%/min)	1.05

CELL PRESSURE (psi)	40.0
SAMPLE PRESSURE (psi)	0.0
CONFINING PRESSURE, σ_3 (psi)	40.0

INITIAL SAMPLE DATA

HEIGHT(in)	5.723	(cm)	14.536
DIAMETER(in)	2.844	(cm)	7.224
AREA(in^2)	6.35	(cm^2)	40.98
VOLUME(in^3)	36.36	(cm^3)	595.76
WEIGHT (g)	1085.46		
% MOISTURE	24.6		
SPECIFIC GRAVITY	2.676		
WET DENSITY (pcf)	113.7		
DRY DENSITY, (pcf) calc	91.3		
VOLUME OF SOLIDS (cm^3)	325.56		
VOLUME OF VOIDS (cm^3)	270.20		
VOID RATIO	0.830		
% SATURATION	79.3		

CORRECTED SAMPLE DATA

HEIGHT (in)	5.653
DIAMETER (in)	2.862
AREA (in^2)	6.43
VOLUME (in^3)	36.36

WATER CONTENT

WT SOIL & TARE, WET (g	1169.51
WT SOIL & TARE, DRY(g)	955.48
WT TARE (g)	84.94
WT MOISTURE (g)	214.03
WT DRY SOIL (g)	870.54
% MOISTURE	24.59

TIME (min)	ACCUM. DEFLECT (inch)	AXIAL LOAD (lbs)	e % STRAIN (in/in)	CORRECTED AREA (in^2)	DEVIATOR STRESS (psf)	(σ_1) devstr+cp (psf)	$(\sigma_1'+\sigma_3')/2$ (P)	$(\sigma_1-\sigma_3)/2$ (Q)
0.0	0.000	13	0.0	6.43	0.00	5760.00	5760.00	0.00
0.1	0.003	37	0.1	6.43	537.10	6297.10	6028.55	268.55
0.1	0.006	51	0.1	6.44	849.96	6609.96	6184.98	424.98
0.2	0.009	61	0.2	6.44	1073.07	6833.07	6296.53	536.53
0.2	0.012	69	0.2	6.44	1251.25	7011.25	6385.63	625.63
0.3	0.015	75	0.3	6.45	1384.59	7144.59	6452.29	692.29
0.4	0.025	90	0.4	6.46	1716.56	7476.56	6618.28	858.28
0.8	0.050	121	0.9	6.49	2397.07	8157.07	6958.54	1198.54
1.3	0.075	142	1.3	6.52	2850.55	8610.55	7185.28	1425.28
1.7	0.100	158	1.7	6.55	3189.93	8949.93	7354.96	1594.96
2.1	0.125	171	2.2	6.57	3460.47	9220.47	7490.23	1730.23
2.5	0.150	181	2.6	6.60	3663.05	9423.05	7591.53	1831.53
2.9	0.175	189	3.1	6.63	3820.27	9580.27	7670.13	1910.13
3.3	0.200	195	3.5	6.66	3932.70	9692.70	7726.35	1966.35
4.2	0.250	207	4.4	6.72	4154.05	9914.05	7837.03	2077.03
5.0	0.300	215	5.2	6.79	4285.84	10045.84	7902.92	2142.92
5.8	0.350	222	6.1	6.85	4393.47	10153.47	7956.74	2196.74
6.7	0.400	227	7.0	6.91	4456.72	10216.72	7988.36	2228.36
7.5	0.450	232	7.9	6.98	4518.01	10278.01	8019.00	2259.00
8.3	0.500	238	8.7	7.05	4597.77	10357.77	8058.89	2298.89
9.2	0.550	242	9.6	7.12	4634.71	10394.71	8077.36	2317.36
10.0	0.600	246	10.5	7.18	4670.09	10430.09	8095.04	2335.04
10.8	0.650	250	11.4	7.26	4703.90	10463.90	8111.95	2351.95
11.7	0.700	253	12.2	7.33	4716.49	10476.49	8118.25	2358.25
12.5	0.750	257	13.1	7.40	4747.37	10507.37	8133.69	2373.69
13.3	0.800	259	14.0	7.48	4738.16	10498.16	8129.08	2369.08
14.2	0.850	263	14.9	7.55	4766.30	10526.30	8143.15	2383.15
15.0	0.900	266	15.7	7.63	4774.00	10534.00	8147.00	2387.00
15.8	0.950	269	16.6	7.71	4780.53	10540.53	8150.27	2390.27
16.7	1.000	272	17.5	7.79	4785.89	10545.89	8152.94	2392.94
					*NORMAL STRESS @ FAILURE	10534.00		

TIME TO FAILURE (min)	15.0
DEFLECTION @ FAILURE (in)	0.900
% STRAIN @ FAILURE	15.7

Failure Sketch

TECH	DA
DATE	5/1/01
CHECK	DA
REVIEW	PWM

* Failure based on the maximum deviator stress or 15% axial strain.

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-51 - **SAMPLE DEPTH:** 3.0 - 5.0'
SAMPLE TYPE: UD

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				25	25	
Weight of Wet Soil & Tare (gm)	19.09	22.64	21.13	19.71	21.57	564.31
Weight of Dry Soil & Tare (gm)	17.30	20.04	18.88	13.86	15.05	417.12
Weight of Tare (gm)	11.40	11.70	11.49	4.27	4.28	0.00
Weight of Water (gm)	1.79	2.60	2.25	5.85	6.52	147.19
Weight of Dry Soil (gm)	5.90	8.34	7.39	9.59	10.77	417.12
Water Content %	30.34	31.18	30.45	61.00	60.54	35.29

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

PLASTIC LIMIT (PL): 31

LIQUID LIMIT (LL): 61

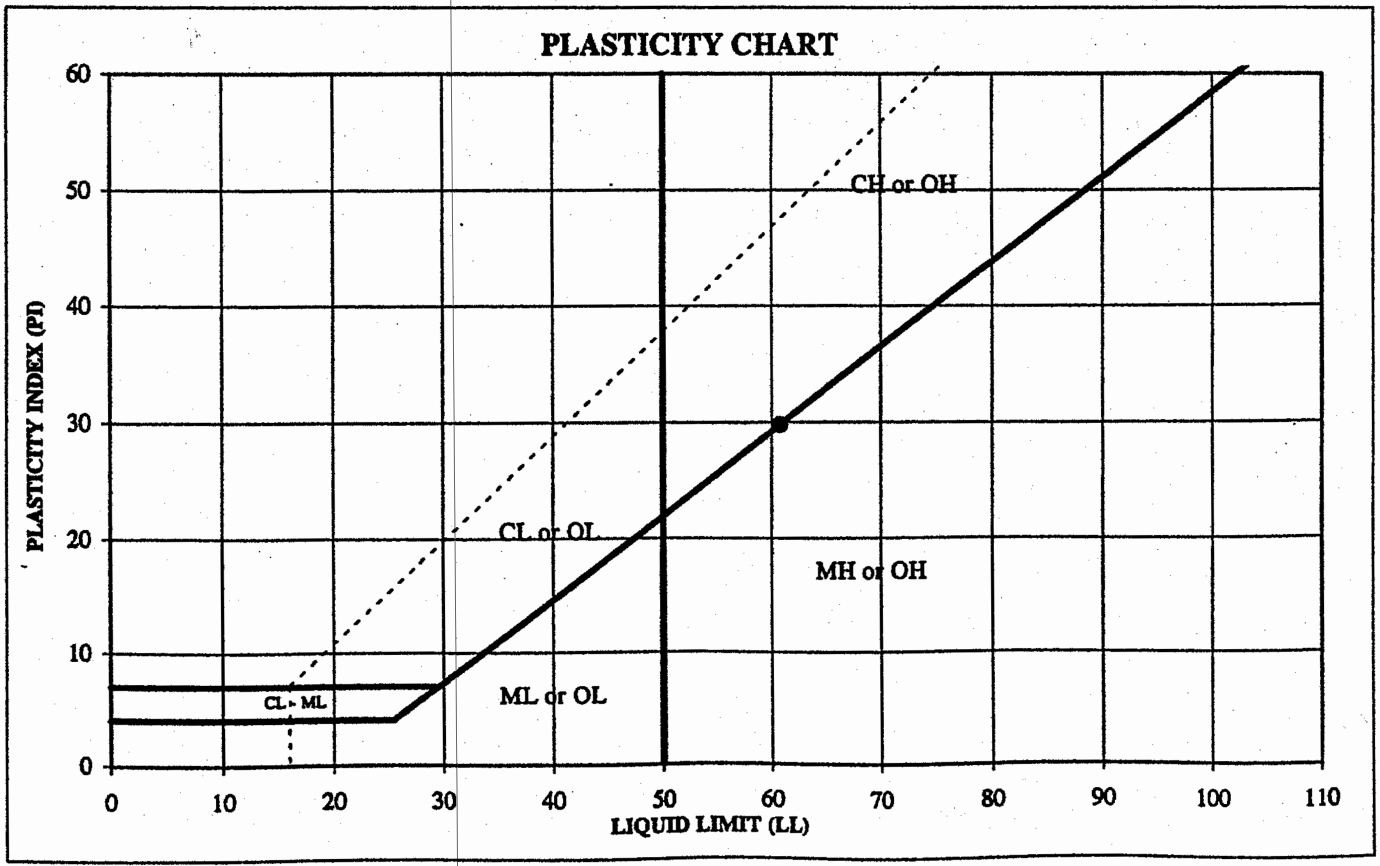
PLASTICITY INDEX (PI): 30

LIQUIDITY INDEX (LI): 0.16

NOTE:

DESCRIPTION: Olive Brown, SILTY CLAY, trace medium to fine sand.

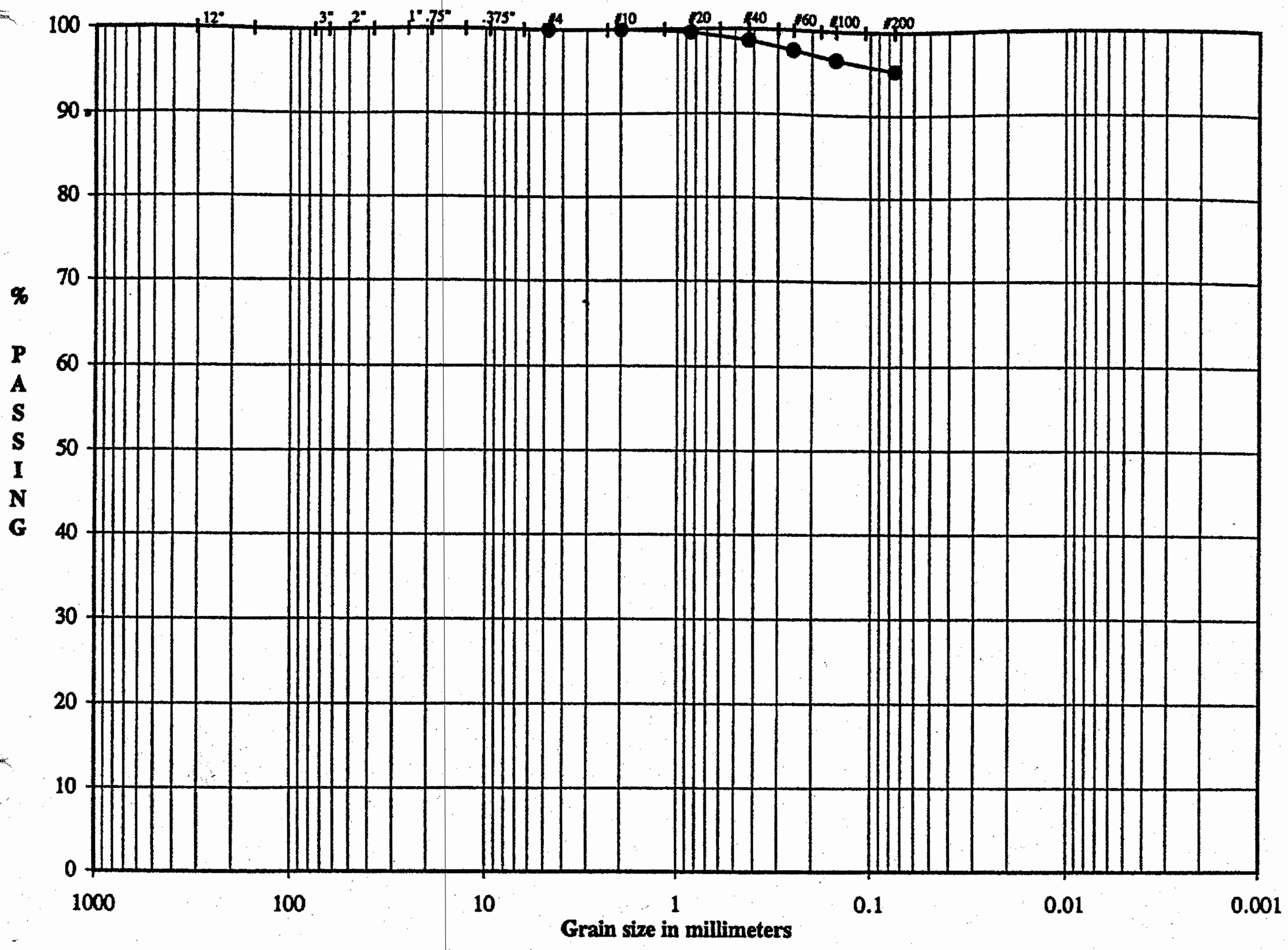
USCS: CH



TECH	DH
DATE	5/4/01
CHECK	
REVIEW	

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-51
SAMPLE TYPE	UD
SAMPLE DEPTH	3.0 - 5.0'

LL	61
PL	31
PI	30

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-51 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	564.31
Wt Dry Soil & Tare (gm)	(w2)	417.12
Weight of Tare (gm)	(w3)	0.00
Weight of Water (gm)	(w4=w1-w2)	147.19
Weight of Dry Soil (gm)	(w5=w2-w3)	417.12
Moisture Content (%)	(w4/w5)*100	35.29

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	299.22
	Tare Weight (gm)	85.72
(W6)	Total Dry Weight (gm)	213.50

SIEVE ANALYSIS

Tare Weight
0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.03	0.03	0.01	99.99	#10	medium sand
#20	0.90	0.90	0.42	99.58	#20	medium sand
#40	2.93	2.93	1.37	98.63	#40	fine sand
#60	5.08	5.08	2.38	97.62	#60	fine sand
#100	7.29	7.29	3.41	96.59	#100	fine sand
#200	9.86	9.86	4.62	95.38	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.01
% M SAND	1.36
% F SAND	3.25
% FINES	95.38
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	61
PL	31
PI	30
Gs	-

DESCRIPTION Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS CH

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			BOARD #	9	COMMENTS	
PROJECT NUMBER	013-3205			CELL #	9		
SAMPLE ID	B-51	-	3.0 -5.0'	Flow Pump Speed	10		
SAMPLE TYPE	UD			Technician	KBG		

Sample Data, Initial

Height, inches	2.953	B-Value, f	0.98
Diameter, inches	2.840	Cell Pres.	85.0
Area, cm²	40.87	Bot. Pres.	80.0
Volume, cm³	306.54	Top Pres.	80.0
Mass, g	566.05	Tot. B.P.	80.0
Moisture Content, %	35.70	Head, max.	149.82
Dry Density, pcf	84.91	Head, min.	149.82
Spec. Gravity	2.683	Max. Grad.	19.91
Volume Solids, cm³	155.47	Min. Grad.	19.91
Volume Voids, cm³	151.07		
Void Ratio	0.97		
Saturation, %	98.6%		

Sample Data, Final

Height, inches	2.963
Diameter, inches	2.846
Area, cm²	41.04
Volume, cm³	308.88
Mass, g	570.83
Moisture Content, %	36.85
Dry Density, pcf	84.27
Volume Solids, cm³	155.47
Volume Voids, cm³	153.41
Void Ratio	0.99
Saturation, %	100.2%

WATER CONTENTS		Trimmings Initial	Sample Final
Wt Soil & Tare, i	g	566.05	622.55
Wt Soil & Tare, f	g	417.12	468.90
Wt Tare	g	0.00	51.94
Wt Moisture Lost	g	148.93	153.65
Wt Dry Soil	g	417.12	416.96
Water Content	%	35.70%	36.85%

DESCRIPTION

Olive Brown, SILTY CLAY, trace medium to fine sand.

Flow Pump Rate 3.00E-05 cm³/sec

USCS CH

		TIME FUNCTIONS, SECONDS						dP					
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)	
5/3/01	37014	10	15	19.6	0	0	0	0	2.13	149.82	19.91	3.7E-08	
5/3/01	37014	10	20	19.6	5	5	300	300	2.13	149.82	19.91	3.7E-08	
5/3/01	37014	10	25	19.6	5	10	300	600	2.13	149.82	19.91	3.7E-08	
5/3/01	37014	10	30	19.6	5	15	300	900	2.13	149.82	19.91	3.7E-08	*
5/3/01	37014	10	35	19.6	5	20	300	1200	2.13	149.82	19.91	3.7E-08	*
5/3/01	37014	10	40	19.6	5	25	300	1500	2.13	149.82	19.91	3.7E-08	*
5/3/01	37014	10	45	19.6	5	30	300	1800	2.13	149.82	19.91	3.7E-08	*

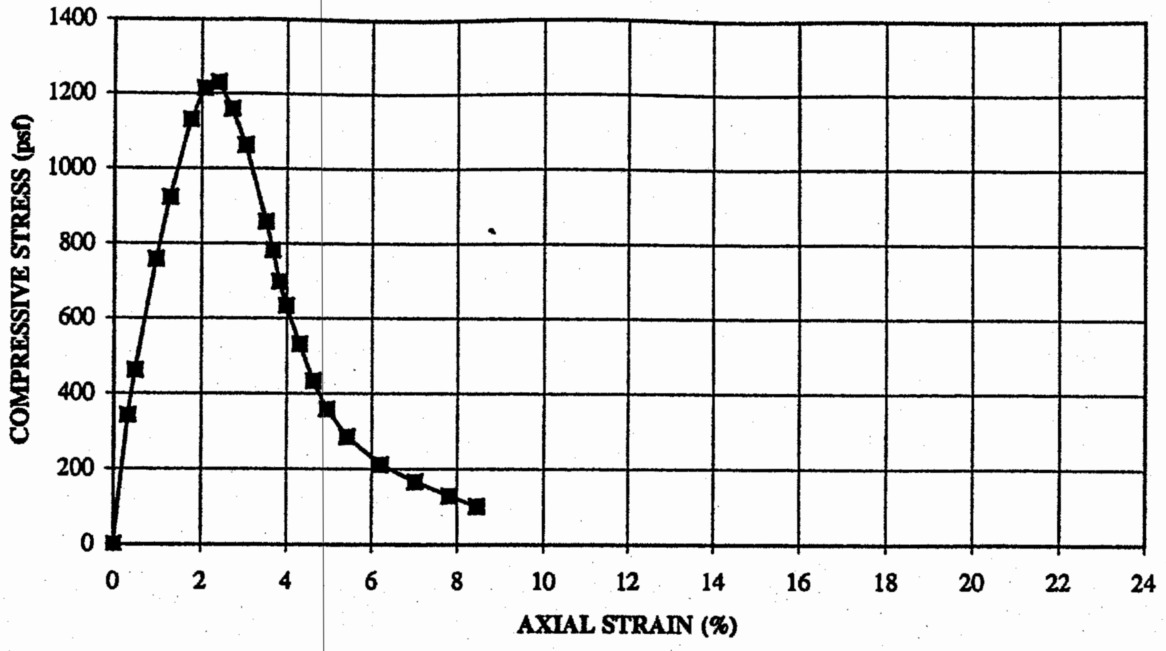
*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 3.7E-08 cm/sec **

DATE	5/3/01
CHECK	DA
REVIEW	lwm

Golder Associates Inc.

UNCONFINED COMPRESSIVE STRENGTH OF SOILS
STRESS-STRAIN - ASTM D 2166



DESCRIPTION	LL	PL	PI	SAMPLE ID
Olive Brown, SILTY CLAY, trace medium to fine sand.	61	31	30	B - 51
	SAMPLE TYPE		UD	3.0 - 5.0'

USCS	CH

SAMPLE DATA

Wet Density (pcf)	113.4
Dry Density (pcf)	83.5
Moisture Content	35.7%

TIME TO FAILURE (min)	2.5
STRAIN @ FAILURE (%)	2.4
TYPE OF FAILURE	SHEAR

UNCONFINED COMPRESSIVE STRENGTH (psf)	1230.2
SHEAR STRENGTH (psf)	615.1

013-3205
GENESIS/PLUM POINT ENERGY/AR

TECH	DA
DATE	5/2/01
CHECK	DA
REVIEW	PwM

UNCONFINED COMPRESSIVE STRENGTH OF SOILS

ASTM D 2166

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B - 51
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'

SAMPLE DATA

Height (in)	6.274
Diameter (in)	2.867
Height/Diameter Ratio	2.19
Area (in^2)	6.46
Volume (ft^3)	0.0234
Weight (gm)	1205.99
Wet Density (pcf)	113.38
Dry Density (pcf)	83.55
Machine Speed (in/min)	0.06
Strain rate (%/min)	0.96

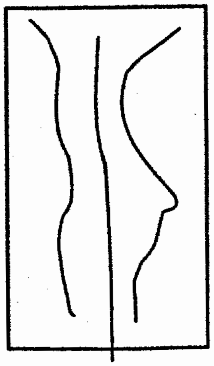
WATER CONTENT	BEFORE SHEAR (entire)	AFTER SHEAR (partial)
Tare No.	SQ-8	-
Wt. Wet Soil & Tare (gm)	1205.99	566.05
Wt. Dry Soil & Tare (gm)	888.69	417.12
Wt. Tare (gm)	0.00	0.00
Wt. Moisture (gm)	317.30	148.93
Wt. Dry Soil (gm)	888.69	417.12
Moisture (%)	35.70%	35.70%

TIME (min)	DEFLECT (inch)	FORCE (lbs)	% STRAIN (in/in)	Ac (in^2)	COMPRESSIVE STRESS (psf)	(psi)
0.0	0.000	0	0.00	6.46	0.00	0.00
0.3	0.020	15	0.32	6.48	342.42	2.38
0.5	0.030	21	0.48	6.49	461.75	3.21
1.0	0.060	34	0.95	6.52	757.78	5.26
1.3	0.080	42	1.27	6.54	922.71	6.41
1.8	0.110	52	1.75	6.57	1130.82	7.85
2.2	0.130	56	2.07	6.59	1214.52	8.43
2.5	0.150	57	2.39	6.61	1230.17	8.54
2.8	0.170	53	2.71	6.64	1158.87	8.05
3.2	0.190	49	3.03	6.66	1062.06	7.38
3.7	0.220	40	3.50	6.69	858.81	5.96
3.8	0.230	36	3.67	6.70	782.17	5.43
4.0	0.240	33	3.83	6.71	699.35	4.86
4.2	0.250	30	3.98	6.72	633.94	4.40
4.5	0.270	25	4.30	6.75	531.51	3.69
4.8	0.290	20	4.62	6.77	434.01	3.01
5.2	0.310	17	4.94	6.79	358.34	2.49
5.7	0.340	14	5.42	6.83	284.81	1.98
6.5	0.390	10	6.22	6.88	211.28	1.47
7.3	0.440	8	7.01	6.94	166.55	1.16
8.2	0.490	6	7.81	7.00	128.73	0.89
8.8	0.530	5	8.45	7.05	101.49	0.70

UNCONFINED COMPRESSIVE STRENGTH	1230.17	8.54
SHEAR STRENGTH	615.08	4.27

TIME TO FAILURE (min)	2.50
STRAIN @ FAILURE (%)	2.39
TYPE OF FAILURE	SHEAR

FAILURE SKETCH



Description Olive Brown, SILTY CLAY, trace medium to fine sand.

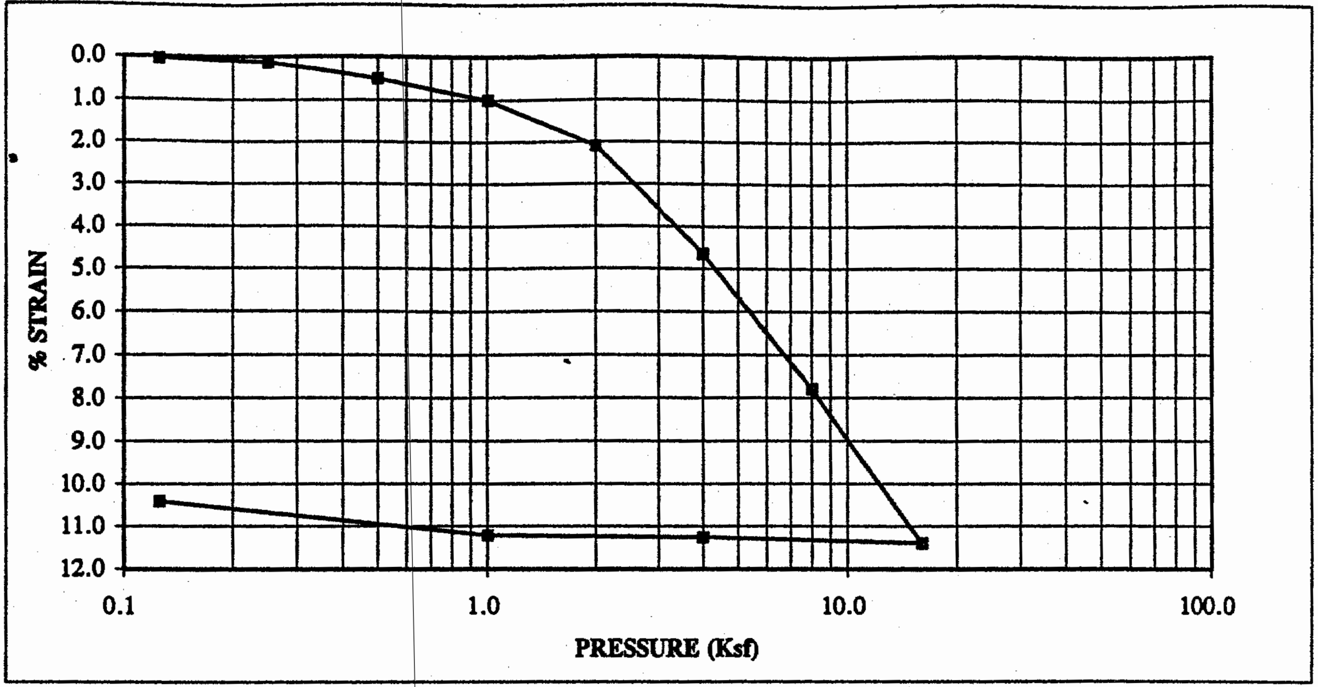
USCS CH

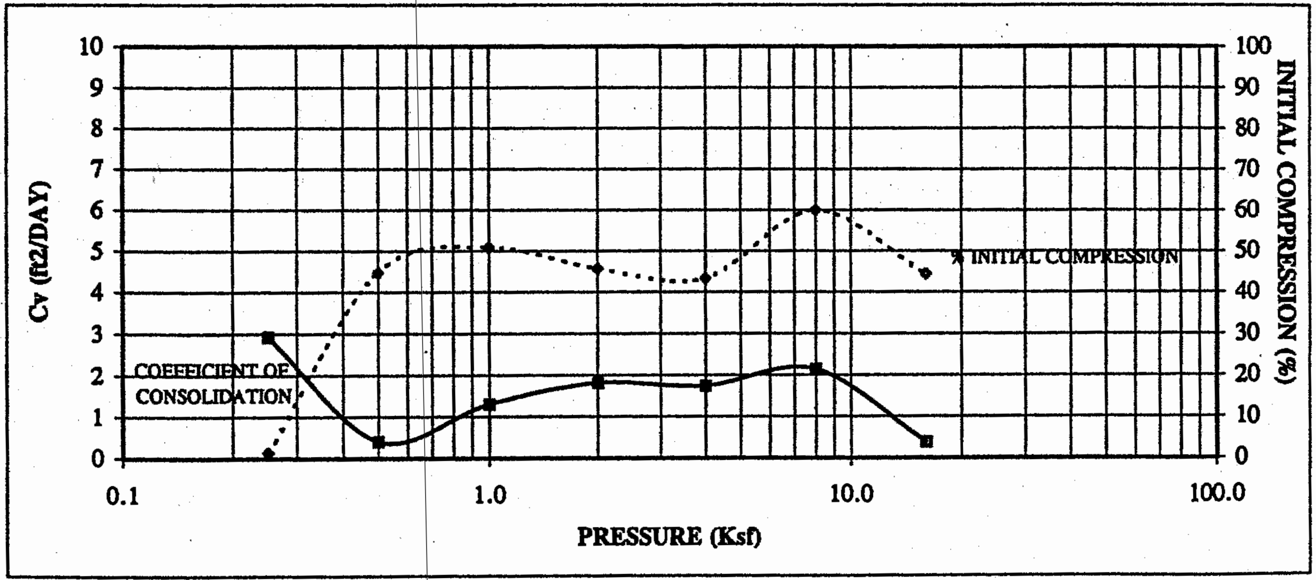
LL	61
PL	31
PI	30

TECH	DA
DATE	5/2/01
CHECK	DA
REVIEW	PWM

Golder Associates Inc.

ONE - DIMENSIONAL CONSOLIDATION
ASTM D 2435





SAMPLE ID	B-51
SAMPLE TYPE	UD
SAMPLE DEPTH	3.0 - 5.0'

LL	61
PL	31
PI	30
Gs	2.683

	Initial	Final
Dry Unit Weight (pcf)	79.9	85.6
Wet Unit Weight (pcf)	108.4	116.1
Moisture Content	35.7%	35.6%
Void Ratio	1.0959	0.9563
Degree of Saturation	87.4%	100.0%

DESCRIPTION: Olive Brown, SILTY CLAY, trace medium to fine sand.

USCS: CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DH/PWM
DATE	5/8/01
CHECK	
REVIEW	

ONE-DIMENSIONAL CONSOLIDATION
ASTM D 2435

PROJECT NAME	GENESIS/PLUM POINT ENERGY/AR	DESCRIPTION	Olive Brown, SILTY CLAY, trace medium to fine sand.	LL	61
PROJECT NUMBER	013-3205			PL	31
SAMPLE ID	B-51 -	CLASSIFICATION	CH	PI	30
SAMPLE DEPTH	3.0 - 5.0'	CONSOLIDOMETER No.	1	Gs	2.683
SAMPLE TYPE	UD				

Sample Data	Trimmings	Before Test	After Test
Tare plus wet soil, g	566.05	179.45	179.39
Tare plus dry soil, g	417.12	151.85	151.85
Tare, g	0.00	74.55	74.55
Water, g	148.93	27.6	27.54
Dry soil, g	417.12	77.3	77.3
Water Content	35.7%	35.7%	35.6%

Diameter (in)	2.500
Height of sample (in)	0.751
Area of sample (in^2)	4.909
Volume of sample (in^3)	3.686
Water Content (Avg) from Trimmings	35.7%
Sample Wt (wet, g)	104.9
Sample Wt (dry, g)	77.3
Water Wt (g)	27.6

Sample Data	Initial	Final
Total Heights (in)	0.751	0.701
Height of solids (in)	0.358	0.358
Height of voids (in)	0.393	0.343
Height of water (in)	0.343	0.343
Void ratio	1.096	0.956
Degree of saturation	87.4%	100.0%
Dry unit wt (pcf)	79.9	85.6
Wet unit wt (pcf)	108.4	116.1

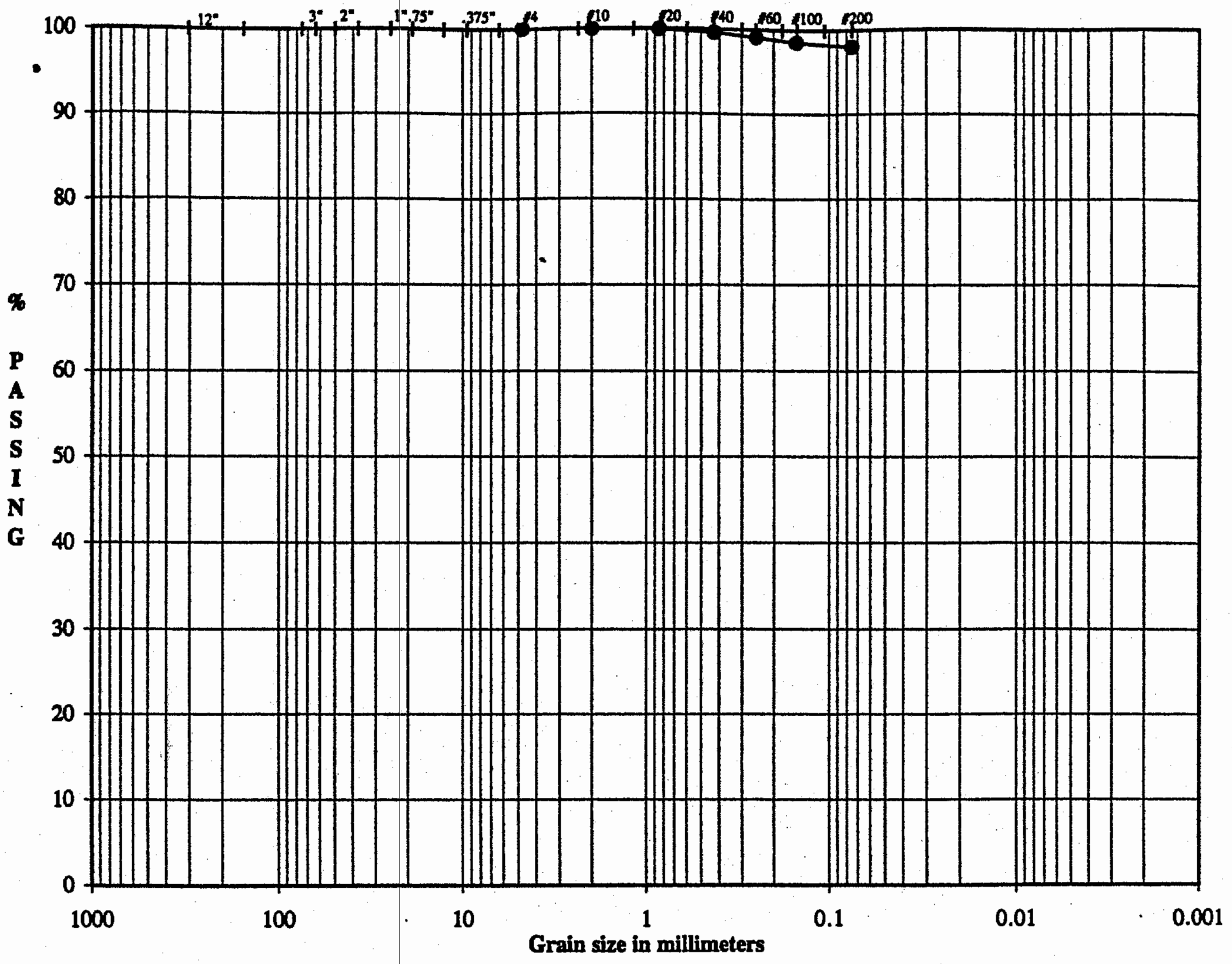
PRESSURE (ksf)	H100 DIAL READING	MACHINE / STONE CORR.	DIAL CHANGE (in)	FITTING TIME (sec) t90	SAMPLE HEIGHT (in)	HEIGHT OF VOIDS Hv	VOID RATIO e	CHANGE IN HEIGHT (accum)	STRAIN %	LENGTH OF DRAINAGE PATH (DOUBLE DRAINAGE) H (in)	H^2 (cm^2)	PERCENT INITIAL COMPRESSION	COEFFICIENT OF CONSOLIDATION (ft^2/day)
0.125	0.0012	0.0000	0.0000	-	0.751	0.3927	1.0959	0.0000	0.0	0.000	0.000	-	-
0.125	0.0018	0.0002	0.0004	38	0.751	0.3923	1.0949	0.0004	0.0	0.375	0.909	-	-
0.250	0.0026	0.0004	0.0010	24	0.750	0.3917	1.0932	0.0010	0.1	0.375	0.908	1.3	2.9
0.500	0.0058	0.0008	0.0038	178	0.747	0.3889	1.0853	0.0038	0.5	0.374	0.904	44.7	0.4
1.000	0.0102	0.0015	0.0075	54	0.743	0.3851	1.0749	0.0075	1.0	0.373	0.896	50.8	1.3
2.000	0.0193	0.0024	0.0157	38	0.735	0.3770	1.0520	0.0157	2.1	0.370	0.882	45.6	1.8
4.000	0.0397	0.0036	0.0349	38	0.716	0.3578	0.9984	0.0349	4.6	0.363	0.849	43.3	1.7
8.000	0.0649	0.0051	0.0586	29	0.692	0.3341	0.9324	0.0586	7.8	0.352	0.800	59.9	2.1
16.000	0.0936	0.0068	0.0856	153	0.665	0.3071	0.8570	0.0856	11.4	0.339	0.743	44.3	0.4
4.000	0.0926	0.0068	0.0846	-	0.666	0.3081	0.8598	0.0846	11.3	0.333	0.715	-	-
1.000	0.0875	0.0020	0.0843	-	0.667	0.3084	0.8608	0.0843	11.2	0.333	0.717	-	-
0.125	0.0797	0.0003	0.0782	-	0.673	0.3145	0.8776	0.0782	10.4	0.335	0.724	-	-

FINAL DIAL READING = 0.0500

TECH	DH/PWM
DATE	5/8/01
CHECK	
REVIEW	

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-54
SAMPLE TYPE	UD
SAMPLE DEPTH	7.0 - 10.0'

LL	74
PL	26
PI	48

DESCRIPTION Brown, SILTY CLAY, trace coarse to fine sand.

USCS CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/7/01
CHECK	
REVIEW	

Golder Associates Inc.

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-54	-
PROJECT NO.	013-3205	**SAMPLE TYPE**	UD	
REMARKS		**SAMPLE DEPTH**	7.0 - 10.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	525.30
Wt Dry Soil & Tare (gm)	(w2)	399.38
Weight of Tare (gm)	(w3)	114.68
Weight of Water (gm)	(w4=w1-w2)	125.92
Weight of Dry Soil (gm)	(w5=w2-w3)	284.70
Moisture Content (%)	(w4/w5)*100	44.23

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Mc

	Weight Of Sample (gm)	399.38
	Tare Weight (gm)	114.68
(W6)	Total Dry Weight (gm)	284.70

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.20	0.20	0.07	99.93	#10	medium sand
#20	0.29	0.29	0.10	99.90	#20	medium sand
#40	1.17	1.17	0.41	99.59	#40	fine sand
#60	2.60	2.60	0.91	99.09	#60	fine sand
#100	4.18	4.18	1.47	98.53	#100	fine sand
#200	5.62	5.62	1.97	98.03	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.07
% M SAND	0.34
% F SAND	1.56
% FINES	98.03
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	74
PL	26
PI	48
Gs	-

DESCRIPTION Brown, SILTY CLAY, trace coarse to fine sand.

USCS CH

TECH	SW
DATE	5/7/01
CHECK	
REVIEW	

FLOW PUMP #1

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR			**BOARD #**	2
PROJECT NUMBER	013-3205			**CELL #**	2
SAMPLE ID	B-54 -	-	-	**Flow Pump Speed**	8
SAMPLE TYPE	UD			**Technician**	PWM

COMMENTS

Sample Data, Initial			
Height, inches	6.190	B-Value, f	1.00
Diameter, inches	2.858	Cell Pres.	85.0
Area, cm²	41.39	Bot. Pres.	80.0
Volume, cm³	650.74	Top Pres.	80.0
Mass, g	1109.27	Tot. B.P.	80.0
Moisture Content, %	48.31	Head, max.	208.21
Dry Density, pcf	71.72	Head, min.	208.21
Spec. Gravity	2.688	Max. Grad.	13.35
Volume Solids, cm³	278.25	Min. Grad.	13.35
Volume Voids, cm³	372.49		
Void Ratio	1.34		
Saturation, %	97.0%		

Sample Data, Final	
Height, inches	6.139
Diameter, inches	2.824
Area, cm²	40.41
Volume, cm³	630.11
Mass, g	1099.96
Moisture Content, %	47.07
Dry Density, pcf	74.07
Volume Solids, cm³	278.25
Volume Voids, cm³	351.87
Void Ratio	1.26
Saturation, %	100.0%

WATER CONTENTS		Trimmings Initial	Sample Final
Wt Soil & Tare, i	g	1109.27	1208.36
Wt Soil & Tare, f	g	747.93	856.35
Wt Tare	g	0.00	108.47
Wt Moisture Lost	g	361.34	352.01
Wt Dry Soil	g	747.93	747.88
Water Content	%	48.31%	47.07%

DESCRIPTION

Brown, SILTY CLAY, trace coarse to fine sand.

Flow Pump Rate 1.40E-04 cm³/sec

USCS CH

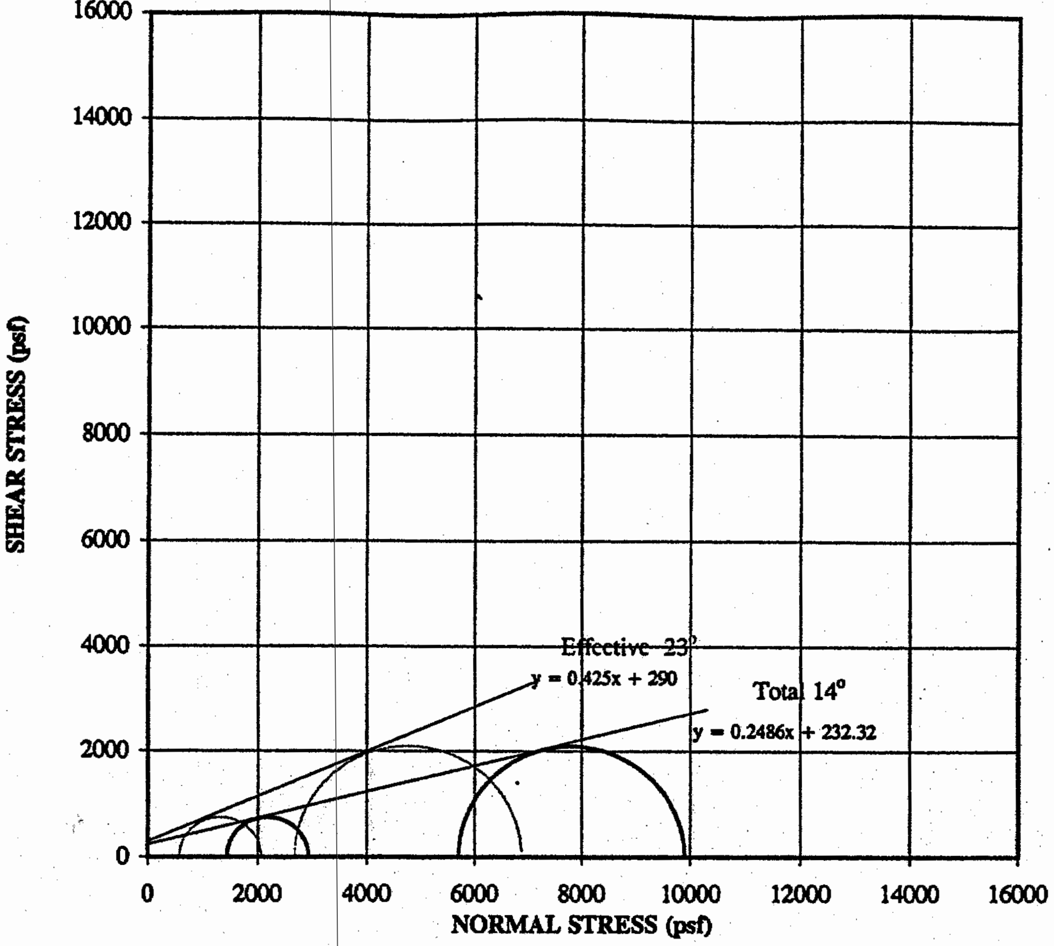
TIME FUNCTIONS, SECONDS								dP					
DATE	DAY	HOUR	MIN	TEMP (°C)	dt (min)	dt,acc (min)	dt (sec)	dt,acc (sec)	Reading (psi)	Head (cm)	Gradient	Permeability (cm/sec)	
5/14/01	37025	16	15	20.7	0	0	0	0	2.96	208.21	13.35	2.6E-07	
5/14/01	37025	16	20	20.7	5	5	300	300	2.96	208.21	13.35	2.6E-07	
5/14/01	37025	16	25	20.7	5	10	300	600	2.96	208.21	13.35	2.6E-07	
5/14/01	37025	16	30	20.7	5	15	300	900	2.96	208.21	13.35	2.6E-07	*
5/14/01	37025	16	35	20.7	5	20	300	1200	2.96	208.21	13.35	2.6E-07	*
5/14/01	37025	16	40	20.7	5	25	300	1500	2.96	208.21	13.35	2.6E-07	*
5/14/01	37025	16	45	20.7	5	30	300	1800	2.96	208.21	13.35	2.6E-07	*

*TRANSCRIBED FROM ORIGINAL DATA SHEETS

PERMEABILITY REPORTED AS ** 2.6E-07 cm/sec **

DATE	5/14/01
CHECK	DA
REVIEW	PWM

TRIAXIAL COMPRESSION TEST TOTAL AND EFFECTIVE MOHR CIRCLES - ASTM D 4767



*TOTAL STRENGTH PARAMETERS	
φ =	14.0 °
C =	232.3 psf

*EFFECTIVE STRENGTH PARAMETERS	
φ' =	23.0 °
C' =	290.0 psf

DESCRIPTION Brown, SILTY CLAY, trace coarse to fine sand.

USCS CH

LL	74
PL	26
PI	48
Gs	2.69

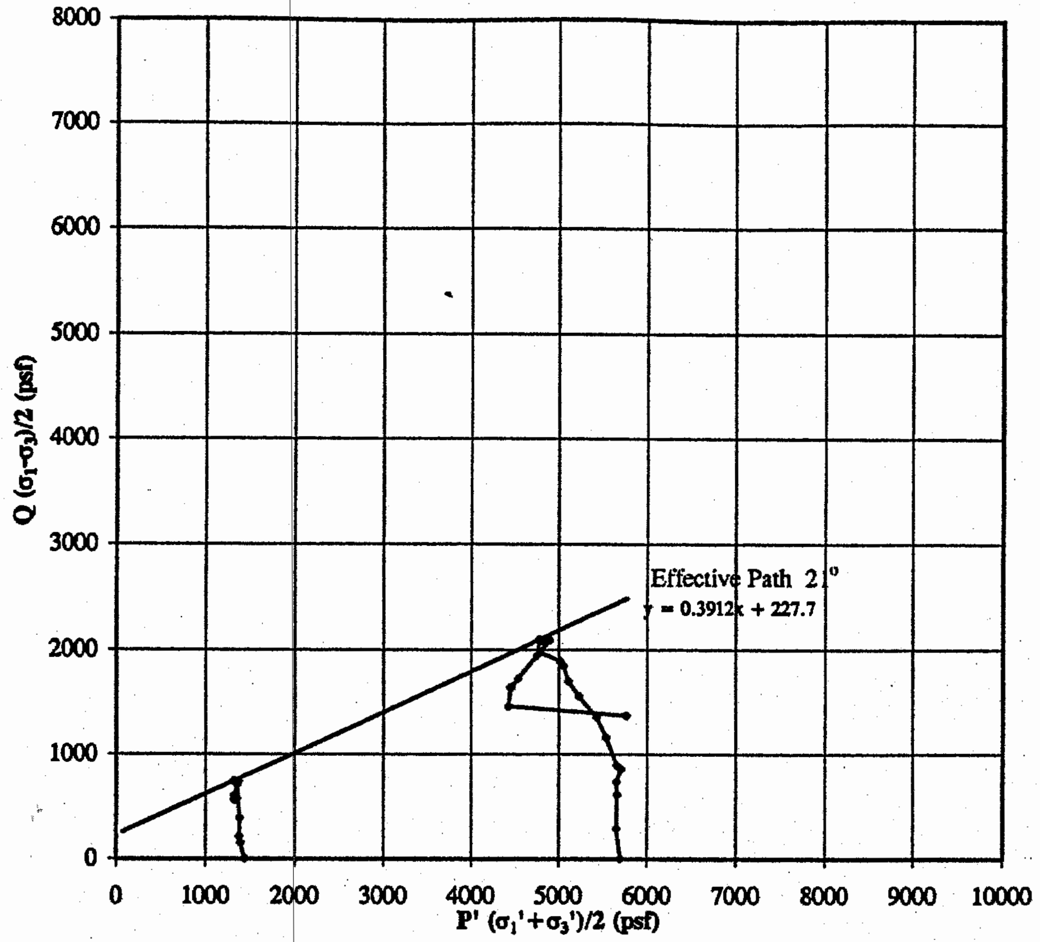
	A	B	C
EFFECTIVE CONSOLIDATION PRESS (psf)	1440	5702	
INITIAL DRY DENSITY (pcf)	71.6	74.2	
INITIAL WATER CONTENT, %	48.3	45.7	

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B-54	7.0 - 10.0'
SAMPLE TYPE	UD	

* Failure based on the maximum principal effective stress ratio or the principal effective stress at 15% strain.

CHECKED	DA
REVIEWED	

TRIAXIAL COMPRESSION TEST EFFECTIVE STRESS PATH
ASTM D 4767



*EFFECTIVE STRESS PARAMETERS	
α' =	21.4^{0}
a' =	227.7 psf

DESCRIPTION	Brown, SILTY CLAY, trace coarse to fine sand.
USCS	CH

LL	74
PL	26
PI	48
Gs	2.69

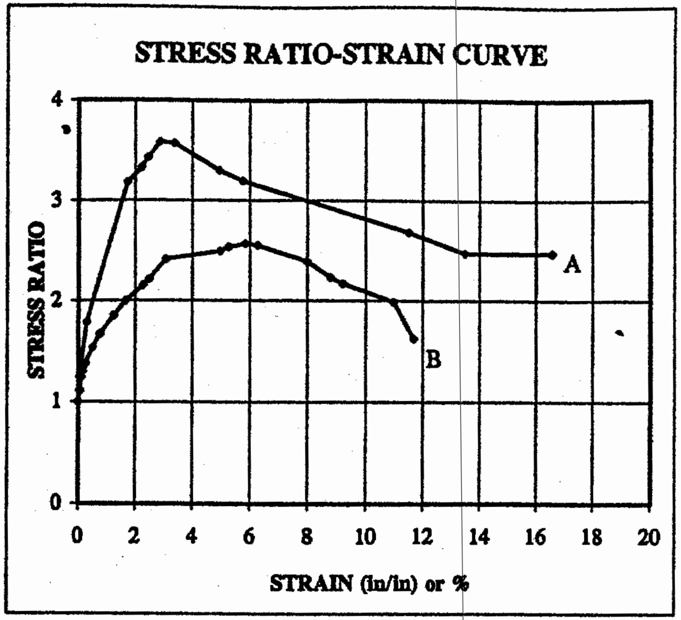
	A	B	C
EFFECTIVE CONSOLIDATION PRESS (psf)	1440	5702.4	
INITIAL DRY DENSITY (pcf)	71.6	74.2	
INITIAL WATER CONTENT %	48.3	45.7	

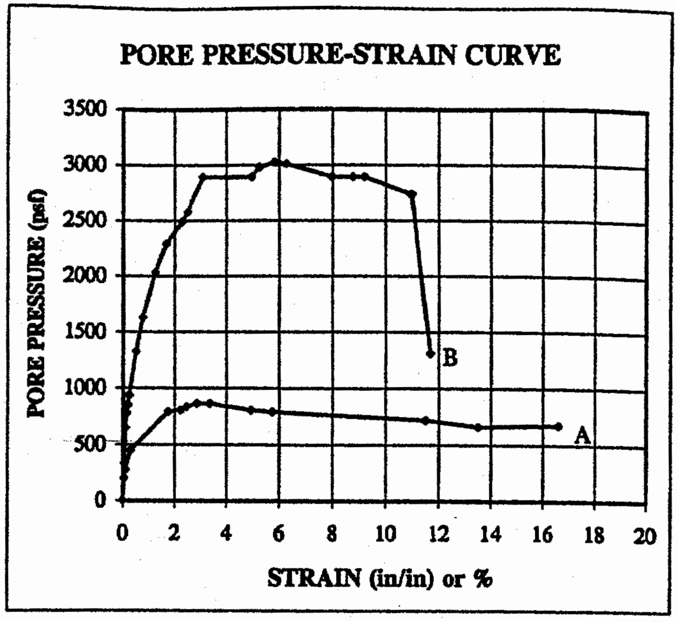
PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	B-54 7.0 - 10.0'
SAMPLE TYPE	UD

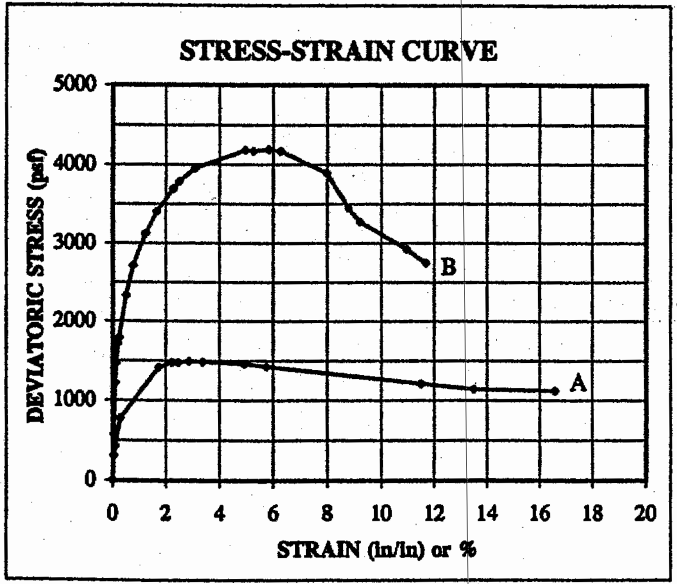
*** Failure based on the maximum principal effective stress ratio or the principal effective stress at 15% strain.**

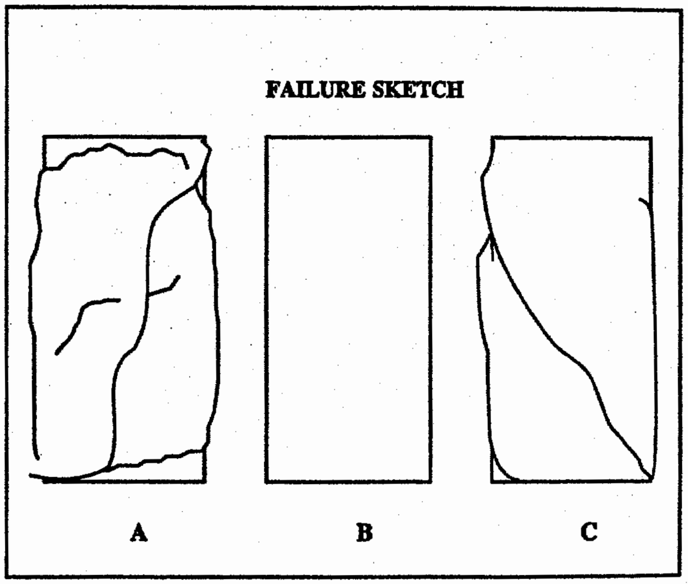
CHECKED	DA
REVIEWED	

TRIAXIAL COMPRESSION TEST
CONSOLIDATED UNDRAINED WITH PORE PRESSURE


STRESS RATIO-STRAIN CURVE


PORE PRESSURE-STRAIN CURVE


STRESS-STRAIN CURVE


FAILURE SKETCH

DESCRIPTION	Brown, SILTY CLAY, trace coarse to fine sand.
USCS	CH

LL	74
PL	26
PI	48
Gs	2.69

	A	B	C
EFFECTIVE CONSOLIDATION PRESS (psf)	1440	5702	
INITIAL DRY DENSITY (pcf)	71.6	74.2	
INITIAL WATER CONTENT (%)	48.3	45.7	
STRAIN RATE (%/min)	0.002	0.002	

PROJECT NAME	GENESIS/PLUM POINT ENERGY/AR	
PROJECT NUMBER	013-3205	
SAMPLE ID	B-54	7.0 - 10.0'
SAMPLE TYPE	UD	

CHECKED	DA
REVIEWED	

TRIAXIAL COMPRESSION TEST (ASTM D-4767; SOLIDATED UNDRAINED WITH PORE PRESSURE

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER	013-3205
SAMPLE ID	B-54 -
SAMPLE TYPE	UD
DEPTH INTERVAL	7.0 - 10.0'
MACHINE SPEED (in/min)	0.00012
STRAIN RATE (%/min)	0.00
CELL PRESSURE (psi)	109.6
SAMPLE PRESSURE (psi)	70.0
EFF. CONSOLIDATION	
PRESSURE, σ_3 (psi)	39.6
PRESSURE, σ_3 (psf)	5702.4
FINAL "B" VALUE	1.00
t_{50} (minutes)	124

INITIAL SAMPLE DATA	cm	in	corrected
HEIGHT	15.664	6.167	5.992
DIAMETER	7.234	2.848	2.716
AREA	41.10	6.37	5.79
VOLUME	643.79	39.29	34.71
WEIGHT (g)	1116.04		1056.04
% MOISTURE	45.7		37.87
SPECIFIC GRAVITY	2.69		
MOIST DENSITY (pcf)	108.2		
DRY DENSITY, calc (pcf)	74.2		
VOLUME OF SOLIDS	284.96		
VOLUME OF VOIDS	358.83		
VOID RATIO	1.259		
SATURATION	97.6		

CORRECTED SAMPLE DATA	
DRY DENSITY, calc (pcf)	84.0
VOLUME OF SOLIDS	284.96
VOLUME OF VOIDS	283.83
VOID RATIO	0.996

WATER CONTENT (% MOISTURE)	
WT SOIL & TARE, MOIST (g)	1056.04
WT SOIL & TARE, DRY (g)	765.97
WT TARE (g)	0.00
WT MOISTURE (g)	290.07
WT DRY SOIL (g)	765.97
% MOISTURE	37.87

TIME (MIN)	ACCUM. DEFLECT. (inches)	AXIAL LOAD (lbs)	PORE PRESS. (psi)=U	PWP change DU (psf) (acc)	e % STRAIN (%)	(1-e)	CORR. AREA (in 2)	CORR. HEIGHT (in)	DEV. STRESS (psf)	SIGMA 1 devstr+cp (σ_1)	SIGMA 1 EFF. (σ_1-dU)	SIGMA 3 EFF. (σ_3-dU)	EFF.PRN STR RATIO (σ_1'/σ_3')	$\frac{(\sigma_1'+\sigma_3')}{2}$ (P)	$\frac{(\sigma_1-\sigma_3)}{2}$ (Q)	(A)
0.0	0.000	25	70.9	0.0	0.00	1.00	5.79	5.992	0.0	5702.4	5702.4	5702.4	1.00	5702.4	0.0	0.00
25.0	0.003	48	73.2	331.2	0.05	1.00	5.80	5.989	571.5	6273.9	5942.7	5371.2	1.11	5656.9	285.7	0.58
50.0	0.006	74	75.4	648.0	0.10	1.00	5.80	5.986	1216.9	6919.3	6271.3	5054.4	1.24	5662.8	608.4	0.53
75.0	0.009	84	76.3	777.6	0.15	1.00	5.80	5.983	1464.5	7166.9	6389.3	4924.8	1.30	5657.0	732.2	0.53
100.0	0.012	94	76.8	849.6	0.20	1.00	5.80	5.980	1711.8	7414.2	6564.6	4852.8	1.35	5708.7	855.9	0.50
125.0	0.015	97	77.4	936.0	0.25	1.00	5.81	5.977	1785.4	7487.8	6551.8	4766.4	1.37	5659.1	892.7	0.52
250.0	0.030	119	80.1	1324.8	0.50	0.99	5.82	5.962	2325.0	8027.4	6702.6	4377.6	1.53	5540.1	1162.5	0.57
383.3	0.046	135	82.2	1627.2	0.77	0.99	5.84	5.946	2713.5	8415.9	6788.7	4075.2	1.67	5431.9	1356.7	0.60
625.0	0.075	152	85.0	2030.4	1.25	0.99	5.87	5.917	3117.6	8820.0	6789.6	3672.0	1.85	5230.8	1558.8	0.65
833.3	0.100	164	86.8	2289.6	1.67	0.98	5.89	5.892	3397.7	9100.1	6810.5	3412.8	2.00	5111.7	1698.9	0.67
1141.7	0.137	177	88.2	2491.2	2.29	0.98	5.93	5.855	3692.2	9394.6	6903.4	3211.2	2.15	5057.3	1846.1	0.67
1250.0	0.150	181	88.8	2577.6	2.50	0.97	5.94	5.842	3780.9	9483.3	6905.7	3124.8	2.21	5015.3	1890.5	0.68
1541.7	0.185	189	91.0	2894.4	3.09	0.97	5.98	5.807	3951.0	9653.4	6759.0	2808.0	2.41	4783.5	1975.5	0.73
2475.0	0.297	202	91.0	2894.4	4.96	0.95	6.09	5.695	4181.9	9884.3	6989.9	2808.0	2.49	4899.0	2091.0	0.69
2625.0	0.315	202	91.6	2980.8	5.26	0.95	6.11	5.677	4168.7	9871.1	6890.3	2721.6	2.53	4806.0	2084.4	0.72
2916.7	0.350	204	91.9	3024.0	5.84	0.94	6.15	5.642	4189.8	9892.2	6868.2	2678.4	2.56	4773.3	2094.9	0.72
3133.3	0.376	204	91.8	3009.6	6.28	0.94	6.18	5.616	4170.5	9872.9	6863.3	2692.8	2.55	4778.1	2085.3	0.72
3983.3	0.478	195	91.0	2894.4	7.98	0.92	6.29	5.514	3888.9	9591.3	6696.9	2808.0	2.38	4752.4	1944.4	0.74
4383.3	0.526	177	91.0	2894.4	8.78	0.91	6.35	5.466	3446.9	9149.3	6254.9	2808.0	2.23	4531.4	1723.4	0.84
4600.0	0.552	170	91.0	2894.4	9.21	0.91	6.38	5.440	3272.5	8974.9	6080.5	2808.0	2.17	4444.2	1636.2	0.88
5475.0	0.657	157	89.9	2736.0	10.96	0.89	6.51	5.335	2921.6	8624.0	5888.0	2966.4	1.98	4427.2	1460.8	0.94
5833.3	0.700	150	80.0	1310.4	11.68	0.88	6.56	5.292	2744.4	8446.8	7136.4	4392.0	1.62	5764.2	1372.2	0.48

DU @ FAILURE	3024.0	DEVIATORIC STRESS @ FAILURE	4189.8	EFFECTIVE PRINCIPLE STRESS RATIO @ FAILURE	2.56

TECH	DA/PWM
DATE	5/15/01
CHECKED	DA
REVIEWED	pwm

Golder Associates Inc.

ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME:	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER:	013-3205
SAMPLE ID:	B-55 -
SAMPLE TYPE:	UD
SAMPLE DEPTH:	3.0 - 5.0'

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION	
Number of Blows				27	27
Weight of Wet Soil & Tare (gm)	23.45	23.78	22.86	22.99	20.27
Weight of Dry Soil & Tare (gm)	21.28	21.60	20.70	18.97	16.33
Weight of Tare (gm)	11.66	11.85	11.36	6.73	4.32
Weight of Water (gm)	2.17	2.18	2.16	4.02	3.94
Weight of Dry Soil (gm)	9.62	9.75	9.34	12.24	12.01
Water Content %	22.56	22.36	23.13	32.84	32.81

	TRIAL 1	TRIAL 2
BLOWS:	27	27
K VALUE:	1.009	1.009

NATURAL MOISTURE
590.01
445.76
0.00
144.25
445.76
32.36

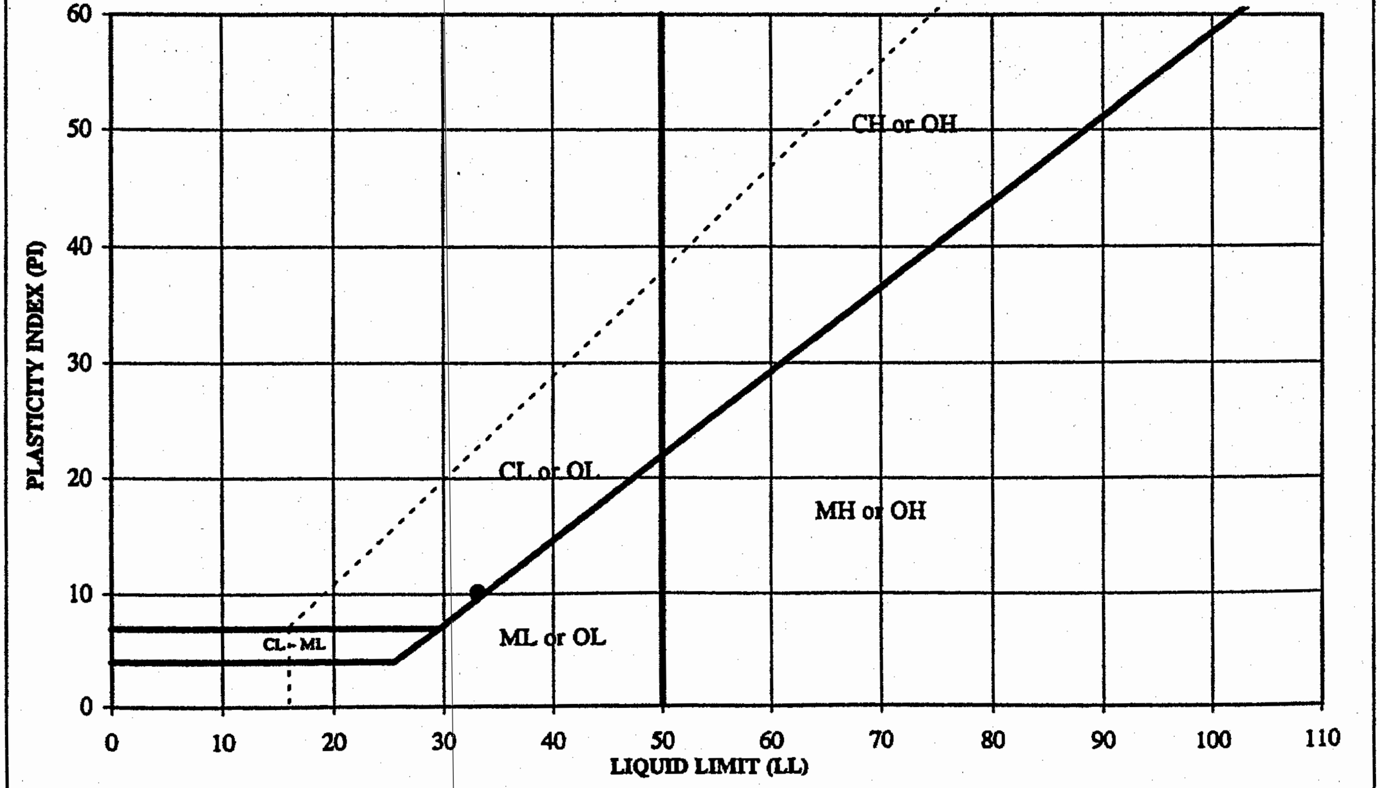
PLASTIC LIMIT (PL)	23
LIQUID LIMIT (LL)	33
PLASTICITY INDEX (PI)	10
LIQUIDITY INDEX (LI)	0.96

NOTE:

DESCRIPTION: Olive Brown, SILTY CLAY, trace fine sand.

USCS: CL

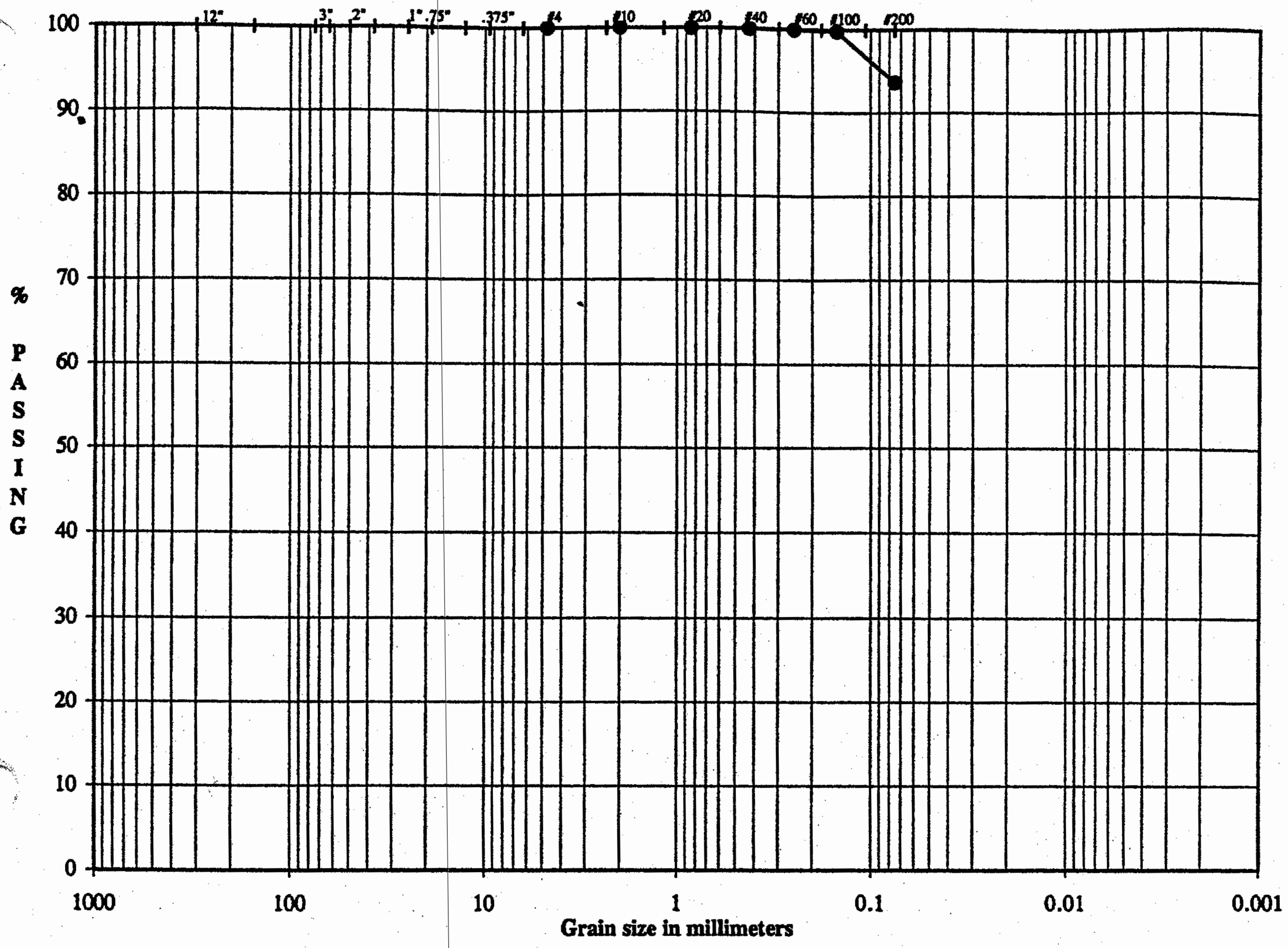
PLASTICITY CHART



TECH	DH
DATE	5/4/01
CHECK	
REVIEW	

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-55
SAMPLE TYPE	UD
SAMPLE DEPTH	3.0 - 5.0'

LL	33
PL	23
PI	10

DESCRIPTION Olive Brown, SILTY CLAY, some fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	DA/JC
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-55	-
ROJECT NO.	013-3205	**SAMPLE TYPE**	UD	
REMARKS		**SAMPLE DEPTH**	3.0 - 5.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	590.01
Wt Dry Soil & Tare (gm)	(w2)	445.76
Weight of Tare (gm)	(w3)	0.00
Weight of Water (gm)	(w4=w1-w2)	144.25
Weight of Dry Soil (gm)	(w5=w2-w3)	445.76
Moisture Content (%)	(w4/w5)*100	32.36

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	326.44
	Tare Weight (gm)	43.02
(W6)	Total Dry Weight (gm)	283.42

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.06	0.06	0.02	99.98	#20	medium sand
#40	0.18	0.18	0.06	99.94	#40	fine sand
#60	0.27	0.27	0.10	99.90	#60	fine sand
#100	0.58	0.58	0.20	99.80	#100	fine sand
#200	17.94	17.94	6.33	93.67	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.06
% F SAND	6.27
% FINES	93.67
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	33
PL	23
PI	10
Gs	2.675

DESCRIPTION Olive Brown, SILTY CLAY, some fine sand.

USCS CL

TECH	DA/JC
DATE	5/1/01
CHECK	
REVIEW	

FLOW PUMP #1

FLEXIBLE WALL PERMEABILITY
ASTM D 5084
METHOD D, CONSTANT RATE OF FLOW

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**BOARD #**	10
PROJECT NUMBER	013-3205	**CELL #**	10
SAMPLE ID	B-55 - - 3.0 -5.0'	**Flow Pump Speed**	8
SAMPLE TYPE	UD	**Technician**	KBG

COMMENTS

Sample Data, Initial

Height, inches	2.967	**B-Value, f**	1.00
Diameter, inches	2.860	**Cell Pres.**	85.0
Area, cm²	41.45	**Bot. Pres.**	80.0
Volume, cm³	312.35	**Top Pres.**	80.0
Mass, g	590.01	**Tot. B.P.**	80.0
Moisture Content, %	32.36	**Head, max.**	66.82
Dry Density, pcf	89.05	**Head, min.**	66.82
Spec. Gravity	2.675	**Max. Grad.**	8.86
Volume Solids, cm³	166.64	**Min. Grad.**	8.86
Volume Voids, cm³	145.71		
Void Ratio	0.87		
Saturation, %	99.0%		

Flow Pump Rate 1.40E-04 cm³/sec

Sample Data, Final

Height, inches	2.969
Diameter, inches	2.767
Area, cm²	38.79
Volume, cm³	292.56
Mass, g	565.46
Moisture Content, %	26.85
Dry Density, pcf	95.08
Volume Solids, cm³	166.64
Volume Voids, cm³	125.92
Void Ratio	0.76
Saturation, %	95.1%

USCS CL

WATER CONTENTS		**Trimmings Initial**	**Sample Final**
Wt Soil & Tare, i	**g**	590.01	616.98
Wt Soil & Tare, f	**g**	445.76	497.34
Wt Tare	**g**	0.00	51.78
Wt Moisture Lost	**g**	144.25	119.64
Wt Dry Soil	**g**	445.76	445.56
Water Content	**%**	32.36%	26.85%

DESCRIPTION

Olive Brown, SILTY CLAY, trace fine sand.

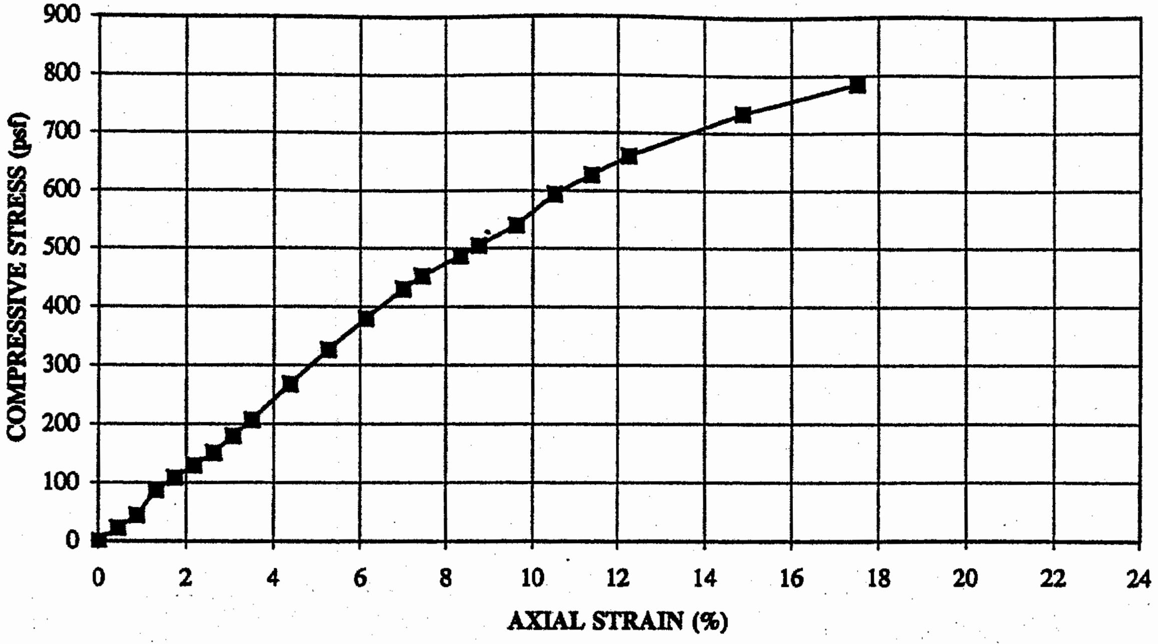
TIME FUNCTIONS, SECONDS								**dP**				
DATE	**DAY**	**HOUR**	**MIN**	**TEMP (°C)**	**dt (min)**	**dt,acc (min)**	**dt (sec)**	**dt,acc (sec)**	**Reading (psi)**	**Head (cm)**	**Gradient**	**Permeability (cm/sec)**
5/3/01	37014	9	10	19.5	0	0	0	0	0.95	66.82	8.86	4.1E-07
5/3/01	37014	9	15	19.5	5	5	300	300	0.95	66.82	8.86	4.1E-07
5/3/01	37014	9	20	19.5	5	10	300	600	0.95	66.82	8.86	4.1E-07
5/3/01	37014	9	25	19.5	5	15	300	900	0.95	66.82	8.86	4.1E-07 *
5/3/01	37014	9	30	19.5	5	20	300	1200	0.95	66.82	8.86	4.1E-07 *
5/3/01	37014	9	35	19.5	5	25	300	1500	0.95	66.82	8.86	4.1E-07 *
5/3/01	37014	9	40	19.5	5	30	300	1800	0.95	66.82	8.86	4.1E-07 *

***TRANSCRIBED FROM ORIGINAL DATA SHEETS**

PERMEABILITY REPORTED AS ** 4.1E-07 **cm/sec ****

DATE 5/3/01
CHECK
REVIEW

UNCONFINED COMPRESSIVE STRENGTH OF SOILS
STRESS-STRAIN - ASTM D 2166



DESCRIPTION	LL	PL	PI	SAMPLE ID
Olive Brown, SILTY CLAY, trace fine sand.	33	23	10	B - 55
	SAMPLE TYPE		UD	3.0 - 5.0'

USCS	CL

NOTE: Sample very soft, slumps under its' own weight.

SAMPLE DATA

Wet Density (pcf)	118.1	TIME TO FAILURE (min)	14.2
Dry Density (pcf)	89.2	STRAIN @ FAILURE (%)	14.9
Moisture Content	32.4%	TYPE OF FAILURE	SHEAR

UNCONFINED COMPRESSIVE STRENGTH (psf)	734.3
SHEAR STRENGTH (psf)	367.1

013-3205
GENESIS/PLUM POINT ENERGY/AR

TECH	DA
DATE	5/1/01
CHECK	AA
REVIEW	PWM

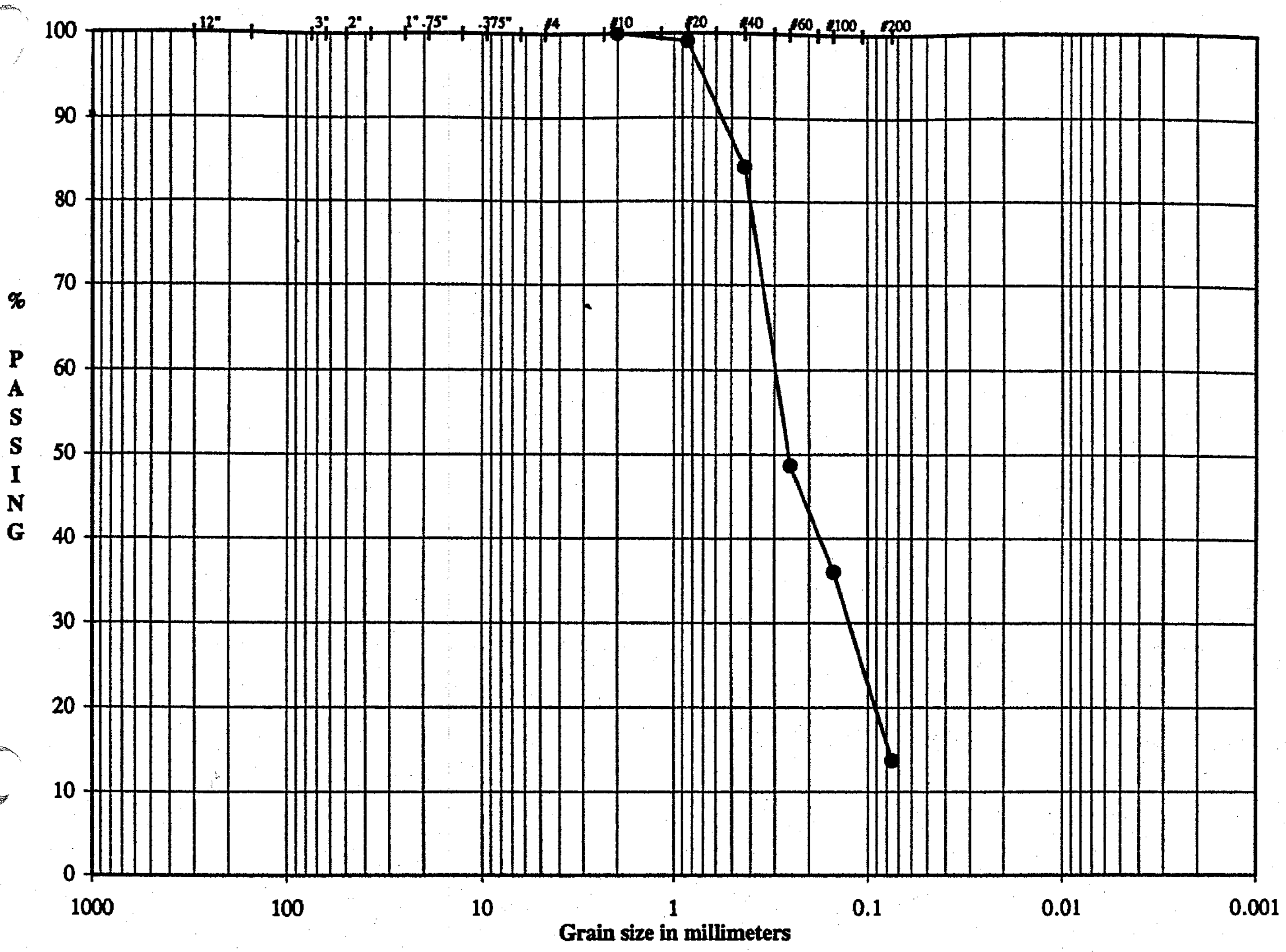
GENESIS/PLUM POINT ENERGY/AR
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classification	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %		Moisture %	Dry (lb/cuft)		
B-30	Bag	4.0-5.0'	(SM)	10.1	-	-	-	-	100.0	13.7	-	-	-	-	-	-	-	-
B-31	Bag	9.0-10.0'	CL	25.2	33	19	14	0.46	100.0	68.1	-	-	-	-	-	-	-	-
B-37	Bag	14.0-15.0'	(SM)	21.8	-	-	-	-	100.0	25.1	-	-	-	-	-	-	-	-
B-38	Bag	4.0-5.0'	CH	38.0	80	28	52	0.19	100.0	96.8	-	-	-	-	-	-	-	-
B-40	Bag	4.0-15.0'	(SM)	17.9	-	-	-	-	100.0	12.9	7.4	-	-	-	-	-	-	-
B-42	Bag	9.0-10.0'	(CL)	20.5	-	-	-	-	100.0	56.7	-	-	-	-	-	-	-	-
B-45	Bag	9.0-10.0'	(CL)	33.2	-	-	-	-	100.0	97.2	-	-	-	-	-	-	-	-
B-45	Bag	20.0-30.0'	(SM)	20.1	-	-	-	-	100.0	32.2	-	-	-	-	-	-	-	-
B-50	Bag	9.0-10.0'	(SP)	13.3	-	-	-	-	100.0	4.2	-	-	-	-	-	-	-	-
B-54	Bag	4.0-5.0'	CL	33.6	38	23	15	0.69	100.0	97.1	-	-	-	-	-	-	-	-
B-54	Bag	25.0-30.0'	(SM)	24.5	-	-	-	-	100.0	27.1	-	-	-	-	-	-	-	-
B-55	Bag	19.0-30.0'	CH	47.6	56	28	28	0.71	100.0	88.1	-	-	-	-	-	-	-	-
B-56	Bag	9.0-20.0'	SC	33.9	32	23	9	1.18	100.0	15.2	7.2	-	-	-	-	-	-	-

ABBREVIATIONS:
LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES:
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID B-30
SAMPLE TYPE Bag
SAMPLE DEPTH 4.0 - 5.0'

LL -
PL -
PI -

DESCRIPTION Brown, MEDIUM TO FINE SAND, some clayey silt.

USCS (SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH JC/TJ
DATE 5/1/01
CHECK
REVIEW

Golder Associates Inc.

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

ROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-30 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	4.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	417.81
Wt Dry Soil & Tare (gm)	(w2)	387.27
Weight of Tare (gm)	(w3)	85.56
Weight of Water (gm)	(w4=w1-w2)	30.54
Weight of Dry Soil (gm)	(w5=w2-w3)	301.71
Moisture Content (%)	(w4/w5)*100	10.12

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	387.27
	Tare Weight (gm)	85.56
(W6)	Total Dry Weight (gm)	301.71

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	2.84	2.84	0.94	99.06	#20	medium sand
#40	47.85	47.85	15.86	84.14	#40	fine sand
#60	154.85	154.85	51.32	48.68	#60	fine sand
#100	193.10	193.10	64.00	36.00	#100	fine sand
#200	260.47	260.47	86.33	13.67	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	15.86
% F SAND	70.47
% FINES	13.67
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, some clayey silt.

USCS (SM)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-31 - **SAMPLE DEPTH:** 9.0 - 10.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

PLASTIC LIMIT DETERMINATION

Number of Blows			
Weight of Wet Soil & Tare (gm)	19.57	21.58	19.66
Weight of Dry Soil & Tare (gm)	18.24	20.06	18.42
Weight of Tare (gm)	11.21	11.84	11.70
Weight of Water (gm)	1.33	1.52	1.24
Weight of Dry Soil (gm)	7.03	8.22	6.72
Water Content %	18.92	18.49	18.45

LIQUID LIMIT DETERMINATION

Number of Blows	26	26
Weight of Wet Soil & Tare (gm)	22.38	24.55
Weight of Dry Soil & Tare (gm)	17.88	19.47
Weight of Tare (gm)	4.27	4.25
Weight of Water (gm)	4.50	5.08
Weight of Dry Soil (gm)	13.61	15.22
Water Content %	33.06	33.38

	TRIAL 1	TRIAL 2
BLOWS:	26	26
K VALUE:	1.005	1.005

NATURAL MOISTURE

Weight of Wet Soil & Tare (gm)	363.87
Weight of Dry Soil & Tare (gm)	307.63
Weight of Tare (gm)	84.48
Weight of Water (gm)	56.24
Weight of Dry Soil (gm)	223.15
Water Content %	25.20

PLASTIC LIMIT (PL) 19

LIQUID LIMIT (LL) 33

PLASTICITY INDEX (PI) 14

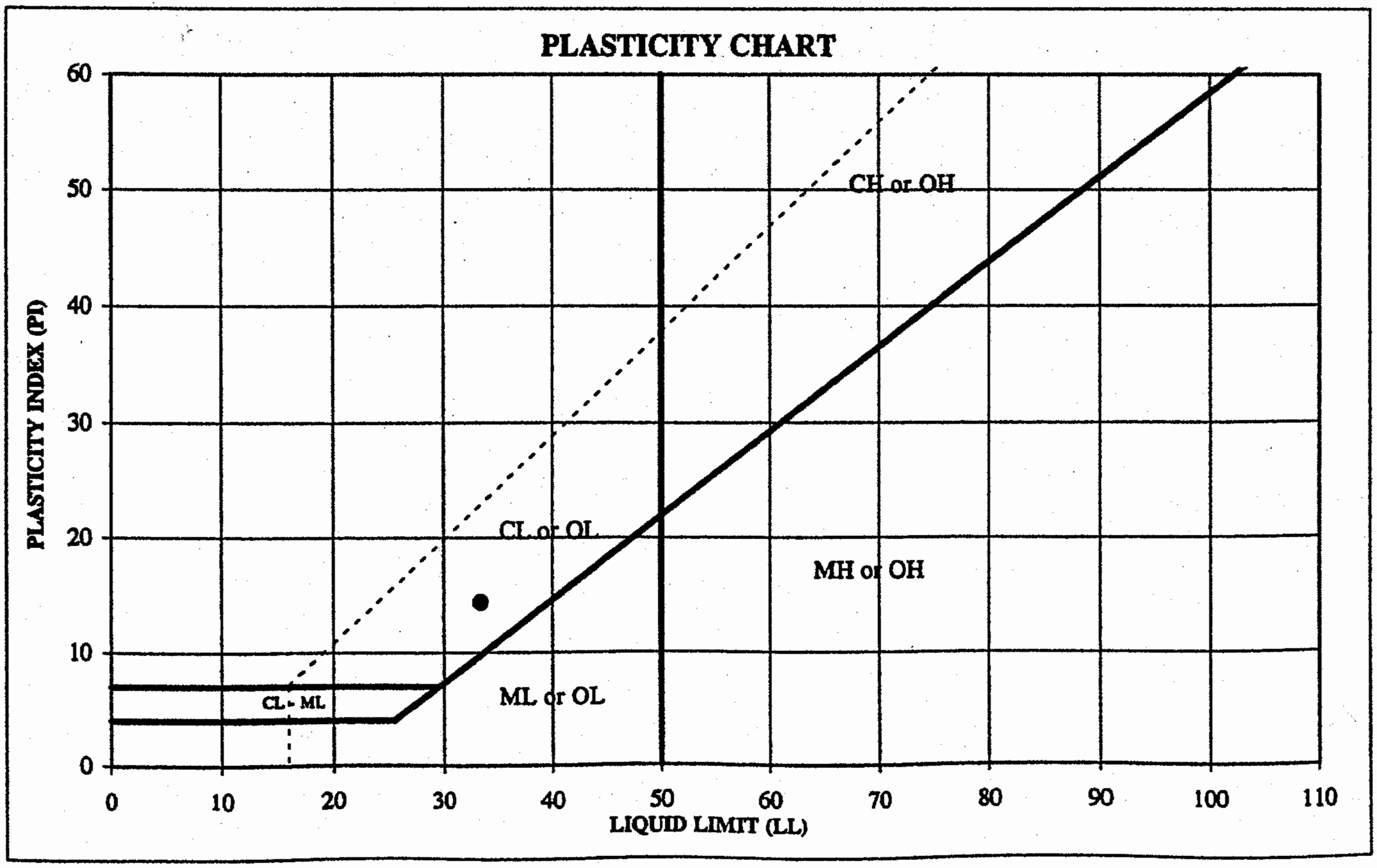
LIQUIDITY INDEX (LI) 0.46

NOTE:

DESCRIPTION Brown, SILTY CLAY, and fine sand.

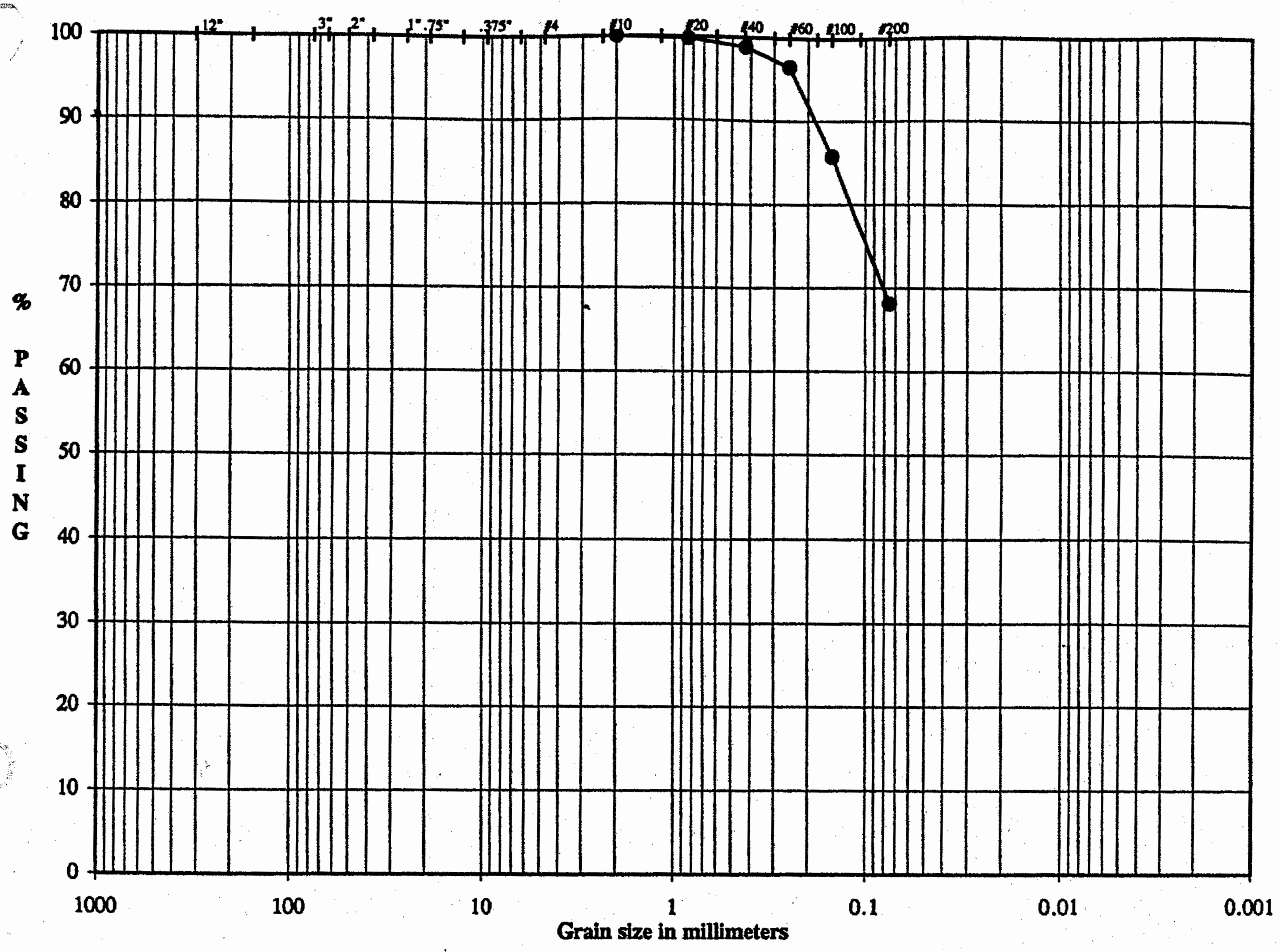
USCS CL

PLASTICITY CHART



TECH	DH
DATE	5/3/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-31
SAMPLE TYPE	Bag
SAMPLE DEPTH	9.0 - 10.0'

LL	33
PL	19
PI	14

DESCRIPTION Brown, SILTY CLAY, and fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE GENESIS/PLUM POINT ENERGY/AR
PROJECT NO. 013-3205
REMARKS

SAMPLE ID B-31 -
SAMPLE TYPE Bag
SAMPLE DEPTH 9.0 - 10.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	363.87
Wt Dry Soil & Tare (gm)	(w2)	307.63
Weight of Tare (gm)	(w3)	84.48
Weight of Water (gm)	(w4=w1-w2)	56.24
Weight of Dry Soil (gm)	(w5=w2-w3)	223.15
Moisture Content (%)	(w4/w5)*100	25.20

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	307.63
	Tare Weight (gm)	84.48
(W6)	Total Dry Weight (gm)	223.15

SIEVE ANALYSIS

Tare Weight
0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.52	0.52	0.23	99.77	#20	medium sand
#40	2.59	2.59	1.16	98.84	#40	fine sand
#60	7.77	7.77	3.48	96.52	#60	fine sand
#100	31.80	31.80	14.25	85.75	#100	fine sand
#200	71.09	71.09	31.86	68.14	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	1.16
% F SAND	30.70
% FINES	68.14
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

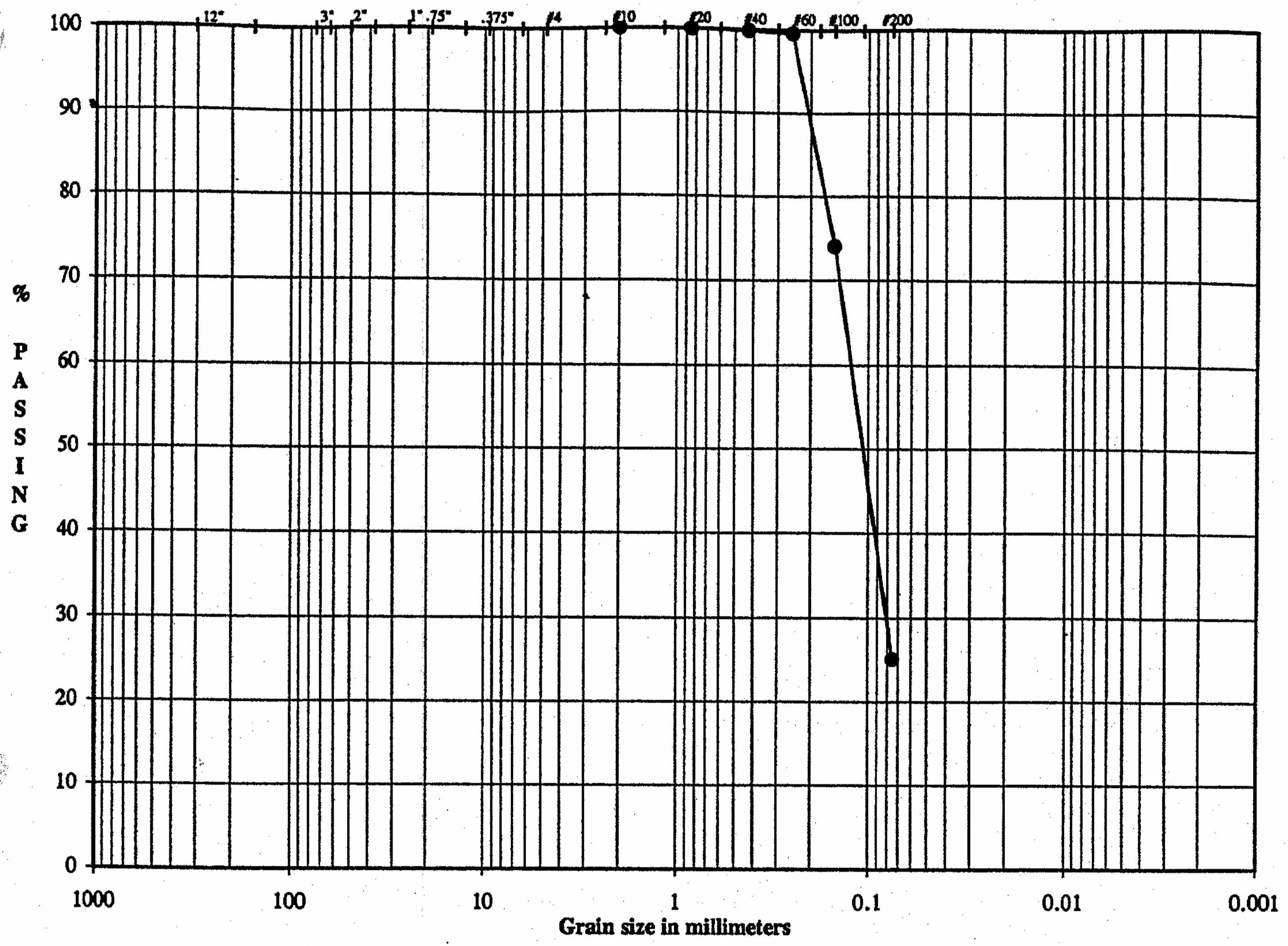
LL	33
PL	19
PI	14
Gs	-

DESCRIPTION Brown, SILTY CLAY, and fine sand.

USCS CL

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-37
SAMPLE TYPE	Bag
SAMPLE DEPTH	14.0 - 15.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, FINE SAND, and clayey silt.

USCS (SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

ROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-37 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	14.0 - 15.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	347.73
Wt Dry Soil & Tare (gm)	(w2)	300.92
Weight of Tare (gm)	(w3)	85.93
Weight of Water (gm)	(w4=w1-w2)	46.81
Weight of Dry Soil (gm)	(w5=w2-w3)	214.99
Moisture Content (%)	(w4/w5)*100	21.77

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	300.92
	Tare Weight (gm)	85.93
(W6)	Total Dry Weight (gm)	214.99

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.06	0.06	0.03	99.97	#20	medium sand
#40	0.28	0.28	0.13	99.87	#40	fine sand
#60	0.93	0.93	0.43	99.57	#60	fine sand
#100	55.91	55.91	26.01	73.99	#100	fine sand
#200	160.98	160.98	74.88	25.12	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.13
% F SAND	74.75
% FINES	25.12
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, FINE SAND, and clayey silt.

USCS (SM)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-38 - **SAMPLE DEPTH:** 4.0 - 5.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				25	25	
Weight of Wet Soil & Tare (gm)	21.43	20.61	20.87	21.68	22.16	254.69
Weight of Dry Soil & Tare (gm)	19.32	18.59	18.88	13.91	14.22	207.91
Weight of Tare (gm)	11.73	11.40	11.74	4.28	4.29	84.93
Weight of Water (gm)	2.11	2.02	1.99	7.77	7.94	46.78
Weight of Dry Soil (gm)	7.59	7.19	7.14	9.63	9.93	122.98
Water Content %	27.80	28.09	27.87	80.69	79.96	38.04

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

PLASTIC LIMIT (PL): 28

LIQUID LIMIT (LL): 80

PLASTICITY INDEX (PI): 52

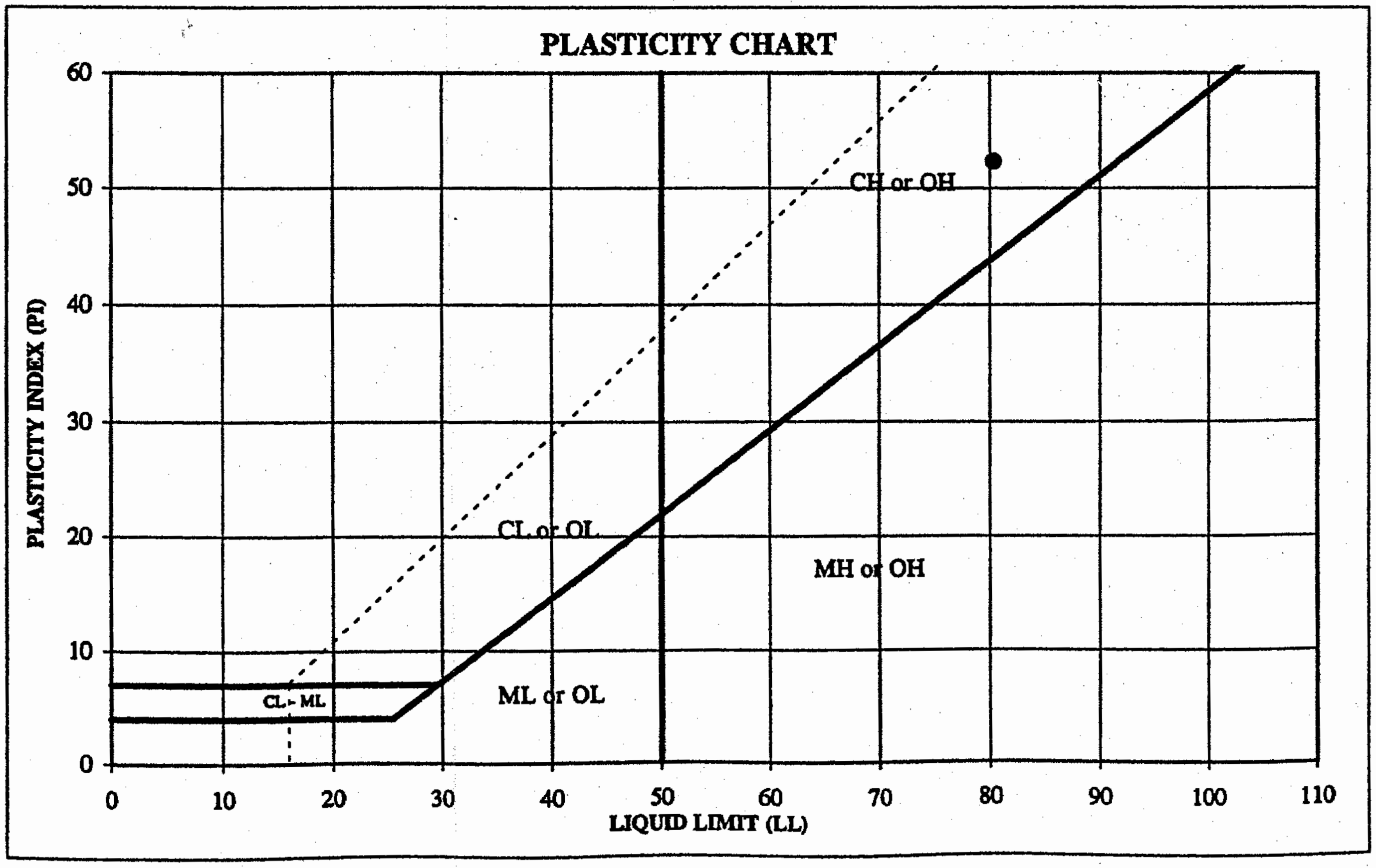
LIQUIDITY INDEX (LI): 0.19

NOTE:

DESCRIPTION: Brown, SILTY CLAY, trace medium to fine sand.

USCS: CH

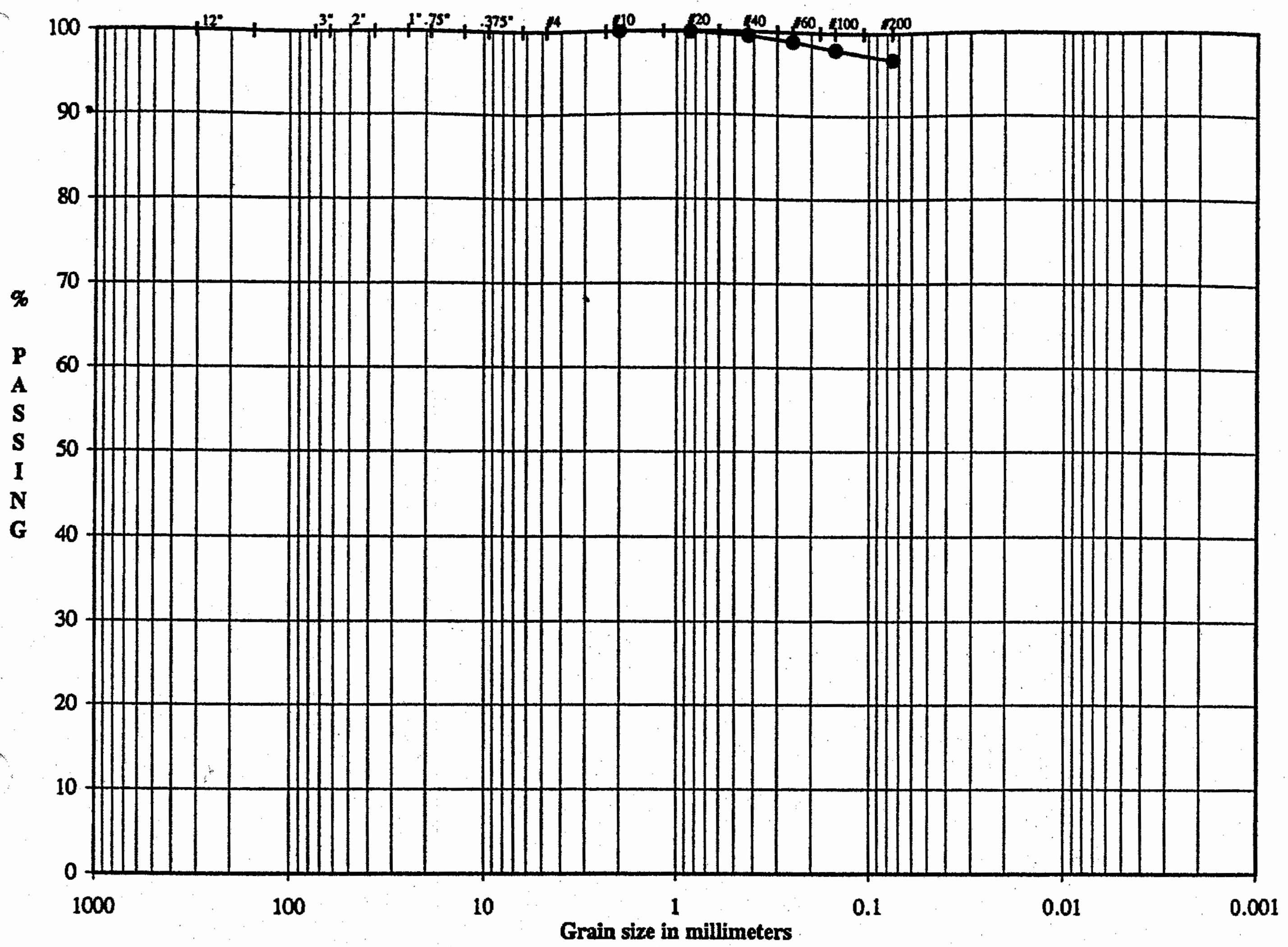
PLASTICITY CHART



TECH: DR
DATE: 5/8/01
CHECK:
REVIEW:

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID B-38
SAMPLE TYPE Bag
SAMPLE DEPTH 4.0 - 5.0'

LL 80
PL 28
PI 52

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH JC/TJ
DATE 5/1/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

ROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-38 / -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	4.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	254.69
Wt Dry Soil & Tare (gm)	(w2)	207.91
Weight of Tare (gm)	(w3)	84.93
Weight of Water (gm)	(w4=w1-w2)	46.78
Weight of Dry Soil (gm)	(w5=w2-w3)	122.98
Moisture Content (%)	(w4/w5)*100	38.04

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	207.91
	Tare Weight (gm)	84.93
(W6)	Total Dry Weight (gm)	122.98

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.16	0.16	0.13	99.87	#20	medium sand
#40	0.64	0.64	0.52	99.48	#40	fine sand
#60	1.41	1.41	1.15	98.85	#60	fine sand
#100	2.53	2.53	2.06	97.94	#100	fine sand
#200	3.97	3.97	3.23	96.77	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.52
% F SAND	2.71
% FINES	96.77
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

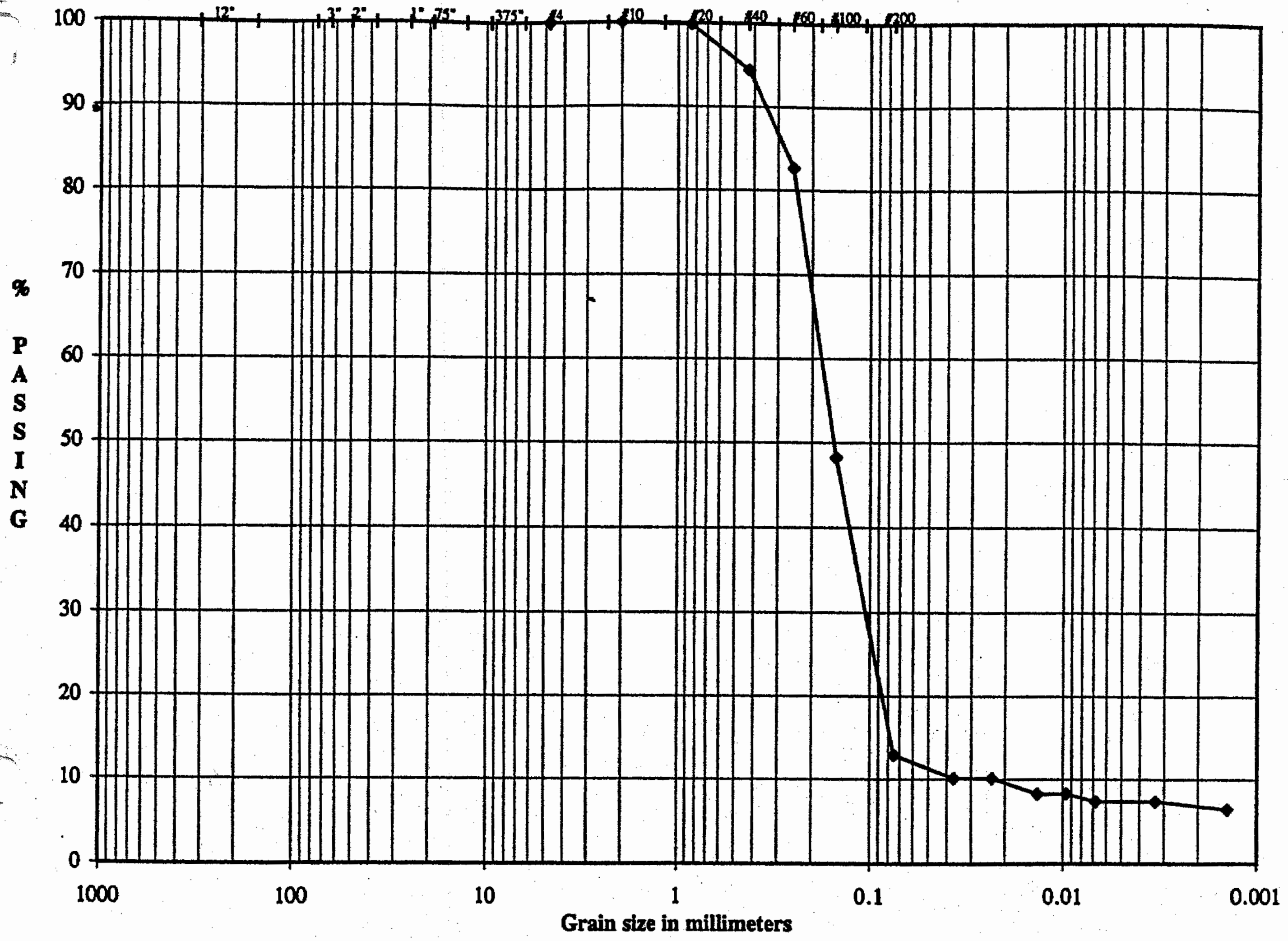
LL	80
PL	28
PI	52
Gs	-

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CH

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-40 -
SAMPLE TYPE	Bag
SAMPLE DEPTH	4.0 - 15.0'

LL	-
PL	-
PI	-

DESCRIPTION	Light Brown, FINE SAND, some clayey silt.
USCS	(SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	TJ/DA
DATE	5/3/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM C117, C136, D421, D422, D1140 and D2217

OJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B-40	-
OJECT NO.	013-3205	SAMPLE TYPE	Bag	
		SAMPLE DEPTH	4.0 - 15.0'	

AS RECEIVED WATER CONTENT

Tare No.		-
Wt. Wet Soil & Tare (gm)	(W1)	225.30
Wt. Dry Soil & Tare (gm)	(W2)	198.85
Weight of Tare (gm)	(W3)	51.24
Weight of Water (gm)	(W4=W1-W2)	26.45
Weight of Dry Soil (gm)	(W5=W2-W3)	147.61
Moisture Content (%)	(W4/W5)*100	17.92

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	48.67
Dry Soil & Tare (gm)	48.49
Tare Weight (gm)	7.22
Moisture Content (%)	0.44

Total Weight of Sample Used For Sieve Analysis Corrected For Hygroscopic Moisture

Weight + Tare, Before Separating On The #4 Sieve (gm)	439.51	
Tare Weight (gm)	113.68	
Total Weight (gm)	324.42	(W6)

Plus #4 Material Sieve

TARE WEIGHT 0.00

	(Wt+Tare)	(((Wt-Tare)/W6)*100)	%PASSING		
12.0"				12.0"	cobbles
3.0"				3.0"	coarse gravel
2.5"				2.5"	coarse gravel
2.0"				2.0"	coarse gravel
1.5"				1.5"	coarse gravel
1.0"				1.0"	coarse gravel
0.75"				0.75"	fine gravel
0.50"				0.50"	fine gravel
0.375"				0.375"	fine gravel
#4				#4	coarse sand

HYDROMETER ANALYSIS

Specific Gravity	(assumed)	2.650
Specific Gravity	(tested)	
ount Dispersing Agent (ml)		125.00
e Dispersion Device		Mechanical
Length of Dispersion Period		1 Minute

Weight of Sample Used For Hydrometer Test

Weight of Sample Wet or Dry (gm)	54.61
Calculated Dry Wt. used in test (gm)	54.37
Hydrometer Bulb Number	624378
% Pass #4 Sieve For Whole Sample	100.00

TARE WEIGHT 0.00

HYDROMETER BACKSIEVE (Percent Passing #10 - #200 Sieves)

	(Wt+Tare)	Cumul Wt. Retained	% PASSING		
#10	0.00	0.00	100.0	#10	medium sand
#20	0.09	0.09	99.8	#20	medium sand
#40	3.03	3.03	94.4	#40	fine sand
#60	9.47	9.47	82.6	#60	fine sand
#100	28.18	28.18	48.2	#100	fine sand
#200	47.35	47.35	12.9	#200	fines

HYDROMETER CALCULATIONS

DATE 5/4/01	TIME 9:57	ET (min)	READING R	TEMP T	TEMP.COR. K	HYD.COR. Cc	READING C	EFFECTIVE LENGTH	A
5/4/01	9:59	2.00	10.5	22.00	0.013	5.00	5.50	15.5	1.00
5/4/01	10:02	5.00	10.5	22.00	0.013	5.00	5.50	15.5	1.00
5/4/01	10:12	15.00	9.5	22.00	0.013	5.00	4.50	15.6	1.00
5/4/01	10:27	30.00	9.5	22.00	0.013	5.00	4.50	15.6	1.00
5/4/01	10:57	60.00	9.0	22.00	0.013	5.00	4.00	15.6	1.00
5/4/01	14:07	250.00	9.0	22.00	0.013	5.00	4.00	15.6	1.00
5/5/01	9:57	1440.00	8.5	21.50	0.014	5.00	3.50	15.8	1.00

GRAIN SIZE PERCENTAGES

Particle Diameter	% PASSING		
0.0370	10.1	% COBBLES	0.00
0.0234	10.1	% COARSE GRAVEL	0.00
0.0136	8.3	% FINE GRAVEL	0.00
0.0096	8.3	% COARSE SAND	0.00
0.0068	7.4	% MEDIUM SAND	5.57
0.0033	7.4	% FINE SAND	81.51
0.0014	6.4	% FINES	12.92
		% TOTAL SAMPLE	100.00

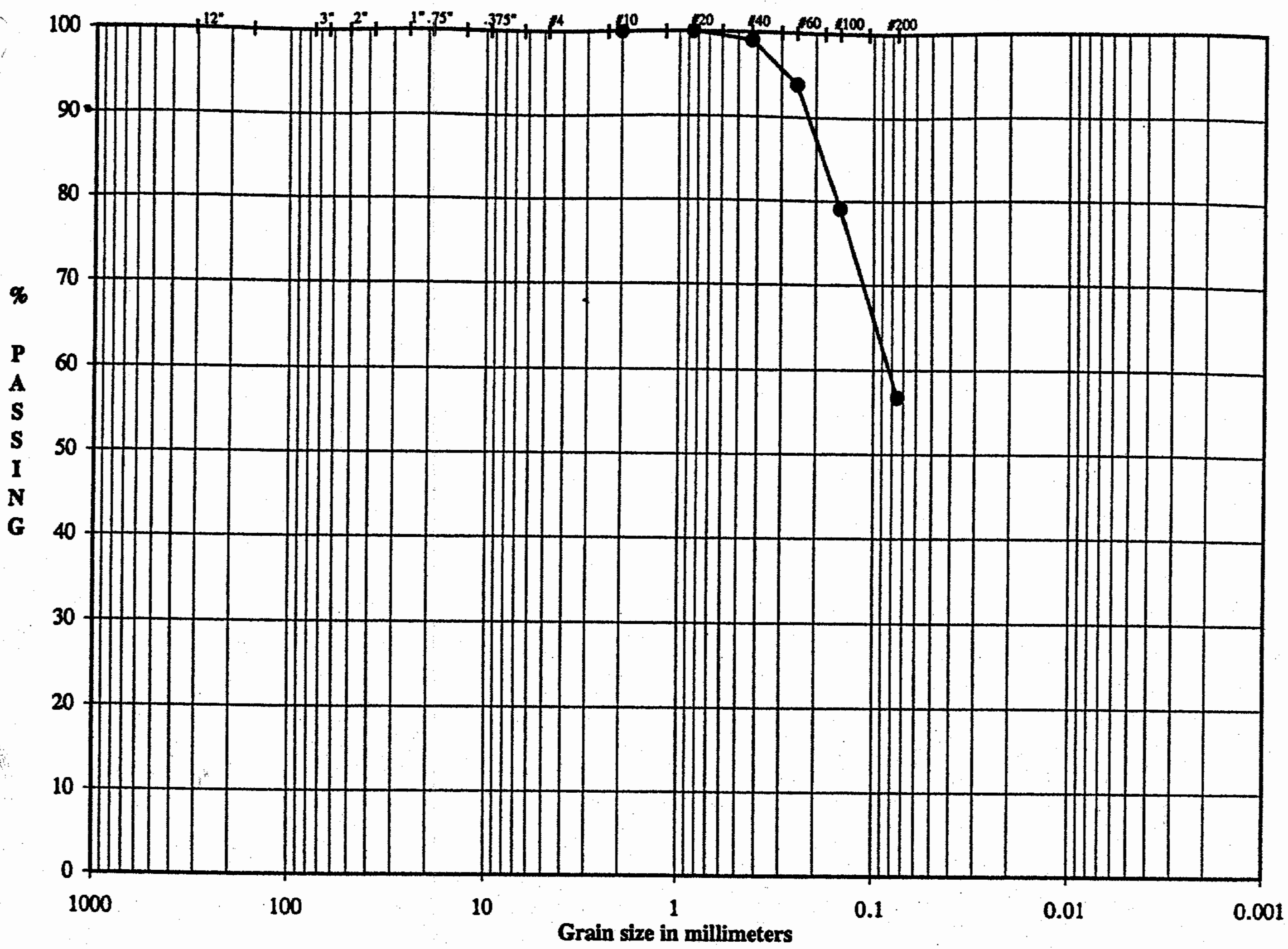
Description Light Brown, FINE SAND, some clayey silt.

USCS (SM)

-	LL
-	PL
-	PI

TECH	TJ/DA
DATE	5/3/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-42
SAMPLE TYPE	Bag
SAMPLE DEPTH	9.0 - 10.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, SILTY CLAY, and fine sand.

USCS (CL)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-42 · -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	9.0 - 10.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	410.67
Wt Dry Soil & Tare (gm)	(w2)	355.42
Weight of Tare (gm)	(w3)	85.27
Weight of Water (gm)	(w4=w1-w2)	55.25
Weight of Dry Soil (gm)	(w5=w2-w3)	270.15
Moisture Content (%)	(w4/w5)*100	20.45

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)	355.42
Tare Weight (gm)	85.27
(W6) Total Dry Weight (gm)	270.15

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.04	0.04	0.01	99.99	#20	medium sand
#40	2.60	2.60	0.96	99.04	#40	fine sand
#60	16.52	16.52	6.12	93.88	#60	fine sand
#100	56.57	56.57	20.94	79.06	#100	fine sand
#200	116.95	116.95	43.29	56.71	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.96
% F SAND	42.33
% FINES	56.71
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

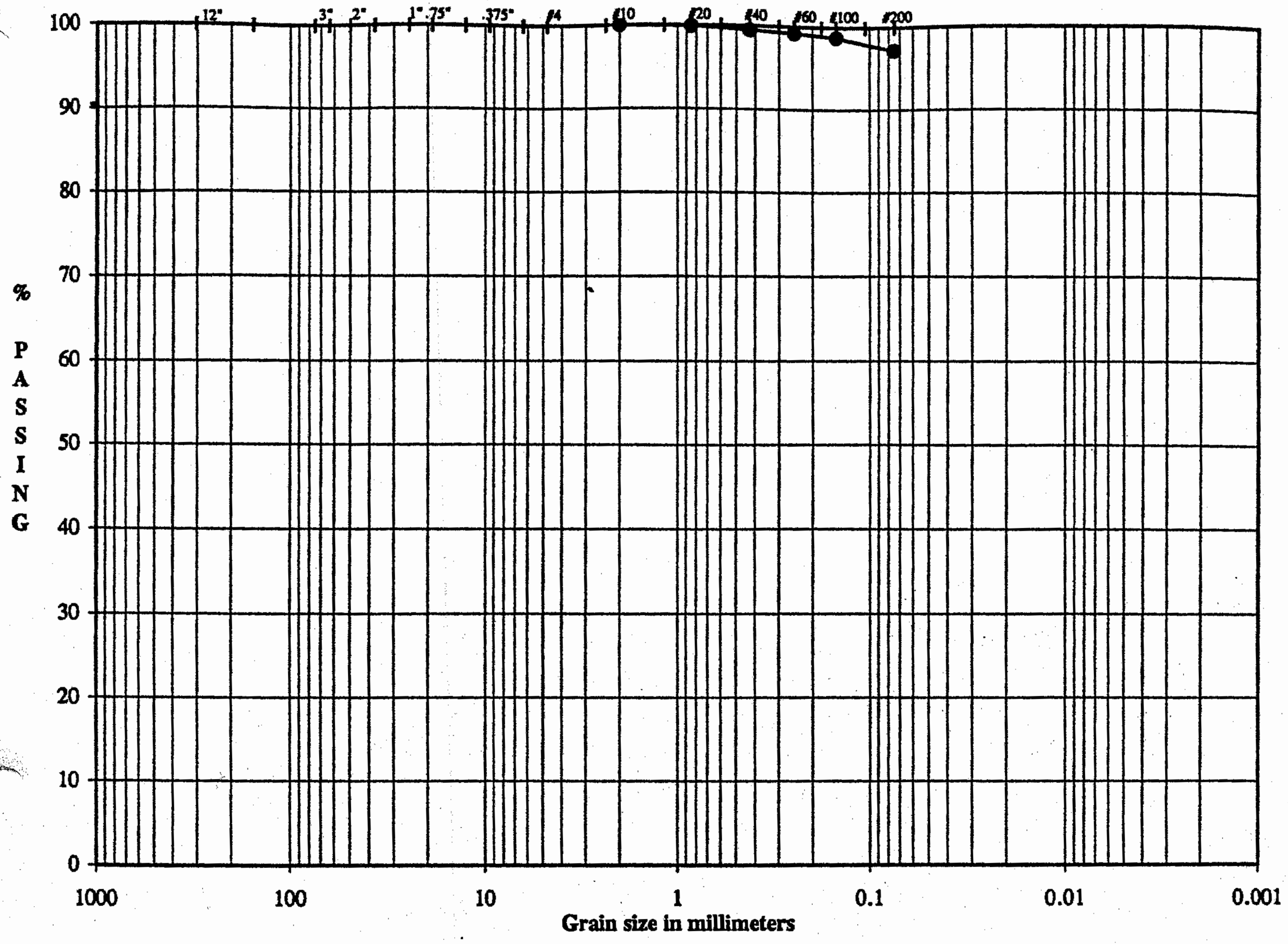
LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, SILTY CLAY, and fine sand.

USCS (CL)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID B-45
SAMPLE TYPE Bag
SAMPLE DEPTH 9.0 - 10.0'

LL -
PL -
PI -

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS (CL)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH JC/TJ
DATE 5/1/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-45 | -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	9.0 - 10.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	281.80
Wt Dry Soil & Tare (gm)	(w2)	232.57
Weight of Tare (gm)	(w3)	84.45
Weight of Water (gm)	(w4=w1-w2)	49.23
Weight of Dry Soil (gm)	(w5=w2-w3)	148.12
Moisture Content (%)	(w4/w5)*100	33.24

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	232.57
	Tare Weight (gm)	84.45
(W6)	Total Dry Weight (gm)	148.12

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.21	0.21	0.14	99.86	#20	medium sand
#40	0.77	0.77	0.52	99.48	#40	fine sand
#60	1.21	1.21	0.82	99.18	#60	fine sand
#100	1.83	1.83	1.24	98.76	#100	fine sand
#200	4.20	4.20	2.84	97.16	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.52
% F SAND	2.32
% FINES	97.16
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

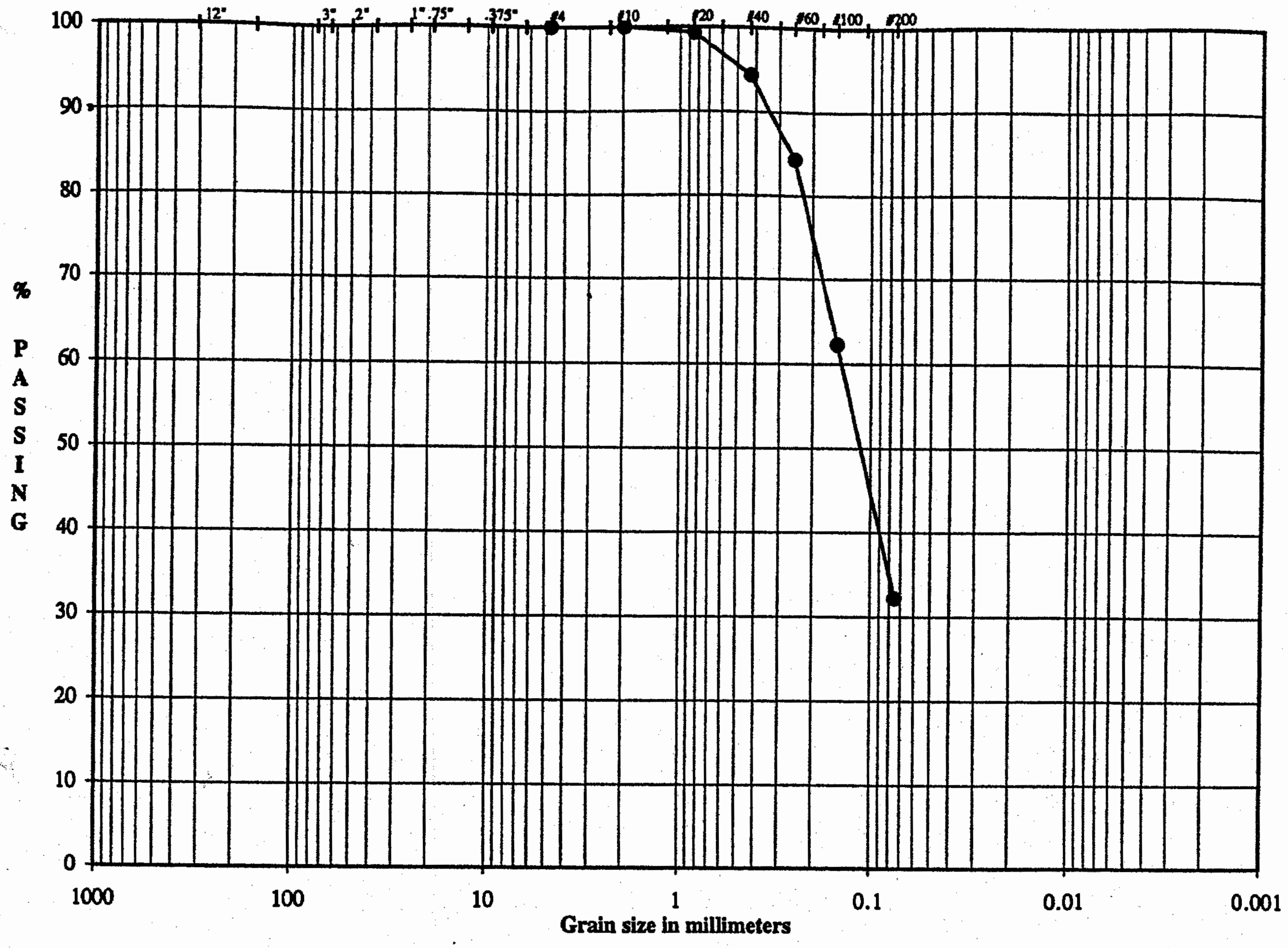
LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS (CL)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID B-45
SAMPLE TYPE Bag
SAMPLE DEPTH 20.0 - 30.0'

LL -
PL -
PI -

DESCRIPTION Brown, Medium to fine sand, and clayey silt.

USCS (SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH SW
DATE 5/1/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE GENESIS/PLUM POINT ENERGY/AR
PROJECT NO. 013-3205
REMARKS

SAMPLE ID B-45 | -
SAMPLE TYPE Bag
SAMPLE DEPTH 20.0 - 30.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	403.31
Wt Dry Soil & Tare (gm)	(w2)	350.05
Weight of Tare (gm)	(w3)	84.75
Weight of Water (gm)	(w4=w1-w2)	53.26
Weight of Dry Soil (gm)	(w5=w2-w3)	265.30
Moisture Content (%)	(w4/w5)*100	20.08

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	350.05
	Tare Weight (gm)	84.75
(W6)	Total Dry Weight (gm)	265.30

SIEVE ANALYSIS

Tare Weight
0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	~~0.04~~	~~0.04~~	0.02	99.98	#10	medium sand
#20	1.84	1.84	0.69	99.31	#20	medium sand
#40	14.95	14.95	5.64	94.36	#40	fine sand
#60	41.66	41.66	15.70	84.30	#60	fine sand
#100	100.17	100.17	37.76	62.24	#100	fine sand
#200	179.91	179.91	67.81	32.19	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.02
% M SAND	5.62
% F SAND	62.18
% FINES	32.19
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

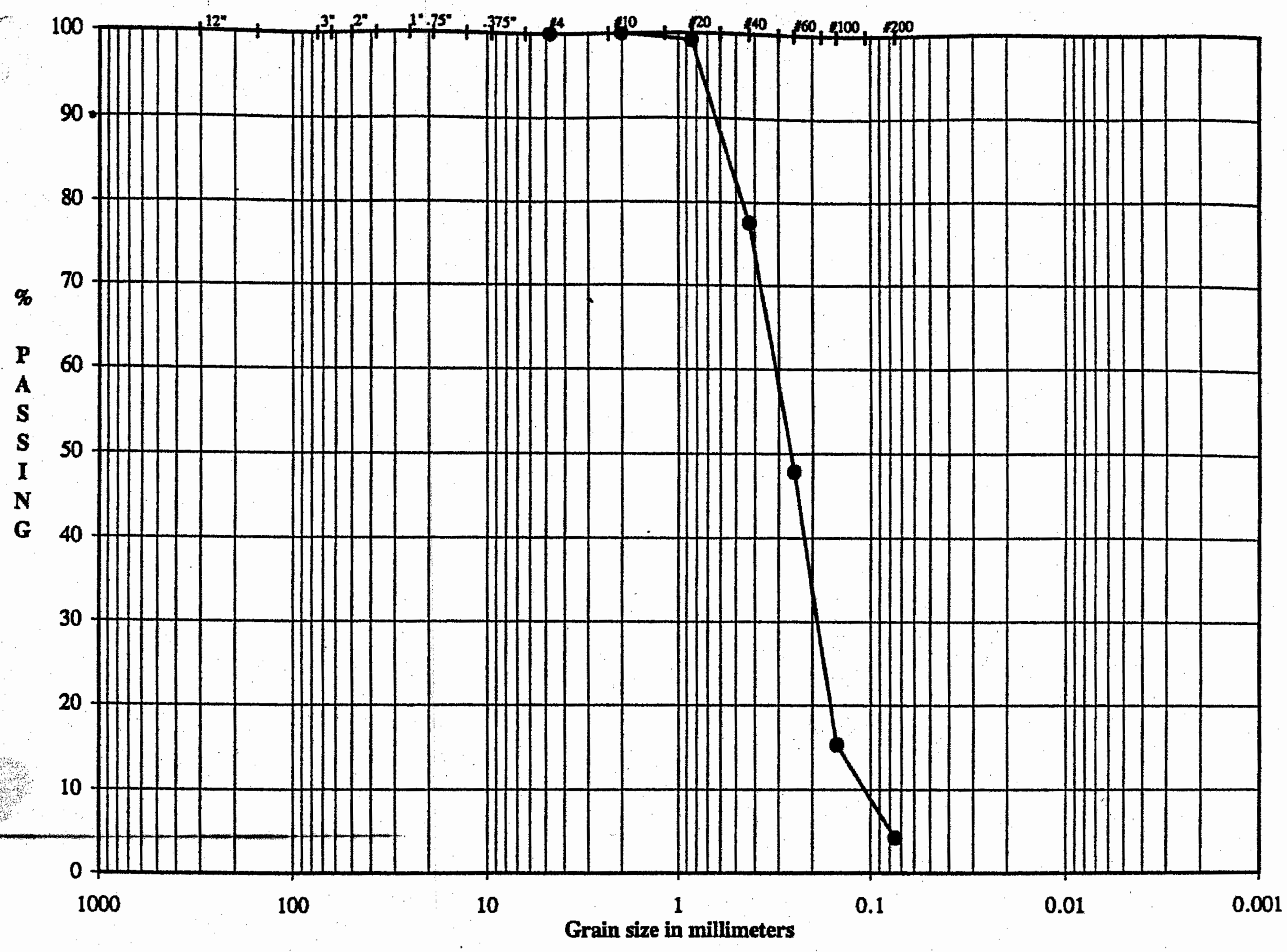
LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, Medium to fine sand, and clayey silt.

USCS (SM)

TECH SW
DATE 5/1/01
CHECK
REVIEW

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



<table>
<tr><td rowspan="2">Boulders</td><td rowspan="2">Cobbles</td><td>Coarse</td><td>Fine</td><td>Cor</td><td>Med</td><td>Fine</td><td>SILT OR CLAY</td></tr>
<tr><td colspan="2">Gravel</td><td colspan="3">SAND</td><td>FINES</td></tr>
</table>

SAMPLE ID	B-50
SAMPLE TYPE	Bag
SAMPLE DEPTH	9.0 - 10.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, trace silt.

USCS (SP)

Cu = D60/D10 = 0.3/0.12 = 2.5 < 6

Cc = D30^2/(D60*D10) = 0.19^2/(0.3*0.12) = 1 > 1

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-50 | -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	9.0 - 10.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	415.16
Wt Dry Soil & Tare (gm)	(w2)	376.27
Weight of Tare (gm)	(w3)	84.32
Weight of Water (gm)	(w4=w1-w2)	38.89
Weight of Dry Soil (gm)	(w5=w2-w3)	291.95
Moisture Content (%)	(w4/w5)*100	13.32

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)	376.27
Tare Weight (gm)	84.32
(W6) Total Dry Weight (gm)	291.95

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.03	0.03	0.01	99.99	#10	medium sand
#20	2.48	2.48	0.85	99.15	#20	medium sand
#40	65.64	65.64	22.48	77.52	#40	fine sand
#60	152.27	152.27	52.16	47.84	#60	fine sand
#100	247.30	247.30	84.71	15.29	#100	fine sand
#200	279.63	279.63	95.78	4.22	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.01
% M SAND	22.47
% F SAND	73.30
% FINES	4.22
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, trace silt.

USCS (SP)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-54 - **SAMPLE DEPTH:** 4.0 - 5.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION	
Number of Blows				22	22
Weight of Wet Soil & Tare (gm)	22.32	21.89	21.92	20.48	23.06
Weight of Dry Soil & Tare (gm)	20.35	19.96	19.94	16.62	18.49
Weight of Tare (gm)	11.80	11.50	11.30	6.71	6.78
Weight of Water (gm)	1.97	1.93	1.98	3.86	4.57
Weight of Dry Soil (gm)	8.55	8.46	8.64	9.91	11.71
Water Content %	23.04	22.81	22.92	38.95	39.03

	TRIAL 1	TRIAL 2
BLOWS:	22	22
K VALUE:	0.985	0.985

NATURAL MOISTURE
124.97
106.62
52.05
18.35
54.57
33.63

PLASTIC LIMIT (PL): 23

LIQUID LIMIT (LL): 38

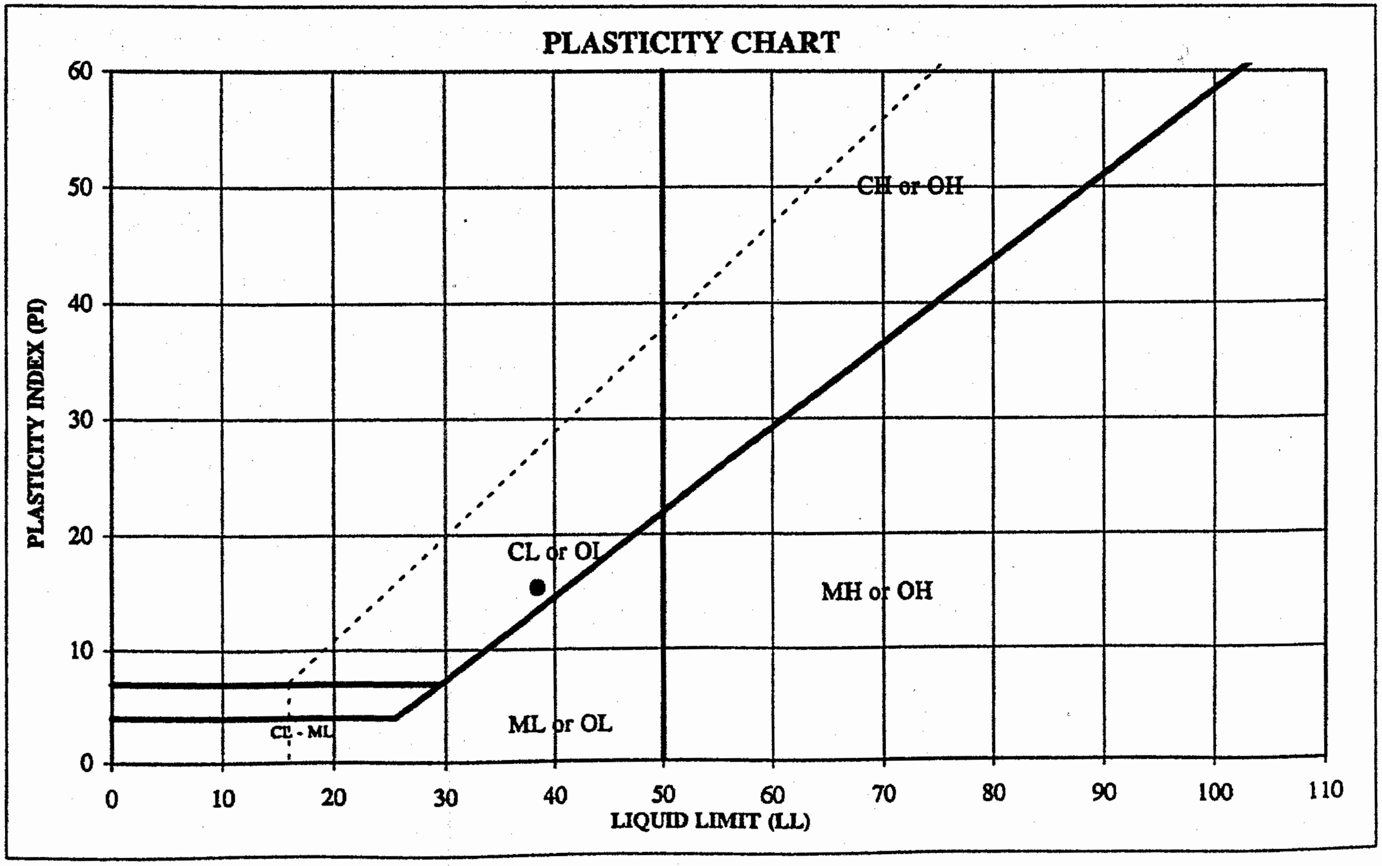
PLASTICITY INDEX (PI): 15

LIQUIDITY INDEX (LI): 0.69

NOTE:

DESCRIPTION: Brown, SILTY CLAY, trace medium to fine sand.

USCS: CL

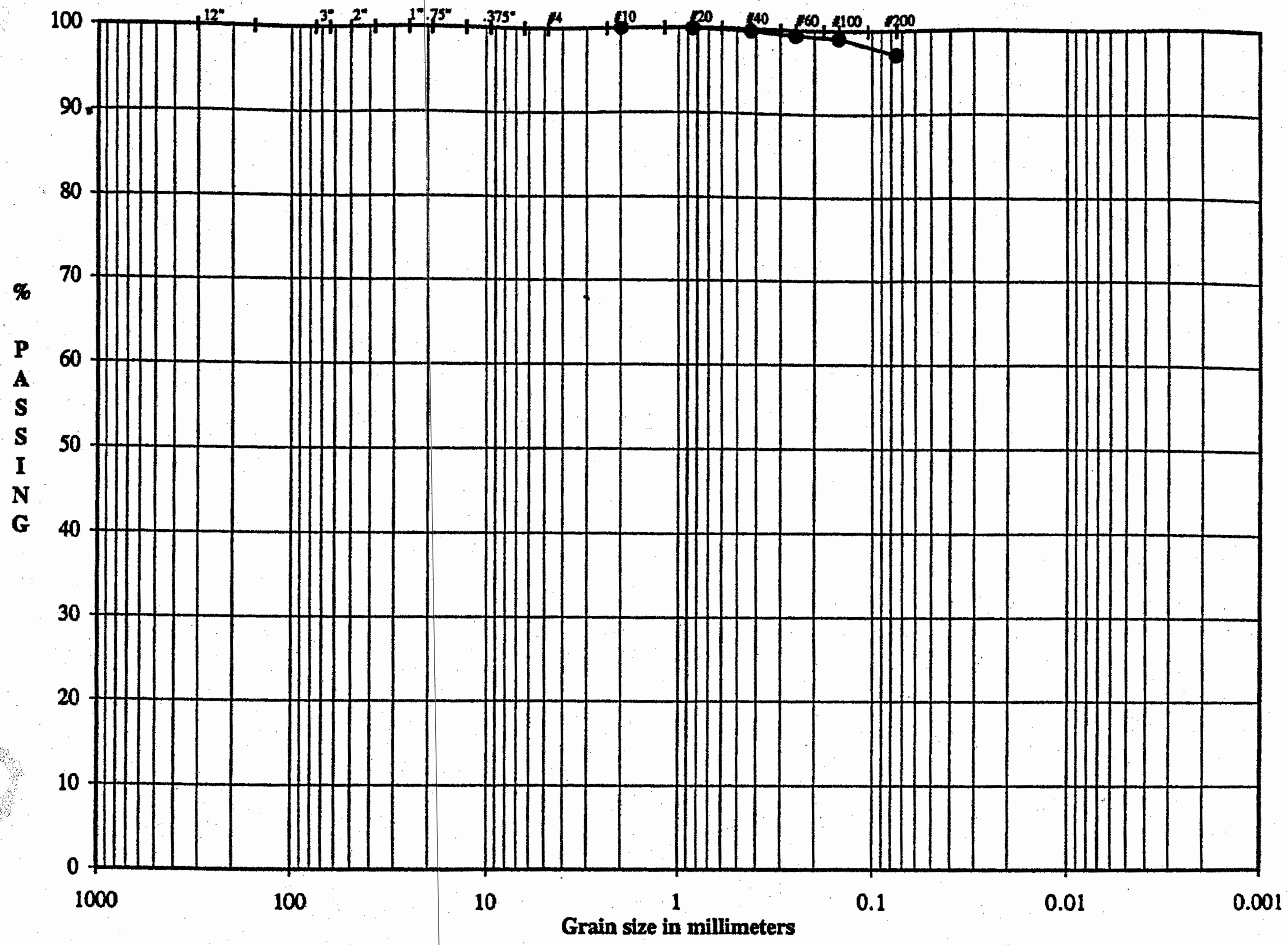


PLASTICITY CHART

TECH DH
DATE 5/3/01
CHECK
REVIEW

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-54
SAMPLE TYPE	Bag
SAMPLE DEPTH	4.0 - 5.0'

LL	38
PL	23
PI	15

DESCRIPTION	Brown, SILTY CLAY, trace medium to fine sand.
USCS	CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-54 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	4.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	124.97
Wt Dry Soil & Tare (gm)	(w2)	106.62
Weight of Tare (gm)	(w3)	52.05
Weight of Water (gm)	(w4=w1-w2)	18.35
Weight of Dry Soil (gm)	(w5=w2-w3)	54.57
Moisture Content (%)	(w4/w5)*100	33.63

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	106.62
	Tare Weight (gm)	52.05
(W6)	Total Dry Weight (gm)	54.57

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.05	0.05	0.09	99.91	#20	medium sand
#40	0.16	0.16	0.29	99.71	#40	fine sand
#60	0.37	0.37	0.68	99.32	#60	fine sand
#100	0.52	0.52	0.95	99.05	#100	fine sand
#200	1.59	1.59	2.91	97.09	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.29
% F SAND	2.62
% FINES	97.09
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

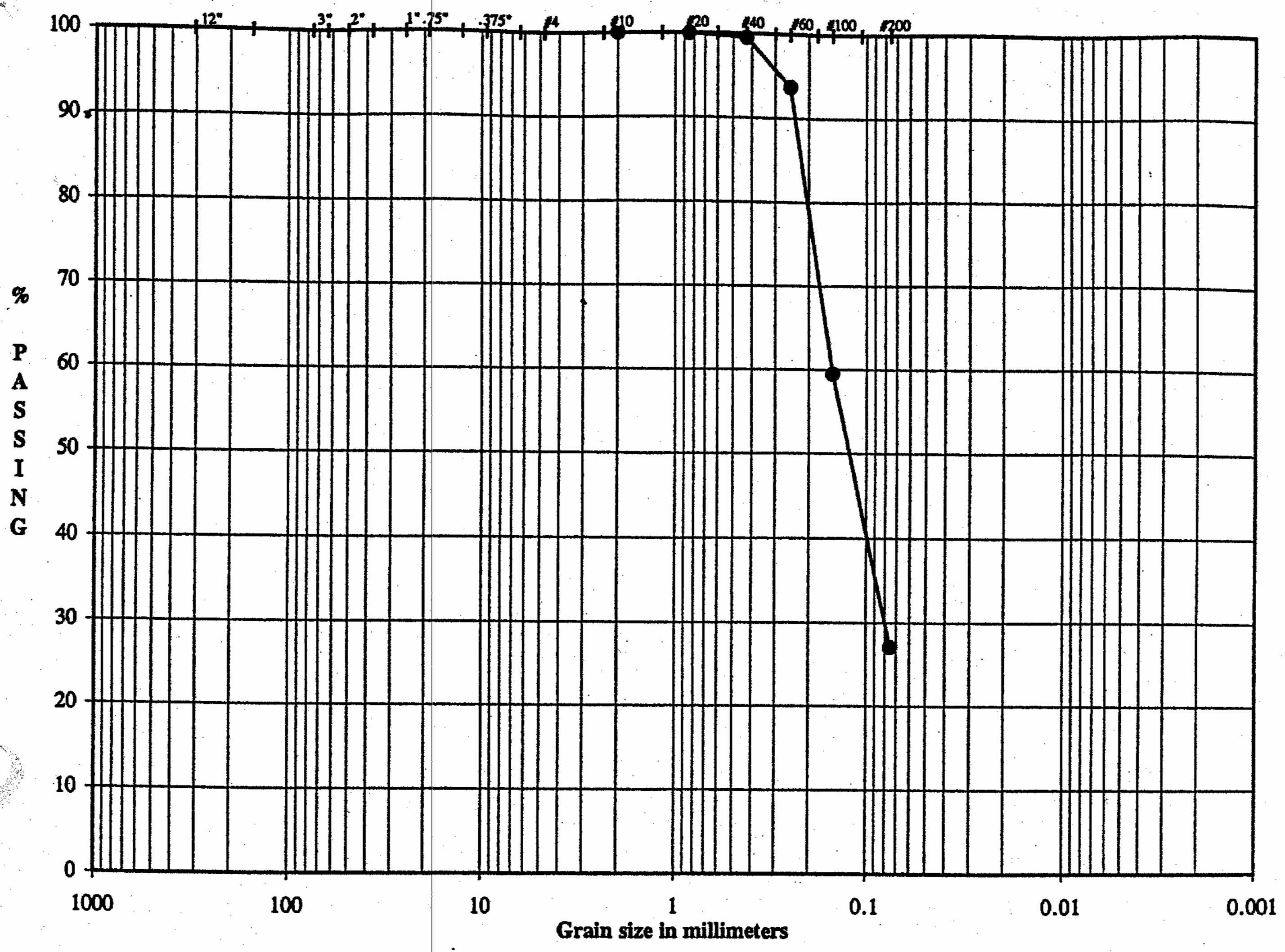
LL	38
PL	23
PI	15
Gs	-

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-54
SAMPLE TYPE	Bag
SAMPLE DEPTH	25.0 - 30.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, FINE SAND, some clayey silt.

USCS (SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-54	-
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag	
REMARKS		**SAMPLE DEPTH**	25.0 - 30.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	515.53
Wt Dry Soil & Tare (gm)	(w2)	431.14
Weight of Tare (gm)	(w3)	86.35
Weight of Water (gm)	(w4=w1-w2)	84.39
Weight of Dry Soil (gm)	(w5=w2-w3)	344.79
Moisture Content (%)	(w4/w5)*100	24.48

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	431.14
	Tare Weight (gm)	86.35
(W6)	Total Dry Weight (gm)	344.79

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.18	0.18	0.05	99.95	#20	medium sand
#40	1.85	1.85	0.54	99.46	#40	fine sand
#60	21.70	21.70	6.29	93.71	#60	fine sand
#100	139.81	139.81	40.55	59.45	#100	fine sand
#200	251.44	251.44	72.93	27.07	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.54
% F SAND	72.39
% FINES	27.07
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

- > 10% mostly coarse (c)
- > 10% mostly medium (m)
- < 10% fine (c-m)
- < 10% coarse (m-f)
- < 10% coarse and fine (m)
- < 10% coarse and medium (f)
- > 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, FINE SAND, some clayey silt.

USCS (SM)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-55 - **SAMPLE DEPTH:** 19.0 - 30.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				27	27	
Weight of Wet Soil & Tare (gm)	20.80	23.31	21.26	20.69	18.30	455.27
Weight of Dry Soil & Tare (gm)	18.77	20.69	19.04	15.73	13.31	336.07
Weight of Tare (gm)	11.40	11.38	11.12	6.74	4.26	85.42
Weight of Water (gm)	2.03	2.62	2.22	4.96	4.99	119.20
Weight of Dry Soil (gm)	7.37	9.31	7.92	8.99	9.05	250.65
Water Content %	27.54	28.14	28.03	55.17	55.14	47.56

	TRIAL 1	TRIAL 2
BLOWS:	27	27
K VALUE:	1.009	1.009

PLASTIC LIMIT (PL): 28

LIQUID LIMIT (LL): 56

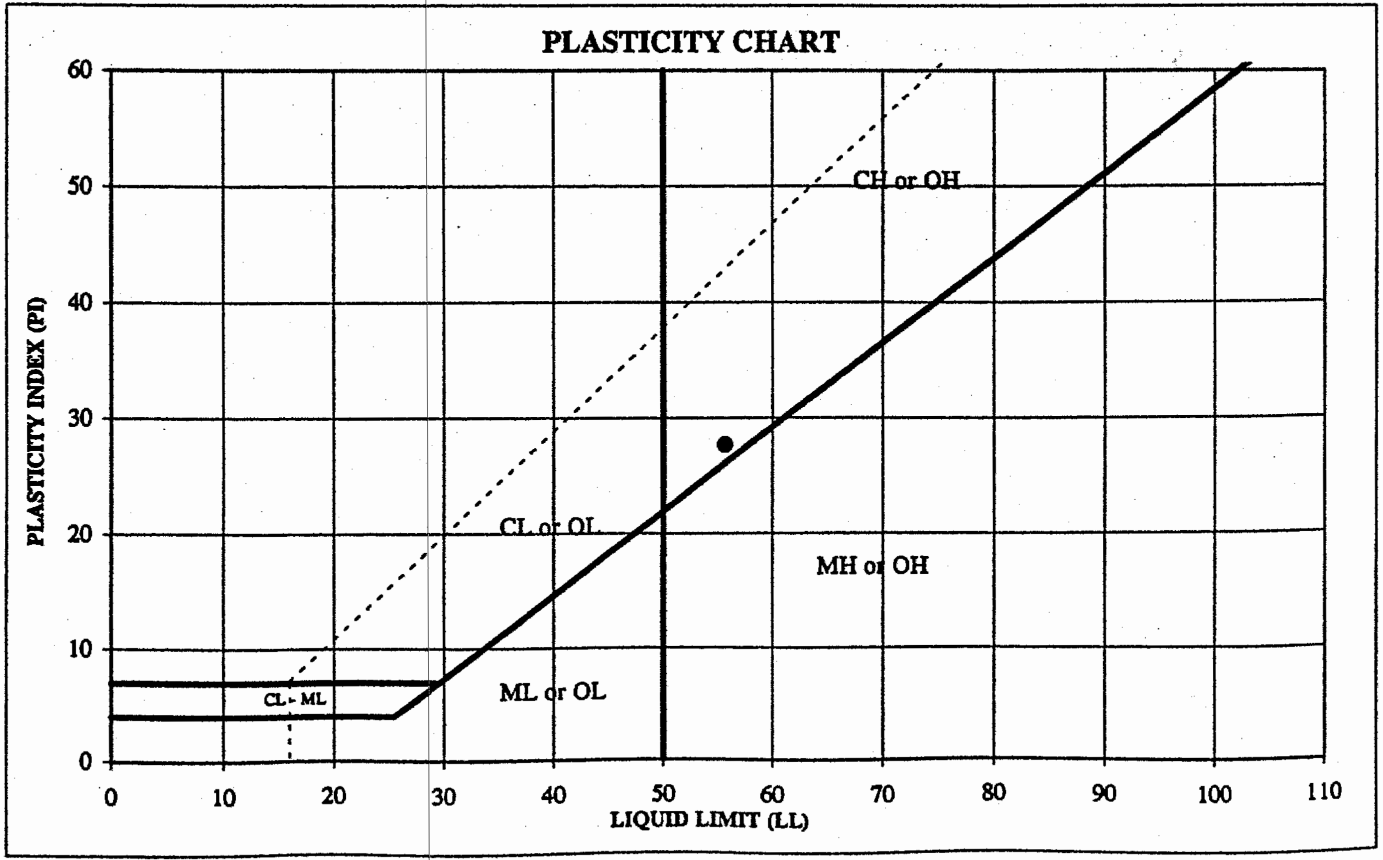
PLASTICITY INDEX (PI): 28

LIQUIDITY INDEX (LI): 0.71

NOTE:

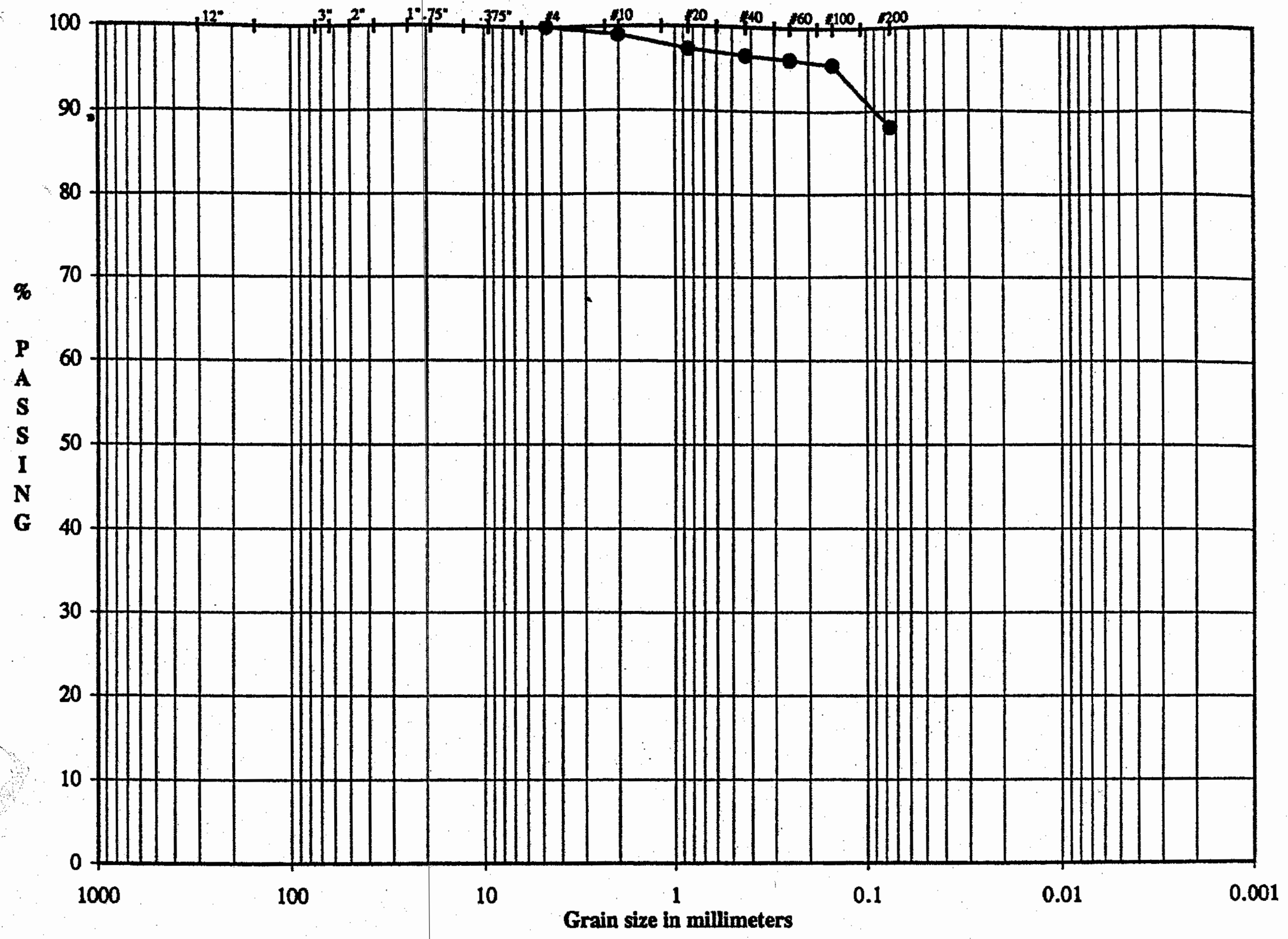
DESCRIPTION: Black and Brown, SILTY CLAY, little medium to fine sand.

USCS: CH



TECH: DH
DATE: 5/4/01
CHECK:
REVIEW:

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-55
SAMPLE TYPE	Bag
SAMPLE DEPTH	19.0 - 30.0'

LL	56
PL	28
PI	28

DESCRIPTION Black and Brown, SILTY CLAY, little medium to fine sand.

USCS CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-55 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	19.0 - 30.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	455.27
Wt Dry Soil & Tare (gm)	(w2)	336.07
Weight of Tare (gm)	(w3)	85.42
Weight of Water (gm)	(w4=w1-w2)	119.20
Weight of Dry Soil (gm)	(w5=w2-w3)	250.65
Moisture Content (%)	(w4/w5)*100	47.56

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	336.07
	Tare Weight (gm)	85.42
(W6)	Total Dry Weight (gm)	250.65

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	2.60	2.60	1.04	98.96	#10	medium sand
#20	6.68	6.68	2.67	97.33	#20	medium sand
#40	8.51	8.51	3.40	96.60	#40	fine sand
#60	9.58	9.58	3.82	96.18	#60	fine sand
#100	11.10	11.10	4.43	95.57	#100	fine sand
#200	29.88	29.88	11.92	88.08	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	1.04
% M SAND	2.36
% F SAND	8.53
% FINES	88.08
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	56
PL	28
PI	28
Gs	-

DESCRIPTION Black and Brown, SILTY CLAY, little medium to fine sand.

USCS CH

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-56 -
SAMPLE DEPTH: 9.0 - 20.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION	
Number of Blows				25	25
Weight of Wet Soil & Tare (gm)	22.20	22.27	22.75	23.43	23.19
Weight of Dry Soil & Tare (gm)	20.30	20.25	20.64	18.74	18.57
Weight of Tare (gm)	11.99	11.40	11.39	4.26	4.31
Weight of Water (gm)	1.90	2.02	2.11	4.69	4.62
Weight of Dry Soil (gm)	8.31	8.85	9.25	14.48	14.26
Water Content %	22.86	22.82	22.81	32.39	32.40

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

NATURAL MOISTURE
248.98
199.00
51.46
49.98
147.54
33.88

PLASTIC LIMIT (PL): 23

LIQUID LIMIT (LL): 32

PLASTICITY INDEX (PI): 9

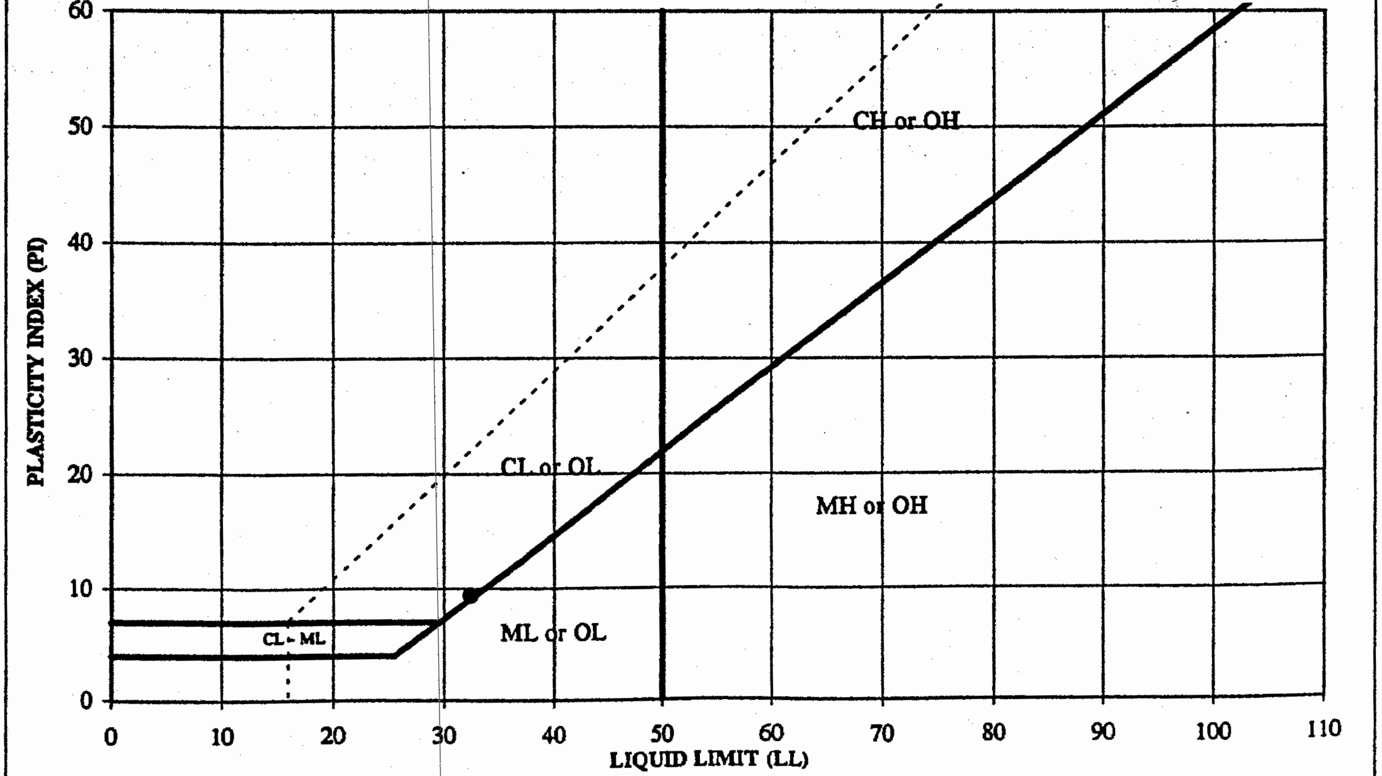
LIQUIDITY INDEX (LI): 1.18

NOTE:

DESCRIPTION Light Brown, FINE SAND, little silty clay.

USCS SC

PLASTICITY CHART



TECH TJ
DATE 5/9/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM C117, C136, D421, D422, D1140 and D2217

PROJECT TITLE: GENESIS/PLUM POINT ENERGY/AR
OJECT NO.: 013-3205

SAMPLE ID: B-56 | -
SAMPLE TYPE: Bag
SAMPLE DEPTH: 9.0 - 20.0'

AS RECEIVED WATER CONTENT

Tare No.		-
Wt. Wet Soil & Tare (gm)	(W1)	248.98
Wt. Dry Soil & Tare (gm)	(W2)	199.00
Weight of Tare (gm)	(W3)	51.46
Weight of Water (gm)	(W4=W1-W2)	49.98
Weight of Dry Soil (gm)	(W5=W2-W3)	147.54
Moisture Content (%)	(W4/W5)*100	33.88

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	49.75
Dry Soil & Tare (gm)	49.70
Tare Weight (gm)	3.15
Moisture Content (%)	0.11

Total Weight of Sample Used For Sieve Analysis Corrected For Hygroscopic Moisture

Weight + Tare, Before Separating On The #4 Sieve (gm)	505.95	
Tare Weight (gm)	114.12	
Total Weight (gm)	391.41	(W6)

Plus #4 Material Sieve

TARE WEIGHT: 0.00

	(Wt+Tare)	(((Wt-Tare)/W6)*100)	%PASSING		
12.0"				12.0"	cobbles
3.0"				3.0"	coarse gravel
2.5"				2.5"	coarse gravel
2.0"				2.0"	coarse gravel
1.5"				1.5"	coarse gravel
1.0"				1.0"	coarse gravel
0.75"				0.75"	fine gravel
0.50"				0.50"	fine gravel
0.375"				0.375"	fine gravel
#4	0.00	0.0	100.0	#4	coarse sand

HYDROMETER ANALYSIS

Specific Gravity	(assumed)	2.650
Specific Gravity	(tested)	
Amount Dispersing Agent (ml)		125.00
e Dispersion Device		Mechanical
gth of Dispersion Period		1 Minute

Weight of Sample Used For Hydrometer Test

Weight of Sample Wet or Dry (gm)	55.84
Calculated Dry Wt. used in test (gm)	55.78
Hydrometer Bulb Number	624378
% Pass #4 Sieve For Whole Sample	100.00

TARE WEIGHT: 0.00

HYDROMETER BACKSIEVE (Percent Passing #10 - #200 Sieves)

	(Wt+Tare)	Cumul Wt. Retained	% PASSING		
#10	0.02	0.02	100.0	#10	medium sand
#20	0.07	0.07	99.9	#20	medium sand
#40	2.54	2.54	95.4	#40	fine sand
#60	8.10	8.10	85.5	#60	fine sand
#100	26.90	26.90	51.8	#100	fine sand
#200	47.31	47.31	15.2	#200	fines

HYDROMETER CALCULATIONS

DATE 5/4/01	TIME 9:47	ET (min)	READING R	TEMP T	TEMP.COR. K	HYD.COR. Cc	READING C	EFFECTIVE LENGTH	A
5/4/01	9:49	2.00	10.5	22.00	0.013	5.00	5.50	15.5	1.00
5/4/01	9:52	5.00	10.0	22.00	0.013	5.00	5.00	15.5	1.00
5/4/01	10:02	15.00	9.5	22.00	0.013	5.00	4.50	15.6	1.00
5/4/01	10:17	30.00	9.5	22.00	0.013	5.00	4.50	15.6	1.00
5/4/01	10:47	60.00	9.0	22.00	0.013	5.00	4.00	15.6	1.00
5/4/01	13:57	250.00	9.0	22.00	0.013	5.00	4.00	15.6	1.00
5/5/01	9:47	1440.00	8.0	21.50	0.014	5.00	3.00	15.8	1.00

GRAIN SIZE PERCENTAGES

Particle Diameter	% PASSING		
		% COBBLES	0.00
0.0370	9.9	% COARSE GRAVEL	0.00
0.0234	9.0	% FINE GRAVEL	0.00
0.0136	8.1	% COARSE SAND	0.04
0.0096	8.1	% MEDIUM SAND	4.52
0.0068	7.2	% FINE SAND	80.26
0.0033	7.2	% FINES	15.18
0.0014	5.4	% TOTAL SAMPLE	100.00

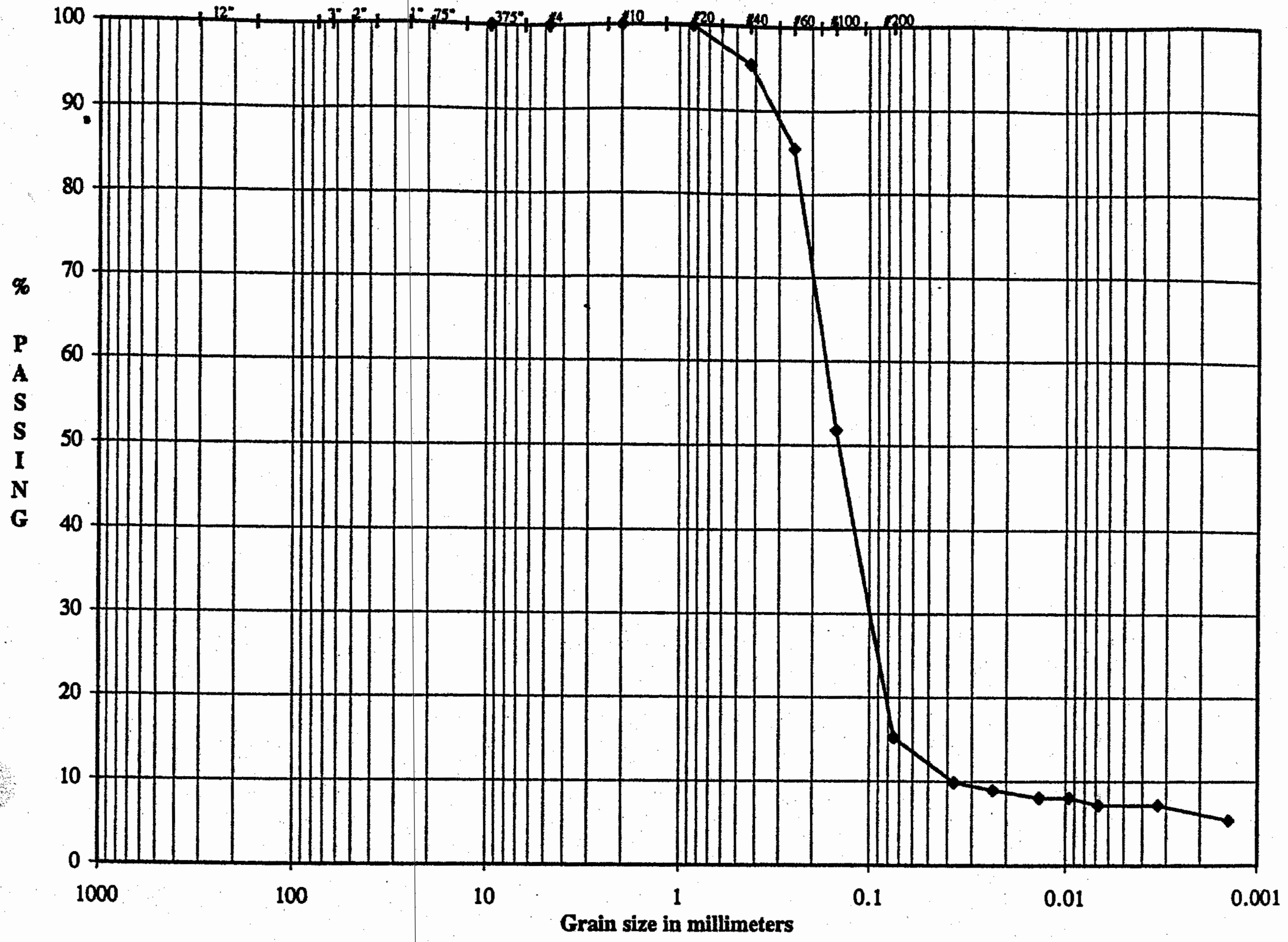
Description: Light Brown, FINE SAND, little silty clay.

USCS: SC

32	LL
23	PL
9	PI

TECH	SW/DA
DATE	5/3/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-56	-
SAMPLE TYPE	Bag	
SAMPLE DEPTH	9.0 - 20.0'	

LL	32
PL	23
PI	9

DESCRIPTION Light Brown, FINE SAND, little silty clay.

USCS SC

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW/DA
DATE	5/3/01
CHECK	
REVIEW	

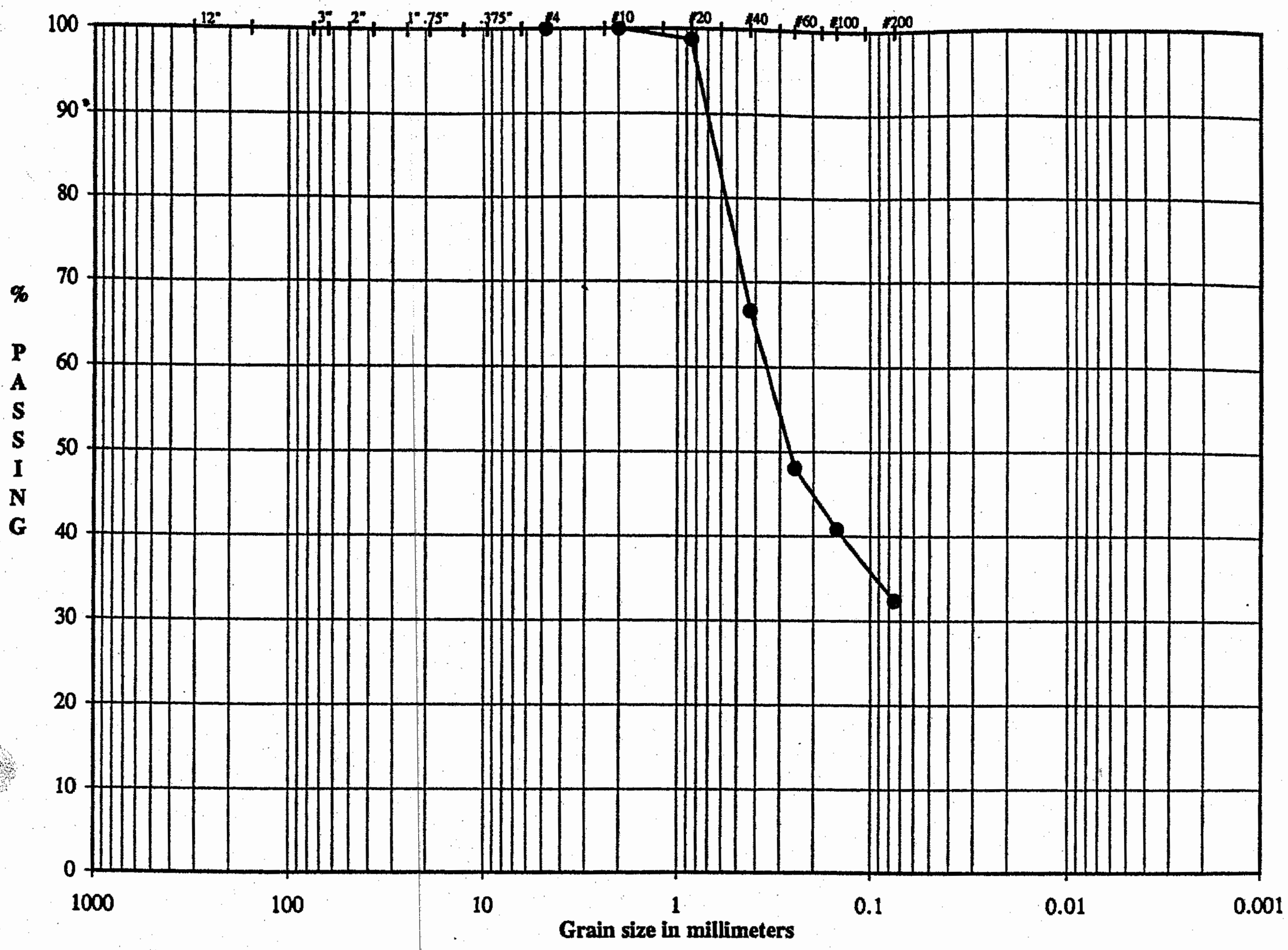
GENESIS/PLUM POINT ENERGY/AR
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classification	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability (cm/sec)	Addition Tests Conducte (See Note
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %		Moisture %	Dry (lb/cuft)		
B-17	Bag	14.0-15.0'	(SM)	19.0	-	-	-	-	100.0	32.4	-	-	-	-	-	-	-	-
B-17	Bag	34.0-40.0'	CL	32.1	33	23	10	0.89	100.0	83.4	-	-	-	-	-	-	-	-
B-17	Bag	69.0-70.0'	(SP-SM)	21.1	-	-	-	-	98.8	7.1	-	-	-	-	-	-	-	-
B-17	Bag	79.0-80.0'	(SP)	19.0	-	-	-	-	99.7	4.8	4.5	-	-	-	-	-	-	-
B-20	Bag	9.0-10.0'	(SP)	3.2	-	-	-	-	99.8	1.0	-	-	-	-	-	-	-	-
B-21	Bag	9.0 -10.0'	(SC)	31.1	34	14	20	0.85	-	-	-	-	-	-	-	-	-	-
B-21	Bag	19.0-20.0'	(SC)	23.4	-	-	-	-	100.0	25.3	-	-	-	-	-	-	-	-
B-23	Bag	9.0-15.0'	(SP-SM)	6.9	-	-	-	-	99.9	8.7	-	-	-	-	-	-	-	-
B-24	Bag	4.0 -5.0'	(SP-SM)	2.1	-	-	-	-	100.0	9.5	-	-	-	-	-	-	-	-
B-24	Bag	19.0-20.0'	(SP)	16.1	-	-	-	-	100.0	0.9	-	-	-	-	-	-	-	-
B-26	Bag	14.0-25.0'	(SM)	17.9	-	-	-	-	99.5	20.3	-	-	-	-	-	-	-	-
B-26	Bag	49.0-50.0'	(SC)	29.9	-	-	-	-	89.1	43.5	32.0	-	-	-	-	-	-	-
B-26	Bag	59.0-130.0'	(SP)	11.9	-	-	-	-	82.3	3.0	-	-	-	-	-	-	-	-
B-27	Bag	19.0-30.0'	(CH)	39.9	-	-	-	-	99.9	93.9	36.0	-	-	-	-	-	-	-
B-28	Bag	19.0-20.0'	CH	57.7	65	27	38	0.80	100.0	98.6	-	-	-	-	-	-	-	-

ABBREVIATIONS:
LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES:
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-17		**LL**	-
SAMPLE TYPE	Bag		**PL**	-
SAMPLE DEPTH	14.0 - 15.0'		**PI**	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, and clayey silt.

USCS (SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

ROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NO.	013-3205
REMARKS	

SAMPLE ID	B-17	-
SAMPLE TYPE	Bag	
SAMPLE DEPTH	14.0 - 15.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	430.52
Wt Dry Soil & Tare (gm)	(w2)	375.43
Weight of Tare (gm)	(w3)	85.29
Weight of Water (gm)	(w4=w1-w2)	55.09
Weight of Dry Soil (gm)	(w5=w2-w3)	290.14
Moisture Content (%)	(w4/w5)*100	18.99

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)	375.43
Tare Weight (gm)	85.29
(W6) Total Dry Weight (gm)	290.14

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.02	0.02	0.01	99.99	#10	medium sand
#20	3.66	3.66	1.26	98.74	#20	medium sand
#40	96.93	96.93	33.41	66.59	#40	fine sand
#60	150.84	150.84	51.99	48.01	#60	fine sand
#100	171.82	171.82	59.22	40.78	#100	fine sand
#200	196.29	196.29	67.65	32.35	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.01
% M SAND	33.40
% F SAND	34.25
% FINES	32.35
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

\> 10% mostly coarse (c)
\> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
\> 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, and clayey silt.

USCS (SM)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-17 - **SAMPLE DEPTH:** 34.0 - 40.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				22	22	
Weight of Wet Soil & Tare (gm)	24.15	22.56	23.06	22.31	23.97	434.62
Weight of Dry Soil & Tare (gm)	21.88	20.48	20.89	17.76	19.02	348.10
Weight of Tare (gm)	12.01	11.51	11.42	4.29	4.36	78.75
Weight of Water (gm)	2.27	2.08	2.17	4.55	4.95	86.52
Weight of Dry Soil (gm)	9.87	8.97	9.47	13.47	14.66	269.35
Water Content %	23.00	23.19	22.91	33.78	33.77	32.12

	TRIAL 1	TRIAL 2
BLOWS:	22	22
K VALUE:	0.985	0.985

PLASTIC LIMIT (PL): 23

LIQUID LIMIT (LL): 33

PLASTICITY INDEX (PI): 10

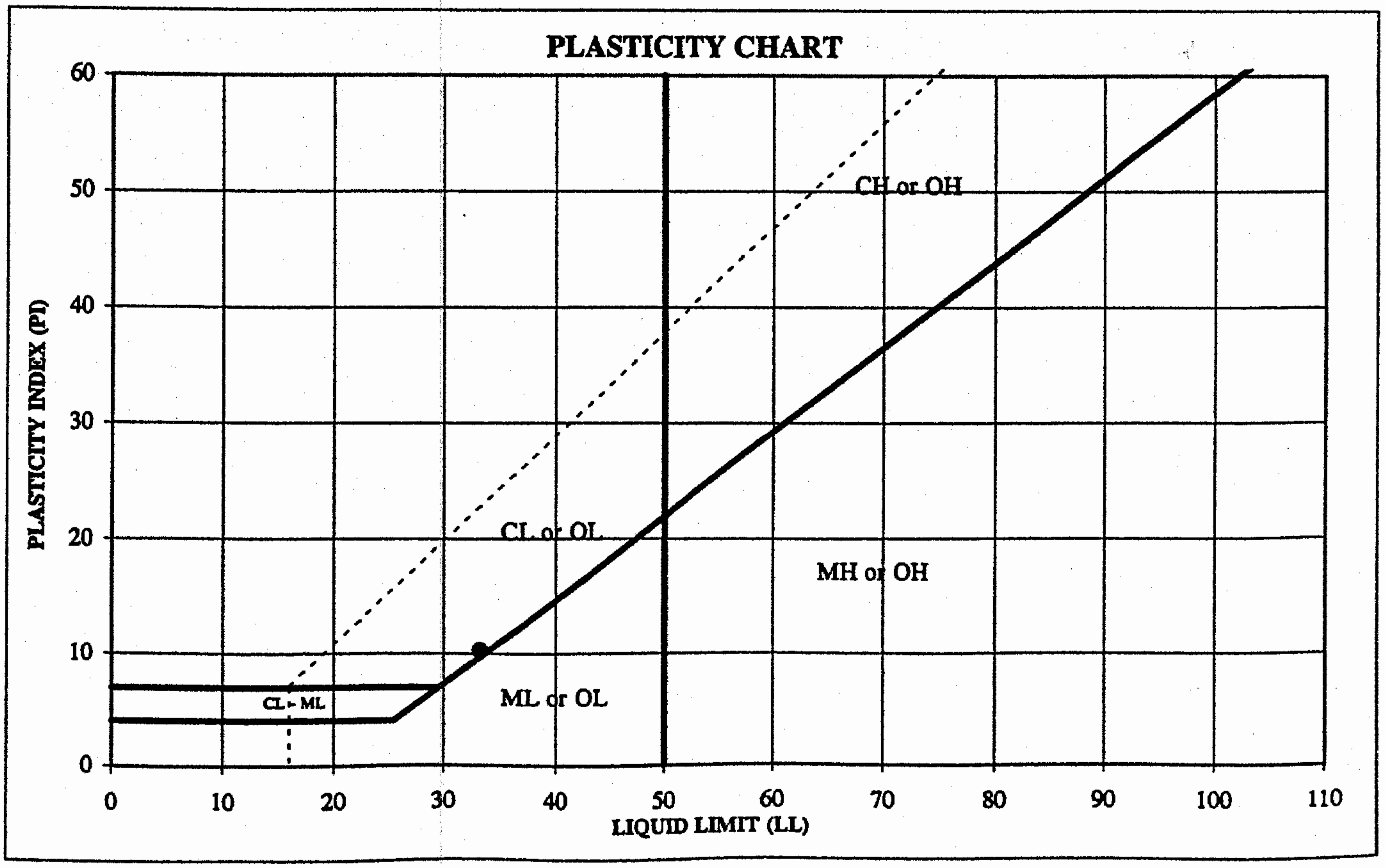
LIQUIDITY INDEX (LI): 0.89

NOTE:

DESCRIPTION: Brown, SILTY CLAY, some fine sand.

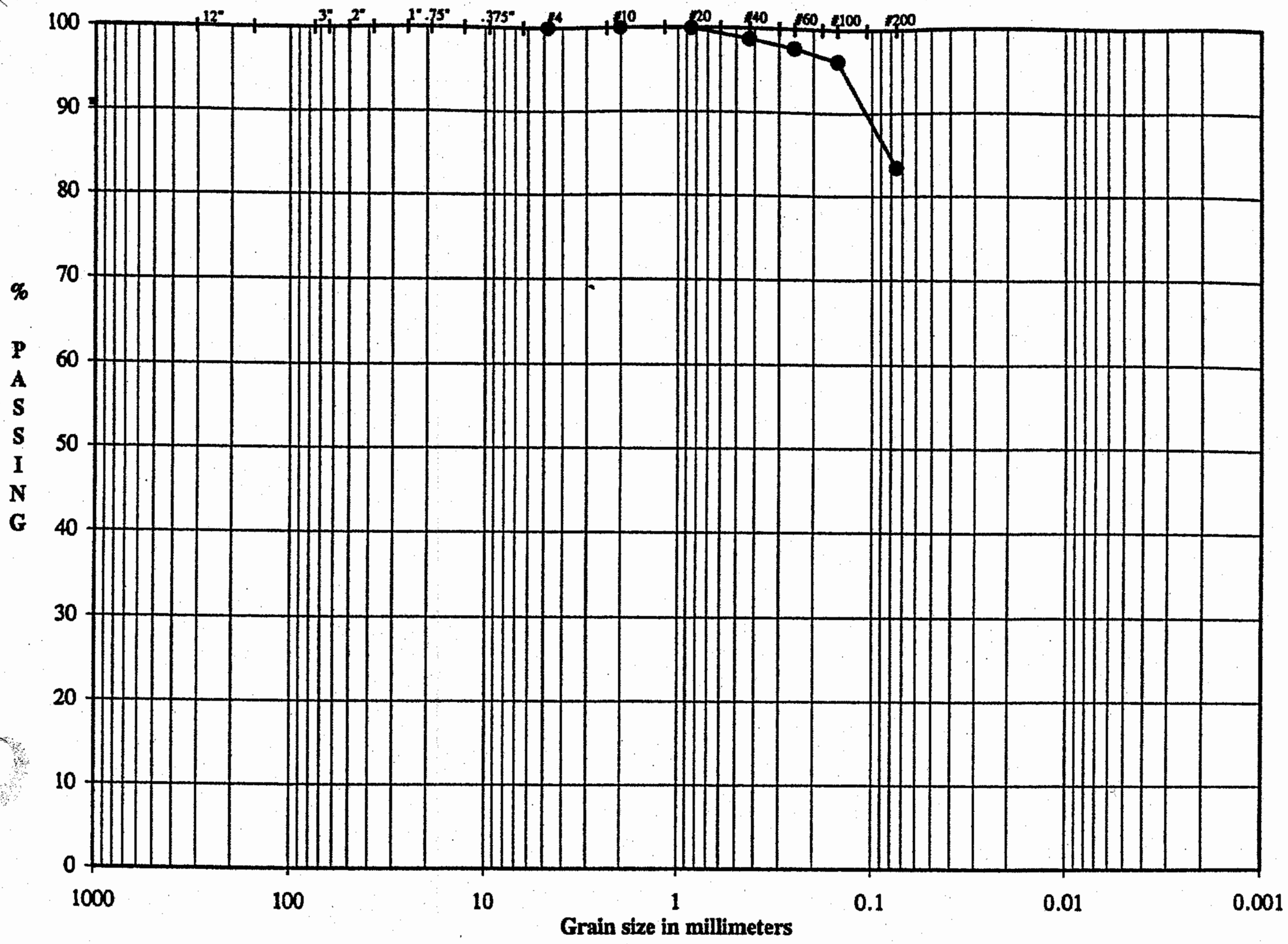
USCS: CL

PLASTICITY CHART



TECH: DH
DATE: 5/3/01
CHECK:
REVIEW:

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-17		**LL**	33
SAMPLE TYPE	Bag		**PL**	23
SAMPLE DEPTH	34.0 - 40.0'		**PI**	10

DESCRIPTION Brown, SILTY CLAY, some fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-17 | -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	34.0 - 40.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	434.62
Wt Dry Soil & Tare (gm)	(w2)	348.10
Weight of Tare (gm)	(w3)	78.75
Weight of Water (gm)	(w4=w1-w2)	86.52
Weight of Dry Soil (gm)	(w5=w2-w3)	269.35
Moisture Content (%)	(w4/w5)*100	32.12

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	348.10
	Tare Weight (gm)	78.75
(W6)	Total Dry Weight (gm)	269.35

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.04	0.04	0.01	99.99	#10	medium sand
#20	0.28	0.28	0.10	99.90	#20	medium sand
#40	3.51	3.51	1.30	98.70	#40	fine sand
#60	6.26	6.26	2.32	97.68	#60	fine sand
#100	10.21	10.21	3.79	96.21	#100	fine sand
#200	44.66	44.66	16.58	83.42	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.01
% M SAND	1.29
% F SAND	15.28
% FINES	83.42
% TOTAL	100.00

Descriptive Terms	
trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

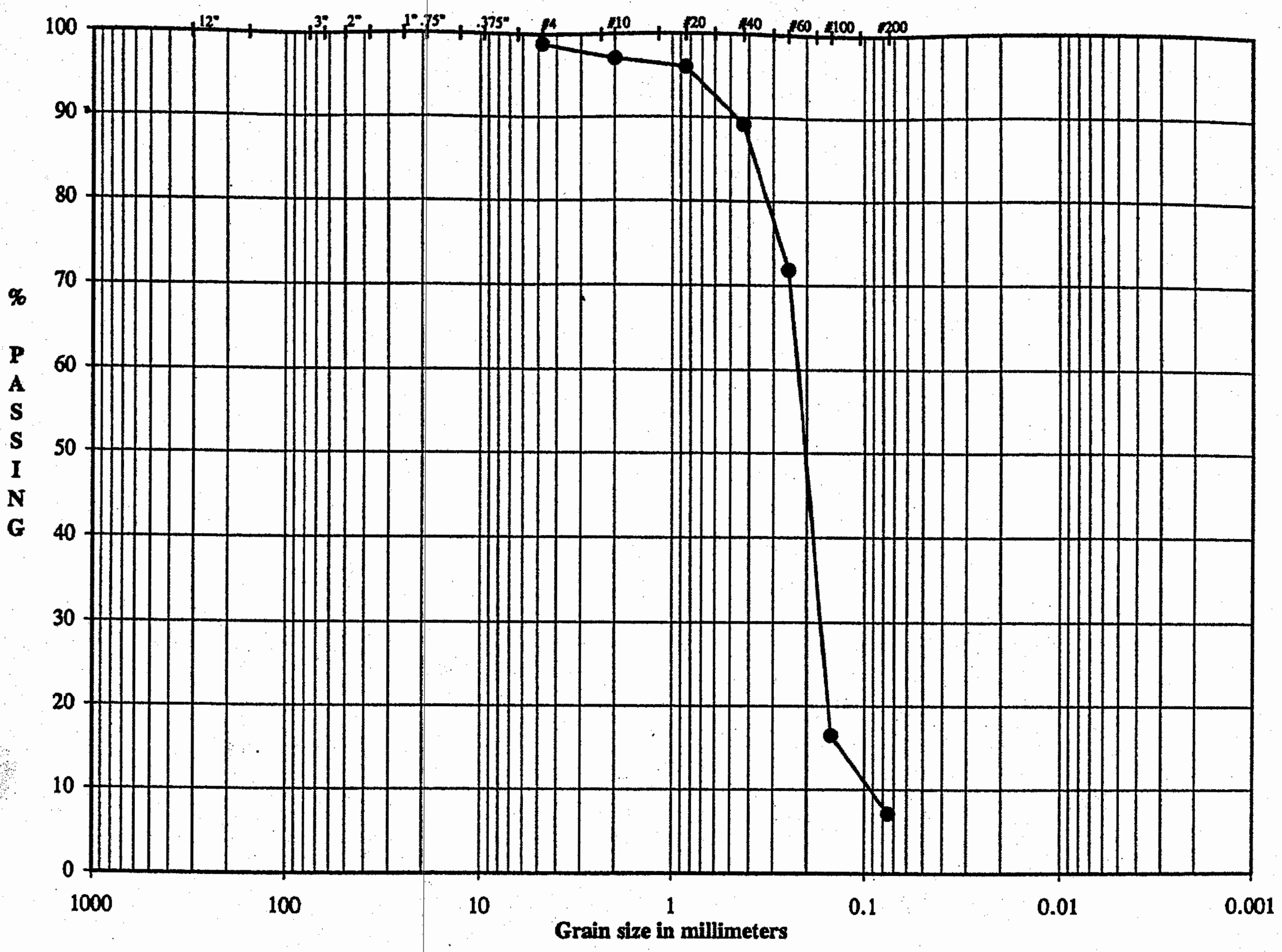
LL	33
PL	23
PI	10
Gs	-

DESCRIPTION Brown, SILTY CLAY, some fine sand.

USCS CL

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID B-17
SAMPLE TYPE Bag
SAMPLE DEPTH 69.0 - 70.0'

LL -
PL -
PI -

DESCRIPTION Brown, FINE SAND, little clayey silt, trace fine gravel.

USCS (SP-SM)

Cu = D60/D10 = 0.22/0.09 = 2.44 < 6
Cc = D30^2/(D60*D10) = 0.18^2/(0.22*0.09) = 1.64 > 1

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH JC/TJ
DATE 5/1/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-17 / -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	69.0 - 70.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	447.55
Wt Dry Soil & Tare (gm)	(w2)	384.30
Weight of Tare (gm)	(w3)	84.81
Weight of Water (gm)	(w4=w1-w2)	63.25
Weight of Dry Soil (gm)	(w5=w2-w3)	299.49
Moisture Content (%)	(w4/w5)*100	21.12

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	384.30
	Tare Weight (gm)	84.81
(W6)	Total Dry Weight (gm)	299.49

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"	0.00	0.00	0.00	100.00	0.375"	fine gravel
#4	3.54	3.54	1.18	98.82	#4	coarse sand
#10	8.85	8.85	2.96	97.04	#10	medium sand
#20	12.03	12.03	4.02	95.98	#20	medium sand
#40	32.48	32.48	10.85	89.15	#40	fine sand
#60	84.45	84.45	28.20	71.80	#60	fine sand
#100	250.21	250.21	83.55	16.45	#100	fine sand
#200	278.21	278.21	92.89	7.11	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	1.18
% C SAND	1.77
% M SAND	7.89
% F SAND	82.05
% FINES	7.11
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

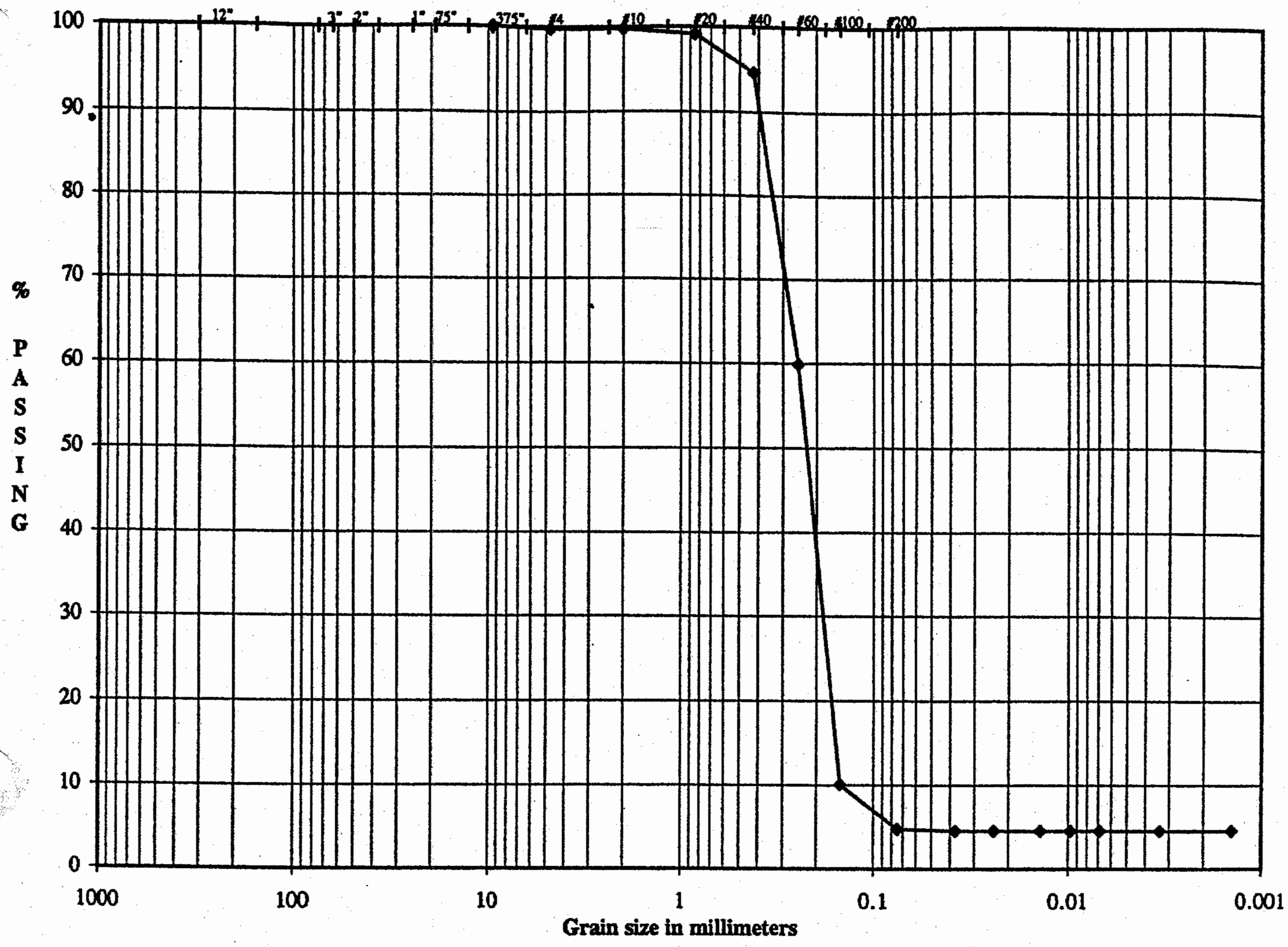
LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, FINE SAND, little clayey silt, trace fine gravel.

USCS (SP-SM)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-17	-
SAMPLE TYPE	Bag	
SAMPLE DEPTH	79.0 - 80.0'	

LL	-
PL	-
PI	-

DESCRIPTION	Brown, FINE SAND, trace silt.
USCS	(SP)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/3/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM C117, C136, D421, D422, D1140 and D2217

ROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B-17	-
OJECT NO.	013-3205	SAMPLE TYPE	Bag	
		SAMPLE DEPTH	79.0 - 80.0'	

AS RECEIVED WATER CONTENT

Tare No.		-
Wt. Wet Soil & Tare (gm)	(W1)	118.91
Wt. Dry Soil & Tare (gm)	(W2)	106.79
Weight of Tare (gm)	(W3)	42.99
Weight of Water (gm)	(W4=W1-W2)	12.12
Weight of Dry Soil (gm)	(W5=W2-W3)	63.80
Moisture Content (%)	(W4/W5)*100	19.00

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	47.94
Dry Soil & Tare (gm)	47.64
Tare Weight (gm)	3.24
Moisture Content (%)	0.68

Total Weight of Sample Used For Sieve Analysis Corrected For Hygroscopic Moisture

Weight + Tare, Before Separating On The #4 Sieve (gm)	497.75	
Tare Weight (gm)	113.93	
Total Weight (gm)	381.24	(W6)

Plus #4 Material Sieve

TARE WEIGHT 0.00

	(Wt+Tare)	(((Wt-Tare)/W6)*100)	%PASSING		
12.0"				12.0"	cobbles
3.0"				3.0"	coarse gravel
2.5"				2.5"	coarse gravel
2.0"				2.0"	coarse gravel
1.5"				1.5"	coarse gravel
1.0"				1.0"	coarse gravel
0.75"				0.75"	fine gravel
0.50"				0.50"	fine gravel
0.375"	0.00	0.0	100.0	0.375"	fine gravel
#4	0.97	0.3	99.7	#4	coarse sand

HYDROMETER ANALYSIS

Specific Gravity	(assumed)	2.650
Specific Gravity	(tested)	
mount Dispersing Agent (ml)		125.00
e Dispersion Device		Mechanical
ngth of Dispersion Period		1 Minute

Weight of Sample Used For Hydrometer Test

Weight of Sample Wet or Dry (gm)	55.49
Calculated Dry Wt. used in test (gm)	55.12
Hydrometer Bulb Number	624378
% Pass #4 Sieve For Whole Sample	99.75

TARE WEIGHT 0.00

HYDROMETER BACKSIEVE (Percent Passing #10 - #200 Sieves)

	(Wt+Tare)	Cumul Wt. Retained	% PASSING		
#10	0.02	0.02	99.7	#10	medium sand
#20	0.35	0.35	99.1	#20	medium sand
#40	2.81	2.81	94.7	#40	fine sand
#60	22.03	22.03	59.9	#60	fine sand
#100	49.55	49.55	10.1	#100	fine sand
#200	52.49	52.49	4.8	#200	fines

HYDROMETER CALCULATIONS

DATE 5/4/01	TIME 9:51	ET (min)	READING R	TEMP T	TEMP.COR. K	HYD.COR. Cc	READING C	EFFECTIVE LENGTH	A
5/4/01	9:53	2.00	7.5	22.00	0.013	5.00	2.50	16.0	1.00
5/4/01	9:56	5.00	7.5	22.00	0.013	5.00	2.50	16.0	1.00
5/4/01	10:06	15.00	7.5	22.00	0.013	5.00	2.50	16.0	1.00
5/4/01	10:21	30.00	7.5	22.00	0.013	5.00	2.50	16.0	1.00
5/4/01	10:51	60.00	7.5	22.00	0.013	5.00	2.50	16.0	1.00
5/4/01	14:01	250.00	7.5	22.00	0.013	5.00	2.50	16.0	1.00
5/5/01	9:51	1440.00	7.5	21.50	0.014	5.00	2.50	16.0	1.00

GRAIN SIZE PERCENTAGES

Particle Diameter	% PASSING		
		% COBBLES	0.00
0.0376	4.5	% COARSE GRAVEL	0.00
0.0238	4.5	% FINE GRAVEL	0.25
0.0137	4.5	% COARSE SAND	0.04
0.0097	4.5	% MEDIUM SAND	5.05
0.0069	4.5	% FINE SAND	89.91
0.0034	4.5	% FINES	4.76
0.0014	4.5	% TOTAL SAMPLE	100.00

Description Brown, FINE SAND, trace silt.

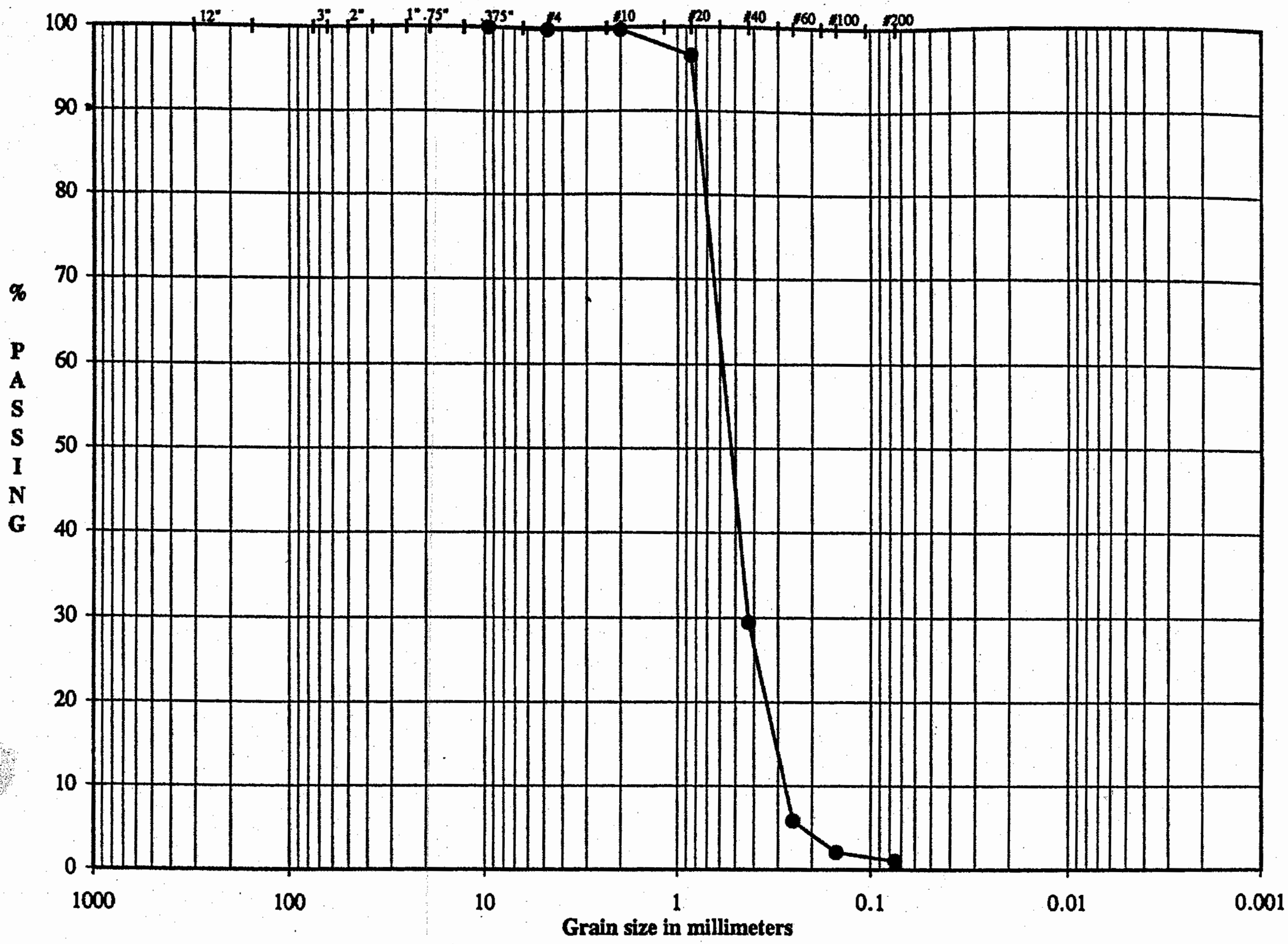
USCS (SP)

-	LL
-	PL
-	PI

TECH	SW
DATE	5/3/01
CHECK	
REVIEW	

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-20
SAMPLE TYPE	Bag
SAMPLE DEPTH	9.0 - 10.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, trace silt, trace fine gravel.

USCS (SP)

Cu = D60/D10 = 0.58/0.28 = 2.07 < 6

Cc = D30^2/(D60*D10) = 0.42^2/(0.58*0.28) = 1.09 > 1

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

ROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B-20	-
PROJECT NO.	013-3205	SAMPLE TYPE	Bag	
REMARKS		SAMPLE DEPTH	9.0 - 10.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	473.31
Wt Dry Soil & Tare (gm)	(w2)	461.37
Weight of Tare (gm)	(w3)	85.84
Weight of Water (gm)	(w4=w1-w2)	11.94
Weight of Dry Soil (gm)	(w5=w2-w3)	375.53
Moisture Content (%)	(w4/w5)*100	3.18

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	461.37
	Tare Weight (gm)	85.84
(W6)	Total Dry Weight (gm)	375.53

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"	0.00	0.00	0.00	100.00	0.375"	fine gravel
#4	0.84	0.84	0.22	99.78	#4	coarse sand
#10	1.12	1.12	0.30	99.70	#10	medium sand
#20	12.84	12.84	3.42	96.58	#20	medium sand
#40	264.95	264.95	70.55	29.45	#40	fine sand
#60	353.85	353.85	94.23	5.77	#60	fine sand
#100	367.95	367.95	97.98	2.02	#100	fine sand
#200	371.81	371.81	99.01	0.99	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.22
% C SAND	0.07
% M SAND	70.26
% F SAND	28.46
% FINES	0.99
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, trace silt, trace fine gravel.

USCS (SP)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	Pwm

ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-21 **SAMPLE DEPTH:** 9.0 -10.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				25	26	
Weight of Wet Soil & Tare (gm)	21.54	21.94	21.73	14.96	16.77	94.43
Weight of Dry Soil & Tare (gm)	20.26	20.67	20.38	12.26	13.62	84.40
Weight of Tare (gm)	11.31	11.57	10.83	4.27	4.29	52.12
Weight of Water (gm)	1.28	1.27	1.35	2.70	3.15	10.03
Weight of Dry Soil (gm)	8.95	9.10	9.55	7.99	9.33	32.28
Water Content %	14.30	13.96	14.14	33.79	33.76	31.07

	TRIAL 1	TRIAL 2
BLOWS:	25	26
K VALUE:	1	1.005

PLASTIC LIMIT (PL): 14

LIQUID LIMIT (LL): 34

PLASTICITY INDEX (PI): 20

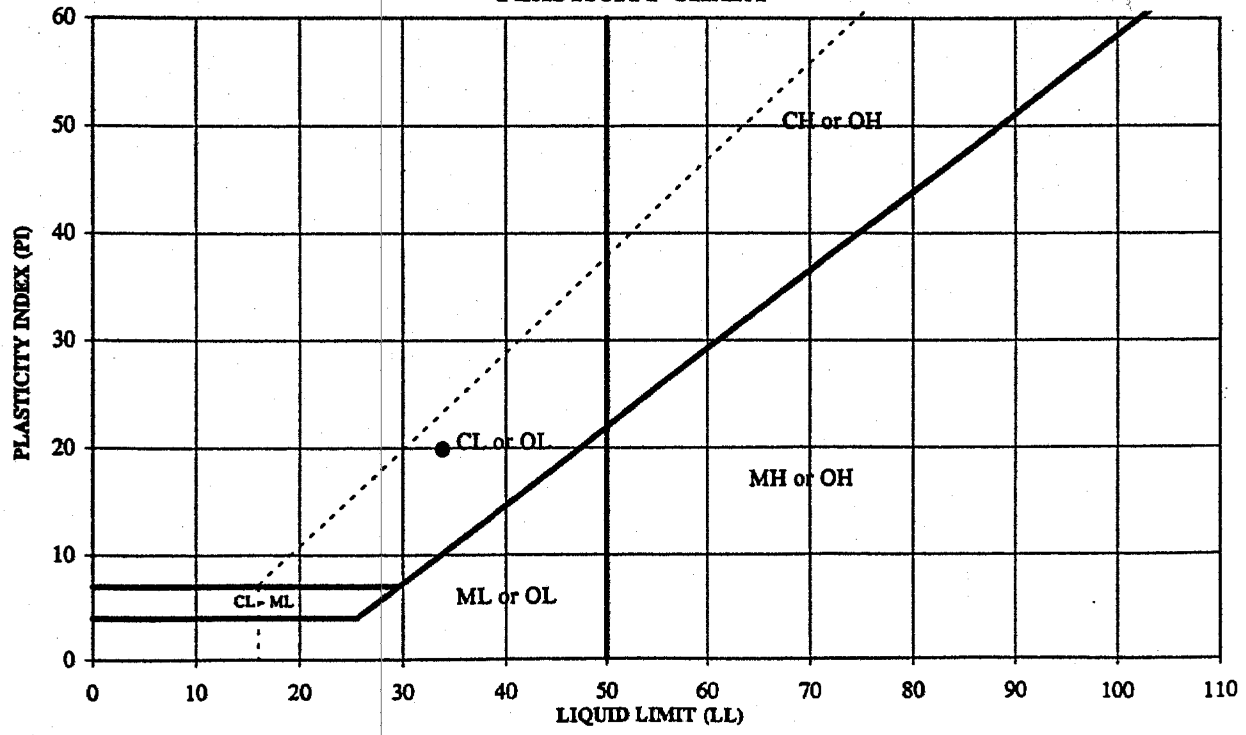
LIQUIDITY INDEX (LI): 0.85

NOTE:

DESCRIPTION: Brown, FINE SAND, some clayey silt.

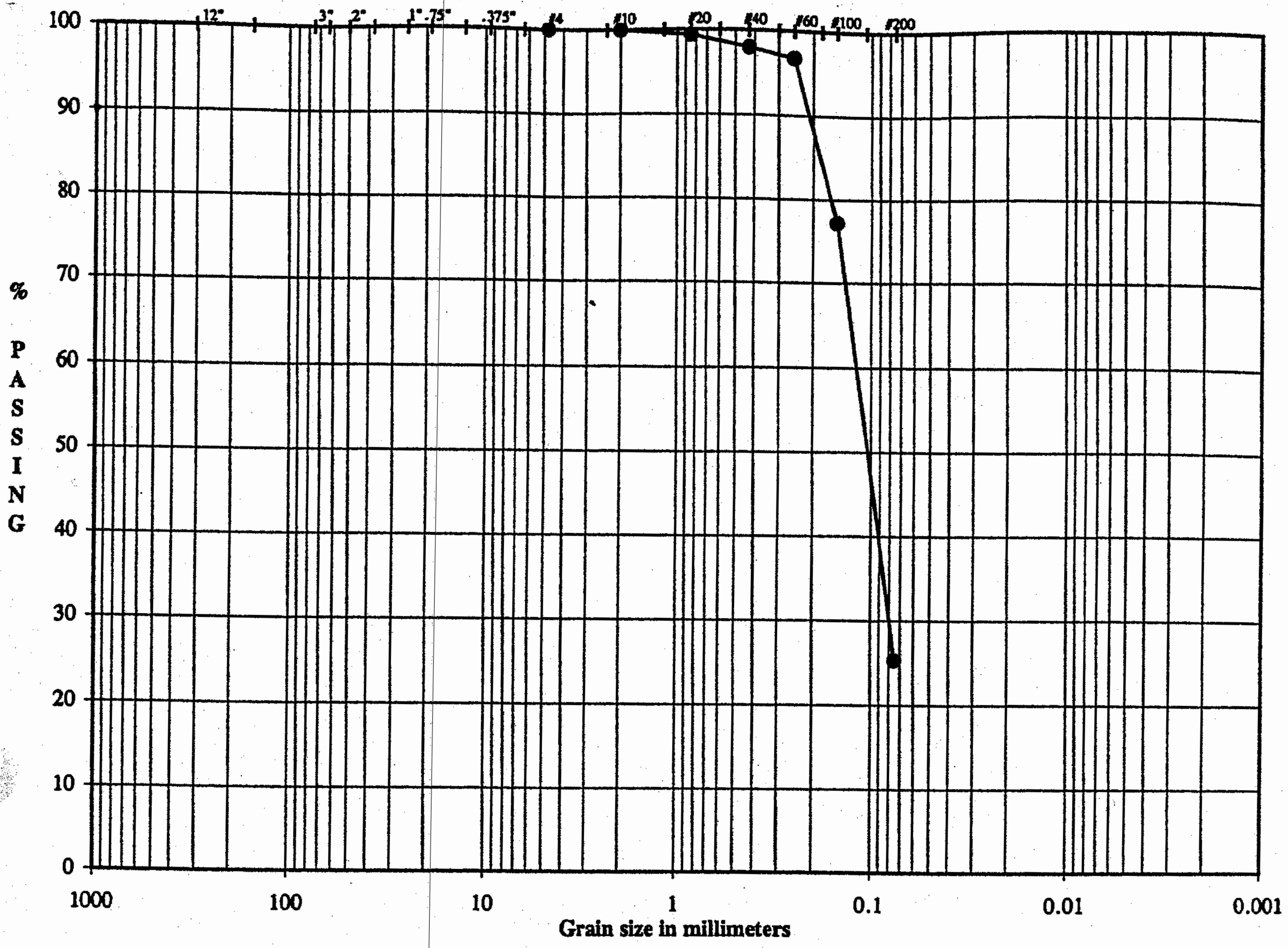
USCS: (SC)

PLASTICITY CHART



TECH: TH
DATE: 5/15/01
CHECK:
REVIEW:

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-21
SAMPLE TYPE	Bag
SAMPLE DEPTH	19.0 - 20.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, FINE SAND, some clayey silt.

USCS (SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

Golder Associates Inc.

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-21 | -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	19.0 - 20.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	435.72
Wt Dry Soil & Tare (gm)	(w2)	369.14
Weight of Tare (gm)	(w3)	84.45
Weight of Water (gm)	(w4=w1-w2)	66.58
Weight of Dry Soil (gm)	(w5=w2-w3)	284.69
Moisture Content (%)	(w4/w5)*100	23.39

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	369.14
	Tare Weight (gm)	84.45
(W6)	Total Dry Weight (gm)	284.69

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.16	0.16	0.06	99.94	#10	medium sand
#20	1.91	1.91	0.67	99.33	#20	medium sand
#40	5.80	5.80	2.04	97.96	#40	fine sand
#60	9.25	9.25	3.25	96.75	#60	fine sand
#100	64.96	64.96	22.82	77.18	#100	fine sand
#200	212.71	212.71	74.72	25.28	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.06
% M SAND	1.98
% F SAND	72.68
% FINES	25.28
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

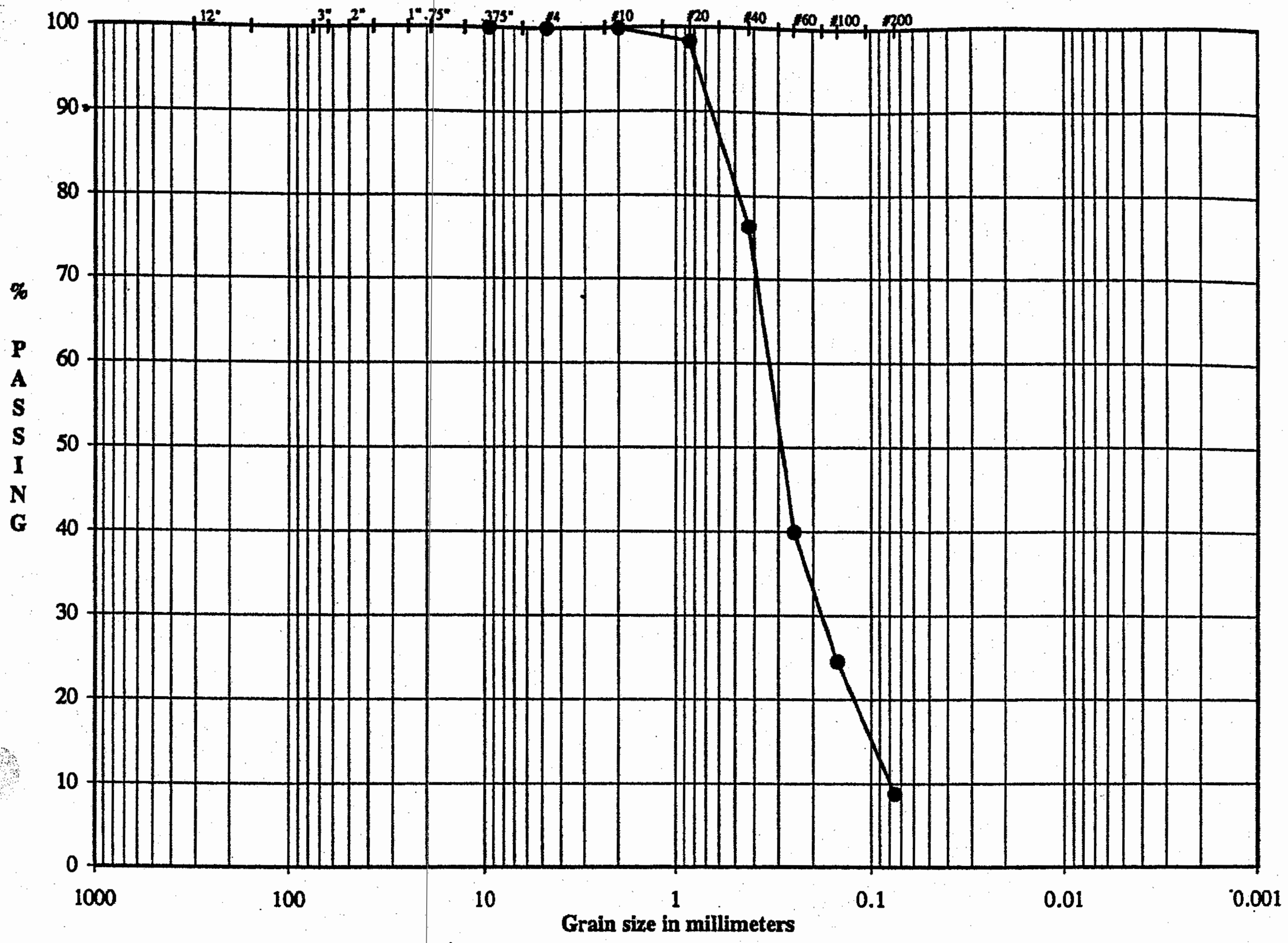
DESCRIPTION Brown, FINE SAND, some clayey silt.

USCS (SM)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-23
SAMPLE TYPE	Bag
SAMPLE DEPTH	9.0 - 15.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, little clayey silt, trace fine gravel.

USCS (SP-SM)

Cu = D60/D10 = 0.32/0.08 = 4 < 6

Cc = D30^2/(D60*D10) = 0.18^2/(0.32*0.08) = 1.27 > 1

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

Golder Associates Inc.

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NO.	013-3205
REMARKS	

SAMPLE ID	B-23	-
SAMPLE TYPE	Bag	
SAMPLE DEPTH	9.0 - 15.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	538.36
Wt Dry Soil & Tare (gm)	(w2)	509.19
Weight of Tare (gm)	(w3)	83.30
Weight of Water (gm)	(w4=w1-w2)	29.17
Weight of Dry Soil (gm)	(w5=w2-w3)	425.89
Moisture Content (%)	(w4/w5)*100	6.85

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	509.19
	Tare Weight (gm)	83.30
(W6)	Total Dry Weight (gm)	425.89

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"	0.00	0.00	0.00	100.00	0.375"	fine gravel
#4	0.29	0.29	0.07	99.93	#4	coarse sand
#10	0.76	0.76	0.18	99.82	#10	medium sand
#20	7.48	7.48	1.76	98.24	#20	medium sand
#40	100.98	100.98	23.71	76.29	#40	fine sand
#60	255.90	255.90	60.09	39.91	#60	fine sand
#100	321.53	321.53	75.50	24.50	#100	fine sand
#200	388.75	388.75	91.28	8.72	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.07
% C SAND	0.11
% M SAND	23.53
% F SAND	67.57
% FINES	8.72
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

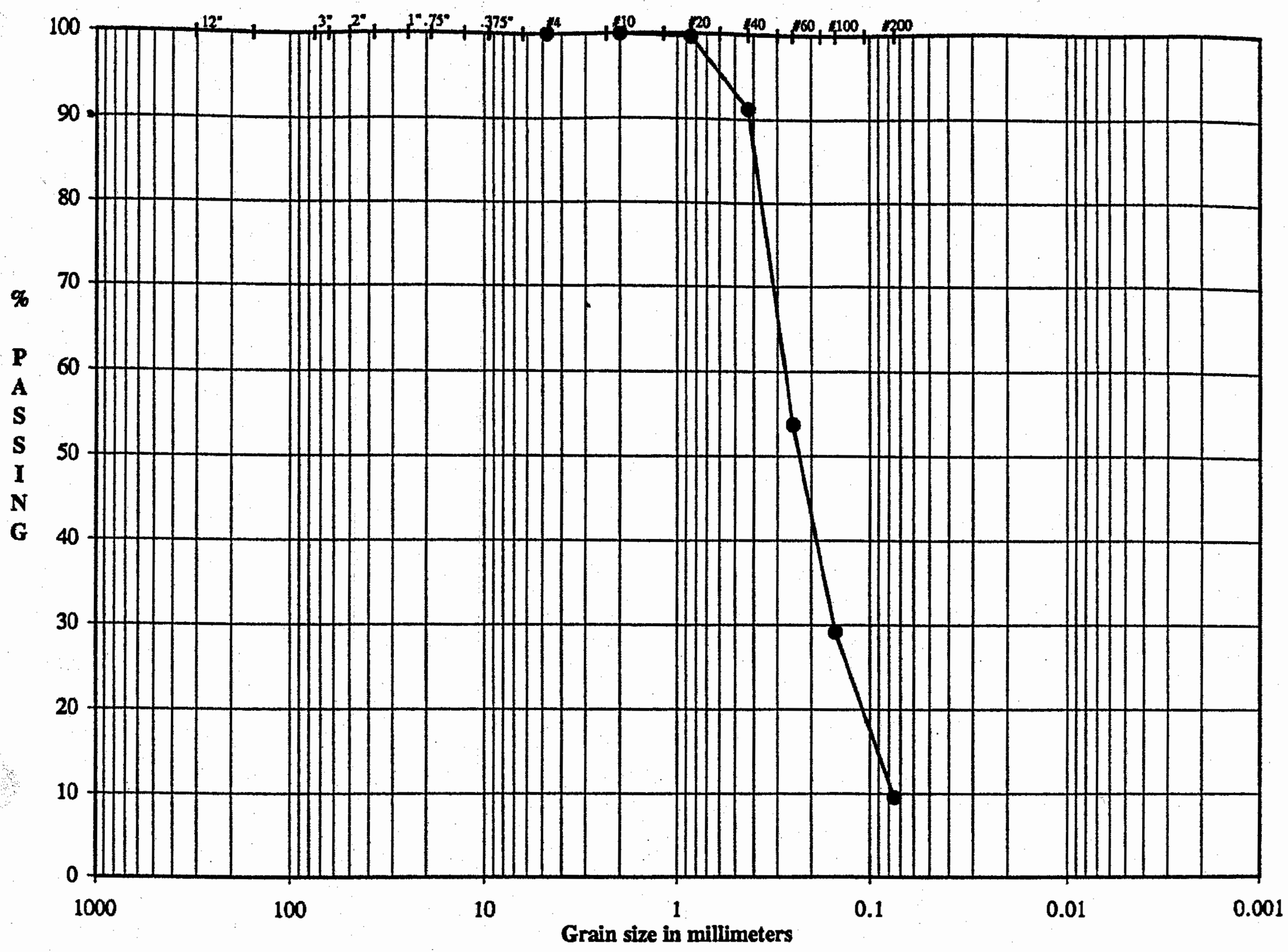
LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, little clayey silt, trace fine gravel.

USCS (SP-SM)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-24
SAMPLE TYPE	Bag
SAMPLE DEPTH	4.0 - 5.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, FINE SAND, little clayey silt.

USCS (SP-SM)

Cu = D60/D10 = 0.28/0.07: = 3.73 < 6

Cc = D30^2/(D60*D10) = 0.16^2/(0.28*0.075) = 1.22 > 1

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-24	-
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag	
REMARKS		**SAMPLE DEPTH**	4.0 - 5.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	318.64
Wt Dry Soil & Tare (gm)	(w2)	313.71
Weight of Tare (gm)	(w3)	77.59
Weight of Water (gm)	(w4=w1-w2)	4.93
Weight of Dry Soil (gm)	(w5=w2-w3)	236.12
Moisture Content (%)	(w4/w5)*100	2.09

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	313.71
	Tare Weight (gm)	77.59
(W6)	Total Dry Weight (gm)	236.12

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.11	0.11	0.05	99.95	#10	medium sand
#20	0.91	0.91	0.39	99.61	#20	medium sand
#40	20.67	20.67	8.75	91.25	#40	fine sand
#60	109.37	109.37	46.32	53.68	#60	fine sand
#100	167.29	167.29	70.85	29.15	#100	fine sand
#200	213.60	213.60	90.46	9.54	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.05
% M SAND	8.71
% F SAND	81.71
% FINES	9.54
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

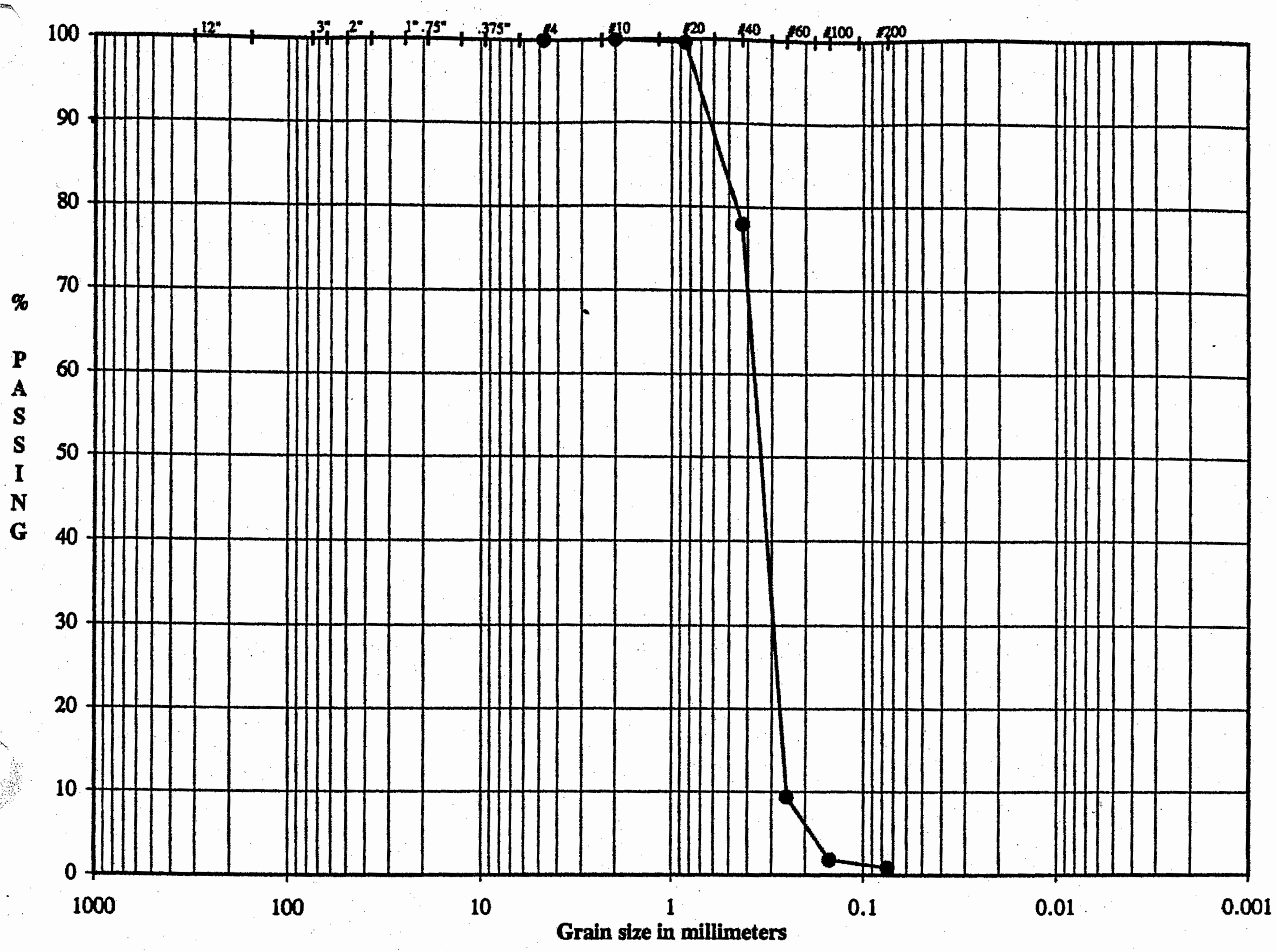
LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, FINE SAND, little clayey silt.

USCS (SP-SM)

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-24
SAMPLE TYPE	Bag
SAMPLE DEPTH	19.0 - 20.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, trace silt.

USCS (SP)

Cu = D60/D10 = 0.38/0.27 = 1.41 < 6

Cc = D30^2/(D60*D10) = 0.29^2/(0.38*0.27) = 0.82 < 1

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE GENESIS/PLUM POINT ENERGY/AR
PROJECT NO. 013-3205
REMARKS

SAMPLE ID B-24 | -
SAMPLE TYPE Bag
SAMPLE DEPTH 19.0 - 20.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	426.02
Wt Dry Soil & Tare (gm)	(w2)	379.02
Weight of Tare (gm)	(w3)	86.25
Weight of Water (gm)	(w4=w1-w2)	47.00
Weight of Dry Soil (gm)	(w5=w2-w3)	292.77
Moisture Content (%)	(w4/w5)*100	16.05

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	379.02
	Tare Weight (gm)	86.25
(W6)	Total Dry Weight (gm)	292.77

SIEVE ANALYSIS

Tare Weight
0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.08	0.08	0.03	99.97	#10	medium sand
#20	1.27	1.27	0.43	99.57	#20	medium sand
#40	64.60	64.60	22.07	77.93	#40	fine sand
#60	265.37	265.37	90.64	9.36	#60	fine sand
#100	287.61	287.61	98.24	1.76	#100	fine sand
#200	290.28	290.28	99.15	0.85	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.03
% M SAND	22.04
% F SAND	77.08
% FINES	0.85
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

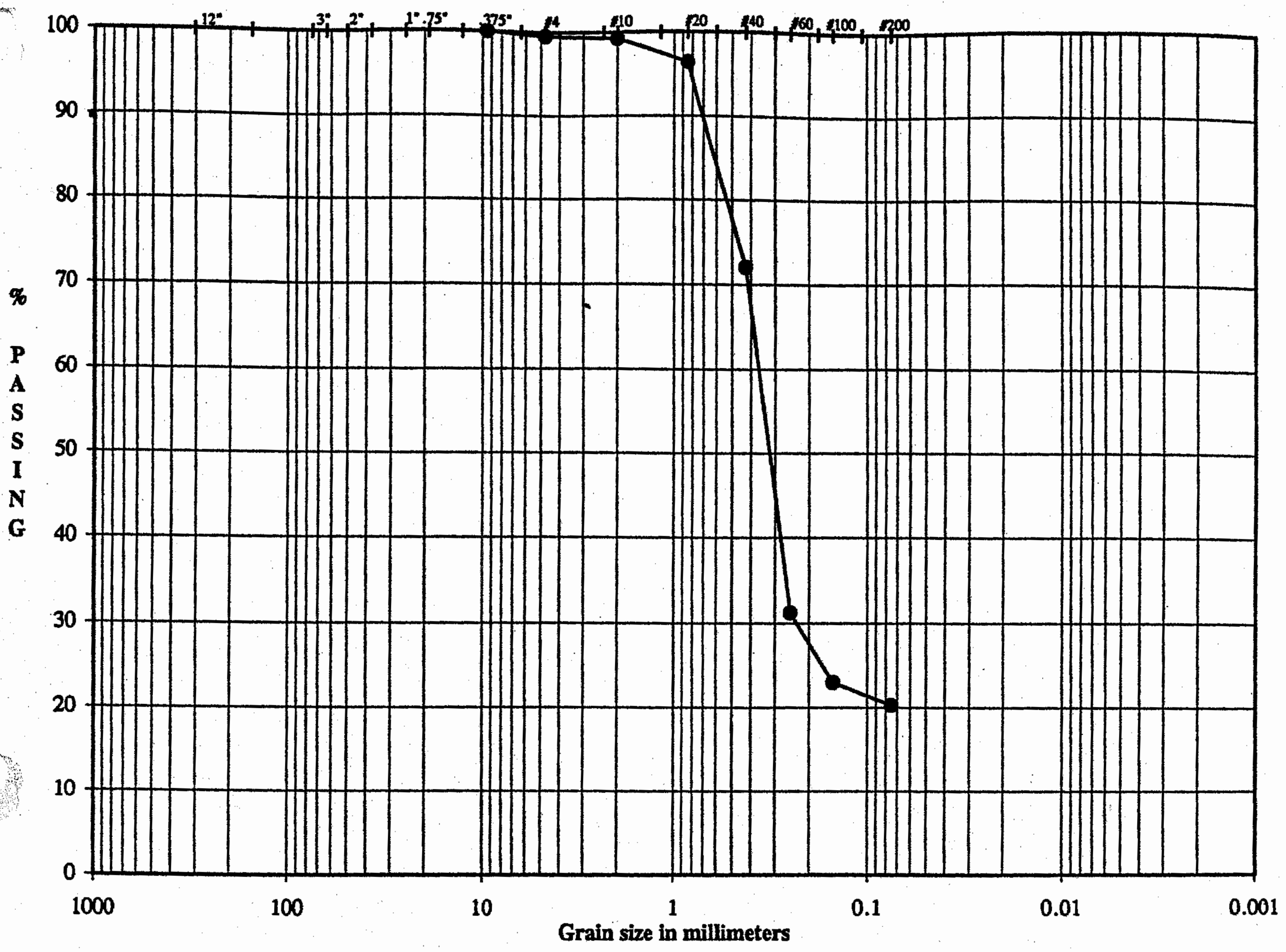
LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, trace silt.

USCS (SP)

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-26
SAMPLE TYPE	Bag
SAMPLE DEPTH	14.0 - 25.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, some clayey silt.

USCS (SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE GENESIS/PLUM POINT ENERGY/AR
PROJECT NO. 013-3205
REMARKS

SAMPLE ID B-26 | -
SAMPLE TYPE Bag
SAMPLE DEPTH 14.0 - 25.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	430.91
Wt Dry Soil & Tare (gm)	(w2)	378.24
Weight of Tare (gm)	(w3)	84.43
Weight of Water (gm)	(w4=w1-w2)	52.67
Weight of Dry Soil (gm)	(w5=w2-w3)	293.81
Moisture Content (%)	(w4/w5)*100	17.93

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	378.24
	Tare Weight (gm)	84.43
(W6)	Total Dry Weight (gm)	293.81

SIEVE ANALYSIS

Tare Weight
0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"	0.00	0.00	0.00	100.00	0.375"	fine gravel
#4	1.48	1.48	0.50	99.50	#4	coarse sand
#10	2.28	2.28	0.78	99.22	#10	medium sand
#20	10.49	10.49	3.57	96.43	#20	medium sand
#40	82.21	82.21	27.98	72.02	#40	fine sand
#60	202.14	202.14	68.80	31.20	#60	fine sand
#100	226.25	226.25	77.01	22.99	#100	fine sand
#200	234.20	234.20	79.71	20.29	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.50
% C SAND	0.27
% M SAND	27.20
% F SAND	51.73
% FINES	20.29
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

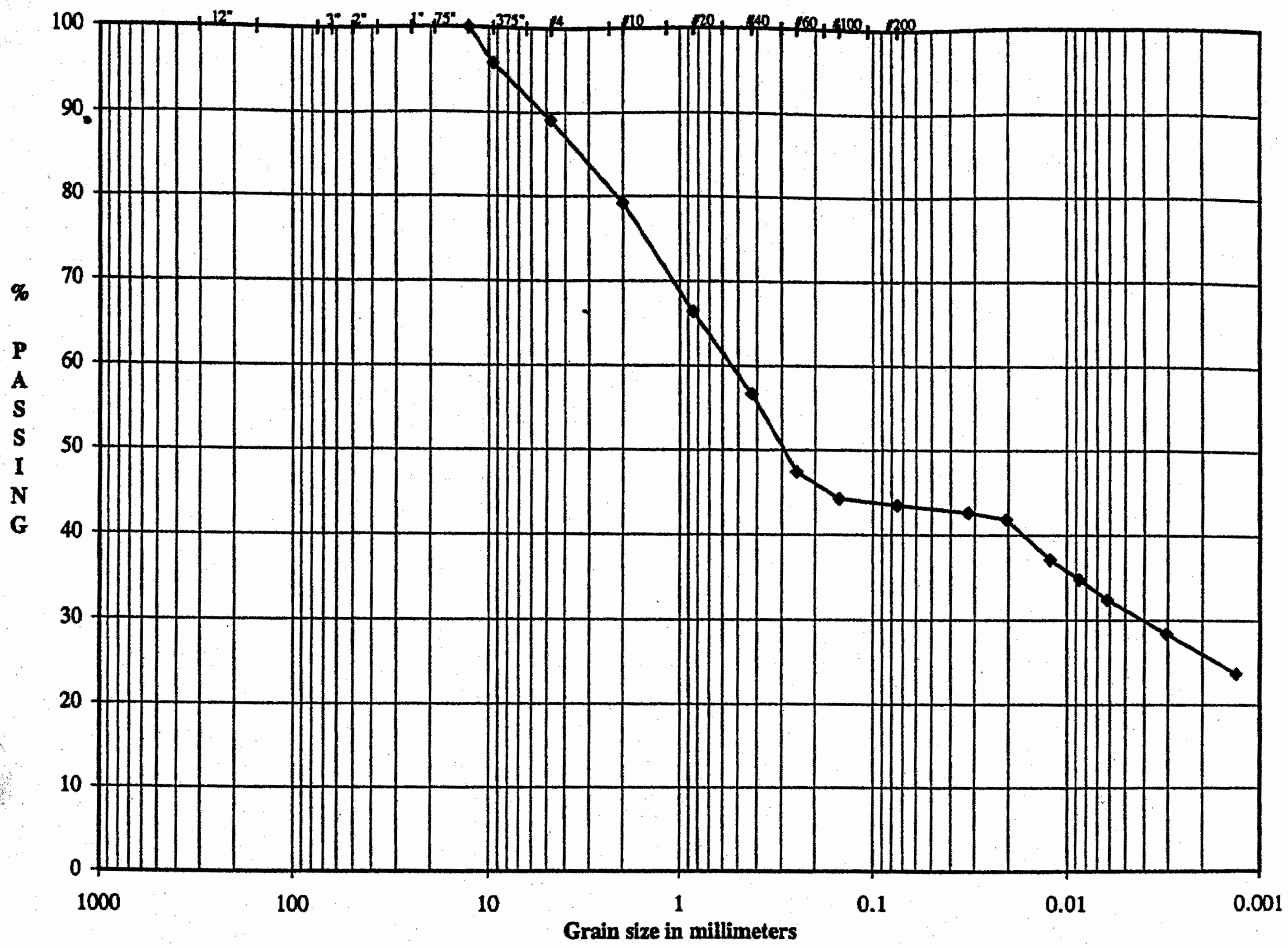
LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, some clayey silt.

USCS (SM)

TECH	SW
DATE	5/1/01
CHECK	AM
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-26 -
SAMPLE TYPE	Bag
SAMPLE DEPTH	49.0 - 50.0'

LL	-
PL	-
PI	-

DESCRIPTION Gray, COARSE TO FINE SAND, and silty clay, little fine gravel.

USCS (SC)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW/DA
DATE	5/3/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM C117, C136, D421, D422, D1140 and D2217

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B-26 -
ROJECT NO.	013-3205	SAMPLE TYPE	Bag
		SAMPLE DEPTH	49.0 - 50.0'

AS RECEIVED WATER CONTENT

Tare No.		-
Wt. Wet Soil & Tare (gm)	(W1)	97.38
Wt. Dry Soil & Tare (gm)	(W2)	86.89
Weight of Tare (gm)	(W3)	51.80
Weight of Water (gm)	(W4=W1-W2)	10.49
Weight of Dry Soil (gm)	(W5=W2-W3)	35.09
Moisture Content (%)	(W4/W5)*100	29.89

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	37.90
Dry Soil & Tare (gm)	37.01
Tare Weight (gm)	3.20
Moisture Content (%)	2.63

Total Weight of Sample Used For Sieve Analysis Corrected For Hygroscopic Moisture

Weight + Tare, Before Separating On The #4 Sieve (gm)	241.18	
Tare Weight (gm)	113.68	
Total Weight (gm)	124.23	(W6)

Plus #4 Material Sieve

TARE WEIGHT 0.00

	(Wt+Tare)	(((Wt-Tare)/W6)*100)	%PASSING		
12.0"				12.0"	cobbles
3.0"				3.0"	coarse gravel
2.5"				2.5"	coarse gravel
2.0"				2.0"	coarse gravel
1.5"				1.5"	coarse gravel
1.0"				1.0"	coarse gravel
0.75"				0.75"	fine gravel
0.50"	0.00	0.0	100.0	0.50"	fine gravel
0.375"	5.14	4.1	95.9	0.375"	fine gravel
#4	13.55	10.9	89.1	#4	coarse sand

HYDROMETER ANALYSIS

Specific Gravity	(assumed)	2.650
Specific Gravity	(tested)	
Amount Dispersing Agent (ml)		125.00
e Dispersion Device		Mechanical
ngth of Dispersion Period		1 Minute

Weight of Sample Used For Hydrometer Test

Weight of Sample Wet or Dry (gm)	57.91
Calculated Dry Wt. used in test (gm)	56.42
Hydrometer Bulb Number	624378
% Pass #4 Sieve For Whole Sample	89.09

TARE WEIGHT 0.00

HYDROMETER BACKSIEVE (Percent Passing #10 - #200 Sieves)

	(Wt+Tare)	Cumul Wt. Retained	% PASSING		
#10	6.29	6.29	79.2	#10	medium sand
#20	14.40	14.40	66.4	#20	medium sand
#40	20.52	20.52	56.7	#40	fine sand
#60	26.41	26.41	47.4	#60	fine sand
#100	28.40	28.40	44.3	#100	fine sand
#200	28.89	28.89	43.5	#200	fines

HYDROMETER CALCULATIONS

DATE	TIME	ET	READING	TEMP	TEMP.COR.	HYD.COR.	READING	EFFECTIVE	
5/4/01	9:53	(min)	R	T	K	Cc	C	LENGTH	A
5/4/01	9:55	2.00	32.0	22.00	0.013	5.00	27.00	11.9	1.00
5/4/01	9:58	5.00	31.5	22.00	0.013	5.00	26.50	12.0	1.00
5/4/01	10:08	15.00	28.5	22.00	0.013	5.00	23.50	12.5	1.00
5/4/01	10:23	30.00	27.0	22.00	0.013	5.00	22.00	12.7	1.00
5/4/01	10:53	60.00	25.5	22.00	0.013	5.00	20.50	13.0	1.00
5/4/01	14:03	250.00	23.0	22.00	0.013	5.00	18.00	13.3	1.00
5/5/01	9:53	1440.00	20.0	21.50	0.014	5.00	15.00	13.8	1.00

GRAIN SIZE PERCENTAGES

Particle Diameter	% PASSING		
		% COBBLES	0.00
0.0324	42.6	% COARSE GRAVEL	0.00
0.0206	41.8	% FINE GRAVEL	10.91
0.0121	37.1	% COARSE SAND	9.93
0.0087	34.7	% MEDIUM SAND	22.47
0.0062	32.4	% FINE SAND	13.22
0.0031	28.4	% FINES	43.48
0.0013	23.7	% TOTAL SAMPLE	100.00

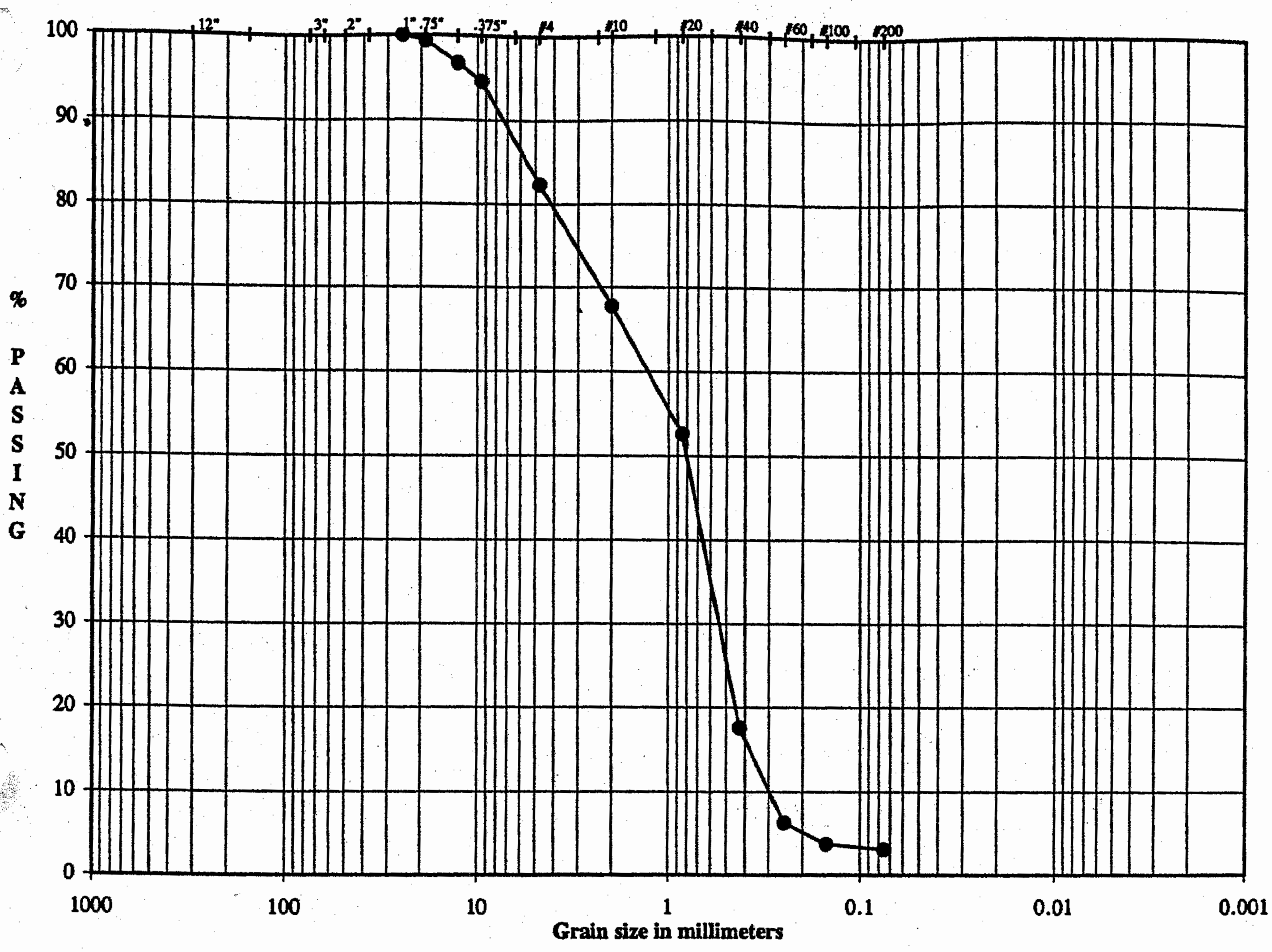
Description Gray, COARSE TO FINE SAND, and silty clay, little fine gravel.

USCS (SC)

-	LL
-	PL
-	PI

TECH	SW/DA
DATE	5/3/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID B-26
SAMPLE TYPE Bag
SAMPLE DEPTH 59.0 - 130.0'

LL -
PL -
PI -

DESCRIPTION Brown, COARSE TO FINE SAND, some fine gravel, trace silt.

USCS (SP)

Cu = D60/D10 = 1.4/0.3 = 4.67 < 6
Cc = D30^2/(D60*D10) = 0.55^2/(1.4*0.3) = 0.72 < 1

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH JC/TJ
DATE 5/1/01
CHECK
REVIEW

Golder Associates Inc.

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-26 / -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	59.0 - 130.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	1637.55
Wt Dry Soil & Tare (gm)	(w2)	1480.98
Weight of Tare (gm)	(w3)	163.45
Weight of Water (gm)	(w4=w1-w2)	156.57
Weight of Dry Soil (gm)	(w5=w2-w3)	1317.53
Moisture Content (%)	(w4/w5)*100	11.88

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)	1480.98
Tare Weight (gm)	163.45
(W6) Total Dry Weight (gm)	1317.53

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"	0.00	0.00	0.00	100.00	1.0"	coarse gravel
0.75"	9.34	9.34	0.71	99.29	0.75"	fine gravel
0.50"	42.92	42.92	3.26	96.74	0.50"	fine gravel
0.375"	71.55	71.55	5.43	94.57	0.375"	fine gravel
#4	232.93	232.93	17.68	82.32	#4	coarse sand
#10	425.58	425.58	32.30	67.70	#10	medium sand
#20	624.67	624.67	47.41	52.59	#20	medium sand
#40	1086.12	1086.12	82.44	17.56	#40	fine sand
#60	1235.07	1235.07	93.74	6.26	#60	fine sand
#100	1269.01	1269.01	96.32	3.68	#100	fine sand
#200	1277.83	1277.83	96.99	3.01	#200	fines
PAN	1278.16	1278.16			PAN	

% COBBLES	0.00
% C GRAVEL	0.71
% F GRAVEL	16.97
% C SAND	14.62
% M SAND	50.13
% F SAND	14.55
% FINES	3.01
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

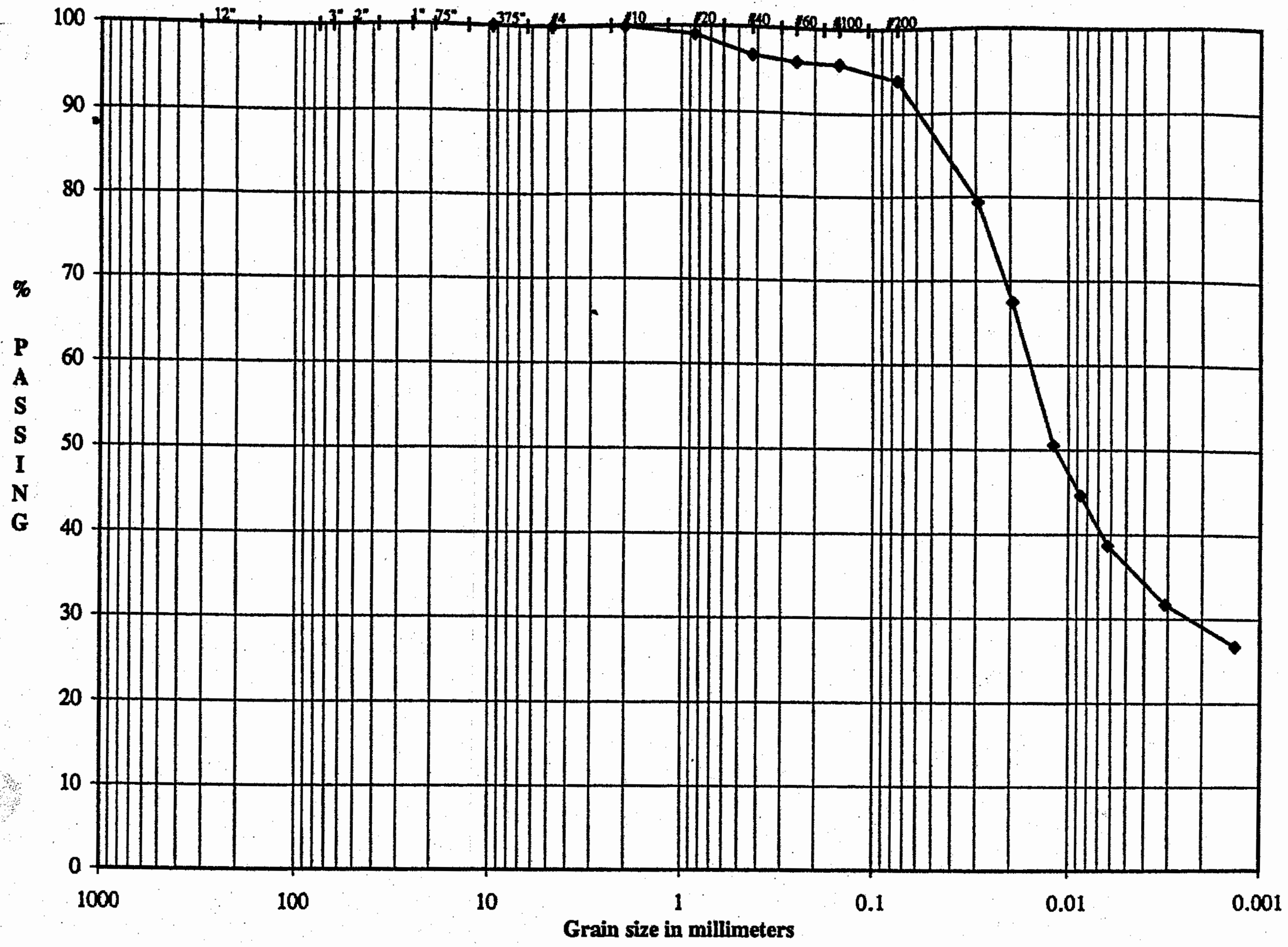
LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, COARSE TO FINE SAND, some fine gravel, trace silt.

USCS (SP)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID B-27 -
SAMPLE TYPE Bag
SAMPLE DEPTH 19.0 - 30.0'

LL -
PL -
PI -

DESCRIPTION Brownish Gray, SILTY CLAY, little medium to fine sand.
USCS (CH)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH SW
DATE 5/3/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM C117, C136, D421, D422, D1140 and D2217

ROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B-27 -
JECT NO.	013-3205	SAMPLE TYPE	Bag
		SAMPLE DEPTH	19.0 - 30.0'

AS RECEIVED WATER CONTENT

Tare No.		-
Wt. Wet Soil & Tare (gm)	(W1)	141.48
Wt. Dry Soil & Tare (gm)	(W2)	115.87
Weight of Tare (gm)	(W3)	51.74
Weight of Water (gm)	(W4=W1-W2)	25.61
Weight of Dry Soil (gm)	(W5=W2-W3)	64.13
Moisture Content (%)	(W4/W5)*100	39.93

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	43.04
Dry Soil & Tare (gm)	40.78
Tare Weight (gm)	3.24
Moisture Content (%)	6.02

Total Weight of Sample Used For Sieve Analysis Corrected For Hygroscopic Moisture

Weight + Tare, Before Separating On The #4 Sieve (gm)	491.95	
Tare Weight (gm)	115.55	
Total Weight (gm)	355.03	(W6)

Plus #4 Material Sieve

TARE WEIGHT 0.00

	(Wt+Tare)	(((Wt-Tare)/W6)*100)	%PASSING		
12.0"				12.0"	cobbles
3.0"				3.0"	coarse gravel
2.5"				2.5"	coarse gravel
2.0"				2.0"	coarse gravel
1.5"				1.5"	coarse gravel
1.0"				1.0"	coarse gravel
0.75"				0.75"	fine gravel
0.50"				0.50"	fine gravel
0.375"	0.00	0.0	100.0	0.375"	fine gravel
#4	0.24	0.1	99.9	#4	coarse sand

HYDROMETER ANALYSIS

Specific Gravity	(assumed)	2.650
Specific Gravity	(tested)	
nount Dispersing Agent (ml)		125.00
Dispersion Device		Mechanical
gth of Dispersion Period		1 Minute

Weight of Sample Used For Hydrometer Test

Weight of Sample Wet or Dry (gm)	53.42
Calculated Dry Wt. used in test (gm)	50.39
Hydrometer Bulb Number	624378
% Pass #4 Sieve For Whole Sample	99.93

TARE WEIGHT 0.00

HYDROMETER BACKSIEVE (Percent Passing #10 - #200 Sieves)

	(Wt+Tare)	Cumul Wt. Retained	% PASSING		
#10	0.04	0.04	99.9	#10	medium sand
#20	0.47	0.47	99.0	#20	medium sand
#40	1.63	1.63	96.7	#40	fine sand
#60	1.97	1.97	96.0	#60	fine sand
#100	2.08	2.08	95.8	#100	fine sand
#200	3.05	3.05	93.9	#200	fines

HYDROMETER CALCULATIONS

DATE 5/4/01	TIME 9:55	ET (min)	READING R	TEMP T	TEMP.COR. K	HYD.COR. Cc	READING C	EFFECTIVE LENGTH	A
5/4/01	9:57	2.00	45.0	22.00	0.013	5.00	40.00	9.7	1.00
5/4/01	10:00	5.00	39.0	22.00	0.013	5.00	34.00	10.7	1.00
5/4/01	10:10	15.00	30.5	22.00	0.013	5.00	25.50	12.2	1.00
5/4/01	10:25	30.00	27.5	22.00	0.013	5.00	22.50	12.7	1.00
5/4/01	10:55	60.00	24.5	22.00	0.013	5.00	19.50	13.2	1.00
5/4/01	14:05	250.00	21.0	22.00	0.013	5.00	16.00	13.7	1.00
5/5/01	9:55	1440.00	18.5	21.50	0.014	5.00	13.50	14.2	1.00

Particle Diameter	% PASSING
0.0293	79.3
0.0195	67.4
0.0120	50.6
0.0087	44.6
0.0062	38.7
0.0031	31.7
0.0013	26.8

GRAIN SIZE PERCENTAGES

% COBBLES	0.00
% COARSE GRAVEL	0.00
% FINE GRAVEL	0.07
% COARSE SAND	0.08
% MEDIUM SAND	3.15
% FINE SAND	2.82
% FINES	93.88
% TOTAL SAMPLE	100.00

Description: Brownish Gray, SILTY CLAY, little medium to fine sand.

USCS: (CH)

-	LL
-	PL
-	PI

TECH	SW
DATE	5/3/01
CHECK	
REVIEW	

Golder Associates Inc.

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-28
SAMPLE TYPE: Bag
SAMPLE DEPTH: 19.0 - 20.0'

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				29	29	
Weight of Wet Soil & Tare (gm)	19.12	19.37	20.13	18.44	20.13	355.53
Weight of Dry Soil & Tare (gm)	17.49	17.68	18.28	12.90	13.90	256.62
Weight of Tare (gm)	11.43	11.42	11.43	4.30	4.20	85.11
Weight of Water (gm)	1.63	1.69	1.85	5.54	6.23	98.91
Weight of Dry Soil (gm)	6.06	6.26	6.85	8.60	9.70	171.51
Water Content %	26.90	27.00	27.01	64.42	64.23	57.67

	TRIAL 1	TRIAL 2
BLOWS:	29	29
K VALUE:	1.018	1.018

PLASTIC LIMIT (PL): 27

LIQUID LIMIT (LL): 65

PLASTICITY INDEX (PI): 38

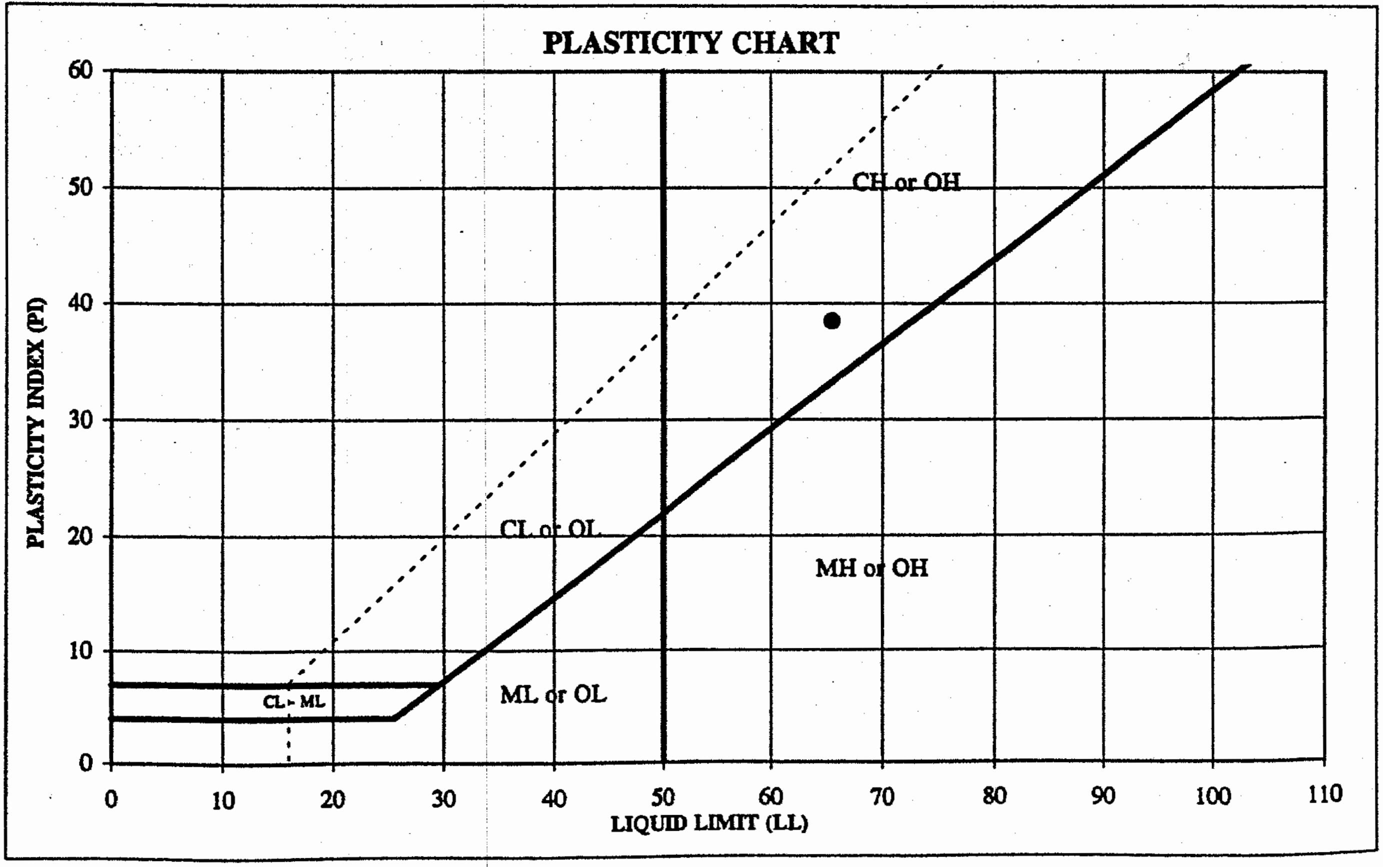
LIQUIDITY INDEX (LI): 0.80

NOTE:

DESCRIPTION: Brown and Gray, SILTY CLAY, trace medium to fine sand.

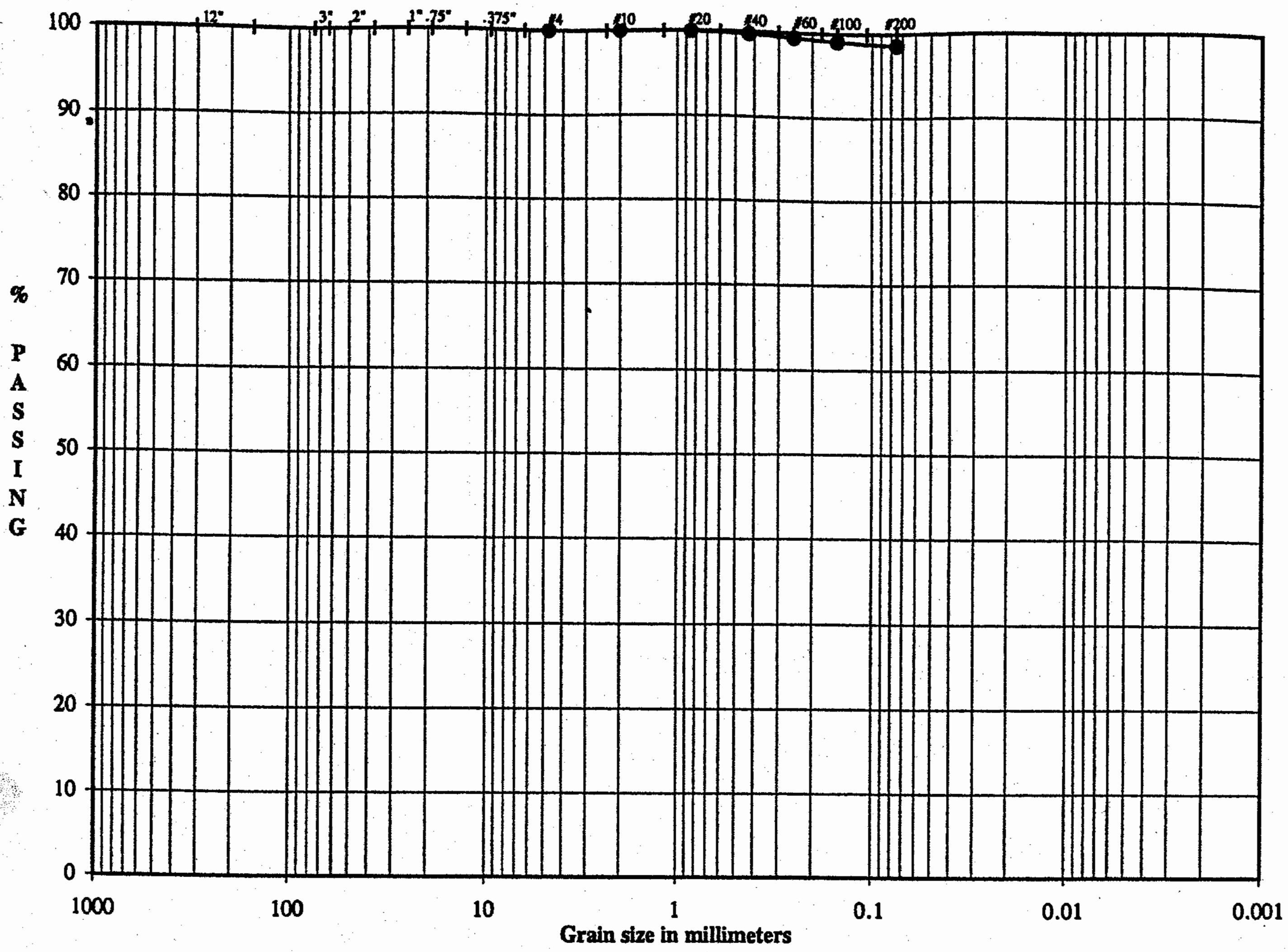
USCS: CH

PLASTICITY CHART



TECH: DH
DATE: 5/4/01
CHECK:
REVIEW:

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-28
SAMPLE TYPE	Bag
SAMPLE DEPTH	19.0 - 20.0'

LL	65
PL	27
PI	38

DESCRIPTION Brown and Gray, SILTY CLAY, trace medium to fine sand.

USCS CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE GENESIS/PLUM POINT ENERGY/AR
ROJECT NO. 013-3205
REMARKS

SAMPLE ID B-28 | -
SAMPLE TYPE Bag
SAMPLE DEPTH 19.0 - 20.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	355.53
Wt Dry Soil & Tare (gm)	(w2)	256.62
Weight of Tare (gm)	(w3)	85.11
Weight of Water (gm)	(w4=w1-w2)	98.91
Weight of Dry Soil (gm)	(w5=w2-w3)	171.51
Moisture Content (%)	(w4/w5)*100	57.67

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)	256.62
Tare Weight (gm)	85.11
(W6) Total Dry Weight (gm)	171.51

SIEVE ANALYSIS

Tare Weight
0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.04	0.04	0.02	99.98	#10	medium sand
#20	0.12	0.12	0.07	99.93	#20	medium sand
#40	0.50	0.50	0.29	99.71	#40	fine sand
#60	1.02	1.02	0.59	99.41	#60	fine sand
#100	1.59	1.59	0.93	99.07	#100	fine sand
#200	2.43	2.43	1.42	98.58	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.02
% M SAND	0.27
% F SAND	1.13
% FINES	98.58
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	65
PL	27
PI	38
Gs	-

DESCRIPTION Brown and Gray, SILTY CLAY, trace medium to fine sand.

USCS CH

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

GENESIS/PLUM POINT ENERGY/AR
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classification	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
									% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %		Moisture %	Dry (lb/cuft)		
					L.L.	P.L.	P.I.	L.I.										
B-1	Bag	14.0-20.0'	(CL)	-	-	-	-	-	100.0	83.3	15.0	-	-	-	-	-	-	-
B-2	Bag	4.0 - 5.0'	CL	38.0	47	22	25	0.62	100.0	95.6	-	-	-	-	-	-	-	-
B-5	Bag	9.0-10.0'	(CH)	33.7	58	24	34	0.30	-	-	-	-	-	-	-	-	-	-
B-5	Bag	24.0-25.0'	(SM)	18.0	NP	NP	NP	NP	-	-	-	-	-	-	-	-	-	-
B-5	Bag	79.0-80.0'	(CL)	-	27	16	11	-	-	-	-	-	-	-	-	-	-	-
B-10	Bag	19.0-20.0'	CL	48.0	38	19	19	1.54	100.0	92.0	-	-	-	-	-	-	-	-
B-10	Bag	24.0-25.0'	(SP-SM)	16.4	-	-	-	-	99.4	11.5	6.2	-	-	-	-	-	-	-
B-11	Bag	4.0-5.0'	CL	29.8	46	21	25	0.37	100.0	88.9	-	-	-	-	-	-	-	-
B-12	Bag	9.0-10.0'	(SM)	12.1	-	-	-	-	100.0	35.5	-	-	-	-	-	-	-	-
B-13	Bag	4.0-5.0'	CL	25.8	34	20	14	0.39	100.0	78.6	-	-	-	-	-	-	-	-
B-13	Bag	19.0-20.0'	(SM)	20.0	-	-	-	-	100.0	16.1	-	-	-	-	-	-	-	-
B-14	Bag	9.0-10.0'	CH	27.1	51	21	30	0.22	100.0	93.0	-	-	-	-	-	-	-	-
B-14	Bag	14.0-20.0'	(SP)	4.2	-	-	-	-	100.0	3.0	-	-	-	-	-	-	-	-
B-15	Bag	4.0-5.0'	CL	31.7	44	23	21	0.42	100.0	91.5	-	-	-	-	-	-	-	-
B-17	Bag	9.0-10.0'	CH	38.1	79	32	47	0.13	100.0	96.0	-	-	-	-	-	-	-	-

ABBREVIATIONS: LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES: T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

ASTM GRAIN SIZE ANALYSIS
ASTM C117, C136, D421, D422, D1140 and D2217

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B-10 | -
JECT NO.	013-3205	SAMPLE TYPE	Bag
		SAMPLE DEPTH	24.0 - 25.0'

AS RECEIVED WATER CONTENT

Tare No.		-
Wt. Wet Soil & Tare (gm)	(W1)	184.26
Wt. Dry Soil & Tare (gm)	(W2)	165.65
Weight of Tare (gm)	(W3)	52.02
Weight of Water (gm)	(W4=W1-W2)	18.61
Weight of Dry Soil (gm)	(W5=W2-W3)	113.63
Moisture Content (%)	(W4/W5)*100	16.38

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	46.91
Dry Soil & Tare (gm)	46.69
Tare Weight (gm)	3.21
Moisture Content (%)	0.51

Total Weight of Sample Used For Sieve Analysis Corrected For Hygroscopic Moisture

Weight + Tare, Before Separating On The #4 Sieve (gm)	664.65	
Tare Weight (gm)	236.28	
Total Weight (gm)	426.21	(W6)

Plus #4 Material Sieve

TARE WEIGHT 0.00

	(Wt+Tare)	(((Wt-Tare)/W6)*100)	%PASSING		
12.0"				12.0"	cobbles
3.0"				3.0"	coarse gravel
2.5"				2.5"	coarse gravel
2.0"				2.0"	coarse gravel
1.5"				1.5"	coarse gravel
1.0"				1.0"	coarse gravel
0.75"				0.75"	fine gravel
0.50"				0.50"	fine gravel
0.375"	0.00	0.0	100.0	0.375"	fine gravel
#4	2.38	0.6	99.4	#4	coarse sand

HYDROMETER ANALYSIS

Specific Gravity	(assumed)	2.650
Specific Gravity	(tested)	
Amount Dispersing Agent (ml)		125.00
Dispersion Device		Mechanical
of Dispersion Period		1 Minute

Weight of Sample Used For Hydrometer Test

Weight of Sample Wet or Dry (gm)	55.23
Calculated Dry Wt. used in test (gm)	54.95
Hydrometer Bulb Number	624378
% Pass #4 Sieve For Whole Sample	99.44

TARE WEIGHT 0.00

HYDROMETER BACKSIEVE (Percent Passing #10 - #200 Sieves)

	(Wt+Tare)	Cumul Wt. Retained	% PASSING		
#10	0.00	0.00	99.4	#10	medium sand
#20	0.44	0.44	98.6	#20	medium sand
#40	15.82	15.82	70.8	#40	fine sand
#60	36.96	36.96	32.6	#60	fine sand
#100	45.66	45.66	16.8	#100	fine sand
#200	48.62	48.62	11.5	#200	fines

HYDROMETER CALCULATIONS

DATE	TIME	ET	READING	TEMP	TEMP.COR.	HYD.COR.	READING	EFFECTIVE	
5/4/01	9:49	(min)	R	T	K	Cc	C	LENGTH	A
5/4/01	9:51	2.00	10.0	22.00	0.013	5.00	5.00	15.5	1.00
5/4/01	9:54	5.00	9.0	22.00	0.013	5.00	4.00	15.6	1.00
5/4/01	10:04	15.00	9.0	22.00	0.013	5.00	4.00	15.6	1.00
5/4/01	10:19	30.00	8.5	22.00	0.013	5.00	3.50	15.8	1.00
5/4/01	10:49	60.00	8.5	22.00	0.013	5.00	3.50	15.8	1.00
5/4/01	13:59	250.00	8.0	22.00	0.013	5.00	3.00	15.8	1.00
5/5/01	9:49	1440.00	7.5	21.50	0.014	5.00	2.50	16.0	1.00

GRAIN SIZE PERCENTAGES

Particle Diameter	% PASSING		
		% COBBLES	0.00
0.0370	9.0	% COARSE GRAVEL	0.00
0.0235	7.2	% FINE GRAVEL	0.56
0.0136	7.2	% COARSE SAND	0.00
0.0097	6.3	% MEDIUM SAND	28.63
0.0068	6.3	% FINE SAND	59.36
0.0033	5.4	% FINES	11.46
0.0014	4.5	% TOTAL SAMPLE	100.00

Description Light Brown, MEDIUM TO FINE SAND, little clayey silt, trace fine gravel.

USCS (SP-SM)

-	LL
-	PL
-	PI

TECH	TJ/DA
DATE	5/3/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-11 - **SAMPLE DEPTH:** 4.0 - 5.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION	
Number of Blows				25	25
Weight of Wet Soil & Tare (gm)	23.08	20.40	22.85	24.70	23.87
Weight of Dry Soil & Tare (gm)	21.09	18.85	20.95	19.01	17.65
Weight of Tare (gm)	11.41	11.28	11.76	6.70	4.27
Weight of Water (gm)	1.99	1.55	1.90	5.69	6.22
Weight of Dry Soil (gm)	9.68	7.57	9.19	12.31	13.38
Water Content %	20.56	20.48	20.67	46.22	46.49

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

NATURAL MOISTURE
405.82
350.74
166.18
55.08
184.56
29.84

PLASTIC LIMIT (PL): 21

LIQUID LIMIT (LL): 46

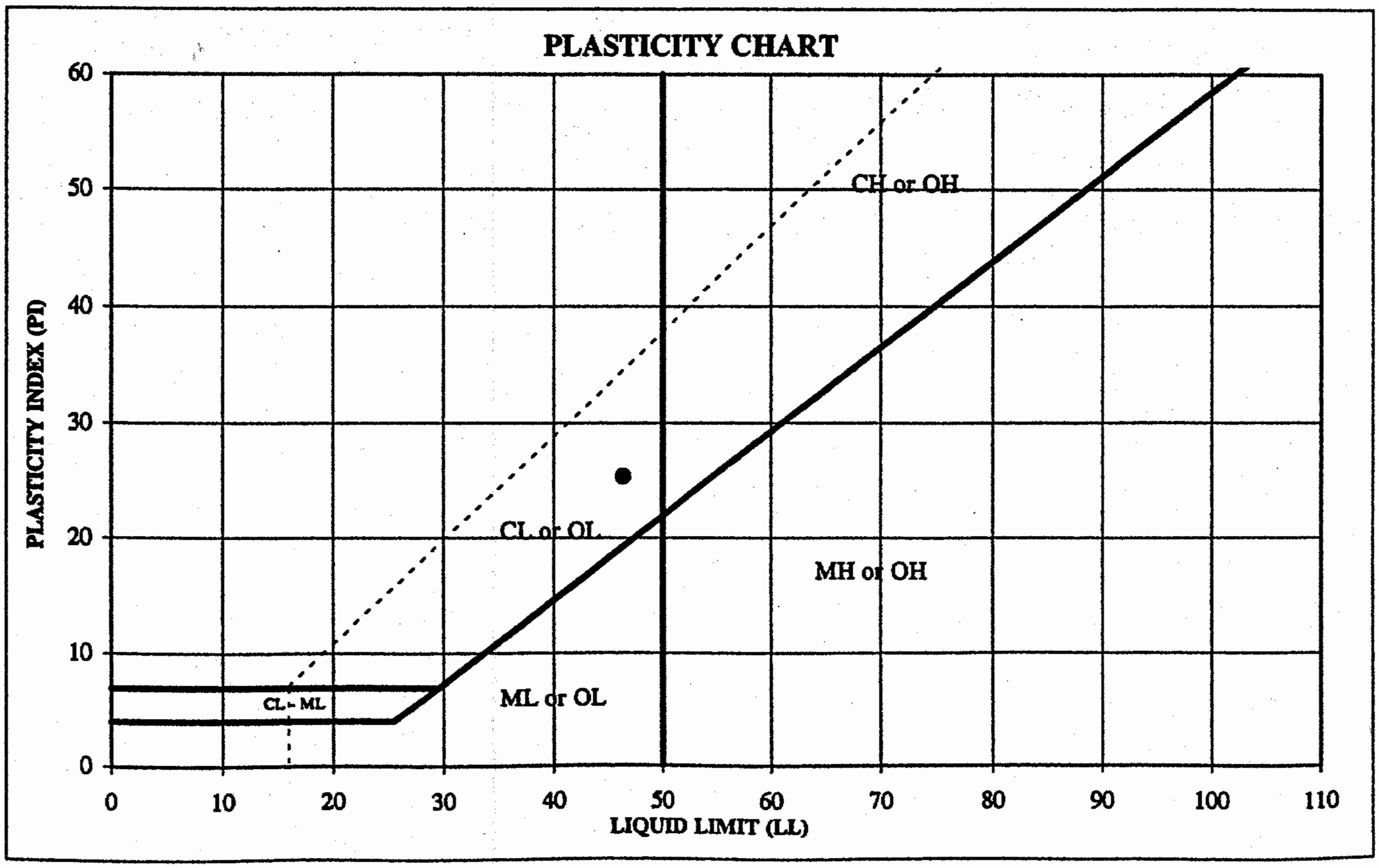
PLASTICITY INDEX (PI): 25

LIQUIDITY INDEX (LI): 0.37

NOTE:

DESCRIPTION: Brown, SILTY CLAY, little medium to fine sand.

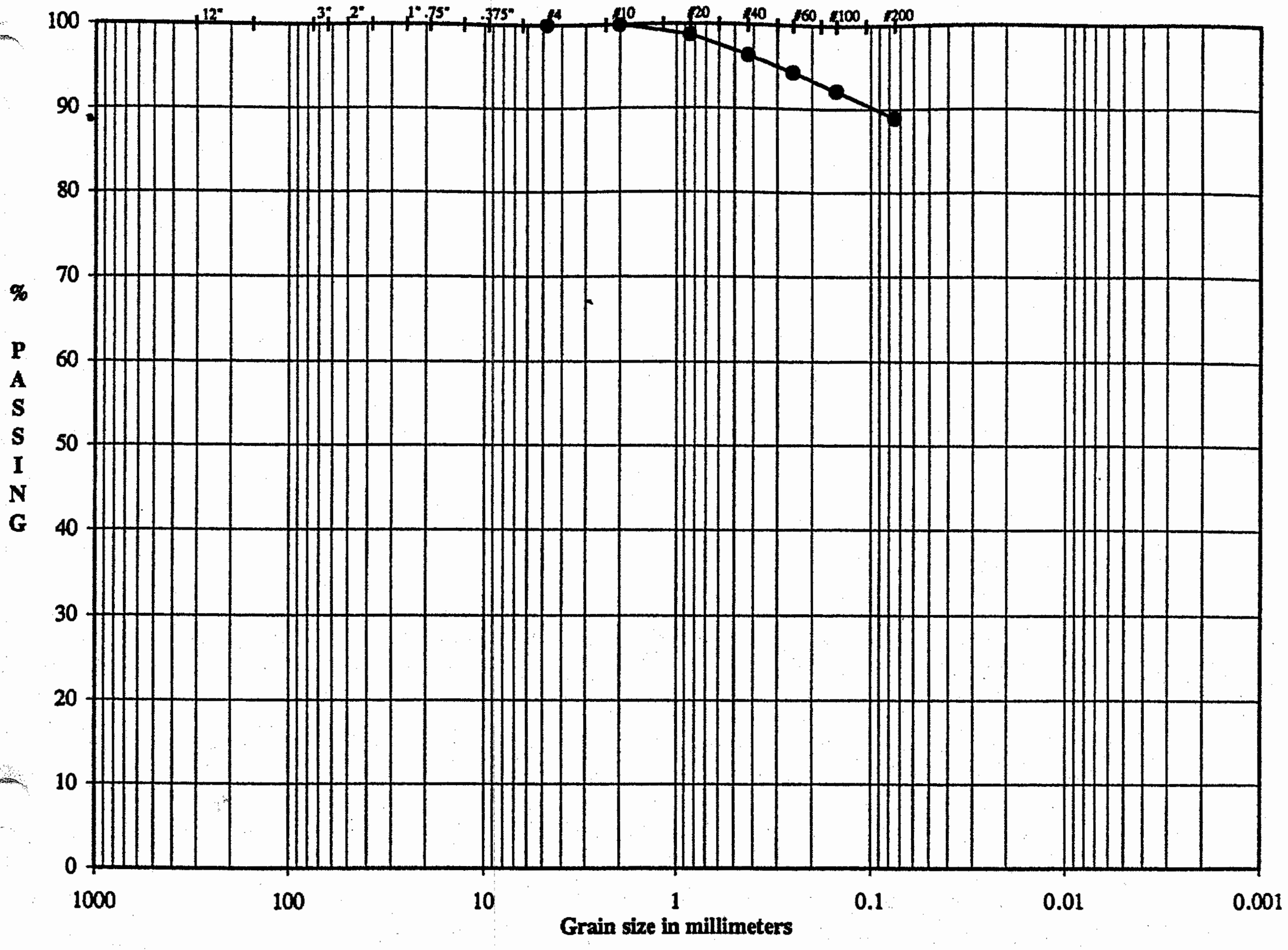
USCS: CL



TECH: TJ
DATE: 5/8/01
CHECK:
REVIEW:

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-11
SAMPLE TYPE	Bag
SAMPLE DEPTH	4.0 - 5.0'

LL	46
PL	21
PI	25

DESCRIPTION	Brown, SILTY CLAY, little medium to fine sand.
USCS	CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR
PROJECT NO.	013-3205
REMARKS	

SAMPLE ID	B-11	-
SAMPLE TYPE	Bag	
SAMPLE DEPTH	4.0 - 5.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	405.82
Wt Dry Soil & Tare (gm)	(w2)	350.74
Weight of Tare (gm)	(w3)	166.18
Weight of Water (gm)	(w4=w1-w2)	55.08
Weight of Dry Soil (gm)	(w5=w2-w3)	184.56
Moisture Content (%)	(w4/w5)*100	29.84

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	350.74
	Tare Weight (gm)	166.18
(W6)	Total Dry Weight (gm)	184.56

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.14	0.14	0.08	99.92	#10	medium sand
#20	2.29	2.29	1.24	98.76	#20	medium sand
#40	6.69	6.69	3.62	96.38	#40	fine sand
#60	10.41	10.41	5.64	94.36	#60	fine sand
#100	14.46	14.46	7.83	92.17	#100	fine sand
#200	20.47	20.47	11.09	88.91	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.08
% M SAND	3.55
% F SAND	7.47
% FINES	88.91
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

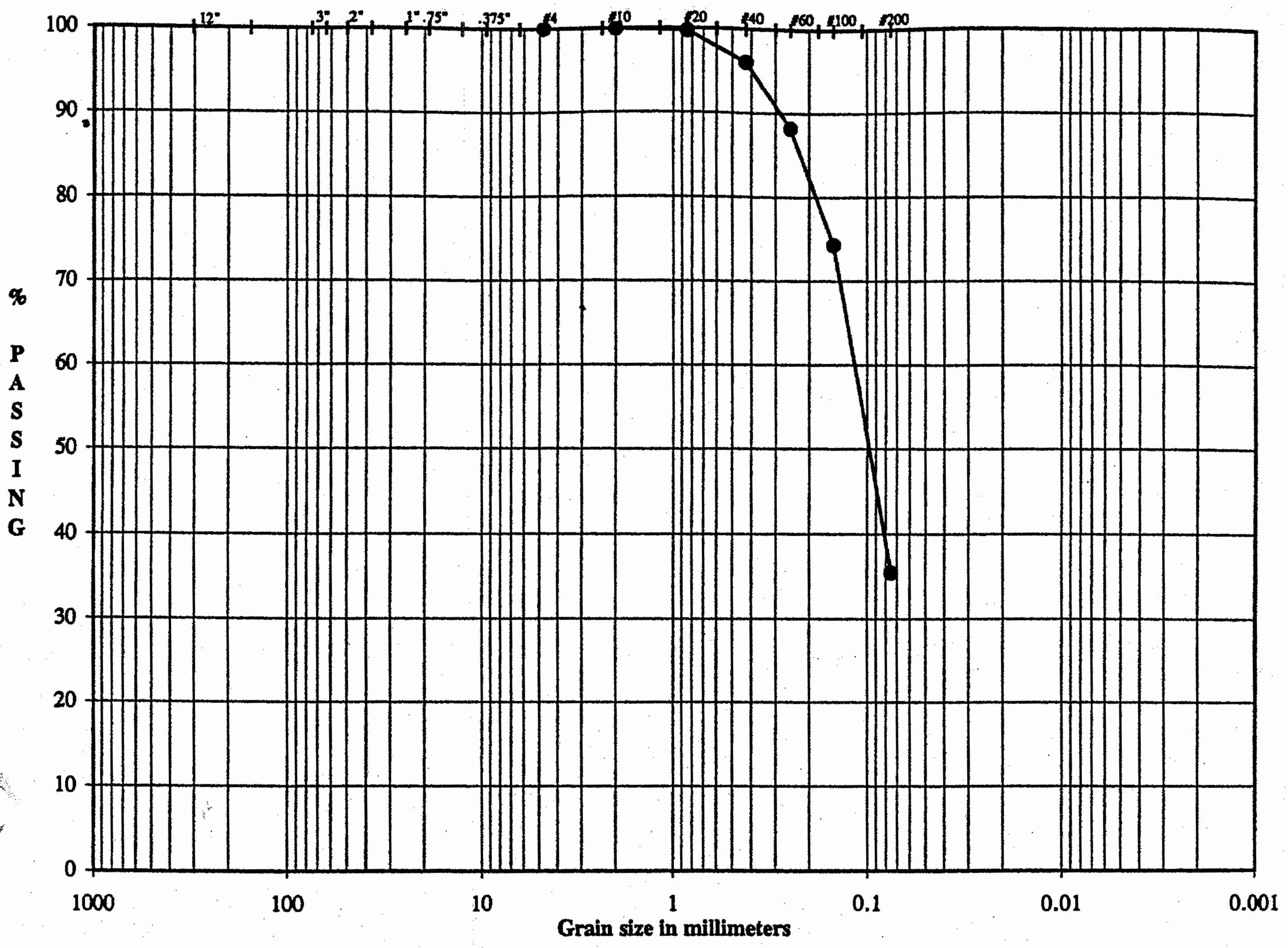
LL	46
PL	21
PI	25
Gs	-

DESCRIPTION Brown, SILTY CLAY, little medium to fine sand.

USCS CL

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-12
SAMPLE TYPE	Bag
SAMPLE DEPTH	9.0 - 10.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, FINE SAND, and clayey silt.

USCS (SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	PWM

Golder Associates Inc.

ASTM GRAIN SIZE ANALYSIS

ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-12	-
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag	
REMARKS		**SAMPLE DEPTH**	9.0 - 10.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	448.91
Wt Dry Soil & Tare (gm)	(w2)	409.17
Weight of Tare (gm)	(w3)	81.84
Weight of Water (gm)	(w4=w1-w2)	39.74
Weight of Dry Soil (gm)	(w5=w2-w3)	327.33
Moisture Content (%)	(w4/w5)*100	12.14

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	409.17
	Tare Weight (gm)	81.84
(W6)	Total Dry Weight (gm)	327.33

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.24	0.24	0.07	99.93	#10	medium sand
#20	1.06	1.06	0.32	99.68	#20	medium sand
#40	13.06	13.06	3.99	96.01	#40	fine sand
#60	38.78	38.78	11.85	88.15	#60	fine sand
#100	84.25	84.25	25.74	74.26	#100	fine sand
#200	211.27	211.27	64.54	35.46	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.07
% M SAND	3.92
% F SAND	60.55
% FINES	35.46
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, FINE SAND, and clayey silt.

USCS (SM)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-13 - **SAMPLE DEPTH:** 4.0 - 5.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

*Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				27	27	
Weight of Wet Soil & Tare (gm)	20.84	22.54	20.83	21.30	24.86	570.39
Weight of Dry Soil & Tare (gm)	19.22	20.62	19.34	16.99	19.67	486.90
Weight of Tare (gm)	11.25	11.38	11.84	4.26	4.27	162.74
Weight of Water (gm)	1.62	1.92	1.49	4.31	5.19	83.49
Weight of Dry Soil (gm)	7.97	9.24	7.50	12.73	15.40	324.16
Water Content %	20.33	20.78	19.87	33.86	33.70	25.76

	TRIAL 1	TRIAL 2
BLOWS:	27	27
K VALUE:	1.009	1.009

PLASTIC LIMIT (PL) 20

LIQUID LIMIT (LL) 34

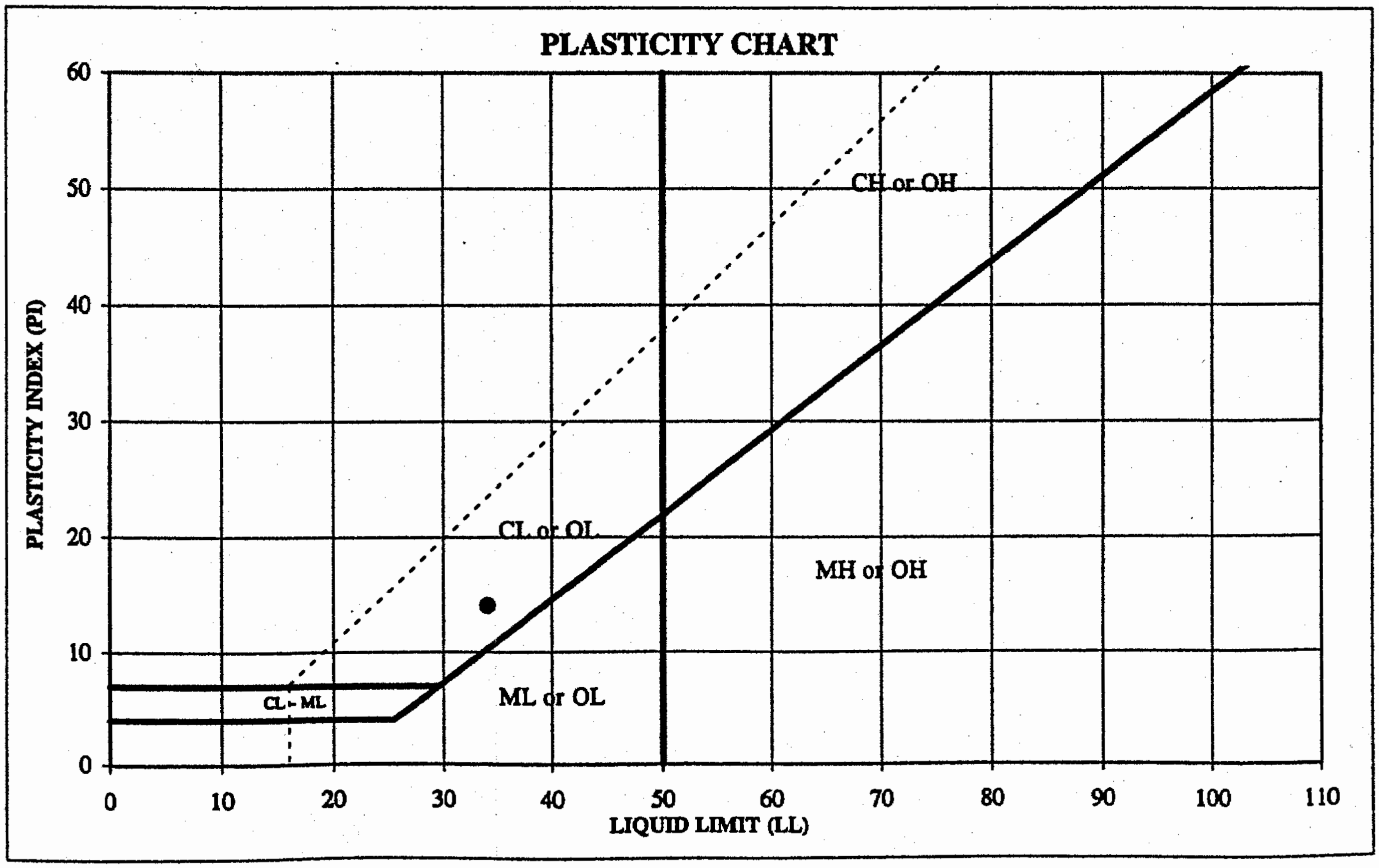
PLASTICITY INDEX (PI) 14

LIQUIDITY INDEX (LI) 0.39

NOTE:

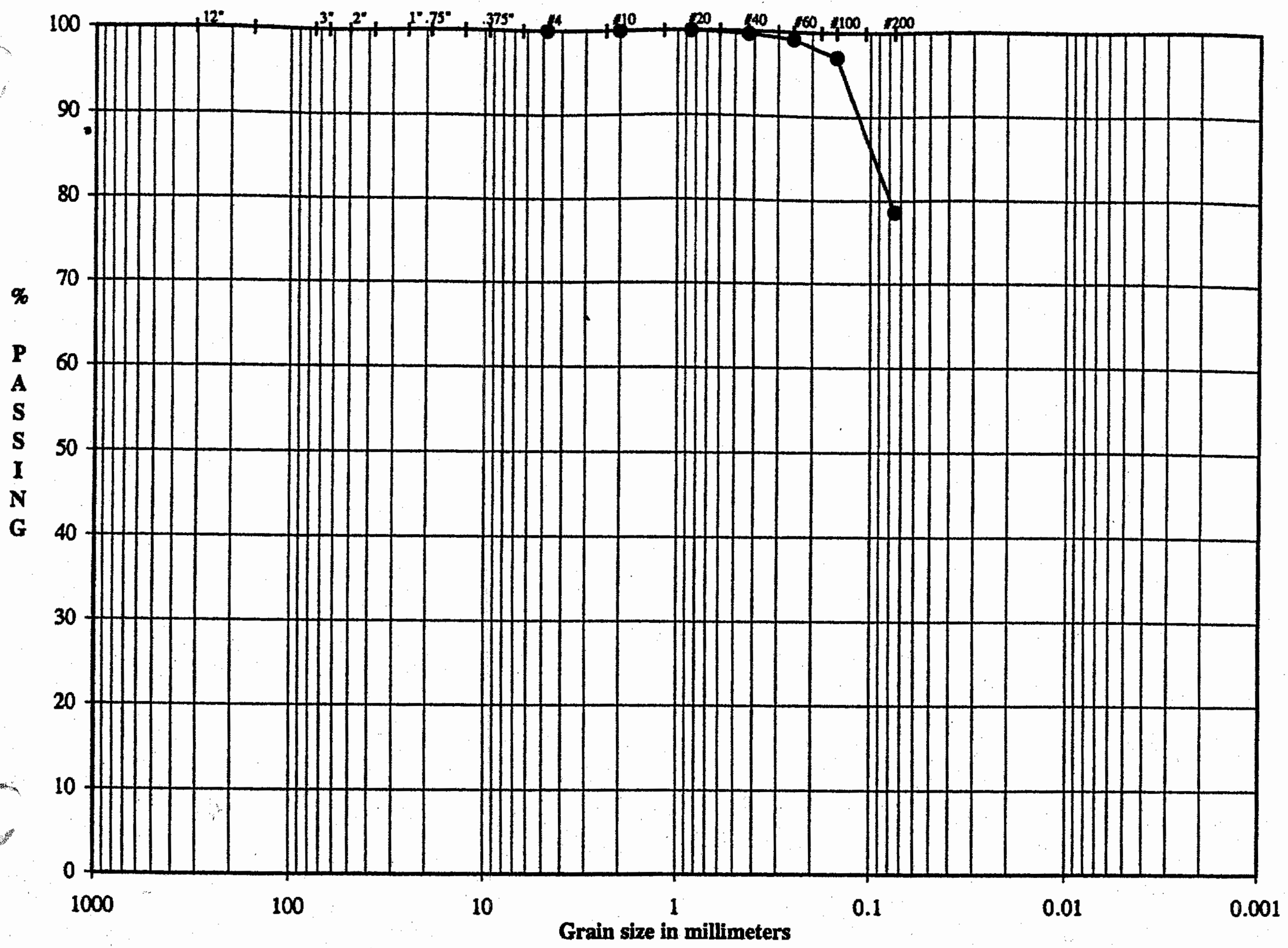
DESCRIPTION Brown, SILTY CLAY, some fine sand.

USCS CL



TECH	DH
DATE	5/3/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID B-13
SAMPLE TYPE Bag
SAMPLE DEPTH 4.0 - 5.0'

LL 34
PL 20
PI 14

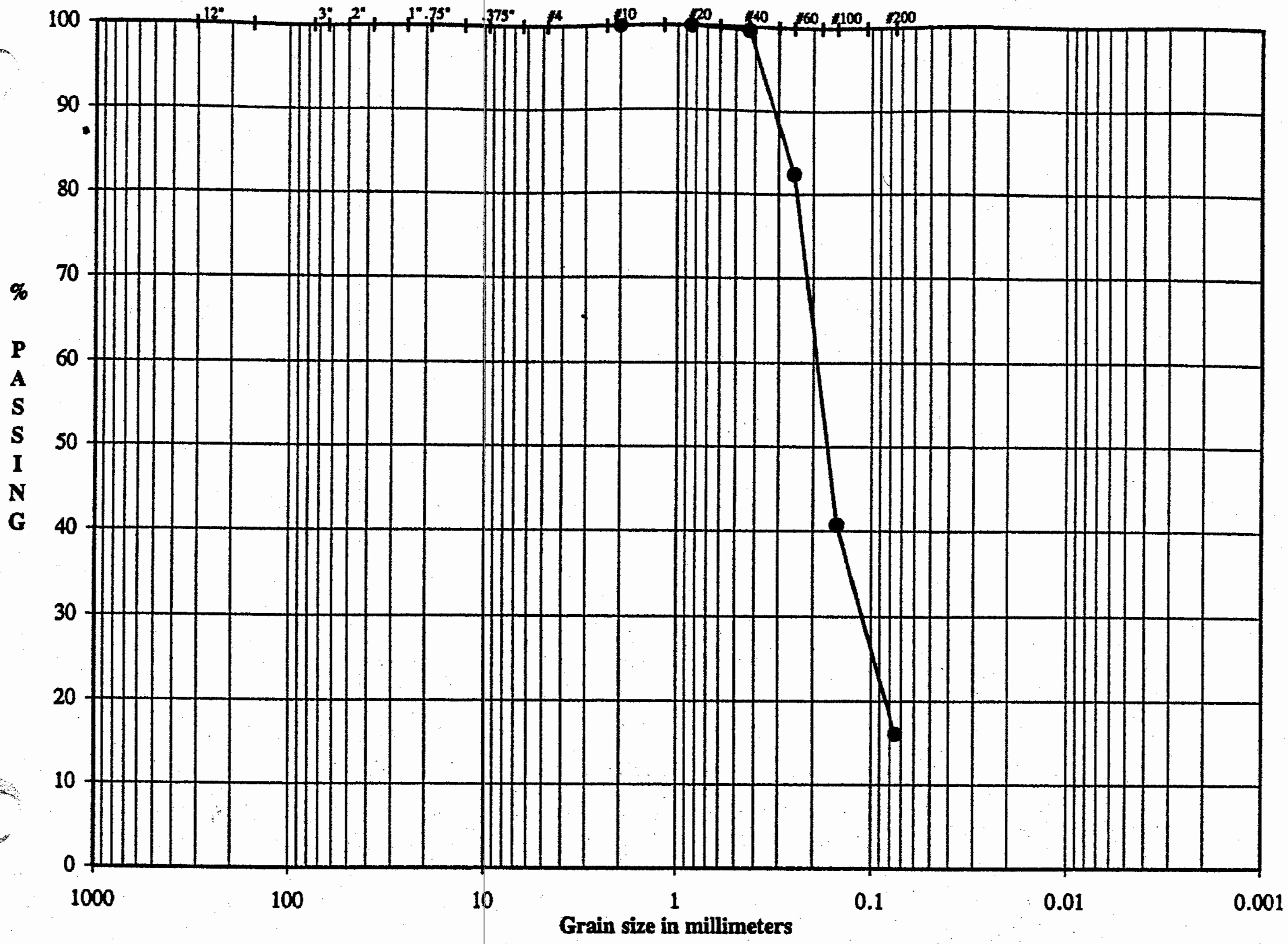
DESCRIPTION Brown, SILTY CLAY, some fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH SW
DATE 5/1/01
CHECK
REVIEW

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-13
SAMPLE TYPE	Bag
SAMPLE DEPTH	19.0 - 20.0'

LL	-
PL	-
PI	-

DESCRIPTION Brown, FINE SAND, some clayey silt.

USCS (SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-13 | -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	19.0 - 20.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	469.87
Wt Dry Soil & Tare (gm)	(w2)	405.67
Weight of Tare (gm)	(w3)	85.10
Weight of Water (gm)	(w4=w1-w2)	64.20
Weight of Dry Soil (gm)	(w5=w2-w3)	320.57
Moisture Content (%)	(w4/w5)*100	20.03

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	405.67
	Tare Weight (gm)	85.10
(W6)	Total Dry Weight (gm)	320.57

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4					#4	coarse sand
#10	0.00	0.00	0.00	100.00	#10	medium sand
#20	0.09	0.09	0.03	99.97	#20	medium sand
#40	1.47	1.47	0.46	99.54	#40	fine sand
#60	56.45	56.45	17.61	82.39	#60	fine sand
#100	190.11	190.11	59.30	40.70	#100	fine sand
#200	269.07	269.07	83.93	16.07	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.00
% M SAND	0.46
% F SAND	83.48
% FINES	16.07
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

- \> 10% mostly coarse (c)
- \> 10% mostly medium (m)
- < 10% fine (c-m)
- < 10% coarse (m-f)
- < 10% coarse and fine (m)
- < 10% coarse and medium (f)
- \> 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, FINE SAND, some clayey silt.

USCS (SM)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-14 - **SAMPLE DEPTH:** 9.0 - 10.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				25	25	
Weight of Wet Soil & Tare (gm)	21.82	22.33	22.50	23.10	25.22	397.66
Weight of Dry Soil & Tare (gm)	20.02	20.53	20.62	16.77	18.22	330.75
Weight of Tare (gm)	11.23	11.86	11.66	4.31	4.29	84.24
Weight of Water (gm)	1.80	1.80	1.88	6.33	7.00	66.91
Weight of Dry Soil (gm)	8.79	8.67	8.96	12.46	13.93	246.51
Water Content %	20.48	20.76	20.98	50.80	50.25	27.14

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

PLASTIC LIMIT (PL): 21

LIQUID LIMIT (LL): 51

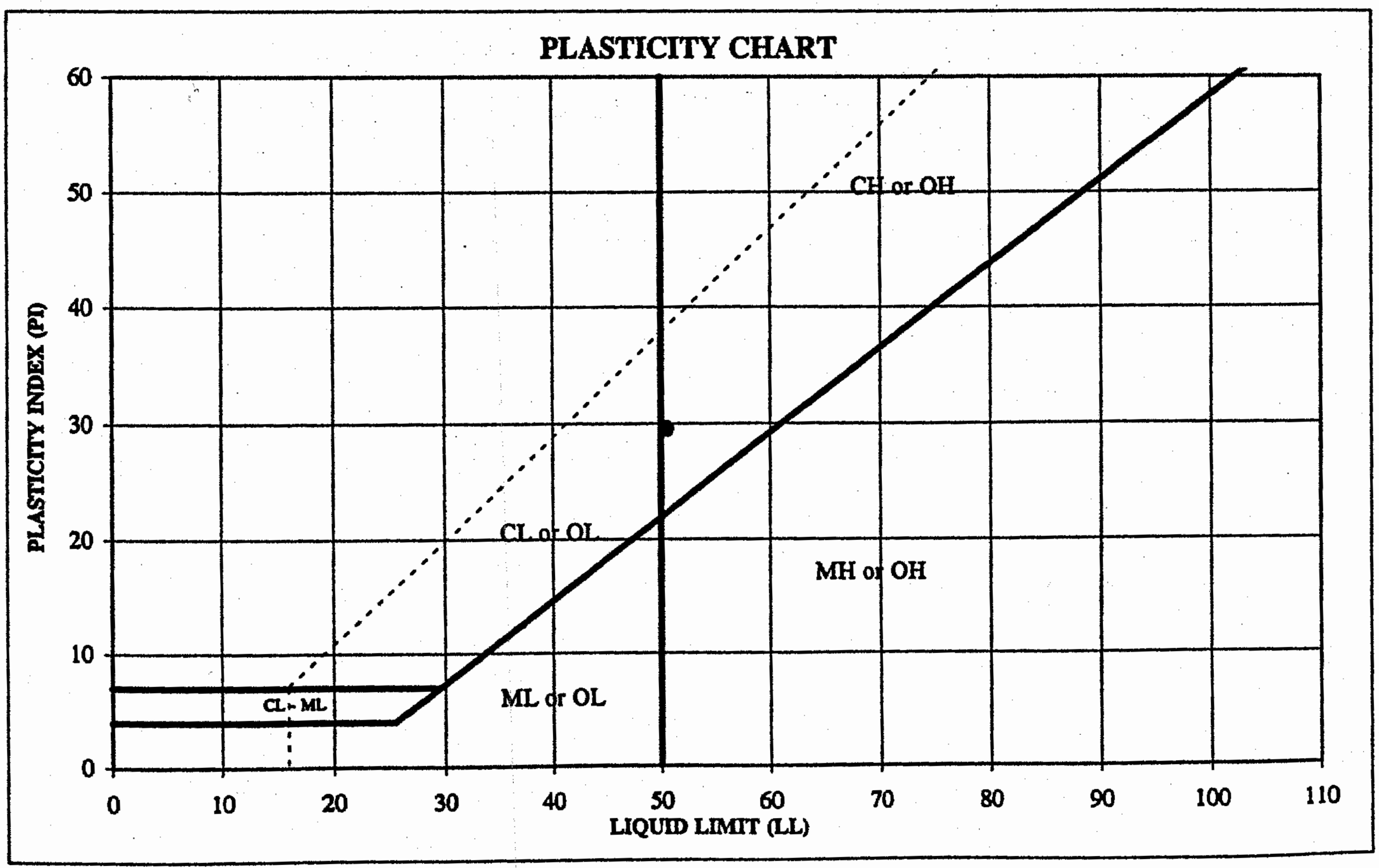
PLASTICITY INDEX (PI): 30

LIQUIDITY INDEX (LI): 0.22

NOTE:

DESCRIPTION Brown, SILTY CLAY, little medium to fine sand.

USCS CH



TECH	TJ
DATE	5/8/01
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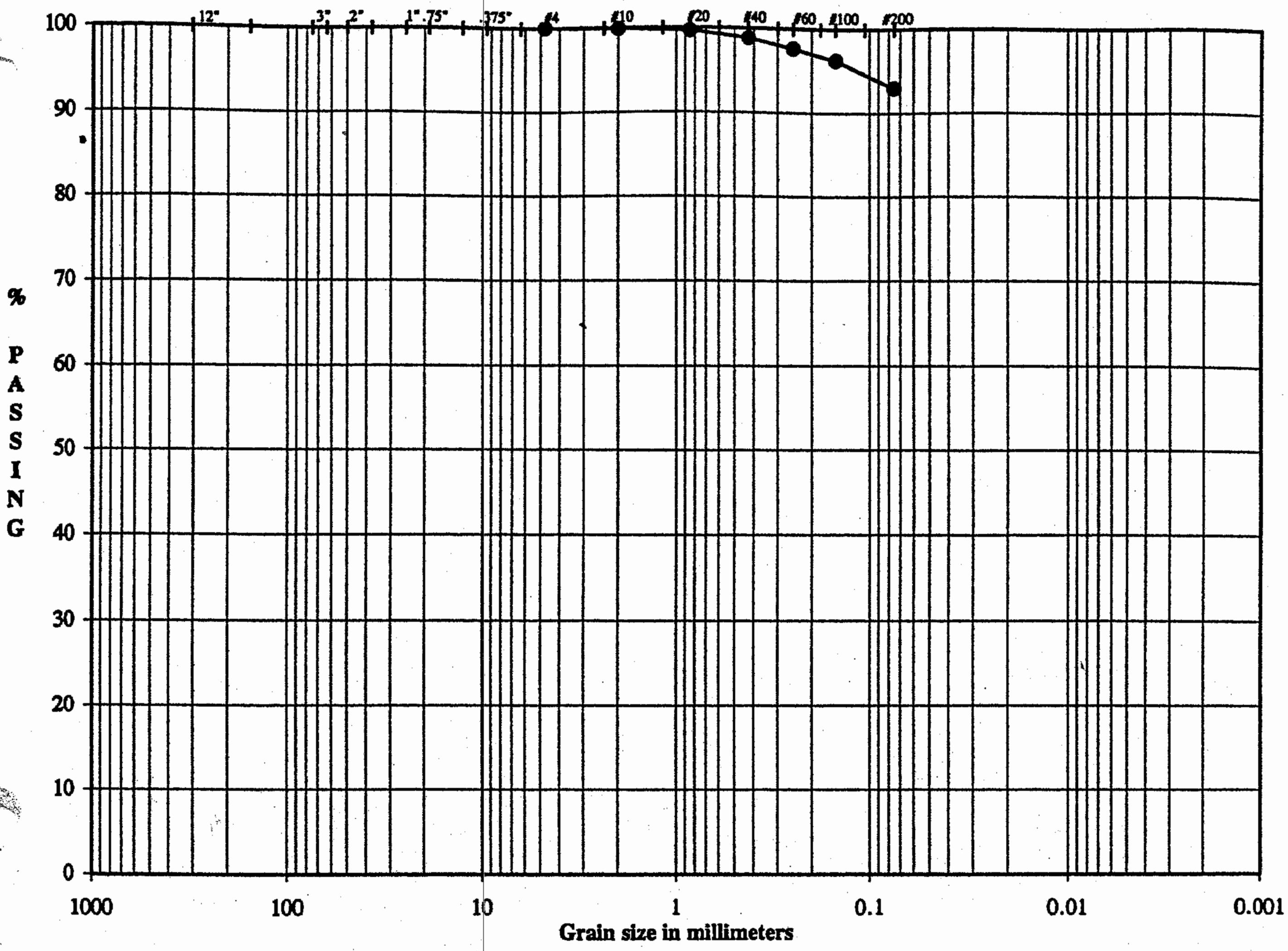
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



<table>
<tr><td rowspan="2">Boulders</td><td rowspan="2">Cobbles</td><td>Coarse</td><td>Fine</td><td>Cor</td><td>Med</td><td>Fine</td><td>SILT OR CLAY</td></tr>
<tr><td colspan="2">Gravel</td><td colspan="3">SAND</td><td>FINES</td></tr>
</table>

SAMPLE ID	B-14
SAMPLE TYPE	Bag
SAMPLE DEPTH	9.0 - 10.0'

LL	51
PL	21
PI	30

DESCRIPTION Brown, SILTY CLAY, little medium to fine sand.

USCS CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-14	-
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag	
REMARKS		**SAMPLE DEPTH**	9.0 - 10.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	397.66
Wt Dry Soil & Tare (gm)	(w2)	330.75
Weight of Tare (gm)	(w3)	84.24
Weight of Water (gm)	(w4=w1-w2)	66.91
Weight of Dry Soil (gm)	(w5=w2-w3)	246.51
Moisture Content (%)	(w4/w5)*100	27.14

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	330.75
	Tare Weight (gm)	84.24
(W6)	Total Dry Weight (gm)	246.51

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.23	0.23	0.09	99.91	#10	medium sand
#20	0.85	0.85	0.34	99.66	#20	medium sand
#40	2.89	2.89	1.17	98.83	#40	fine sand
#60	5.90	5.90	2.39	97.61	#60	fine sand
#100	9.23	9.23	3.74	96.26	#100	fine sand
#200	17.33	17.33	7.03	92.97	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.09
% M SAND	1.08
% F SAND	5.86
% FINES	92.97
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	51
PL	21
PI	30
Gs	-

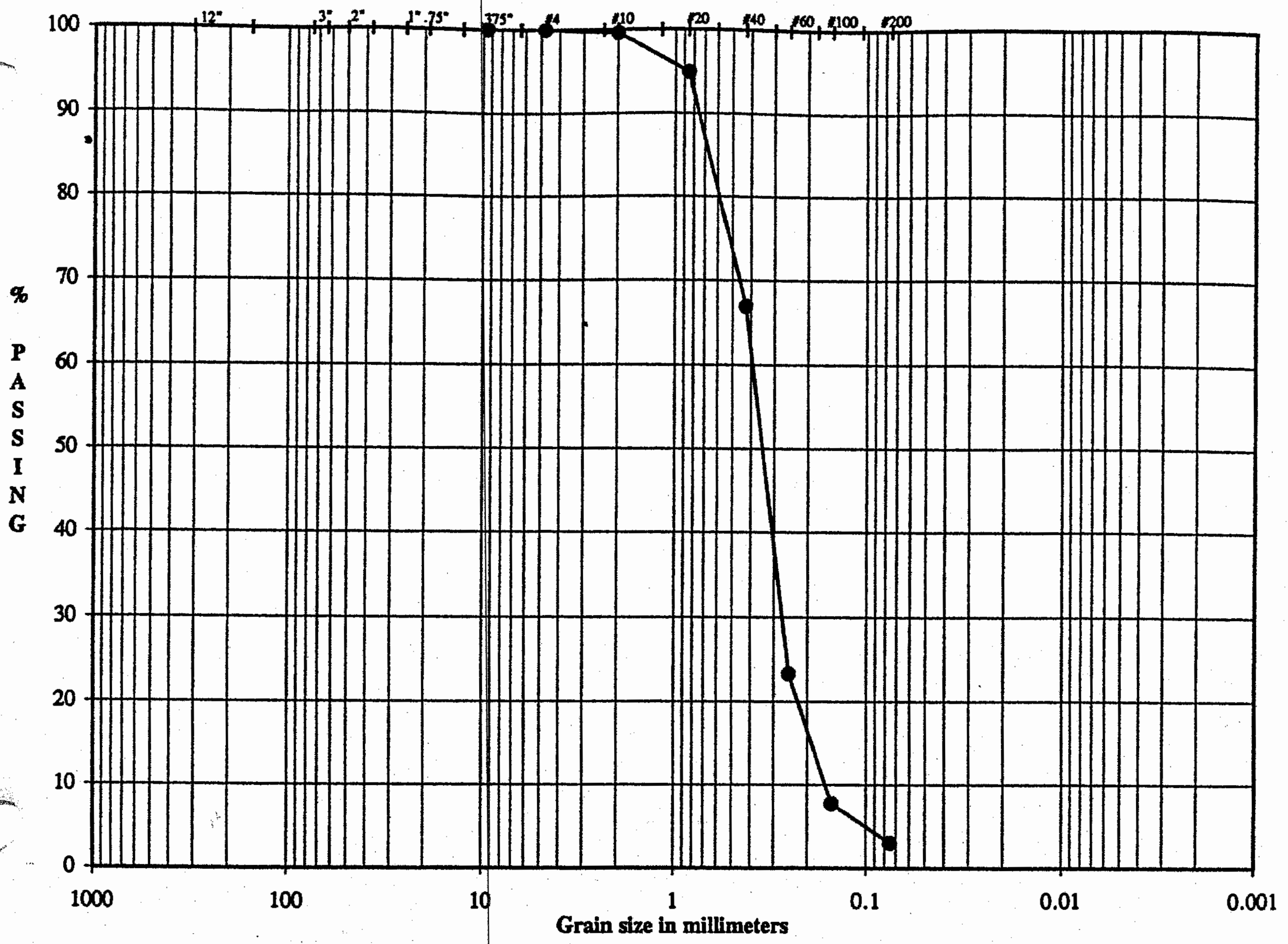
DESCRIPTION Brown, SILTY CLAY, little medium to fine sand.

USCS CH

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID B-14
SAMPLE TYPE Bag
SAMPLE DEPTH 14.0 - 20.0'

LL -
PL -
PI -

DESCRIPTION Brown, MEDIUM TO FINE SAND, trace silt, trace fine gravel.

USCS (SP)

Cu = D60/D10 = 0.3/0.16 = 1.88 < 6
Cc = D30^2/(D60*D10) = 0.28^2/(0.3*0.16) = 1.63 > 1

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH JC/TJ
DATE 5/1/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-14	-
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag	
REMARKS		**SAMPLE DEPTH**	14.0 - 20.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	505.15
Wt Dry Soil & Tare (gm)	(w2)	488.40
Weight of Tare (gm)	(w3)	85.10
Weight of Water (gm)	(w4=w1-w2)	16.75
Weight of Dry Soil (gm)	(w5=w2-w3)	403.30
Moisture Content (%)	(w4/w5)*100	4.15

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	488.40
	Tare Weight (gm)	85.10
(W6)	Total Dry Weight (gm)	403.30

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"	0.00	0.00	0.00	100.00	0.375"	fine gravel
#4	0.15	0.15	0.04	99.96	#4	coarse sand
#10	1.62	1.62	0.40	99.60	#10	medium sand
#20	20.54	20.54	5.09	94.91	#20	medium sand
#40	133.47	133.47	33.09	66.91	#40	fine sand
#60	309.24	309.24	76.68	23.32	#60	fine sand
#100	372.25	372.25	92.30	7.70	#100	fine sand
#200	391.42	391.42	97.05	2.95	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.04
% C SAND	0.36
% M SAND	32.69
% F SAND	63.96
% FINES	2.95
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	-
PL	-
PI	-
Gs	-

DESCRIPTION Brown, MEDIUM TO FINE SAND, trace silt, trace fine gravel.

USCS (SP)

TECH	JC/TJ
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-15 - **SAMPLE DEPTH:** 4.0 - 5.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

* Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION	
Number of Blows				23	23
Weight of Wet Soil & Tare (gm)	22.21	21.47	21.35	19.56	22.62
Weight of Dry Soil & Tare (gm)	20.17	19.51	19.58	14.84	17.68
Weight of Tare (gm)	11.31	10.99	11.76	4.24	6.62
Weight of Water (gm)	2.04	1.96	1.77	4.72	4.94
Weight of Dry Soil (gm)	8.86	8.52	7.82	10.60	11.06
Water Content %	23.02	23.00	22.63	44.53	44.67

	TRIAL 1	TRIAL 2
BLOWS:	23	23
K VALUE:	0.99	0.99

NATURAL MOISTURE

359.01
290.69
75.24
68.32
215.45
31.71

PLASTIC LIMIT (PL): 23

LIQUID LIMIT (LL): 44

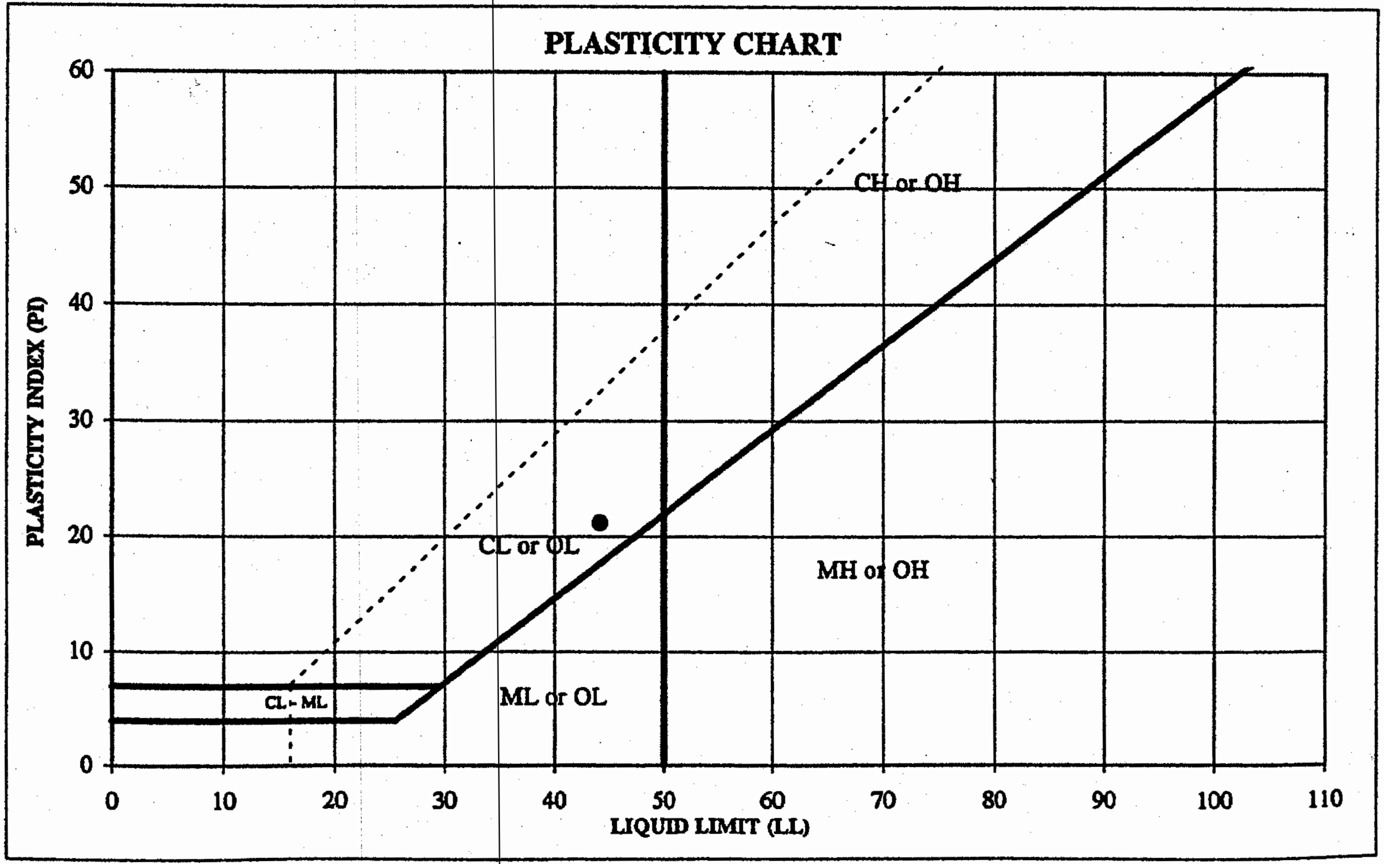
PLASTICITY INDEX (PI): 21

LIQUIDITY INDEX (LI): 0.42

NOTE:

DESCRIPTION: Brown, SILTY CLAY, little fine sand.

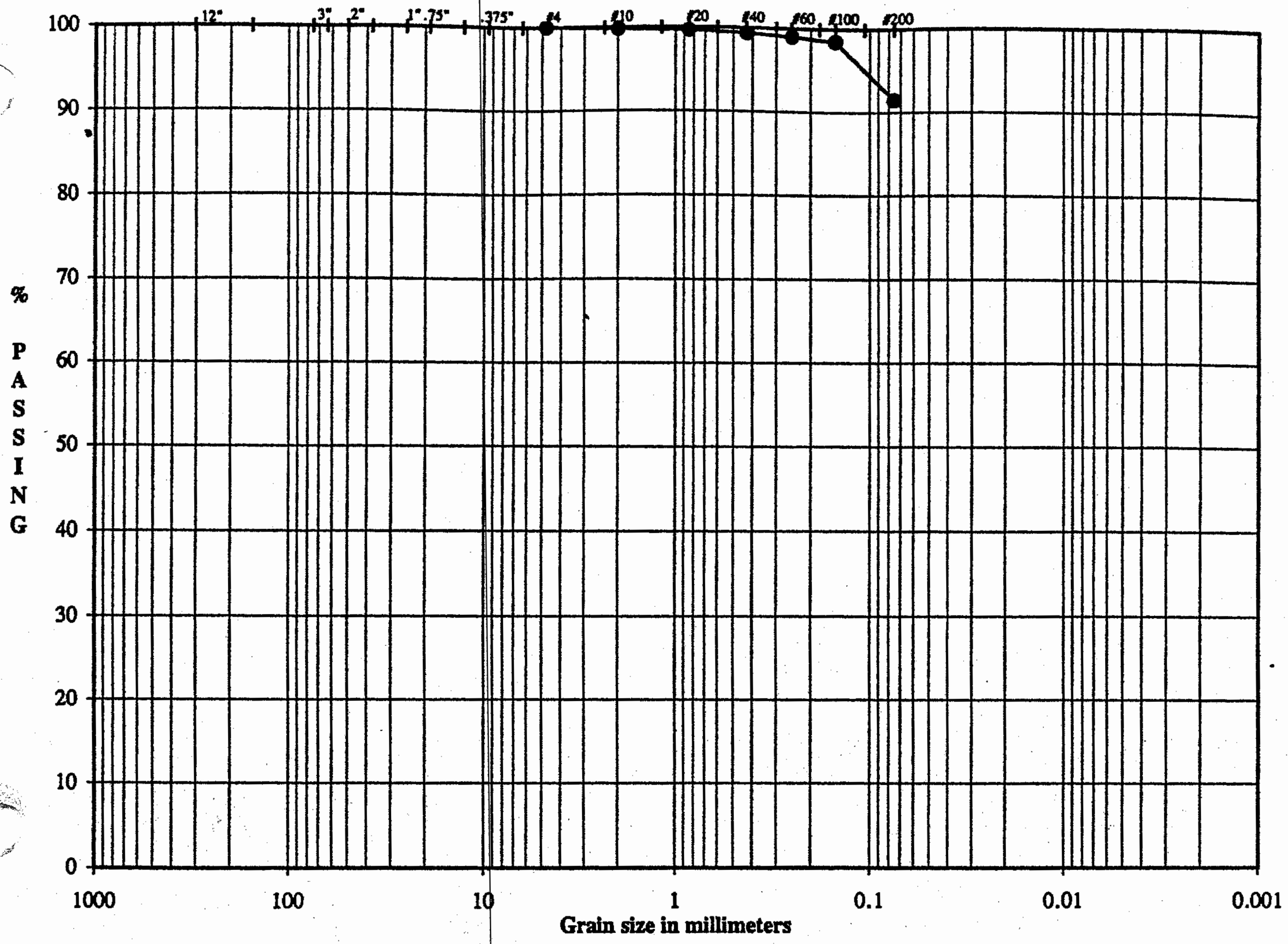
USCS: CL


PLASTICITY CHART

TECH: DH
DATE: 5/3/01
CHECK:
REVIEW:

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID B-15
SAMPLE TYPE Bag
SAMPLE DEPTH 4.0 - 5.0'

LL 44
PL 23
PI 21

DESCRIPTION Brown, SILTY CLAY, little fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH SW
DATE 5/1/01
CHECK
REVIEW

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-15 / -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	4.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	359.01
Wt Dry Soil & Tare (gm)	(w2)	290.69
Weight of Tare (gm)	(w3)	75.24
Weight of Water (gm)	(w4=w1-w2)	68.32
Weight of Dry Soil (gm)	(w5=w2-w3)	215.45
Moisture Content (%)	(w4/w5)*100	31.71

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	290.69
	Tare Weight (gm)	75.24
(W6)	Total Dry Weight (gm)	215.45

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.43	0.43	0.20	99.80	#10	medium sand
#20	0.83	0.83	0.39	99.61	#20	medium sand
#40	1.46	1.46	0.68	99.32	#40	fine sand
#60	2.16	2.16	1.00	99.00	#60	fine sand
#100	3.29	3.29	1.53	98.47	#100	fine sand
#200	18.36	18.36	8.52	91.48	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.20
% M SAND	0.48
% F SAND	7.84
% FINES	91.48
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	44
PL	23
PI	21
Gs	-

DESCRIPTION	Brown, SILTY CLAY, little fine sand.
USCS	CL

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-17 - **SAMPLE DEPTH:** 9.0 - 10.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

* Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				28	28	
Weight of Wet Soil & Tare (gm)	22.34	21.36	20.16	17.51	17.07	358.29
Weight of Dry Soil & Tare (gm)	19.62	18.97	18.06	11.69	11.49	282.74
Weight of Tare (gm)	11.24	11.41	11.38	4.24	4.28	84.67
Weight of Water (gm)	2.72	2.39	2.10	5.82	5.58	75.55
Weight of Dry Soil (gm)	8.38	7.56	6.68	7.45	7.21	198.07
Water Content %	32.46	31.61	31.44	78.12	77.39	38.14

	TRIAL 1	TRIAL 2
BLOWS:	28	28
K VALUE:	1.014	1.014

PLASTIC LIMIT (PL): 32

LIQUID LIMIT (LL): 79

PLASTICITY INDEX (PI): 47

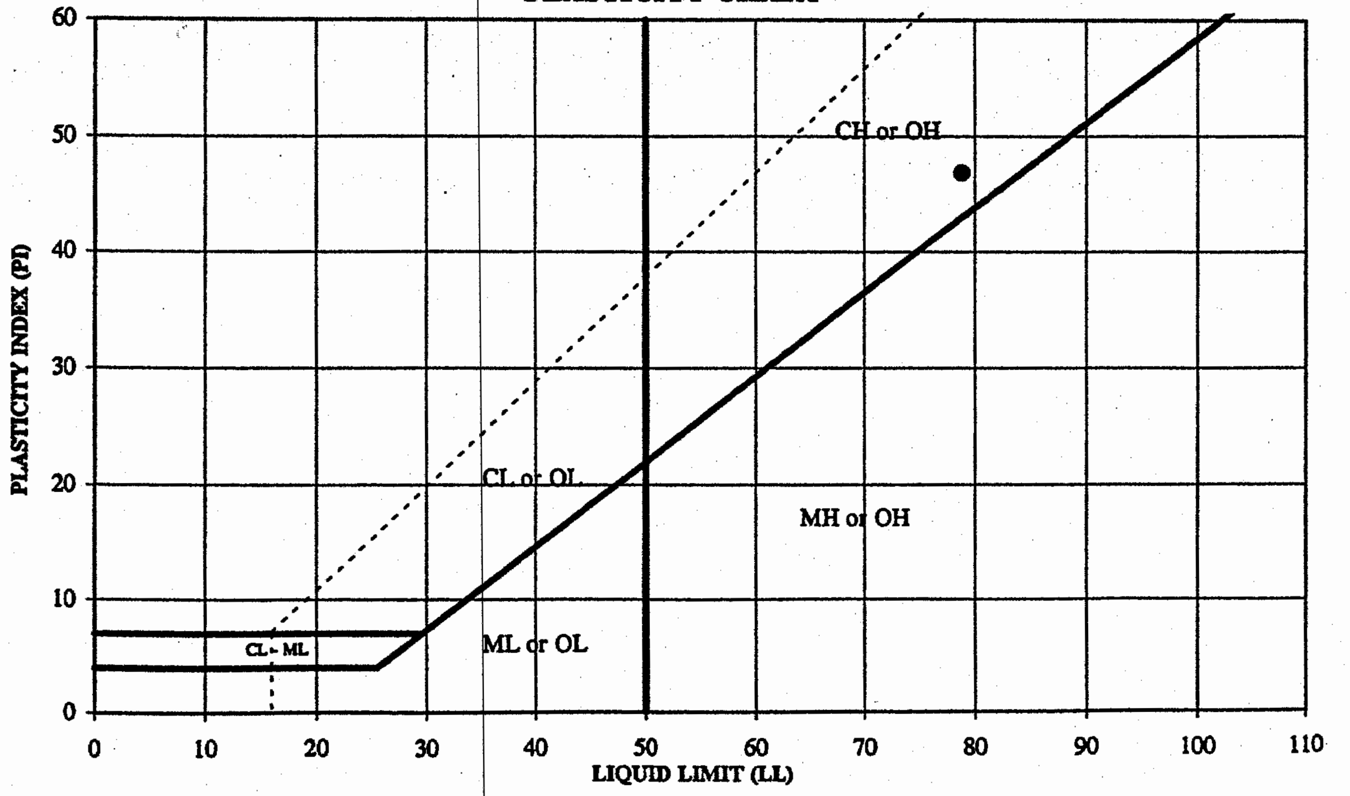
LIQUIDITY INDEX (LI): 0.13

NOTE:

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

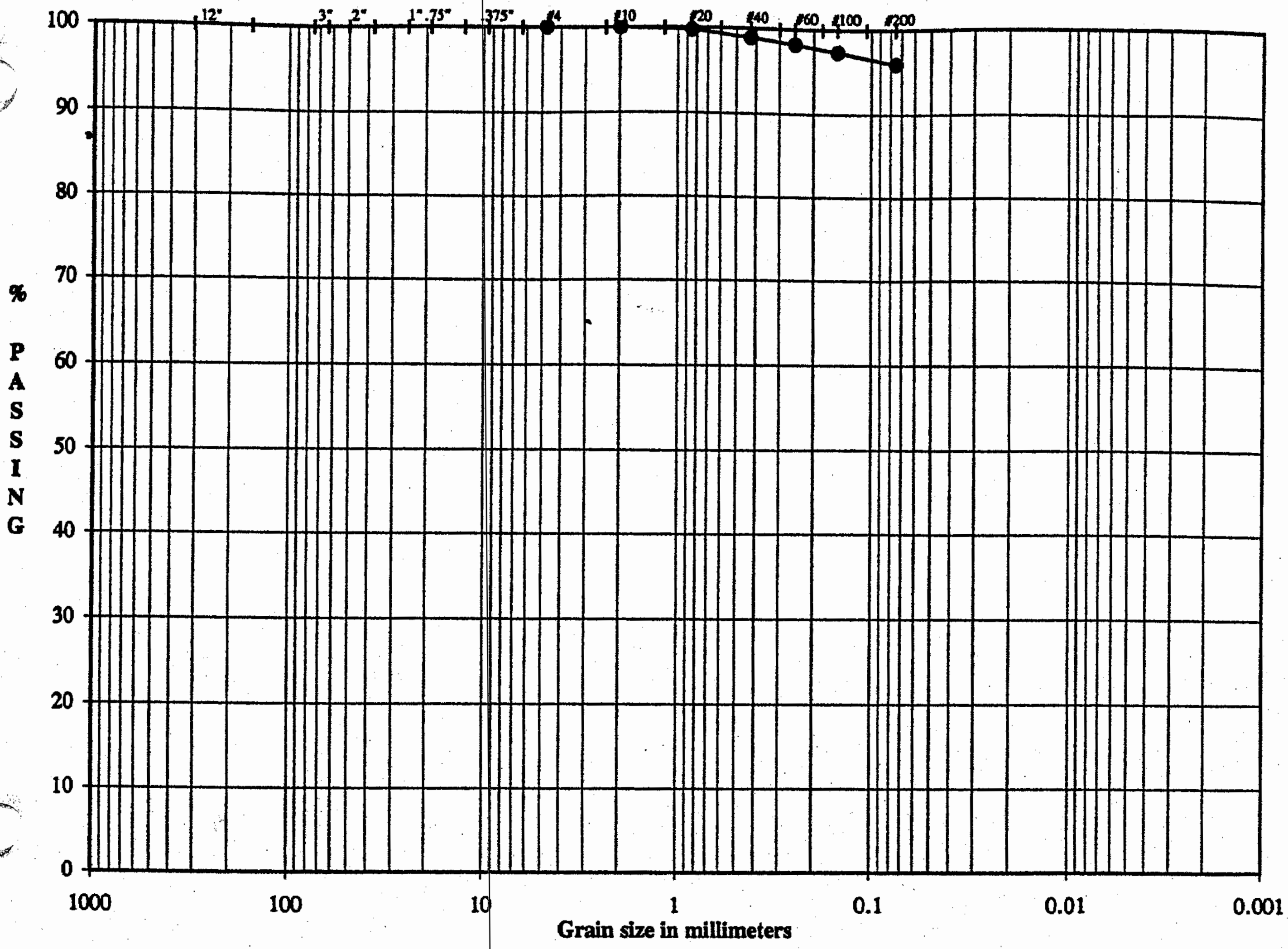
PLASTICITY CHART



TECH DH
DATE 5/3/01
CHECK
REVIEW

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-17
SAMPLE TYPE	Bag
SAMPLE DEPTH	9.0 - 10.0'

LL	79
PL	32
PI	47

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CH

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	PWM

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-17	-
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag	
REMARKS		**SAMPLE DEPTH**	9.0 - 10.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	358.21
Wt Dry Soil & Tare (gm)	(w2)	282.74
Weight of Tare (gm)	(w3)	84.67
Weight of Water (gm)	(w4=w1-w2)	75.47
Weight of Dry Soil (gm)	(w5=w2-w3)	198.07
Moisture Content (%)	(w4/w5)*100	38.10

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	282.74
	Tare Weight (gm)	89.67
(W6)	Total Dry Weight (gm)	193.07

SIEVE ANALYSIS

Tare Weight

0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.02	0.02	0.01	99.99	#10	medium sand
#20	0.56	0.56	0.29	99.71	#20	medium sand
#40	2.18	2.18	1.13	98.87	#40	fine sand
#60	3.51	3.51	1.82	98.18	#60	fine sand
#100	5.10	5.10	2.64	97.36	#100	fine sand
#200	7.78	7.78	4.03	95.97	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.01
% M SAND	1.12
% F SAND	2.90
% FINES	95.97
% TOTAL	100.00

Descriptive Terms	
trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	79
PL	32
PI	47
Gs	-

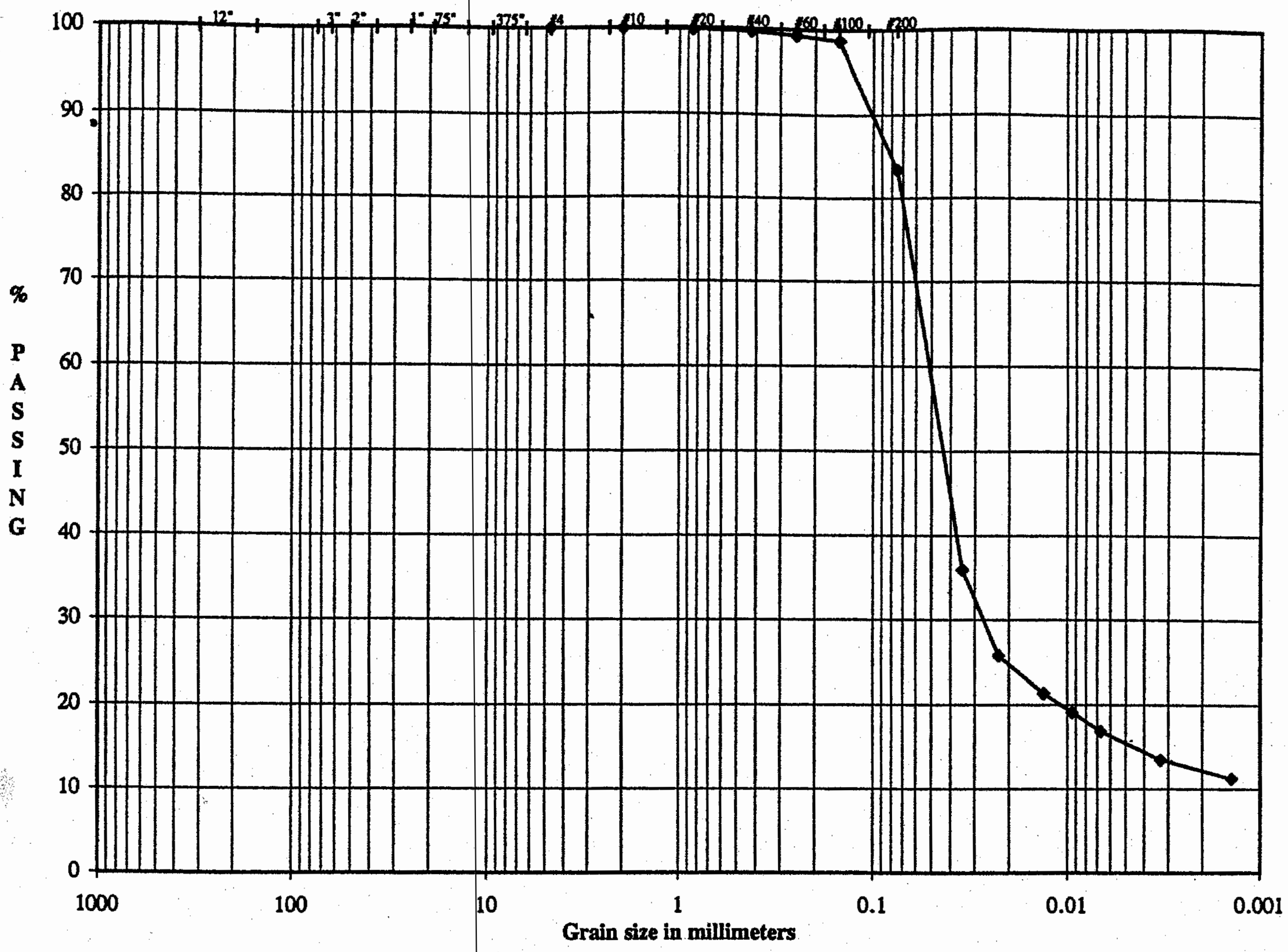
DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CH

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID	B-1	-
SAMPLE TYPE	Bag	
SAMPLE DEPTH	14.0 - 20.0'	

LL	-
PL	-
PI	-

DESCRIPTION Brown, SILTY CLAY, some fine sand.

USCS (CL)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	TJ
DATE	5/24/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM C117, C136, D421, D422, D1140 and D2217

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	SAMPLE ID	B-1 | -
OJECT NO.	013-3205	SAMPLE TYPE	Bag
		SAMPLE DEPTH	14.0 - 20.0'

AS RECEIVED WATER CONTENT

Tare No.		
Wt. Wet Soil & Tare (gm)	(W1)	
Wt. Dry Soil & Tare (gm)	(W2)	
Weight of Tare (gm)	(W3)	
Weight of Water (gm)	(W4=W1-W2)	
Weight of Dry Soil (gm)	(W5=W2-W3)	
Moisture Content (%)	(W4/W5)*100	

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	45.44
Dry Soil & Tare (gm)	37.47
Tare Weight (gm)	3.24
Moisture Content (%)	23.28

Total Weight of Sample Used For Sieve Analysis Corrected For Hygroscopic Moisture

Weight + Tare, Before Separating On The #4 Sieve (gm)	935.83	
Tare Weight (gm)	220.32	
Total Weight (gm)	580.38	(W6)

Plus #4 Material Sieve

TARE WEIGHT 0.00

	(Wt+Tare)	(((Wt-Tare)/W6)*100)	%PASSING		
12.0"				12.0"	cobbles
3.0"				3.0"	coarse gravel
2.5"				2.5"	coarse gravel
2.0"				2.0"	coarse gravel
1.5"				1.5"	coarse gravel
1.0"				1.0"	coarse gravel
0.75"				0.75"	fine gravel
0.50"				0.50"	fine gravel
0.375"				0.375"	fine gravel
#4	0.00	0.0	100.0	#4	coarse sand

HYDROMETER ANALYSIS

Specific Gravity	(assumed)	2.650
Specific Gravity	(tested)	
Amount Dispersing Agent (ml)		125.00
Dispersion Device		Mechanical
h of Dispersion Period		1 Minute

Weight of Sample Used For Hydrometer Test

Weight of Sample Wet or Dry (gm)	54.92
Calculated Dry Wt. used in test (gm)	44.55
Hydrometer Bulb Number	624378
% Pass #4 Sieve For Whole Sample	100.00

TARE WEIGHT 0.00

HYDROMETER BACKSIEVE (Percent Passing #10 - #200 Sieves)

	(Wt+Tare)	Cumul Wt. Retained	% PASSING		
#10	0.05	0.05	99.9	#10	medium sand
#20	0.10	0.10	99.8	#20	medium sand
#40	0.15	0.15	99.7	#40	fine sand
#60	0.31	0.31	99.3	#60	fine sand
#100	0.56	0.56	98.7	#100	fine sand
#200	7.42	7.42	83.3	#200	fines

HYDROMETER CALCULATIONS

DATE 5/29/01	TIME 13:36	ET (min)	READING R	TEMP T	TEMP.COR. K	HYD.COR. Cc	READING C	EFFECTIVE LENGTH	A
5/29/01	13:38	2.00	21.5	22.50	0.013	5.50	16.00	13.7	1.00
5/29/01	13:41	5.00	17.0	22.50	0.013	5.50	11.50	14.5	1.00
5/29/01	13:51	15.00	15.0	22.50	0.013	5.50	9.50	14.8	1.00
5/29/01	14:06	30.00	14.0	22.50	0.013	5.50	8.50	15.0	1.00
5/29/01	14:36	60.00	13.0	22.00	0.013	5.50	7.50	15.2	1.00
5/29/01	17:46	250.00	11.5	22.00	0.013	5.50	6.00	15.3	1.00
5/30/01	13:36	1440.00	10.5	21.50	0.014	5.50	5.00	15.5	1.00

GRAIN SIZE PERCENTAGES

Particle Diameter	% PASSING		
0.0348	35.9	% COBBLES	0.00
0.0226	25.8	% COARSE GRAVEL	0.00
0.0132	21.3	% FINE GRAVEL	0.00
0.0094	19.1	% COARSE SAND	0.11
0.0067	16.8	% MEDIUM SAND	0.22
0.0033	13.5	% FINE SAND	16.32
0.0014	11.2	% FINES	83.34
		% TOTAL SAMPLE	100.00

Description Brown, SILTY CLAY, some fine sand.

USCS (CL)

-	LL
-	PL
-	PI

TECH	TJ
DATE	5/24/01
CHECK	
REVIEW	

Golder Associates Inc.

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-2 - **SAMPLE DEPTH:** 4.0 - 5.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				25	25	
Weight of Wet Soil & Tare (gm)	21.28	22.39	21.48	22.22	23.05	245.78
Weight of Dry Soil & Tare (gm)	19.50	20.42	19.62	16.48	17.75	180.37
Weight of Tare (gm)	11.39	11.58	11.42	4.33	6.64	8.36
Weight of Water (gm)	1.78	1.97	1.86	5.74	5.30	65.41
Weight of Dry Soil (gm)	8.11	8.84	8.20	12.15	11.11	172.01
Water Content %	21.95	22.29	22.68	47.24	47.70	38.03

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

PLASTIC LIMIT (PL) 22

LIQUID LIMIT (LL) 47

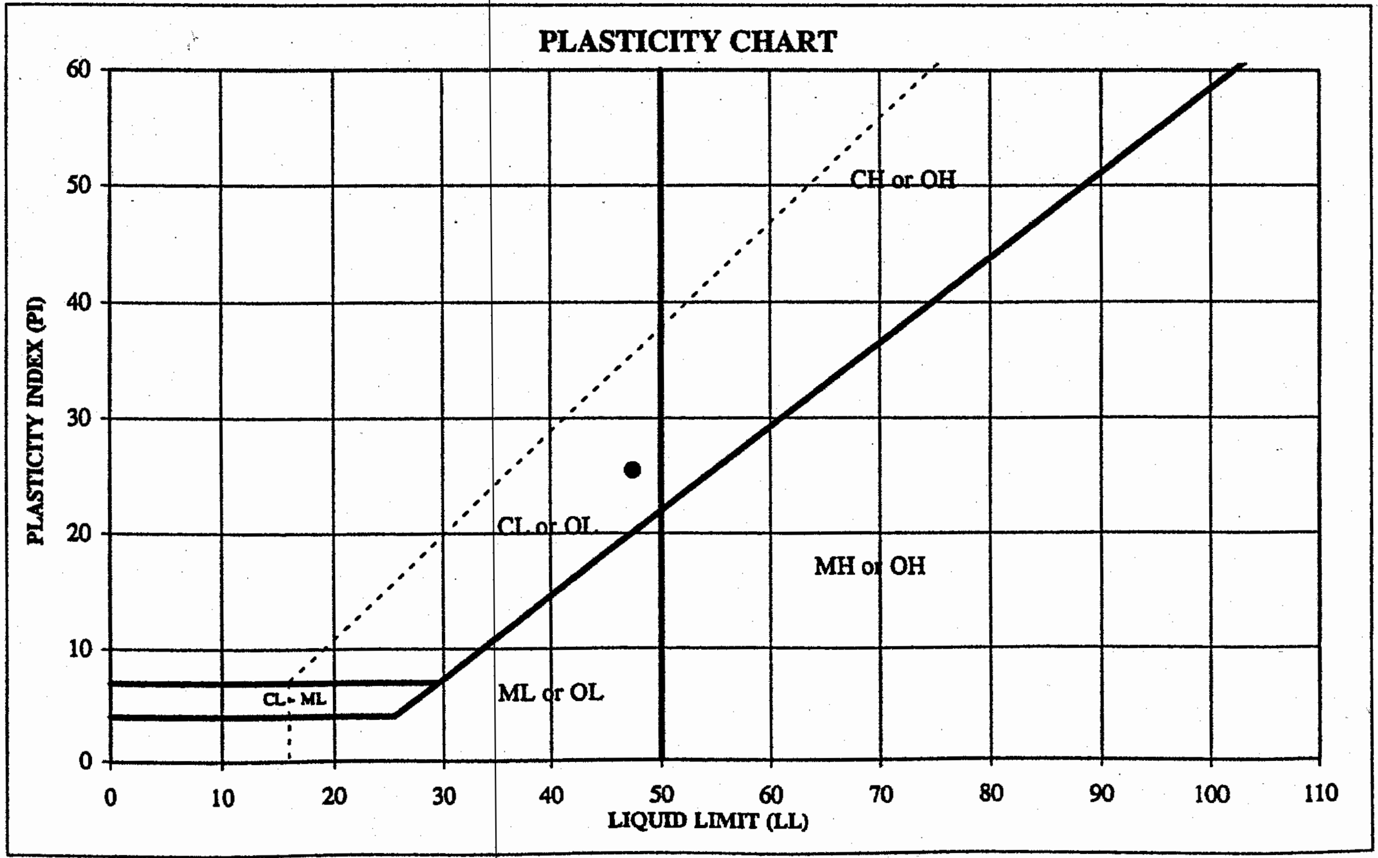
PLASTICITY INDEX (PI) 25

LIQUIDITY INDEX (LI) 0.62

NOTE:

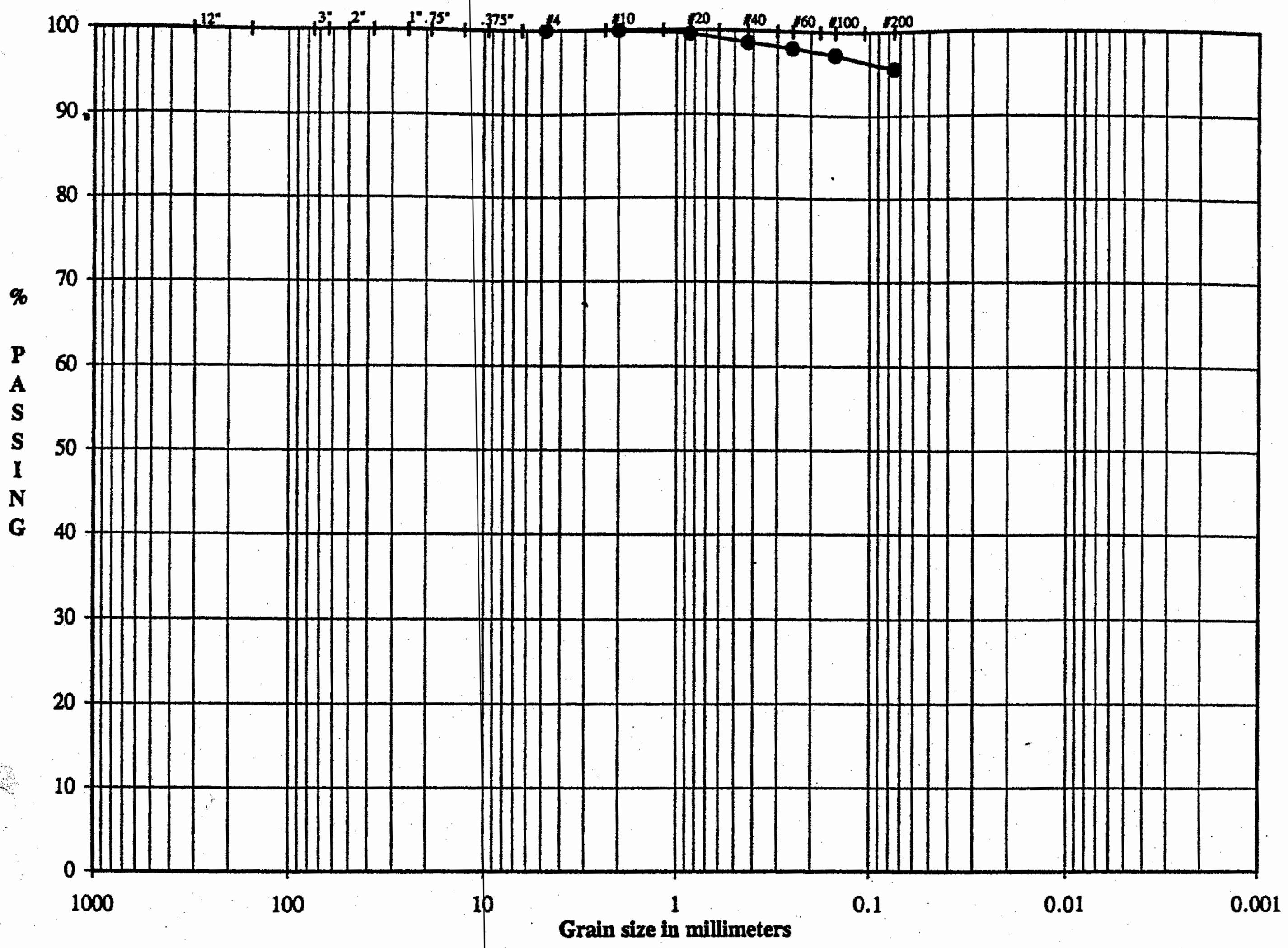
DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CL



TECH DR
DATE 5/8/01
CHECK
REVIEW

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-2
SAMPLE TYPE	Bag
SAMPLE DEPTH	4.0 - 5.0'

LL	47
PL	22
PI	25

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-2 -
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag
REMARKS		**SAMPLE DEPTH**	4.0 - 5.0'

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	245.78
Wt Dry Soil & Tare (gm)	(w2)	180.37
Weight of Tare (gm)	(w3)	8.36
Weight of Water (gm)	(w4=w1-w2)	65.41
Weight of Dry Soil (gm)	(w5=w2-w3)	172.01
Moisture Content (%)	(w4/w5)*100	38.03

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

	Weight Of Sample (gm)	180.37
	Tare Weight (gm)	8.36
(W6)	Total Dry Weight (gm)	172.01

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.18	0.18	0.10	99.90	#10	medium sand
#20	0.82	0.82	0.48	99.52	#20	medium sand
#40	2.44	2.44	1.42	98.58	#40	fine sand
#60	3.45	3.45	2.01	97.99	#60	fine sand
#100	4.73	4.73	2.75	97.25	#100	fine sand
#200	7.61	7.61	4.42	95.58	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.10
% M SAND	1.31
% F SAND	3.01
% FINES	95.58
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	47
PL	22
PI	25
Gs	-

DESCRIPTION Brown, SILTY CLAY, trace medium to fine sand.

USCS CL

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-5 - **SAMPLE DEPTH:** 9.0 - 10.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				26	26	
Weight of Wet Soil & Tare (gm)	21.32	22.51	20.99	25.29	24.21	15.48
Weight of Dry Soil & Tare (gm)	19.50	20.38	19.24	18.50	17.85	12.40
Weight of Tare (gm)	11.83	11.40	11.80	6.73	6.74	3.25
Weight of Water (gm)	1.82	2.13	1.75	6.79	6.36	3.08
Weight of Dry Soil (gm)	7.67	8.98	7.44	11.77	11.11	9.15
Water Content %	23.73	23.72	23.52	57.69	57.25	33.66

	TRIAL 1	TRIAL 2
BLOWS:	26	26
K VALUE:	1.005	1.005

PLASTIC LIMIT (PL) 24

LIQUID LIMIT (LL) 58

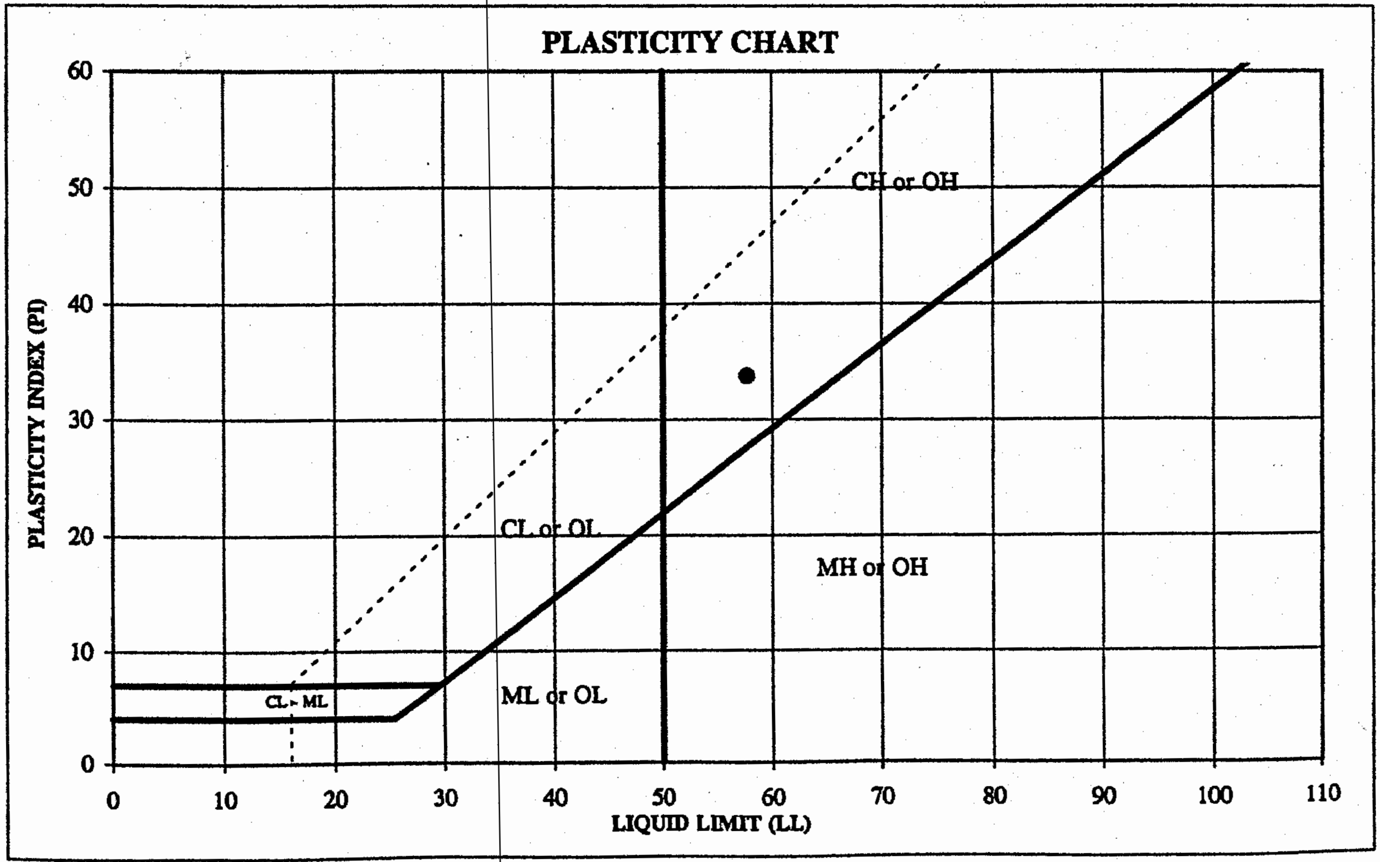
PLASTICITY INDEX (PI) 34

LIQUIDITY INDEX (LI) 0.30

NOTE:

DESCRIPTION Brown, SILTY CLAY, trace fine sand.

USCS (CH)



TECH	DR
DATE	5/9/01
CHECK	
REVIEW	

ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-5 - **SAMPLE DEPTH:** 24.0 - 25.0'
SAMPLE TYPE: Bag

SAMPLE PREBARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				10	10	
Weight of Wet Soil & Tare (gm)	22.32	22.45	22.80	23.03	24.10	24.13
Weight of Dry Soil & Tare (gm)	20.92	21.13	21.32	20.42	21.30	20.93
Weight of Tare (gm)	11.44	11.85	11.45	4.29	4.29	3.17
Weight of Water (gm)	1.40	1.32	1.48	2.61	2.80	3.20
Weight of Dry Soil (gm)	9.48	9.28	9.87	16.13	17.01	17.76
Water Content %	14.77	14.26	14.99	16.18	16.46	18.02

PLASTIC LIMIT (PL) NP

LIQUID LIMIT (LL) NP

PLASTICITY INDEX (PI) NP

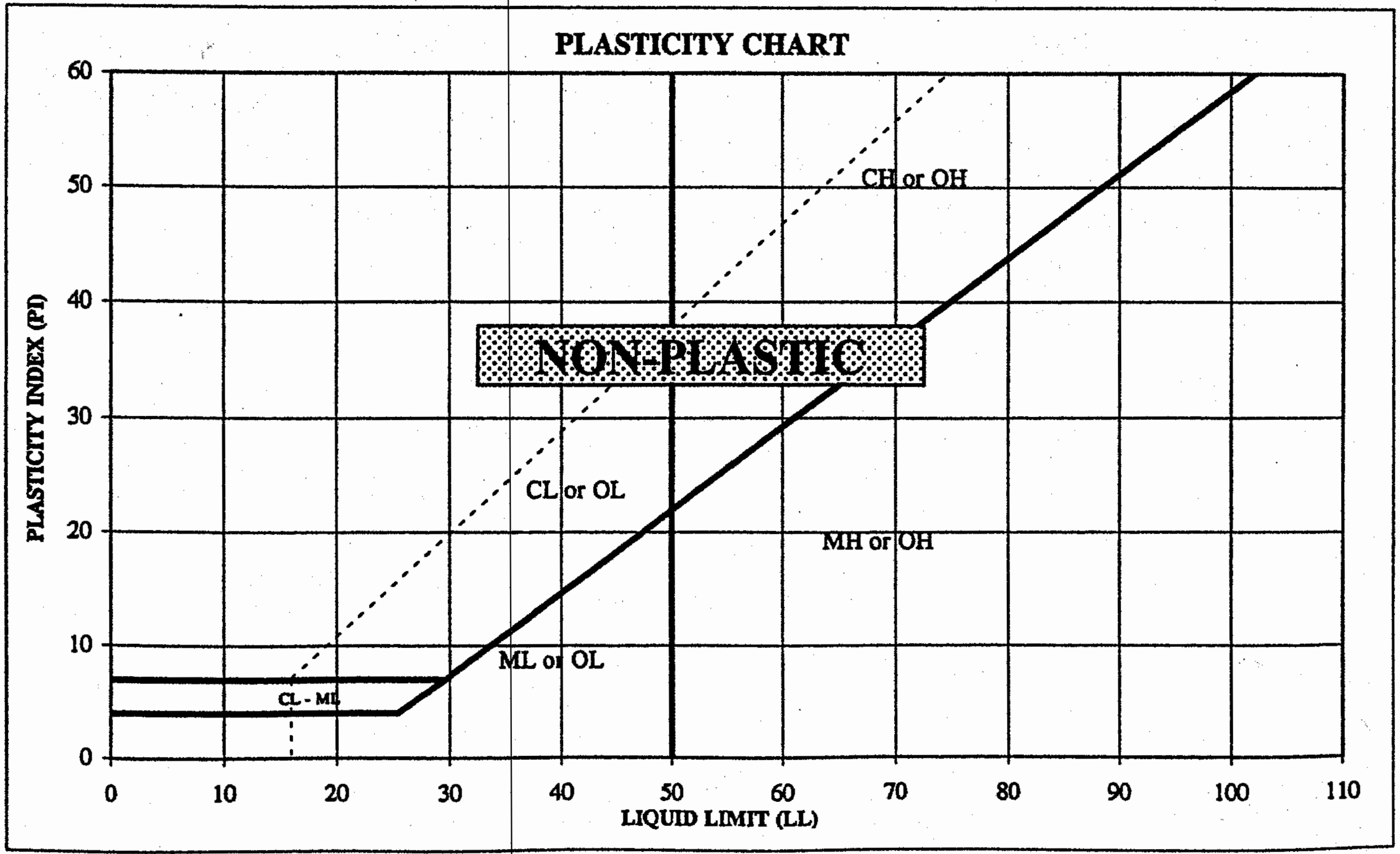
LIQUIDITY INDEX (LI) NP

NOTE:

DESCRIPTION Brown, FINE SAND, some clayey silt.

USCS (SM)

PLASTICITY CHART



TECH DR
DATE 5/10/01
CHECK
REVIEW

ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME:	GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER:	013-3205
SAMPLE ID:	B-5 -
SAMPLE TYPE:	Bag

SAMPLE DEPTH: 79.0 - 80.0'

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION	
Number of Blows				25	25
Weight of Wet Soil & Tare (gm)	16.17	16.65	15.86	18.99	18.99
Weight of Dry Soil & Tare (gm)	15.57	15.91	15.26	15.86	15.86
Weight of Tare (gm)	11.85	11.33	11.48	4.30	4.30
Weight of Water (gm)	0.60	0.74	0.60	3.13	3.13
Weight of Dry Soil (gm)	3.72	4.58	3.78	11.56	11.56
Water Content %	16.13	16.16	15.87	27.08	27.08

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

NATURAL MOISTURE

PLASTIC LIMIT (PL): 16

LIQUID LIMIT (LL): 27

PLASTICITY INDEX (PI): 11

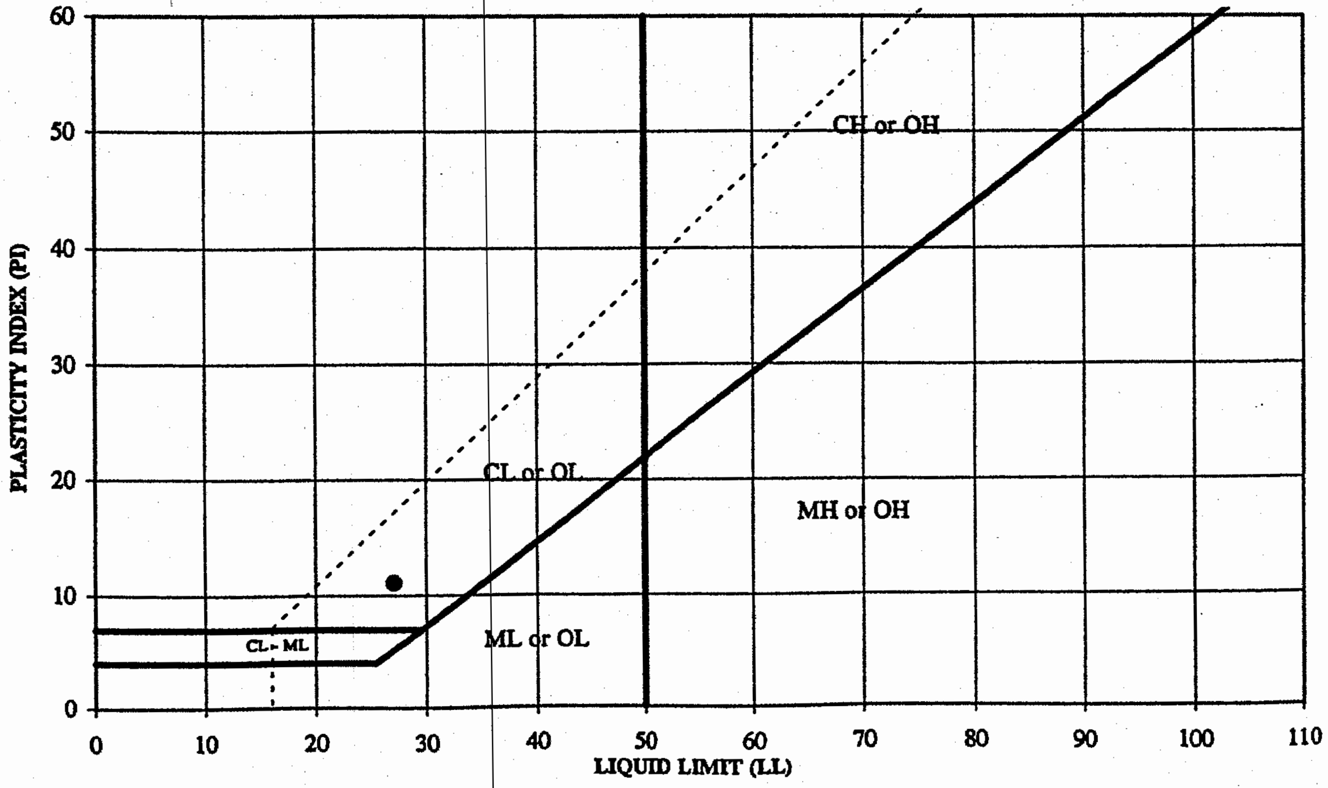
LIQUIDITY INDEX (LI):

NOTE: *Not enough sample to run moisture content.*

DESCRIPTION Brown, SILTY CLAY, some fine sand.

USCS (CL)

PLASTICITY CHART



TECH	DR
DATE	5/10/01
CHECK	
REVIEW	

Golder Associates Inc.

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: GENESIS/PLUM POINT ENERGY/AR
PROJECT NUMBER: 013-3205
SAMPLE ID: B-10 -
SAMPLE DEPTH: 19.0 - 20.0'
SAMPLE TYPE: Bag

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				25	25	
Weight of Wet Soil & Tare (gm)	22.37	21.15	21.59	20.56	18.78	277.82
Weight of Dry Soil & Tare (gm)	20.62	19.54	19.92	16.76	14.82	190.42
Weight of Tare (gm)	11.43	11.33	11.37	6.64	4.32	8.35
Weight of Water (gm)	1.75	1.61	1.67	3.80	3.96	87.40
Weight of Dry Soil (gm)	9.19	8.21	8.55	10.12	10.50	182.07
Water Content %	19.04	19.61	19.53	37.55	37.71	48.00

	TRIAL 1	TRIAL 2
BLOWS:	25	25
K VALUE:	1	1

PLASTIC LIMIT (PL): 19

LIQUID LIMIT (LL): 38

PLASTICITY INDEX (PI): 19

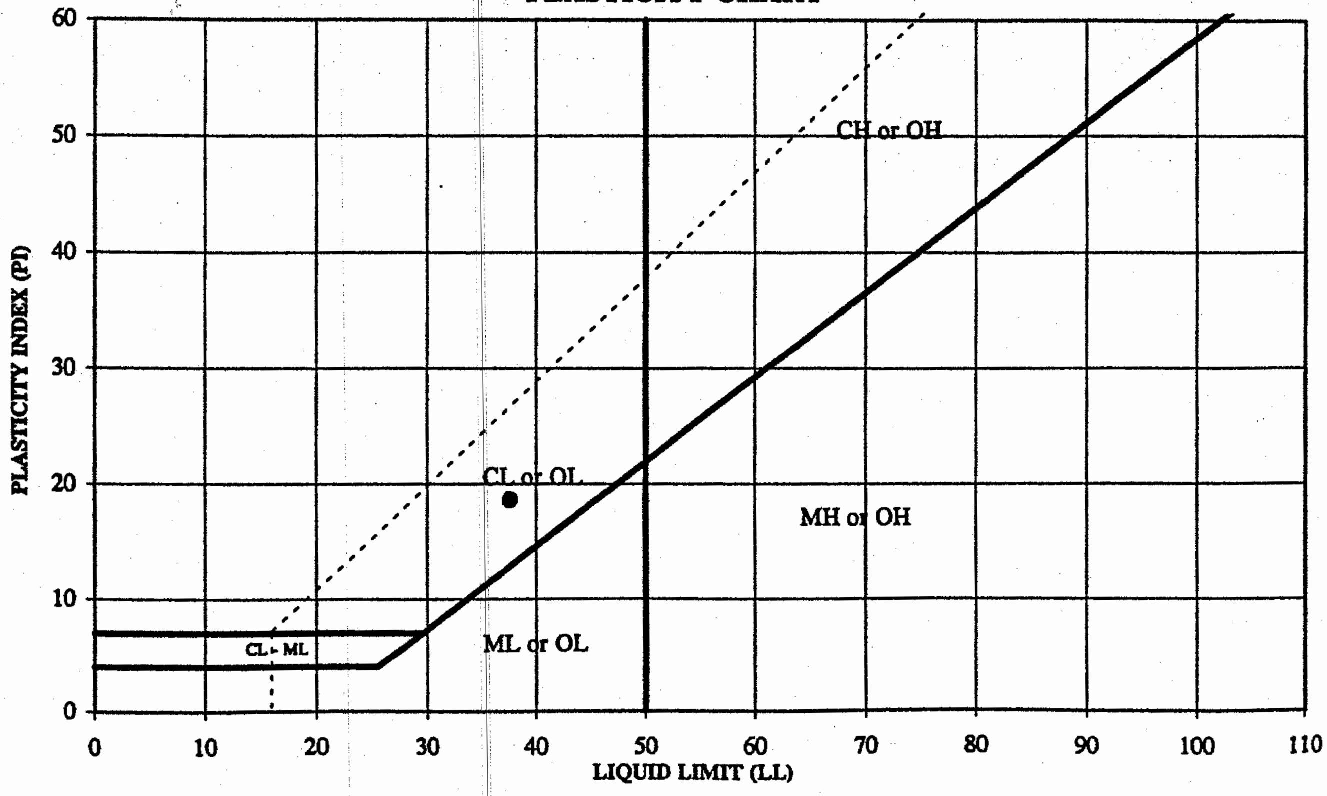
LIQUIDITY INDEX (LI): 1.54

NOTE:

DESCRIPTION: Brown, SILTY CLAY, little fine sand.

USCS: CL

PLASTICITY CHART



TECH: DH
DATE: 3/4/01
CHECK:
REVIEW:

ASTM GRAIN SIZE ANALYSIS
ASTM D 421, D 2217, D 1140, C 117, D 422, C 136

PROJECT TITLE	GENESIS/PLUM POINT ENERGY/AR	**SAMPLE ID**	B-10	-
PROJECT NO.	013-3205	**SAMPLE TYPE**	Bag	
REMARKS		**SAMPLE DEPTH**	19.0 - 20.0'	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	277.82
Wt Dry Soil & Tare (gm)	(w2)	190.42
Weight of Tare (gm)	(w3)	8.35
Weight of Water (gm)	(w4=w1-w2)	87.40
Weight of Dry Soil (gm)	(w5=w2-w3)	182.07
Moisture Content (%)	(w4/w5)*100	48.00

Hygroscopic Moisture For Sieve Sample

Wet Soil & Tare (gm)	
Dry Soil & Tare (gm)	
Tare Weight (gm)	
Moisture Content (%)	

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)	190.42
Tare Weight (gm)	8.35
(W6) Total Dry Weight (gm)	182.07

SIEVE ANALYSIS

Tare Weight: 0.00

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	SIEVE	
12.0"					12.0"	cobbles
3.0"					3.0"	coarse gravel
2.5"					2.5"	coarse gravel
2.0"					2.0"	coarse gravel
1.5"					1.5"	coarse gravel
1.0"					1.0"	coarse gravel
0.75"					0.75"	fine gravel
0.50"					0.50"	fine gravel
0.375"					0.375"	fine gravel
#4	0.00	0.00	0.00	100.00	#4	coarse sand
#10	0.02	0.02	0.01	99.99	#10	medium sand
#20	0.14	0.14	0.08	99.92	#20	medium sand
#40	0.53	0.53	0.29	99.71	#40	fine sand
#60	1.26	1.26	0.69	99.31	#60	fine sand
#100	3.69	3.69	2.03	97.97	#100	fine sand
#200	14.64	14.64	8.04	91.96	#200	fines
PAN					PAN	

% COBBLES	0.00
% C GRAVEL	0.00
% F GRAVEL	0.00
% C SAND	0.01
% M SAND	0.28
% F SAND	7.75
% FINES	91.96
% TOTAL	100.00

Descriptive Terms

trace	0 to 5%
little	5 to 12%
some	12 to 30%
and	30 to 50%

> 10% mostly coarse (c)
> 10% mostly medium (m)
< 10% fine (c-m)
< 10% coarse (m-f)
< 10% coarse and fine (m)
< 10% coarse and medium (f)
> 10% equal amounts each (c-f)

LL	38
PL	19
PI	19
Gs	-

DESCRIPTION Brown, SILTY CLAY, little fine sand.

USCS CL

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES

		Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
Boulders	Cobbles	Gravel		SAND			FINES

SAMPLE ID	B-10
SAMPLE TYPE	Bag
SAMPLE DEPTH	19.0 - 20.0'

LL	38
PL	19
PI	19

DESCRIPTION Brown, SILTY CLAY, little fine sand.

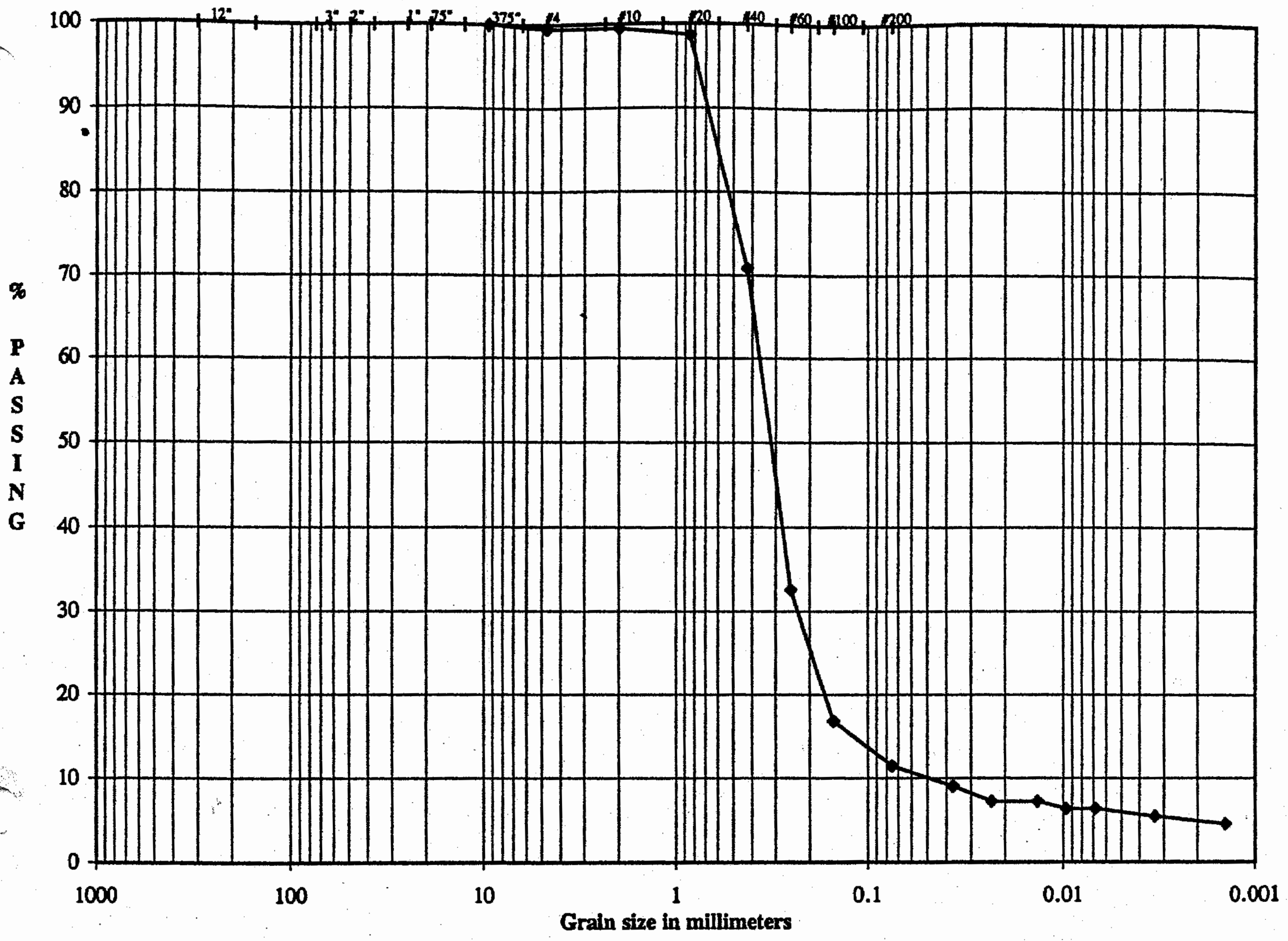
USCS CL

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH	SW
DATE	5/1/01
CHECK	
REVIEW	

Golder Associates Inc.

PARTICLE SIZE DISTRIBUTION ASTM D 421 AND D 422
US STANDARD SIEVE OPENING SIZES



Boulders	Cobbles	Coarse	Fine	Cor	Med	Fine	SILT OR CLAY
		Gravel		SAND			FINES

SAMPLE ID B-10 -
SAMPLE TYPE Bag
SAMPLE DEPTH 24.0 - 25.0'

LL -
PL -
PI -

DESCRIPTION Light Brown, MEDIUM TO FINE SAND, little clayey silt, trace fine gravel.
USCS (SP-SM)

GENESIS/PLUM POINT ENERGY/AR
013-3205

TECH TJ/DA
DATE 5/3/01
CHECK
REVIEW

Golder Associates Inc.