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# Results of the Fire Training Facility Siting Investigation at Davis-Monthan Air Force Base, Tucson, Arizona

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Printed in the United States of America. Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road, Springfield, Virginia 22161
NTIS price codes—Printed Copy: A11 Microfiche A01

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ORNL/TM-10716

HEALTH AND SAFETY RESEARCH DIVISION

Nuclear and Chemical Waste Programs
(Activity No. AH 10 15 01 00)

# RESULTS OF THE FIRE TRAINING FACILITY SITING INVESTIGATION AT DAVIS-MONTHAN AIR FORCE BASE, TUCSON, ARIZONA

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Date of Issue – May 1988

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operated by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under Contract No. DE-AC05-84OR21400

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## ACKNOWLEDGMENTS

The authors gratefully acknowledge the following individuals for their assistance in the successful completion of this project: the geotechnical subcontractor personnel, especially William Kintis and Ramesh Patel from The Earth Technology Corporation for their assistance during the conduct of the field project and for the timely completion of the geotechnical report; Richard Westmoreland and Larry Burnett of the ORGDP Analytical Chemistry Department for sample analyses and reporting; Davis-Monthan AFB fire chief Chris Burdette and his staff for their assistance and for allowing the field crew to store sampling supplies at the base fire station; J. R. Russell and the Oak Ridge Engineering Division for their support; and the Environmentally Safe Fire Training Facility Project which made this investigation necessary.

## ABSTRACT

An investigative drilling and sampling survey at the site of a proposed Fire Training Facility (FTF) at Davis-Monthan Air Force Base, Tucson, Arizona, was conducted by the Pollutant Assessments Group of ORNL's Health and Safety Research Division during the period February-October 1987. The objectives of this survey were: (1) to provide environmental/chemical information and geotechnical characteristics of the site from soil samples collected at the proposed site, (2) to determine the concentrations of volatile organic compounds (VOCs) and petroleum hydrocarbon contaminants in these samples, and (3) to make an assessment of survey data to determine if the proposed FTF site is environmentally and geotechnically suitable.

Results of the chemical analyses indicate the presence of subsurface petroleum hydrocarbons directly related to the former fire training burn pits. Although one of the samples was found to have a relatively high concentration of petroleum hydrocarbons (9300 $\mu g/g$), the contamination was limited in vertical extent, and the location of the bore hole was approximately 61 m (200 ft) downgradient from any construction planned for the proposed FTF site. All chemical analyses performed on bore hole samples for VOCs were found to be at or below detection limits. This indicates that no significant subsurface concentrations of hazardous wastes are present at the site of the planned FTF. The geotechnical investigation performed by The Earth Technology Corporation provided several recommendations for construction of the FTF, but presents no data to indicate that the site planned for the proposed FTF is geotechnically unsuitable.

The results of this siting investigation support the location of the new FTF in close proximity to the present fire training area as planned.

# RESULTS OF THE FIRE TRAINING FACILITY SITING INVESTIGATION AT DAVIS-MONTHAN AIR FORCE BASE, TUCSON, ARIZONA

## 1. INTRODUCTION

The Engineering Division of the Oak Ridge Gaseous Diffusion Plant and the Hazardous Waste Remedial Action Program (HAZWRAP) of Oak Ridge National Laboratory (ORNL) requested that the Pollutant Assessments Group (PAG) of ORNL's Health and Safety Research Division conduct a drilling and sampling project to provide chemical verification and geotechnical information for the siting of a new, environmentally safe Fire Training Facility (FTF) at Davis-Monthan Air Force Base (AFB), Tucson, Arizona. The PAG is located in Grand Junction, Colorado.

### 1.1 PURPOSE

Base officials want to locate the new FTF within the general confines of the existing FTF. The existing fire training pits were known to have already contaminated part of the area, but concentrations of contaminants and extent of contaminant migration were not known. The purpose of this study was to examine geotechnical characteristics of the proposed FTF area and to determine if the site was grossly contaminated with hazardous materials. Therefore, drilling and soil sampling were conducted to verify that the proposed site was relatively clean. Also, before finalizing the engineering design for the new facility, the characteristics of the soil needed to be evaluated (ORNL 1987a).

The goal of the project was to verify that the proposed FTF could be built in close proximity to the existing site. A soil boring program was implemented to provide samples of subsurface material for examination and analysis (ORNL 1987b).

### 1.2 SITE DESCRIPTION

The FTF at Davis-Monthan AFB in Tucson, Arizona (see Fig. 1), includes a triangular-shaped area with sides measuring about 150 m (500 ft) each. Each corner is defined by a circular area about 46 m (150 ft) across, which is surrounded by a low dike. At one of these circular areas is an aircraft mock-up. During exercises this mock-up is sprayed with fuel and ignited (see Fig. 2). In the course of an Installation Restoration Program (IRP) remedial investigation, it was learned that fuel from the exercises had seeped into the shallow subsurface. The FTF has been used for about 10 years (Dames and Moore 1986).

#### 1.2.1 Physiography

Davis-Monthan AFB is situated in the Tucson Basin within the southern part of the Basin and Range physiographic province. The Tucson Basin is typical of this region: it is a

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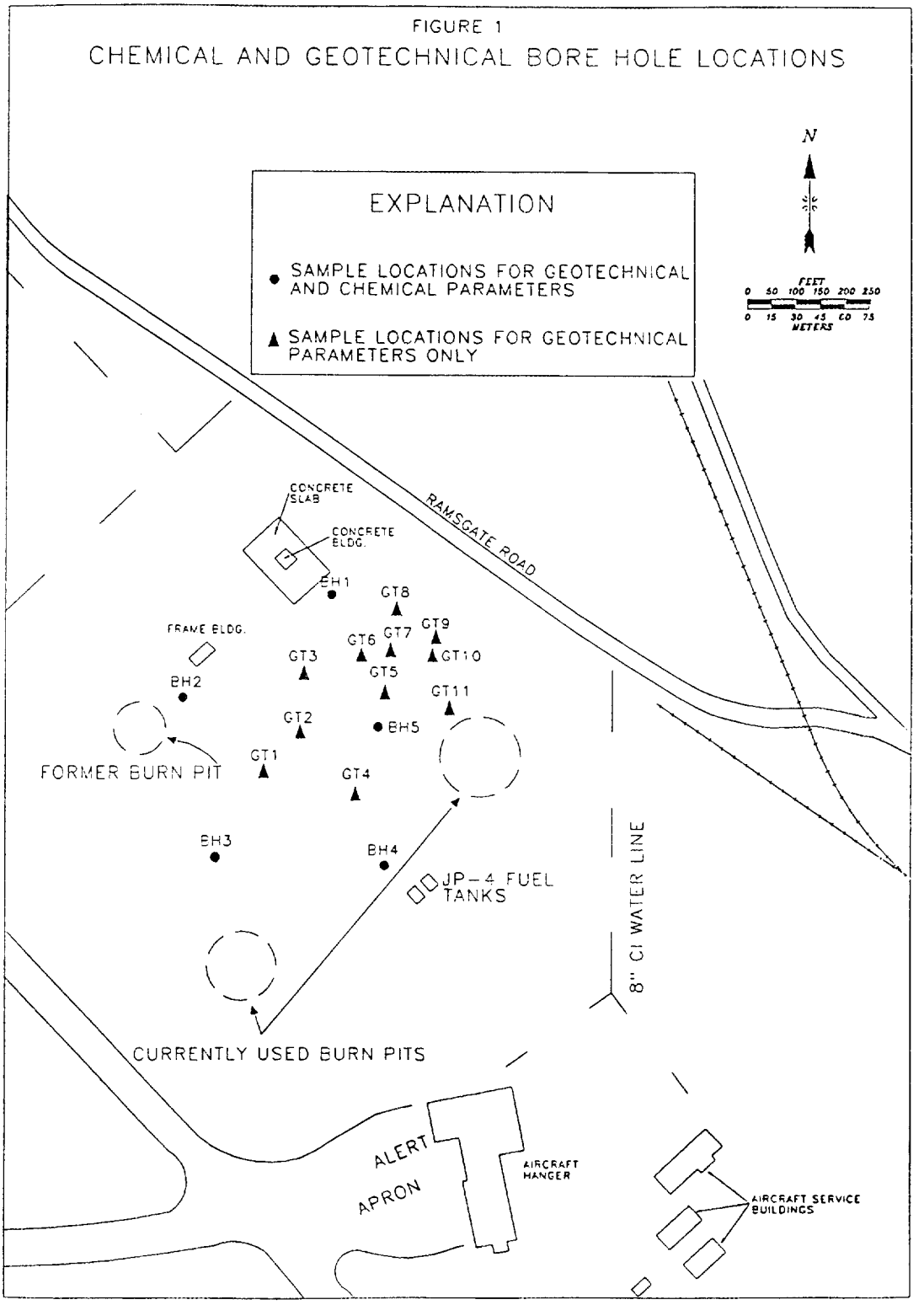


**Fig. 1. Chemical and geotechnical bore hole locations at Davis-Monthan AFB.**

ORNL PHOTO 02281-88

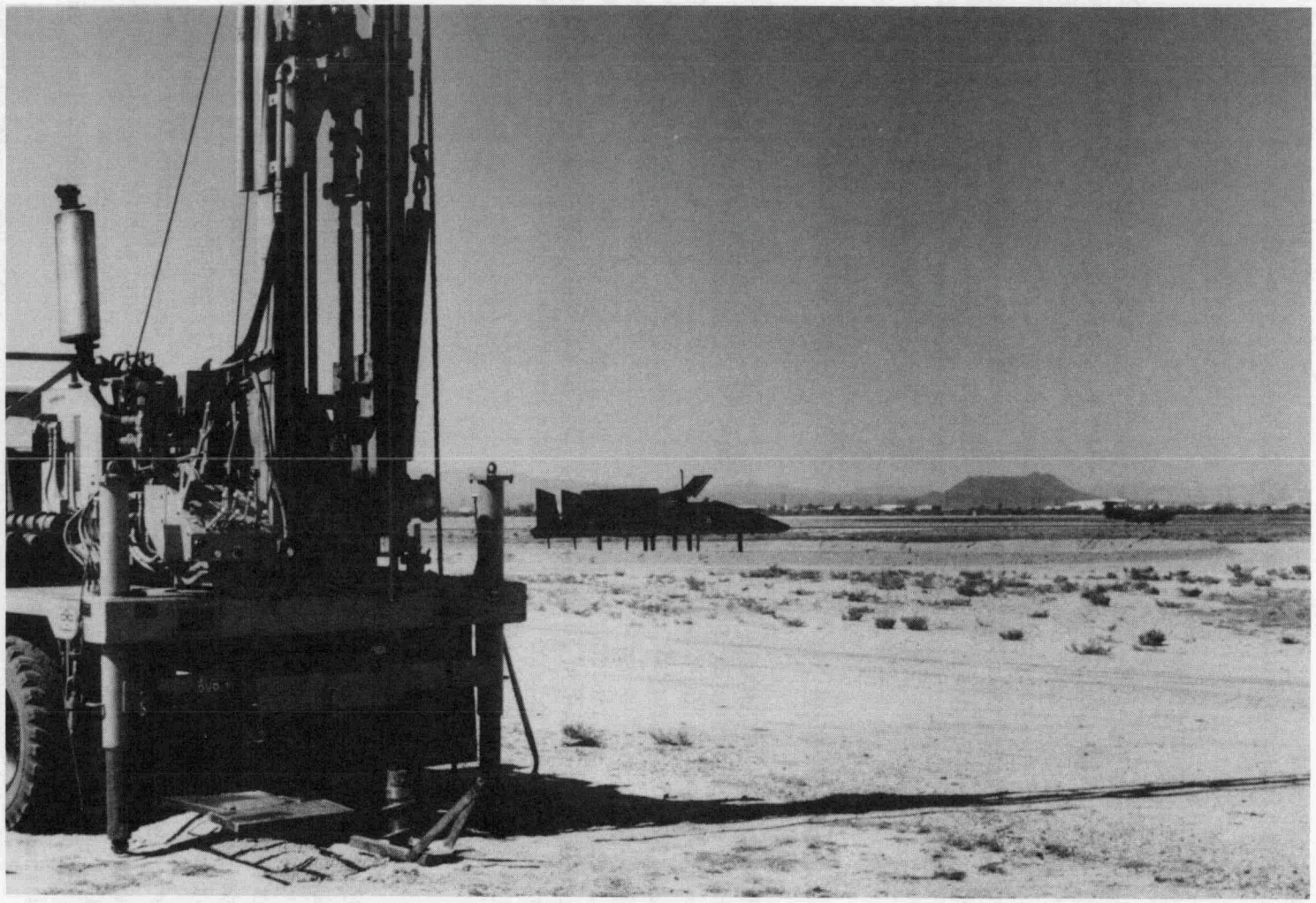

**Fig. 2. Hollow-stem auger rig with FTF aircraft mock-up in background at Davis-Monthan AFB.** Note berm for containment of fuel and fire-extinguishing agents near mock-up.

broad alluvial basin with adjacent hills and high mountains composed mainly of crystalline rocks. Alluvial fill within the basin includes sand, gravel, and silts with a total thickness of thousands of meters. Some of these strata are aquifers which are a major water supply source for the Tucson area (Dames and Moore 1986).

### 1.2.2 General Hydrogeology

Water is provided to Davis-Monthan by eight wells which range in depth from 124 to 308 m (405 to 1010 ft). Several produce water from two or more intervals. The water table is at a depth of about 92 m (300 ft). As is commonplace throughout much of the desert southwest, the water table has been drawn down in response to pumping, which far exceeds the recharge rate. Static water level in the base wells has declined from 8 m (26 ft) to more than 30 m (100 ft) during the last 30 years. The overall gradient of the water table is to the northwest, toward the center of the Tucson Basin (Dames and Moore 1986).

### 1.2.3 General Geology

Prior to this investigation, near-surface geology was known from six 6.1-m (20-ft) bore holes drilled during the previous IRP Phase II investigation. Other observations have been made of the general character of near-surface substrata at a gravel pit elsewhere on the base. Shallow subsurface material includes sands, gravels, sand-gravel mixtures, and a few clay beds. Based on these field data, it is reasonable to conclude that these shallow alluvial deposits are moderately permeable, but that clay-silt beds may retard shallow groundwater movement. In addition, drillers' logs of the water wells on the base describe cemented sands and caliche in the shallow subsurface that also may affect groundwater infiltration (Dames and Moore 1986).

### 1.2.4 Extent of Previously Detected Contamination

Contaminants consisting of JP-4 jet fuel and associated components were detected in almost all subsurface samples collected at the FTF during the IRP Phase II investigation (Dames and Moore 1986). Contaminated soil was found from top to bottom of some holes. Detection was based on odor and/or organic vapor instrument readings. In some cases, samples showed visible contamination. The samples in which contaminants were found by chemical analysis came from depths of 3.0 and 6.1 m (10 and 20 ft).

Contaminants present in the soils at this site are derived primarily from waste fuels, lubricants, and solvents. The principal contaminants are volatile organic compounds (VOCs) and oil and grease. The contaminants detected in samples from the base water wells W-4 and W-11 include methylene chloride, chloroform, 1,2-dichloroethane, oil and grease, and phenol (Dames and Moore 1986).

The greatest suggestion of potential contamination at this site was found in the three IRP drill holes (Borings 3-1, 3-2, and 3-6), which were located where jet fuel is currently

burned for fire training exercises or adjacent to the waste fuel storage tanks that supply fuel to the FTF (Dames and Moore 1986). The Phase II, Stage 1 IRP borings, however, were terminated at 6.4 m (21 ft), so it is not possible to estimate the vertical extent of the potential contamination. VOC contamination detected at termination depth at a boring near the waste fuel storage facility indicates that contamination is not limited to the fire training areas investigated by Borings 3-1 and 3-2 (ORNL 1987a).

The extent of groundwater contamination can be estimated by the locations of the base wells in which contaminants were detected sporadically. Base wells W-4 and W-11 are within about 760 m (2500 ft) of each other and the FTF. Contaminants from the FTF could be carried downgradient and captured in the cones of depression in the groundwater surface created by pumping base wells W-4 and W-11. However, contaminants detected in the base water wells were not the same as those detected in the soil borings (Dames and Moore 1986). Therefore, it was unknown to what extent JP-4 and other possible contaminants had migrated from the existing FTF (ORNL 1987a).

# 2. FIELD INVESTIGATIONS

The objectives of the field investigation at Davis-Monthan AFB were to collect samples and data in order to: (1) test for the presence of contaminants in the soil and (2) define the geotechnical characteristics of the soil as they relate to the planned FTF construction (ORNL1987a).

The basic components of the field investigations were (1) soil borings for environmental sampling and (2) soil borings for geotechnical data and sampling (see Fig. 1). The numbers of each type of boring and the types of samples collected are discussed below, as are the procedures, equipment, and materials utilized for sampling (ORNL 1987c).

## 2.1 ENVIRONMENTAL TESTING

Soil samples for environmental testing as well as geotechnical samples were obtained from the first five drill holes. These holes were drilled to a depth of 11 m (37.5 ft). This depth range was used in order to provide an adequate stratigraphic section for study. The six 6.1-m-deep (20-ft-deep) holes drilled during the IRP Phase II investigation found sand and gravelly sand in the bottom several meters of each hole.

### 2.1.1 Environmental Borings

The five combined environmental and geotechnical test borings (see Fig. 1) were drilled prior to those holes needed only for geotechnical evaluation. This allowed for the discontinuation of strict decontamination of the sampling tools (split-barrel and/or split-ring samplers) used for the geotechnical sampling (see Figs. 3 and 4).

ORNL PHOTO 02285-88

Fig. 3. "California" split-ring sampler inserts intact as taken from split-barrel.

ORNL PHOTO 02286-88

Fig. 4. "California" split-ring inserts being cleaned out for reinsertion into 3 × 12 in. split-barrel (not shown).

### 2.1.2 Drilling Operations

The Earth Technology Corporation (Earth Technology) conducted the drilling and geotechnical evaluation. Holes were located on the alluvium around the present fire training area and were drilled with a hollow stem auger.

### 2.1.3 General Conduct of Work

The first bore hole, BH-1 (see Fig. 1), was sampled for both environmental/chemical (E/C) and geotechnical analyses. E/C sampling was conducted at approximately 1-m (3.3-ft) intervals as described in the work plan. It was determined from this bore hole that the combined E/C and geotechnical sampling at the intervals specified in the work plan caused serious sampling delays and extra work for the drill crew. To alleviate this problem, the sampling interval and procedures were modified for the remaining four combined E/C and geotechnical bore holes. The sample interval was modified to every 1.5 m (5 ft), which allowed the drillers to drill one full auger flight and then take the split-barrel E/C sample, followed immediately by the split-ring geotechnical sample. This procedural change greatly expedited the sampling and also minimized the possibility of cross-contamination of the E/C samples. The split-barrel used for the E/C sampling was also decontaminated between each interval (see Fig. 5).

One other deviation from the work plan was initiated during the field project. Upon completion of the first deep geotechnical bore hole (GT-2, 28 m (91 ft)), which was sampled every 1.5 m (5 ft), it was determined that the lithology remained essentially constant. Therefore, the other two 28-m (91-ft) deep bore holes (GT-7 and GT-10) were sampled at 1.5-m (5-ft) intervals to 9.1 m (30 ft) and then at 4.5-m (15-ft) intervals to the bottom of the holes.

ORNL representatives were responsible for sampling and shipping of all E/C samples to the Analytical Chemistry Department at Oak Ridge Gaseous Diffusion Plant in Oak Ridge, Tennessee.

Earth Technology representatives were responsible for all the geotechnical samples, including transport to their geotechnical laboratory in Phoenix, Arizona, for analyses. An ORNL representative supervised all drilling and sampling.

### 2.1.4 Drilling and Sampling Methods

A hollow-stem auger was used to drill all of the bore holes. Split-barrel samples for environmental and chemical analyses were collected at 1.5-m (5-ft) intervals using a 5 × 45.7 cm (2 × 18 in.) split-barrel sampler. The geotechnical samples were collected using a 7.5 × 30 cm (3 × 12 in.) split barrel with inserted 2.54 × 6.35 cm (1 × 2.5 in.) "California" split-ring samplers.

To determine standard penetration, blow counts per 15 cm (6 in.) were recorded for both types of split-barrel sampling using the standard 63.5-kg (140-lb) hammer falling 75 cm (30 in.). Fifty blows per 15 cm (6 in.) was considered refusal.

ORNL PHOTO 02291-88

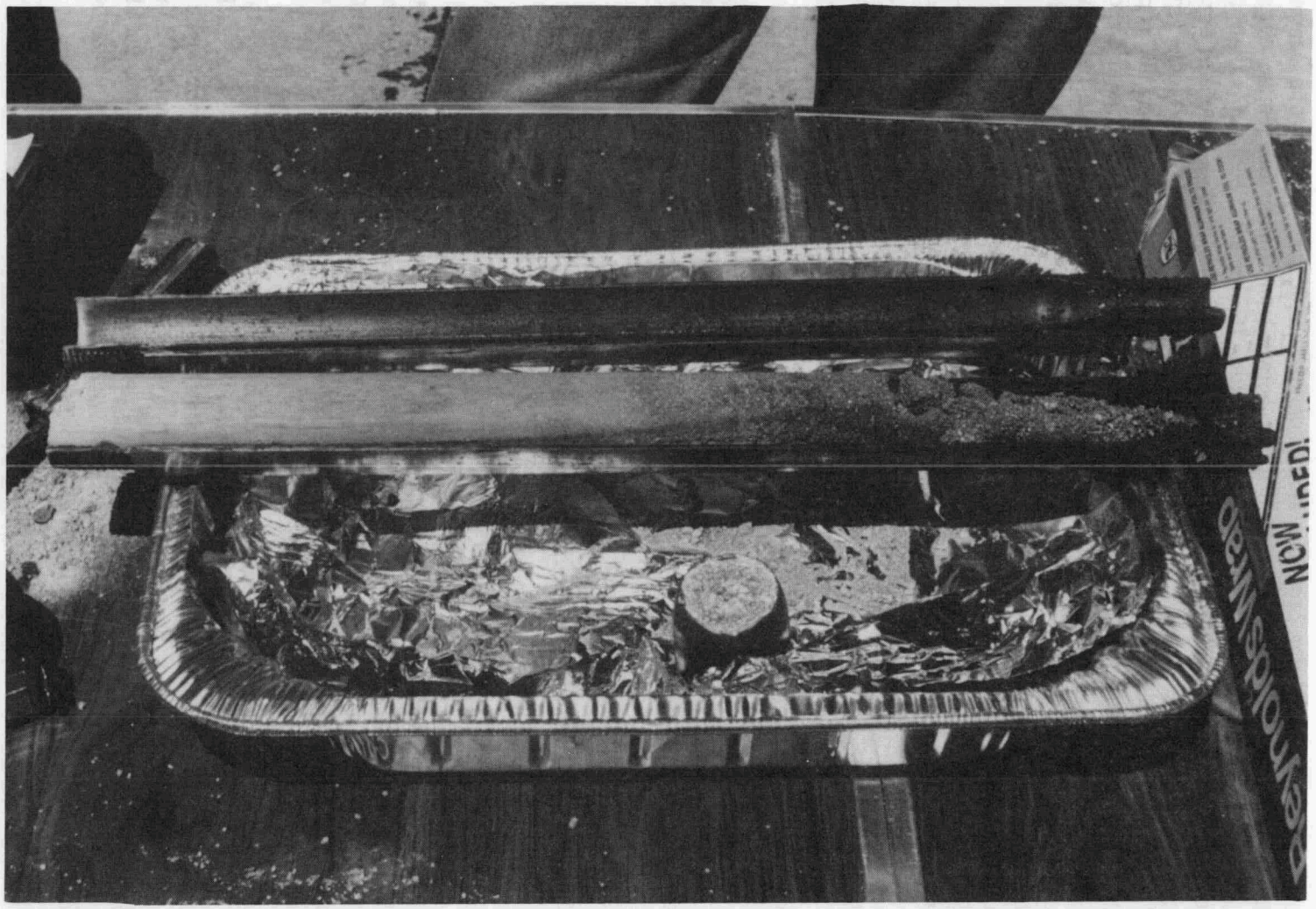


**Fig. 5. Full recovery of a 2 × 18 in. split-barrel sample for environmental/chemical (E/C) analysis.**

### 2.1.5 Equipment Decontamination and Waste Handling

To minimize potential for cross-contamination of samples, all drilling and sampling equipment was decontaminated prior to drilling, between environmental sample borings, prior to sampling, and before removal from the site. Equipment decontamination procedures consisted of thorough high-pressure hot water washing with a laboratory-grade detergent, followed by a potable water rinse. The environmental sampling tools (split-barrel) also received a deionized water rinse and a final rinse with pesticide-grade isopropyl alcohol. Earth Technology was responsible for the collection, containment, and disposal of all fluids and waste materials generated by decontamination procedures and field investigations until it was determined that no significant contamination was present, at which time the rinse water was spread on the concrete pad at the northwest side of the site and was allowed to evaporate. Strict decontamination procedures were discontinued after the chemical sampling of the first five bore holes was completed, but air monitoring with a photoionization detector (PID) was conducted for personnel safety throughout the project.

Cuttings from the drilling were backfilled into the drill holes after all sampling was completed.

### 2.1.6 Sampling Procedures

During the field investigation appropriate standards for sampling methods and quality controls (QC) were followed. For sampling procedures the following items were relevant:

- the number, types, and locations of all samples;
- the methods of sample acquisition and preservation;
- the design, construction, and abandonment procedures for soil borings; and
- the schedule for implementing the various sampling tasks.

During drilling, a PID was used to monitor ambient air, drill cuttings, and split-barrel samples. This was done for three reasons: to detect any organic vapor that might have been harmful to the workers; to locate subsurface zones that were contaminated; and to screen split-barrel samples in order to determine which samples should be retained for possible chemical analysis.

At least three samples were selected from each hole for chemical analysis. A sample was taken from the bottom of each hole, plus two others from zones with the highest PID readings. Samples were analyzed for the following substances, which are diagnostic for JP-4 jet fuel: oil and grease, benzene, napthalene, xylene, and toluene. Appropriate analytical techniques were used as required by U.S. Environmental Protection Agency (EPA) protocols, including SW5030/8020 for aromatic volatiles, SW5030/8240 for halogenated volatiles, and SW3550/E418.1 for petroleum hydrocarbons.

The results of the chemical analyses are presented in Appendix I.

## 2.2 GEOTECHNICAL TESTING

A subsurface investigation of the proposed FTF site was performed by Earth Technology. The design of the new FTF consists of a 61-m-diam (200-ft-diam) gravel fill vehicle-maneuvering pad 0.61 m (2 ft) above grade, various concrete pads, a double-lined containment pit on the top of the fill, and other support facilities. Anticipated loads include only the 0.61 m (2 ft) of fill, the concrete pads, and truck-mounted fire-fighting equipment. The facility will be constructed using locally available aggregate as fill.

### 2.2.1 Geotechnical Sampling

The selected method of drilling was by hollow-stem auger. Sampling was conducted at approximately 1.5-m (5-ft) intervals using either split-ring samplers inserted into 7.5 × 30 cm (3 × 12 in.) split barrels or standard 5 × 45 cm (2 × 18 in.) split-barrel samplers with no inserts. A total of 16 holes drilled for geotechnical sampling, including the 5 previously described 11-m-deep (37.5-ft-deep) chemical test holes; 3 holes were 28 m (91 ft) deep, and the remaining 8 holes were 7 m (21.5 ft) deep. All holes were sited in the construction area.

### 2.2.2 Geotechnical Laboratory Testing

Twenty-five split-barrel or split-ring samples were selected for natural moisture content and tested in accordance with ASTM D-2216-71. A modified proctor analysis (ASTM D-1557) on five samples was performed, and at least ten samples were selected for grain-size analysis (ASTM D-422-72). Five samples were selected for the determination of plasticity or Atterberg limits (ASTM D-4318-83). At least two samples of clay strata were tested for one-dimensional consolidation in accordance with ASTM D-4186. All geotechnical samples taken but not used for laboratory testing were stored for a period of three months prior to disposal in case further testing was needed. This included the samples taken from the environmental test borings that were not turned in for chemical analysis. Geotechnical testing results are presented in Appendix II.

## 2.3 SAMPLE HANDLING AND SHIPPING PROCEDURES

Environmental samples collected by split-barrel were placed in clean 946-mL (32-oz) glass jars with teflon-lined covers that were labeled to show the project name, hole number, sample interval, and date. Samples were packed into iced cooler chests immediately after collection (see Fig. 6). Sample descriptions included lithology, color, grain size, texture, and relative amounts of gravel, sand, silt, and clay. Samples were also described in accordance with standards of the Unified Soil Classification System (USCS) (Prokopovich 1977).

Environmental samples were shipped to the analytical lab in accordance with established EPA protocols for packaging, transportation, and storage (ORNL 1988). ORNL

ORNL PHOTO 02290-88

**Fig. 6. Environmental/chemical (E/C) sampling table.** Note coolers for VOC sample preservation.

representatives shipped all of the environmental samples. Chain-of-custody forms accompanied all samples to the analytical laboratory. Geotechnical samples were collected by personnel from Earth Technology and were sent to their geotechnical lab according to common work practices.

## 2.4 QUALITY ASSURANCE/QUALITY CONTROL

Elements of quality assurance/quality control (QA/QC) specifically applicable to the environmental investigation included:

- adherence to decontamination procedures for all equipment and materials used in drilling;
- designation by the subcontractor of an individual who was responsible for monitoring the quality of work and who would interface with the ORNL representative;
- maintenance of a daily log with a thorough summary of each day's work;
- adherence to the QA/QC plan for this investigation.
- sample chain-of-custody requirements;
- sample handling protocols;
- specifications or regulations for QA/QC duplicate samples, field blanks, and decontamination rinsate samples;
- specifications or regulations for field and laboratory data management;
- specifications or regulations for decontamination procedures; and
- procedures and requirements for disposal of investigation-generated wastes.

The analytical laboratory was to analyze 10% of the samples in duplicate. These samples along with the regular samples were sent as QC splits for secondary laboratory analysis. Duplicates requested by the various regulatory agencies or other approved parties were made from the same base samples. Upon collection, soil samples were composited in the field in an appropriate large container from which all duplicate samples were homogenized and subsampled, using the appropriate sample containers.

# 3. SIGNIFICANCE OF FINDINGS

## 3.1 CHEMICAL ANALYSES

Results of the chemical analyses of soil samples from five bore holes indicated the presence of significant petroleum hydrocarbons in two samples from bore hole 2 and one sample from bore hole 5 (see Fig. 1 and Appendix I).

Concentrations of petroleum hydrocarbons in bore hole 2 were 9300 $\mu g/g$ at approximately 3.6 m (12 ft) and 390 $\mu g/g$ at approximately 6.7 m (22 ft). The sample from the bottom of the hole [at approximately 11 m (37 ft)] was below the detection limit of 17 $\mu g/g$. Bore hole 2 was drilled adjacent to an area which had been used for fire training (burn pit) in the past. There were obvious carbon residues on the surface, but the area did not have a definite berm built up around it for containment, as did the two other burn pits. Bore hole 2 was drilled approximately 61 m (200 ft) northwest (downgradient) from any of the planned new facilities. Thus, the contamination found should not adversely affect the present siting plans.

Bore hole 5 also showed significant petroleum hydrocarbons (120 $\mu g/g$) at approximately 4 m (12 ft) deep. The other two samples analyzed from bore hole 5 were found to be below the detection limit (17 $\mu g/g$) for petroleum hydrocarbons. The location of bore hole 5 was approximately 24 m (80 ft) northwest of one of the two currently used burn pits (see Fig. 1). The containment berm of this burn pit was breeched on its northwest side, which may have allowed some unburned fuel to escape the burn pit. The east edge of the vehicle-maneuvering area of the new FTF will reach the location of bore hole 5. However, since only one of the samples from bore hole 5 showed slight contamination, siting the new FTF should not be affected.

Chemical analyses for VOCs showed concentrations of methylene chloride, toluene, chloroform, and 2-butanone at detection limit values in several of the samples. All other VOCs except acetone were found to be below detection limits.

Acetone was detected in all the samples analyzed. The Analytical Chemistry Department of the Oak Ridge Gaseous Diffusion Plant has attributed it to the conversion of the isopropyl alcohol used for decontamination of the sampling tools to acetone by exposure to sunlight.

## 3.2 GEOTECHNICAL INVESTIGATION

Results of the geotechnical investigation support the conclusion that no significant restrictions to building the new FTF at Davis-Monthan AFB exist. Earth Technology did, however, make several recommendations in its geotechnical report (Appendix II). These include:

1. Site preparation should remove all vegetation, abandoned utility lines, or other buried obstructions. A minimum of 15 cm (6 in.) of surface soil should be removed from the entire site followed by compaction of 95% according to ASTM D-1557.

2. For building areas, soil should be excavated and removed from the site, replaced with clean (uncontaminated) soil, and compacted. The extent of the area treated by such procedures varies with intended use. To provide support for foundations and slabs, the treated area should extend 1.2 m (4 ft) below footings, 0.6 m (2 ft) below slabs, and 1.5 m (5 ft) beyond outside dimensions of all structures; for effluent pond and containment pit it should extend 1.2 m (4 ft) below and 1.5 m (5 ft) around perimeters; and it should extend 0.9 m (3 ft) below and 0.6 m (2 ft) along side of pit drain lines. In all cases the recompaction material should be of a nonexpansive fill.

3. Fill placement and compaction should use organic-free nonexpansive fill placed in horizontal lifts not exceeding 20 cm (8 in.) in loose thickness, moisture conditioned, and compacted to a minimum of 95% according to ASTM D-1557.

4. Shallow foundations should utilize wall footings of 30 cm (12 in.) minimum width and embedded at least 45 cm (18 in.) below lowest adjacent finish grade. Interior spread footings should be placed at least 60 cm (24 in.) below lowest adjacent grade and be 60 cm (24 in.) in width.

5. Floor slab thickness and reinforcement requirements should be designed by a structural engineer, but minimum design recommendations include: 10-cm-thick (4-in.-thick) slabs with welded mesh (6 × 6-10/10 WWF) placed at mid-height to control thermal cracking; a minimum 6-mL-thick plastic moisture barrier placed between a 5-cm (2-in.) sand blanket on compacted fill with another 5-cm-thick (2-in.-thick) sand blanket between it and the slab where moisture-sensitive floor covering is planned. Moisture conditioning of at least 30 cm (12 in.) of the slab subgrade should also be provided.

6. Lateral earth pressures are based on 120 $lb/ft^3$ unit weight for level backfill material under free drainage conditions. If variations in backfill materials occur or if sloping backfill is used, including any retaining walls, the following parameters should be considered:

| | |
|---|---|
| Active equivalent fluid pressures: | 40 $lb/ft^3$ |
| Passive equivalent fluid pressures: | 300 $lb/ft^3$ |
| At-rest equivalent fluid pressures: | 60 $lb/ft^3$ |
| Coefficient of friction (concrete on soil): | 0.3 |
| Allowable bearing capacity: | 2,400 $lb/ft^3$ |

Also, properly outletted drain systems should be provided behind any retaining walls to avoid hydrostatic pressure buildup.

7. Soil corrosivity and cement-type recommendations include use of nonmetallic or corrosive-resistant utility pipes, and, based on sulfate test results, Type II cement may be used for all concrete.

8. Drainage and erosion prevention should be provided by designing pad grades such that surface runoff is directed off-site towards approved drainage devices. Erosion should be minimized by covering all slopes with coarse gravel and planting drought-tolerant vegetation.

## 3.3 CONCLUSIONS

Possible contaminants expected at the FTF site were JP-4 and related fuels, lubricants, and solvents; therefore, chemical analyses requested were diagnostic analytical parameters for petroleum hydrocarbons and volatile organic compounds (VOCs).

Results of chemical analyses determined that petroleum hydrocarbons directly related to the former fire training burn pits are present in the subsurface. Although one of the samples was found to have a relatively high concentration of petroleum hydrocarbons (9300 $\mu g/g$), the contamination was limited in vertical extent, and the location of the bore

hole was approximately 61 m (200 ft) from any construction planned for the proposed FTF site. All chemical analyses performed on bore hole samples for VOCs were found to be at or below detection limits.

The geotechnical investigation provided several recommendations for construction of the FTF, but did not present any data which would indicate that the site planned for the new FTF is geotechnically unsuitable.

In summary, results of this siting investigation support the location of the new FTF within the present fire training area as planned.

# 4. REFERENCES

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ORNL. 1987a. Oak Ridge National Laboratory. *Scope of Work for Subsurface Investigation for Davis-Monthan for AFB Fire Training Facility,* Pollutant Assessment Group. ORNL/PAG, March 1987 (Unpublished).

ORNL. 1987b. Oak Ridge National Laboratory. *Statement of Work for Drilling at Davis-Monthan AFB,* Pollutant Assessment Group. ORNL/PAG, February 1987 (Unpublished).

ORNL. 1987c. Oak Ridge National Laboratory. *Work Plan for Fire Training Facility Siting Investigation, Davis-Monthan Air Force Base, Tucson, Arizona,* Pollutant Assessment Group. ORNL/PAG, August 1987 (Unpublished).

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# APPENDIX I

MARTIN MARIETTA

nternal Correspondence

MARTIN MARIETTA ENERGY SYSTEMS, INC.

*November 2, 1987*

*P. J. Franco, HAZWRAP, FEDC*

***Results from Davis-Monthan AFB QA/QC Split Samples***

*One set of samples has been received from Davis-Monthan AFB. The samples arrived at the Analytical Chemistry Department (ACD) at Oak Ridge Gaseous Diffusion Plant on September 3, 1987. Data from this set is presented in this report.*

*Copies of the chain of custody which were received by ACD are attached. Chain of custody kept in the laboratory is on file and has been reviewed for completeness.*

*EPA Method 8240 was performed for the volatiles analysis on soils, and EPA Method 624 was performed for the volatiles analysis on waters. No surrogate recoveries on the volatiles exceeded the October 1986 Revised CLP criteria. None of the samples exceeded the 10-day holding time for volatiles, except DMTB03-RI-0901-02. This sample was originally analyzed on September 4, 1987, but the data was lost due to instrumental problems, and the sample was re-analyzed on September 18, 1987. The volatile blanks met the CLP criteria for common solvents. The volatile matrix spikes and matrix spike duplicates were within the CLP limits. Calibration and tuning of the GC/MS was performed as per the October 1986 Revised CLP method. Every sample showed above detection limit levels of acetone, including the field blanks. It is my understanding that the sampling equipment was decontaminated with isopropyl alcohol, and we know that sunlight converts isopropyl alcohol to acetone. Acetone is a common problem when isopropyl alcohol is used for equipment decontamination. The trip blanks also showed significant levels of acetone, but the method blanks, with one exception, showed below detection levels of acetone. The one exception was slightly above detection limits. Several of the samples showed methylene chloride, toluene, and chloroform at concentrations near the detection limits.*

*EPA Method 418.1 was performed for the petroleum hydrocarbons. None of the samples exceeded the 28-day holding time for petroleum hydrocarbons. There is not a surrogate program available for petroleum hydrocarbons. One set of matrix spikes and matrix spike duplicates was performed, and they met the CLP criteria. Three of the samples showed significant levels of petroleum hydrocarbons.*

R D Westmoreland

*R. D. Westmoreland, K-1000, MS-440, ORGDP (4-8072) - NoRC*

*RDW:mpo*

*Attachments:*
*As stated*

*cc/att:* *D. Campbell, HAZWRAP, FEDC*
*D Smuin, ORNL, Grand Junction, Colorado*

*cc/wo att:* *M. S. Miller*
*R. W. Morrow*
*File-RDW-NoRC (2)*

*TABLE 1. CUSTOMER SAMPLE NUMBER VERSUS LABORATORY SAMPLE NUMBER*

| Laboratory Sample Number | Customer Sample Number | Analysis |
|---|---|---|
| 871016-090 | DMBH01-SO-0831-06 | VOA, PET. H.C. |
| 871016-091 | DMBH01-SO-0831-07 | VOA, PET. H.C. |
| 871016-092 | DMBH01-SO-0831-09 | VOA, PET. H.C. |
| 871016-093 | DMBH02-SO-0831-03 | VOA, PET. H.C. |
| 871016-094 | DMBH02-SO-0831-05 | VOA, PET. H.C. |
| 871016-095 | DMBH02-SO-0831-08 | VOA, PET. H.C. |
| 871016-096 | DMBH03-SO-0901-02 | VOA, PET. H.C. |
| 871016-097 | DMBH03-SO-0901-04 | VOA, PET. H.C. |
| 871016-098 | DMBH03-SO-0901-08 | VOA, PET. H.C. |
| 871016-099 | DMBH04-SO-0901-05 | VOA, PET. H.C. |
| 871016-100 | DMBH04-SO-0901-06 | VOA, PET. H.C. |
| 871016-101 | DMBH04-SO-0901-08 | VOA, PET. H.C. |
| 871016-102 | DMBH05-SO-0901-02 | VOA, PET. H.C. |
| 871016-103 | DMBH05-SO-0901-03 | VOA, PET. H.C. |
| 871016-104 | DMBH05-SO-0901-08 | VOA, PET. H.C. |
| 871016-105 | DMBH03-SO-0901-04D | VOA, PET. H.C. |

*TABLE 2. MATRIX SPIKE SAMPLE NUMBERS VERUS LABORATORY SAMPLE NUMBERS*

| Laboratory Sample Numbers | Matrix Spike Sample Numbers | Analysis |
|---|---|---|
| 871016-106 | DMBH03-SO-0901-04MS | VOA |
| 871016-107 | DMBH03-SO-0901-04MSD | VOA |
| 871016-112 | DMTB01-RI-0831-01MS | VOA |
| 871016-113 | DMTB01-RI-0831-01MSD | VOA |

*TABLE 3. FIELD AND TRIP BLANK SAMPLE NUMBERS VERSUS LABORATORY SAMPLE NUMBERS*

| Laboratory Sample Numbers | Field and Trip Blank Sample Numbers | Analysis |
|---|---|---|
| 871016-108 | DMFB01-RI-0831-01 | VOA, PET. H.C. |
| 871016-109 | DMFB03-RI-0901-02 | VOA, PET. H.C. |
| 871016-110 | DMTB01-RI-0831-01 | VOA |
| 871016-111 | DMTB03-RI-0901-02 | VOA |

*TABLE 4. METHOD BLANK SAMPLE NUMBERS VERSUS LABORATORY SAMPLE NUMBERS*

| Laboratory Sample Numbers | Field and Trip Blank Sample Numbers | Analysis |
|---|---|---|
| 871016-114 | VOBLK0908 | VOA |
| 871016-115 | VBLK09092 | VOA |
| 871016-116 | VOBLK09092 | VOA |
| 871016-117 | VOBL09091 | VOA |
| 871016-118 | VOBLK0910 | VOA |
| 871016-119 | VOBL09081 | VOA |
| 871016-120 | VBLK09042 | VOA |
| 871016-121 | VOBL09181 | VOA |

*TABLE 5. LABORATORY BLANK SAMPLES*

| *Number of Blank* | *Associated Samples* |
|---|---|
| *871016-114* | *871016-090* |
| | *871016-091* |
| | *871016-092* |
| | *871016-093* |
| | *871016-094* |
| | *871016-095* |
| | *871016-096* |
| | *871016-097* |
| | *871016-098* |
| | *871016-103* |
| | *871016-104* |
| | *871016-105* |
| | *871016-106* |
| | *871016-107* |
| *871016-115* | *871016-099* |
| *871016-116* | *871016-100* |
| | *871016-101* |
| | *871016-102* |
| *871016-117* | |
| *871016-118* | |
| *871016-119* | *871016-108* |
| | *871016-109* |
| *871016-120* | *871016-110* |
| | *871016-112* |
| | *871016-113* |
| *871016-121* | *871016-111* |

CHAIN-OF-CUSTODY

ornl OAK RIDGE NATIONAL LABORATORY
Grand Junction Office

Mailing Address:
P.O. Box 2567
Grand Junction, CO 81502

Street Address:
2597 B¾ Road
Grand Junction, CO 81503

Phone (303) 242-8621

# Chain of Sample Custody



Date 9/1/87

1. Project No. N/A 2. Project Name Davis Monthan AFB

| 3. Sample No. | 4. Sample Type | 5. Remarks |
|---|---|---|
| DMBH01-SO-0231-06 | Soil (1-32oz, 1-40ml) | Bore Hole #1 — 2 bottles |
| " " " 07 | " (1-32oz, 1-40ml) | " " " |
| " " " 09 | " | " " " — Cooler #1 |
| DMBH02-SO-0831-03 | " | Bore Hole #2 |
| " " " 051 | " | " " |
| " " " 08 | " | " |

| 6. Relinquished By | Date | Dept. | Received By | Date | Dept. |
|---|---|---|---|---|---|
| David S. Foster | 9/2/87 | | M L McAlduff | 9/3/87 | 1030 |
| | | | | | |

7. Company Name
Received By
Date

Distribution: Original accompanies samples, copies to relinquishers.

ornl OAK RIDGE NATIONAL LABORATORY
Grand Junction Office

Mailing Address:
P.O. Box 2567
Grand Junction, CO 81502

Street Address:
2597 B¾ Road
Grand Junction, CO 81503

Phone (303) 242-8621

# Chain of Sample Custody

Page 1 of 1
Date 9/2/87

1. Project No. _____ 2. Project Name Davis Monthan AFB

| 3. Sample No. | 4. Sample Type | 5. Remarks |
|---|---|---|
| DM BH 03-SO-0901-02 | Soil | 2 bottles (1-32 oz, 1 40 ml) |
| DM BH 03-SO-0901-04 | " | replicate sample |
| DM BH 03-SO-0901-04 | " | |
| DM-BH-03-SO-0901-08 | " | |
| DM BH-04-SO-0901-05 | " | |
| DM BH-04-SO-0901-08 | " | |
| DM BH-04-SO-0901-08 | " | |

| 6. Relinquished By | Date | Dept. | Received By | Date | Dept. |
|---|---|---|---|---|---|
| David S. Foster | 9/2/87 | | M L McAlduff | 9/3/87 | 1030 |
| | | | | | |

7. Company Name _____
Received By _____
Date _____

Distribution: Original accompanies samples, copies to relinquishers.

ornl OAK RIDGE NATIONAL LABORATORY
Grand Junction Office

Mailing Address:
P.O. Box 2567
Grand Junction, CO 81502

Street Address:
2597 B¾ Road
Grand Junction, CO 81503

Phone (303) 242-8621

# Chain of Sample Custody

Page 1 of 1
Date 9/2/87

1. Project No. _____ 2. Project Name _____

| 3. Sample No. | 4. Sample Type | 5. Remarks |
|---|---|---|
| ✓ OMBH-05-SO-0901-02 | Soil | ✓ Borehole #5 - 2 bottles (1 32 oz, 1 40 ml) |
| ✓ OMBH-05-SO-0901-03 | " | " " 2 bottles (1 32 oz, 1 40 ml) |
| ✓ OMBH-05-SO-0901-08 | " | " " 2 bottles (1 32 oz, 1 40 ml) |
| ✓ OMFB-01-RI-0831-01 | water | 32 oz bottle for petroleum hydrocarbons } 1st field blank |
| ✓ OMFB-01-RI-0831-01 | " | 40 ml bottle for VOA's (air bubble) } taken 8/31/87 |
| ✓ OMFB-03-RI-0901-02 | " | 32 oz bottle - petroleum hydrocarbons } 2nd FB taken |
| ✓ OMFB-03-RI-0901-02 | " | 40 ml bottle - VOA's ✓ } 9/1/87 |
| ✓ OMTB-01-RI-0831-01 | " | 40 ml " } taken from deionized } Trip Blank |
| ✓ OMTB-03-RI-0901-02 | " | 40 ml " } water storage container } |

| 6. Relinquished By | Date | Dept. | Received By | Date | Dept. |
|---|---|---|---|---|---|
| David S. Foster | 9/2/87 | CAT | M L McAlduff | 9/3/87 | 1030 |
| | | | | | |

7. Company Name _____
Received By _____
Date _____

Distribution: Original accompanies samples, copies to relinquishers.

INTERNATIONAL TECHNOLOGY CORPORATION

# CHAIN-OF-CUSTODY RECORD

R/A Control No. 030370

C/C Control No. 49811

PROJECT NAME/NUMBER: DAVIS MONTHAN

LAB DESTINATION: ITAS/KNOXVILLE

SAMPLE TEAM MEMBERS:

CARRIER/WAYBILL NO.:

| Sample Number | Sample Location and Description | Date and Time Collected | Sample Type | Container Type | Condition on Receipt (Name and Date) | Disposal Record No. |
|---|---|---|---|---|---|---|
| DMBH04-SO-0901-05 | | 9/1 | SOIL | | | |
| DMBH04-SO-0901-06 | | 9/1 | | | | |
| DMBH04-SO-0901-08 | | 9/1 | | | | |
| DMBH05-SO-0901-02 | | 9/1 | | | | |
| DMBH05-SO-0901-03 | | 9/1 | | | | |
| DMBH05-SO-0901-08 | | 9/1 | | | | |
| DMFB01-RI-0831-01 | | 8/31 | Water | | | |
| DMFB03-RI-0901-02 | | 9/1 | | | | |
| DMTB01-RI-0831-01 | | 8/31 | | | | |
| DMTB03-RI-0901-02 | | 9/1 | | | | |

COPY

Special Instructions: Analyze for UDA (HSL) Emergency analysis to meet holding times

Possible Sample Hazards:

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: William P. Gingrich 9-4-87 1210
   Received By: Gary M. Wheatley ITAS 9/4/87 1210
2. Relinquished By:
   Received By:
3. Relinquished By:
   Received by:
4. Relinquished By:
   Received By:

WHITE - To accompany samples
YELLOW - Field copy

INTERNATIONAL TECHNOLOGY CORPORATION

# CHAIN-OF-CUSTODY RECORD

R/A Control No. 130369

C/C Control No. 49810

PROJECT NAME/NUMBER Davis-Monthan

LAB DESTINATION TAS/Knoxville

SAMPLE TEAM MEMBERS

CARRIER/WAYBILL NO.

| Sample Number | Sample Location and Description | Date and Time Collected | Sample Type | Container Type | Condition on Receipt (Name and Date) | Disposal Record No. |
|---|---|---|---|---|---|---|
| DMBH01-SO-0831-06 | | 8/31 | Soil | 40mL VOA Vial | | |
| DMBH01-SO-0831-07 | | 8/31 | | | | |
| DMBH01-SO-0831-09 | | 8/31 | | | | |
| DMBH02-SO-0831-03 | | 8/31 | | | | |
| DMBH02-SO-0831-05 | | 8/31 | | | | |
| DMBH02-SO-0831-08 | | 8/31 | | | | |
| DMBH03-SO-0901-02 | | 9/1 | | | | |
| DMBH03-SO-0901-04 | | 9/1 | | | | |
| DMBH03-SO-0901-04D | | 9/1 | | | | |
| DMBH03-SO-0901-08 | | 9/1 | | | | |

COPY

Special Instructions: Analyze for VOA (HSL) - Emergency analysis to meet holding times

Possible Sample Hazards:

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: [illegible] 9-4-87 12:10 PM

Received By: Gary M Wood TAS 9/4/87 1210

2. Relinquished By:

Received By:

3. Relinquished By:

Received by:

4. Relinquished By:

Received By:

WHITE - To accompany samples
YELLOW - Field copy

INTERNATIONAL TECHNOLOGY CORPORATION

# CHAIN-OF-CUSTODY RECORD

R/A Control No. 030372

C/C Control No. 49812

PROJECT NAME/NUMBER DAVIS MOATHAN

LAB DESTINATION ITAS KNOXVILLE, TN

SAMPLE TEAM MEMBERS

CARRIER/WAYBILL NO.

| Sample Number | Sample Location and Description | Date and Time Collected | Sample Type | Container Type | Condition on Receipt (Name and Date) | Disposal Record No. |
|---|---|---|---|---|---|---|
| DMEH04-SO-0901-05 | | | SOIL | 32 oz Jar | | |
| DMEH04-SO-0901-06 | | | | | | |
| DMEH04-SO-0901-08 | | | | | | |
| DMEH03-SO-0901-02 | | | | | | |
| DMEH03-SO-0901-03 | | | | | | |
| DMEH03-SO-0901-08 | | | | | | |
| DMEB01-RI-0921-01 | | | WATER | | | |
| DMEB03-RI-0901-02 | | | | | | |
| | | | | | | |
| | | | | | | |

COPY

Special Instructions: TOTAL PETROLEUM HYDROCARBONS (EPA 418.1)

Possible Sample Hazards:

SIGNATURES: (Name, Company, Date and Time) 11:00AM

1. Relinquished By: William P. Ingram 9-10-87
   Received By: Daryl O Stagg ITASMM 9-10-87 1055
2. Relinquished By:
   Received By:
3. Relinquished By:
   Received by:
4. Relinquished By:
   Received By:

WHITE - To accompany samples

INTERNATIONAL TECHNOLOGY CORPORATION

# CHAIN-OF-CUSTODY RECORD

R/A Control No. 030373

C/C Control No. 49814

PROJECT NAME/NUMBER Lewis Mountain

LAB DESTINATION ITASL/Knoxville, TN

SAMPLE TEAM MEMBERS

CARRIER/WAYBILL NO.

| Sample Number | Sample Location and Description | Date and Time Collected | Sample Type | Container Type | Condition on Receipt (Name and Date) | Disposal Record No. |
|---|---|---|---|---|---|---|
| LMIBH01-SO-0831-06 | | | Soil | 32oz JAR | | |
| LMIBH01-SO-0831-07 | | | | | | |
| LMIBH01-SO-0831-09 | | | | | | |
| LMIBH02-SO-0831-03 | | | | | | |
| LMIBH02-SO-0831-05 | | | | | | |
| LMIBH02-SO-0831-18 | | | | | | |
| LMIBH03-SO-0901-02 | | | | | | |
| LMIBH03-SO-0901-04 | | | | | | |
| LMIBH03-SO-0901-24D | | | | | | |
| LMIBH03-SO-0901-08 | | | | | | |

COPY

Special Instructions: Total Petroleum Hydrocarbons (EPA 418.1)

Possible Sample Hazards:

SIGNATURES: (Name, Company, Date and Time) MM. 11:00AM

1. Relinquished By: W.P. Ingram 9-10-87
   Received By: Deryl Ottinger ITASMK 9-10-87 1055
2. Relinquished By:
   Received By:
3. Relinquished By:
   Received by:
4. Relinquished By:
   Received By:

WHITE - To accompany samples
YELLOW - Field copy

LABORATORY DATA SET

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH01-S0-0831-06 Lab Sample Number: 871016-090
Date Sample Received: 16-OCT-1987 Date Sample Completed: 30-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | ug/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 30-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-090
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITASB
Data Release Authorized By: DC Canada

Customer Sample ID: BH01-S0-0831-06
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Mositure:
Percent Moisture (decanted):
Associated Blank: 871016-114

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/KgB | CAS | | ug/KgB |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 3 J | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 87 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reasent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 54.5 | 109.0 |
| BROMOFLUOROBENZENE | 50 | 57 | 114.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 54.5 | 109.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH01-S0-0831-07 Lab Sample Number: 871016-091
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | us/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-091
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: RH01-SO-0831-07
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-114

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 6 | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 98 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 53.5 | 107.0 |
| BROMOFLUOROBENZENE | 50 | 52.0 | 104.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 59.0 | 118.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH01-S0-0831-09 Lab Sample Number: 871016-092
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | us/s | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-092
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH01-S0-0831-09
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Mositure:
Percent Moisture (decanted):
Associated Blank: 871016-114

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 20 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 1 J |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 53.0 | 106.0 |
| BROMOFLUOROBENZENE | 50 | 50.5 | 101.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 54.5 | 109.0 |

Spike Recovery Data

| Analysis | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| PETROLEUM HYDROCARBON | 8100 | 7500. | 92.59 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH02-S0-0831-03 Lab Sample Number: B71016-093
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | 9300 | ug/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-093
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH02-S0-0831-03
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-114

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 8 | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 86 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 1 J |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 55.5 | 111.0 |
| BROMOFLUOROBENZENE | 50 | 46.0 | 92.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 54.0 | 108.0 |

***** Comments from the Wet Chemistry Laboratory *****

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH02-S0-0831-05 Lab Sample Number: 871016-094
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | 390 | us/s | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALISIS DATA REPORT

AnaLIS ID: 871016-094
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH02-SO-0831-05
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-114

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5 | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 30 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 49.0 | 98.0 |
| BROMOFLUOROBENZENE | 50 | 51.5 | 103.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 50.0 | 100.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH02-S0-0B31-08 Lab Sample Number: 871016-095
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | ug/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-095
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH02-SO-0831-08
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-114

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 3 J | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 29 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 50.0 | 100.0 |
| BROMOFLUOROBENZENE | 50 | 50.5 | 101.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 47.5 | 95.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH03-S0-0901-02 Lab Sample Number: 871016-096
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | ug/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-096
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH03-S0-0901-02
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-114

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 4 J | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 3400 B* | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 52.5 | 105.0 |
| BROMOFLUOROBENZENE | 50 | 53.5 | 107.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 50.5 | 101.0 |

***** Comments from the Organic Mass Spectroscopy Laboratory *****

ACETONE  Based on 1/50 dilution.

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH03-S0-0901-04 Lab Sample Number: 871016-097
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | ug/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

# ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-097
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH03-S0-0901-04
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

## Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-114

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5 | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 79 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 52.0 | 104.0 |
| BROMOFLUOROBENZENE | 50 | 54.5 | 109.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 51.0 | 102.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: RH03-S0-0901-08 Lab Sample Number: 871016-098
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | us/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-098
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH03-S0-0901-08
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-114

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 12 | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 38 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 2 J | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 54.5 | 109.0 |
| BROMOFLUOROBENZENE | 50 | 53.5 | 107.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 50.5 | 101.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH04-S0-0901-05 Lab Sample Number: 871016-099
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | ug/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALISIS DATA REPORT

AnaLIS ID: 871016-099
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH04-S0-0901-05
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-119

Date Analyzed: 9-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 2 J | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 77 | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 2 J | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 50.5 | 101.0 |
| BROMOFLUOROBENZENE | 50 | 57.5 | 115.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 44.0 | 88.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH04-S0-0901-06 Lab Sample Number: 871016-100
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | us/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-100
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH04-S0-0901-06
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-116

Date Analyzed: 9-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 95 | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 2 J | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 53.5 | 107.0 |
| BROMOFLUOROBENZENE | 50 | 50.5 | 101.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 43.0 | 86.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH04-S0-0901-08 Lab Sample Number: 871016-101
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | ug/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALISIS DATA REPORT

AnaLIS ID: B71016-101
Laboratory Name: Organic Mass Spectroscopy
File ID: ITK
Instrument ID: ITK
Data Release Authorized By: DC Canada

Customer Sample ID: BH04-S0-0901-08
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Mositure:
Percent Moisture (decanted):
Associated Blank:

Date Analyzed: 9-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: GJ PARDUE JR

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 2 J | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 40 | 108-10-1 | 4-methyl-2-pentanone | ND |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 52 | 104.0 |
| BROMOFLUOROBENZENE | 50 | 58 | 116.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 41.5 | 83.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH05-S0-0901-02 Lab Sample Number: B71016-102
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | ug/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALISIS DATA REPORT

AnaLIS ID: 871016-102
Laboratory Name: Organic Mass Spectroscopy
File ID: ITK
Instrument ID: ITK
Data Release Authorized By: DC Canada

Customer Sample ID: BH05-S0-0901-02
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Mositure: 4.7
Percent Moisture (decanted):
Associated Blank: 871016-119

Date Analyzed: 9-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: GJ PARDUE JR

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 4 J | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 1800* | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 52.5 | 105.0 |
| BROMOFLUOROBENZENE | 50 | 45.0 | 90.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 56.5 | 113.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH05-S0-0901-03 Lab Sample Number: 871016-103
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | 120 | ug/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-103
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH05-S0-0901-03
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-119

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 1 J | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 290 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 1 J | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 55.0 | 110.0 |
| BROMOFLUOROBENZENE | 50 | 51.0 | 102.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 53.0 | 106.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH05-50-0901-08 Lab Sample Number: 871016-104
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | us/s | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH03-S0-090104D
Lab Sample Number: 871016-105
Date Sample Received: 16-OCT-1987
Date Sample Completed: 27-OCT-1987
Date Sampled:
Sampled By:
Material Description: DAVIS-MONTHAN SOIL
Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184207 | EPA-3540 | EPA-418.1 | Petroleum Hydrocarbon | <17 | ug/g | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-105
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: RH03-S0-090104D
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Mositure:
Percent Moisture (decanted):
Associated Blank: 871016-119

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 2 J | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 190 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 48.5 | 97.0 |
| BROMOFLUOROBENZENE | 50 | 50.0 | 100.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 40.5 | 81.0 |

MATRIX SPIKE DATA

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: BH03S0090104DMS  Lab Sample Number: 871016-106
Date Sample Received: 16-OCT-1987  Date Sample Completed: 28-OCT-1987
Date Sampled:  Sampled By:
Material Description: DAVIS-MONTHAN SOIL  Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-106
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: BH0350090104DMS
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Mositure:
Percent Moisture (decanted):
Associated Blank: 871016-119

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 54 S |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 10U | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 36 S | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 56 S |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 62 S |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 61 S | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 58.5 | 117.0 |
| BROMOFLUOROBENZENE | 50 | 49.0 | 98.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 52.0 | 104.0 |

***** Comments from the Organic Mass Spectroscopy Laboratory *****

SOIL VOLATILE MATRIX SPIKE RECOVERY

| Compound | Conc. Spike Added | Sample Result | Conc. MS | % Rec. | Conc. MSD | % Rec. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethene | 50 | 5 U | 36 | 72 | 36 | 72 | 0 |
| Trichloroethene | 50 | 5 U | 61 | 122 | 58 | 116 | 5.0 |
| Chlorobenzene | 50 | 5 U | 62 | 124 | 63 | 126 | -1.6 |
| Toluene | 50 | 5 U | 56 | 112 | 57 | 114 | 1.8 |
| Benzene | 50 | 5 U | 54 | 108 | 54 | 108 | 0 |

* - ASTERISKED VALUES ARE OUTSIDE QC LIMITS.

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: H03S0090104DMSD  Lab Sample Number: 871016-107
Date Sample Received: 16-OCT-1987  Date Sample Completed: 28-OCT-1987
Date Sampled:  Sampled By:
Material Description: DAVIS-MONTHAN SOIL  Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-107
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: H03S0090104DMSD
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-119

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 54 S |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 10U | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 36 S | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 57 S |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 63 S |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 58 S | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 56.0 | 112.0 |
| BROMOFLUOROBENZENE | 50 | 47.5 | 95.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 56.5 | 113.0 |

***** Comments from the Organic Mass Spectroscopy Laboratory *****

SOIL VOLATILE MATRIX SPIKE DUPLICATE RECOVERY

| Compound | Conc. Spike Added | Sample Result | Conc. MS | % Rec. | Conc. MSD | % Rec. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethene | 50 | 5 U | 36 | 72 | 36 | 72 | 0 |
| Trichloroethene | 50 | 5 U | 61 | 122 | 58 | 116 | 5.0 |
| Chlorobenzene | 50 | 5 U | 62 | 124 | 63 | 126 | -1.6 |
| Toluene | 50 | 5 U | 56 | 112 | 57 | 114 | 1.8 |
| Benzene | 50 | 5 U | 54 | 108 | 54 | 108 | 0 |

* - ASTERISKED VALUES ARE OUTSIDE QC LIMITS.

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: TB01RI083101MS  Lab Sample Number: 871016-112
Date Sample Received: 16-OCT-1987  Date Sample Completed: 28-OCT-1987
Date Sampled:  Sampled By:
Material Description: DAVIS-MONTHAN WATER  Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-112
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: TR01RI0B3101MS
Customer Name: FRANCO
Sample Matrix: WATER
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-624
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-120

Date Analyzed: 4-SEP-1987
Analysis Procedure Number: EPA-624
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/L | CAS | | ug/L |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 53 S |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 10U | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 45 S | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 51 S |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 54 S |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 56 S | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 47.0 | 94.0 |
| BROMOFLUOROBENZENE | 50 | 46.5 | 93.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 39.0 | 78.0 |

***** Comments from the Organic Mass Spectroscopy Laboratory *****

WATER VOLATILE MATRIX SPIKE RECOVERY

| Compound | Conc. Spike Added | Sample Result | Conc. MS | % Rec. | Conc. MSD | % Rec. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethene | 50 | 5 U | 45 | 91 | 44 | 89 | 2.2 |
| Trichloroethene | 50 | 5 U | 56 | 112 | 57 | 114 | -1.8 |
| Chlorobenzene | 50 | 5 U | 54 | 107 | 54 | 108 | 0.4 |
| Toluene | 50 | 5 U | 51 | 102 | 51 | 102 | 0.3 |
| Benzene | 50 | 5 U | 53 | 106 | 54 | 107 | -1.9 |

* - ASTERISKED VALUES ARE OUTSIDE QC LIMITS.

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: TR01RI083101MSD  Lab Sample Number: 871016-113
Date Sample Received: 16-OCT-1987  Date Sample Completed: 28-OCT-1987
Date Sampled:  Sampled By:
Material Description: DAVIS-MONTHAN WATER  Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-113
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: TR01RI083101MSD
Customer Name: FRANCO
Sample Matrix: WATER
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-624
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-120

Date Analyzed: 4-SEP-1987
Analysis Procedure Number: EPA-624
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/L | CAS | | ug/L |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 54 S |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 10U | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 44 S | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 51 S |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 54 S |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 57 S | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 47.5 | 95.0 |
| BROMOFLUOROBENZENE | 50 | 48.5 | 97.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 38.5 | 77.0 |

***** Comments from the Organic Mass Spectroscopy Laboratory *****

WATER VOLATILE MATRIX SPIKE DUPLICATE RECOVERY

| Compound | Conc. Spike Added | Sample Result | Conc. MS | % Rec. | Conc. MSD | % Rec. | RPD |
|---|---|---|---|---|---|---|---|
| 1,1-Dichloroethene | 50 | 5 U | 45 | 91 | 44 | 89 | 2.2 |
| Trichloroethene | 50 | 5 U | 56 | 112 | 57 | 114 | -1.8 |
| Chlorobenzene | 50 | 5 U | 54 | 107 | 54 | 108 | 0.4 |
| Toluene | 50 | 5 U | 51 | 102 | 51 | 102 | 0.3 |
| Benzene | 50 | 5 U | 53 | 106 | 54 | 107 | -1.9 |

* - ASTERISKED VALUES ARE OUTSIDE QC LIMITS.

**Sample Description:** DMBH01S0-0831-09 871016-092

Concentration units are mg/kg (ppm)

SOIL MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

| Compound | Conc. Spike Added | Sample Result | Conc. MS | % Rec. | Conc. MSD | % Rec. | RPD |
|---|---|---|---|---|---|---|---|
| Total Petroleum Hydrocarbons | 8,100 | <17 | 7,500 | 93 | 7,300 | 90. | 3.3 |

RPD = Relative Percent Difference

# FIELD BLANK DATA

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: FB01RI083101 Lab Sample Number: 871016-108
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN WATER Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184208 | EPA-418.1 | EPA-418.1 | Petroleum Hydrocarbon | <0.2 | mg/L | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-108
Laboratory Name: Organic Mass Spectroscopy
File ID: ITK
Instrument ID: ITK
Data Release Authorized By: DC Canada

Customer Sample ID: FB01RI083101
Customer Name: FRANCO
Sample Matrix: WATER
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-624
Percent Mositure:
Percent Moisture (decanted):
Associated Blank: 871016-120

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-624
Conc/Dilution Factor: 1.0
Analyst: GJ PARDUE JR

| CAS | | ug/L | CAS | | ug/L |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 260 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 2 JB |
| 78-93-3 | 2-butanone | 8 J | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 53.0 | 106.0 |
| BROMOFLUOROBENZENE | 50 | 49.0 | 98.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 41.0 | 82.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: FB03RI090102 Lab Sample Number: 871016-109
Date Sample Received: 16-OCT-1987 Date Sample Completed: 27-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN WATER Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|
| 184208 | EPA-418.1 | EPA-418.1 | Petroleum Hydrocarbon | 0.3 | mg/L | MR POWELL | 27-OCT-1987 |

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALISIS DATA REPORT

AnaLIS ID: 871016-109
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: FR03RI090102
Customer Name: FRANCO
Sample Matrix: WATER
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-624
Percent Mositure:
Percent Moisture (decanted):
Associated Blank: 871016-120

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-624
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/L | CAS | | ug/L |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 280 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 2 JB |
| 78-93-3 | 2-butanone | 12 | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 52.0 | 104.0 |
| BROMOFLUOROBENZENE | 50 | 49.5 | 99.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 39.5 | 79.0 |

TRIP BLANK DATA

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: TB01RI083101 Lab Sample Number: 871016-110
Date Sample Received: 16-OCT-1987 Date Sample Completed: 28-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN WATER Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-110
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: TB01RI083101
Customer Name: FRANCO
Sample Matrix: WATER
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-624
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: 871016-120

Date Analyzed: 4-SEP-1987
Analysis Procedure Number: EPA-624
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/L | CAS | | ug/L |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 260 B | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 49 | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 49.0 | 98.0 |
| BROMOFLUOROBENZENE | 50 | 49.0 | 98.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 43.0 | 86.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: TR03RI090102 Lab Sample Number: 871016-111
Date Sample Received: 16-OCT-1987 Date Sample Completed: 28-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN WATER Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 28-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-111
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: TR03RI090102
Customer Name: FRANCO
Sample Matrix: WATER
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-624
Percent Mositure:
Percent Moisture (decanted):
Associated Blank: 871016-120

Date Analyzed: 18-SEP-1987
Analysis Procedure Number: EPA-624
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/L | CAS | | ug/L |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 120 | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 1 J |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 6 J | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 45.0 | 90.0 |
| BROMOFLUOROBENZENE | 50 | 44.0 | 88.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 44.0 | 88.0 |

# LABORATORY BLANK DATA

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: VOBLK0908 Lab Sample Number: 871016-114
Date Sample Received: 16-OCT-1987 Date Sample Completed: 21-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 26-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: B71016-114
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: VOBLK0908
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 8-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Mositure:
Percent Moisture (decanted):
Associated Blank:

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 26 | 108-10-1 | 4-methyl-2-pentanone | 2 J |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 4 J |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 50.0 | 100.0 |
| BROMOFLUOROBENZENE | 50 | 51.5 | 103.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 49.0 | 98.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: VRLK09092 Lab Sample Number: 871016-115
Date Sample Received: 16-OCT-1987 Date Sample Completed:
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved:

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-115
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: VBLK09092
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 9-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: BLANK

Date Analyzed: 9-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 10U | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 1 J |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 50.0 | 100.0 |
| BROMOFLUOROBENZENE | 50 | 55.5 | 111.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 46.5 | 93.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: VOBLK09092 Lab Sample Number: 871016-116
Date Sample Received: 16-OCT-1987 Date Sample Completed: 21-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 26-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-116
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: VOBLK09092
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 9-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Mositure:
Percent Moisture (decanted):
Associated Blank: BLANK

Date Analyzed: 9-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 2 J | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 10U | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 52.5 | 105.0 |
| BROMOFLUOROBENZENE | 50 | 49.5 | 99.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 46.5 | 93.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: VORL09091 Lab Sample Number: 871016-117
Date Sample Received: 16-OCT-1987 Date Sample Completed: 21-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 26-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-117
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: VOBL09091
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 9-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Mositure:
Percent Moisture (decanted):
Associated Blank: BLANK

Date Analyzed: 9-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 4 J | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 50.0 | 100.0 |
| BROMOFLUOROBENZENE | 50 | 58.0 | 116.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 45.5 | 91.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: VOBLK0910 Lab Sample Number: 871016-118
Date Sample Received: 16-OCT-1987 Date Sample Completed: 21-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN SOIL Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 26-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-118
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: VOBLK0910
Customer Name: FRANCO
Sample Matrix: SOIL
Requisition Number:
Date Sample Received: 10-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-5030
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: BLANK

Date Analyzed: 10-SEP-1987
Analysis Procedure Number: EPA-8240
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/Kg | CAS | | ug/Kg |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 11 | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 50.0 | 100.0 |
| BROMOFLUOROBENZENE | 50 | 55.0 | 110.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 47.5 | 95.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: V0BL09081 Lab Sample Number: 871016-119
Date Sample Received: 16-OCT-1987 Date Sample Completed: 21-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN WATER Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 26-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-119
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: VORL09081
Customer Name: FRANCO
Sample Matrix: WATER
Requisition Number:
Date Sample Received: 8-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-624
Percent Moisture:
Percent Moisture (decanted):
Associated Blank:

Date Analyzed: 8-SEP-1987
Analysis Procedure Number: EPA-624
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/L | CAS | | ug/L |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 2 J | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 50 | 53.0 | 106.0 |
| BROMOFLUOROBENZENE | 50 | 45.5 | 91.0 |
| 1,2-DICHLOROETHANE-D4 | 50 | 42.5 | 85.0 |

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: VBLK09042 Lab Sample Number: 871016-120
Date Sample Received: 16-OCT-1987 Date Sample Completed: 21-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN WATER Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 26-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-120
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: VBLK09042
Customer Name: FRANCO
Sample Matrix: WATER
Requisition Number:
Date Sample Received: 4-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-624
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: BLANK

Date Analyzed: 4-SEP-1987
Analysis Procedure Number: EPA-624
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/L | CAS | | ug/L |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 6 | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 5 J | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 4 J |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 1 J |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 0 | 0 | 0.0 |
| BROMOFLUOROBENZENE | 0 | 0 | 0.0 |
| 1,2-DICHLOROETHANE-D4 | 0 | 0 | 0.0 |

***** Comments from the Organic Mass Spectroscopy Laboratory *****

AD YOU SURROGATE STANDARDS WITH THIS SAMPLE.

Oak Ridge Gaseous Diffusion Plant
Analytical Chemistry Department
Results of Analyses

Customer Name: FRANCO
Customer Sample Number: VORL09181 Lab Sample Number: B71016-121
Date Sample Received: 16-OCT-1987 Date Sample Completed: 21-OCT-1987
Date Sampled: Sampled By:
Material Description: DAVIS-MONTHAN WATER Req. Number:

| Activity Number | Preparation Procedure No. | Analysis Procedure No. | Analysis | Result | Units | Analyst | Date Completed |
|---|---|---|---|---|---|---|---|

Program Manager: MS Miller
Date Approved: 26-OCT-1987

ORGANIC ANALYSIS DATA REPORT

AnaLIS ID: 871016-121
Laboratory Name: Organic Mass Spectroscopy
File ID: ITAS
Instrument ID: ITAS
Data Release Authorized By: DC Canada

Customer Sample ID: VOBL09181
Customer Name: FRANCO
Sample Matrix: WATER
Requisition Number:
Date Sample Received: 18-SEP-1987

Volatile Organic Compounds - HSL

Date Extracted/Prepared:
Preparation Procedure Number: EPA-624
Percent Moisture:
Percent Moisture (decanted):
Associated Blank: BLANK

Date Analyzed: 18-SEP-1987
Analysis Procedure Number: EPA-624
Conc/Dilution Factor: 1.0
Analyst: L HOLSOPPLE

| CAS | | ug/L | CAS | | ug/L |
|---|---|---|---|---|---|
| 74-87-3 | chloromethane | 10U | 79-00-5 | 1,1,2-trichloroethane | 5U |
| 74-83-9 | bromomethane | 10U | 71-43-2 | benzene | 5U |
| 75-01-4 | vinyl chloride | 10U | 10061-02-6 | trans-1,3-dichloropropene | 5U |
| 75-00-3 | chloroethane | 10U | 110-75-8 | 2-chloroethylvinyl ether | 10U |
| 75-09-2 | methylene chloride | 5U | 75-25-2 | bromoform | 5U |
| 67-64-1 | acetone | 10U | 108-10-1 | 4-methyl-2-pentanone | 10U |
| 75-15-0 | carbon disulfide | 5U | 591-78-6 | 2-hexanone | 10U |
| 75-35-4 | 1,1-dichloroethene | 5U | 127-18-4 | tetrachloroethene | 5U |
| 75-34-3 | 1,1-dichloroethane | 5U | 79-34-5 | 1,1,2,2-tetrachloroethane | 5U |
| 156-60-5 | trans-1,2-dichloroethene | 5U | 108-88-3 | toluene | 5U |
| 67-66-3 | chloroform | 5U | 108-90-7 | chlorobenzene | 5U |
| 107-06-2 | 1,2-dichloroethane | 5U | 100-41-4 | ethylbenzene | 5U |
| 78-93-3 | 2-butanone | 10U | 100-42-5 | styrene | 5U |
| 71-55-6 | 1,1,1-trichloroethane | 5U | | total xylenes | 5U |
| 56-23-5 | carbon tetrachloride | 5U | | | |
| 108-05-4 | vinyl acetate | 10U | | | |
| 75-27-4 | bromodichloromethane | 5U | | | |
| 78-87-5 | 1,2-dichloropropane | 5U | | | |
| 10061-01-5 | cis-1,3-dichloropropene | 5U | | | |
| 79-01-6 | trichloroethene | 5U | | | |
| 124-48-1 | dibromochloromethane | 5U | | | |

Data Reporting Qualifiers:

U - Compound was analyzed for but not detected. The number is the attainable detection limit for the sample.
B - Analyte was found in the reagent blank as well as the sample.
J - Indicates an estimated value.
ND - Not Detected.

Surrogate Recovery Data

| Surrogate Compound | Amount Spiked | Amount Recovered | Percent Recovered |
|---|---|---|---|
| TOLUENE-D8 | 0 | 0 | 0.0 |
| BROMOFLUOROBENZENE | 0 | 0 | 0.0 |
| 1,2-DICHLOROETHANE-D4 | 0 | 0 | 0.0 |

***** Comments from the Organic Mass Spectroscopy Laboratory *****

NO VOA SURROGATE STANDARDS WITH THIS SAMPLE.

(HSL) NONE DETECTED.

# APPENDIX II

# GEOTECHNICAL INVESTIGATION

# FOR

# FIRE TRAINING FACILITY SITING

# DAVIS-MONTHAN AIR FORCE BASE

PREPARED FOR

OAK RIDGE NATIONAL LABORATORY

ENVIRONMENTAL ASSESSMENTS GROUP

BY

THE EARTH TECHNOLOGY CORPORATION

3116 WEST THOMAS ROAD, SUITE 601

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Earth Technology Project No. 87-853

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FIELD INVESTIGATION


| FIGURE NO. | |
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| A-6 through A-16 | Logs of Geotechnical Borings GT-1 through GT-11 |


### APPENDIX B

GEOTECHNICAL LABORATORY TESTING


| TABLE/FIGURE NO. | |
|---|---|
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| Figures B-1 through B-19 | Unified Soil Classifications |
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# 1.0 INTRODUCTION

## 1.1 General

This report presents the results of a geotechnical investigation and engineering analysis conducted by The Earth Technology Corporation (Earth Technology) for the project site located near the present fire training facility along the southwest side of Ramsgate Road on the Davis-Monthan Air Force Base (D-M AFB). The site location is shown in Figure 1. D-M AFB is in Pima County on the southeast side of Tucson, Arizona.

The purpose of this study was to determine if any gross contamination that might require remediation is present under the site proposed for the Fire Training Facility (FTF). In addition, the study was intended to determined the subsoil conditions underlying the subject site and provide geotechnical recommendations for the site development. During the course of the work, Oak Ridge National Laboratory, (ORNL) was responsible for the interpretations related to the determination of contaminated soil and/or ground water. Earth Technology's responsibility included conducting the field investigation, geotechnical laboratory testing, engineering analysis and geotechnical report preparation.

## 1.2 Scope of Work

The field and office tasks consisted of the following:

- Review of available reports and work plans for the project area.
- Drilling, sampling and logging of a total of 5 Environmental Borings (hollow stem) to a depth of 37.5 feet for environmental/chemical (E/C) and geotechnical testing.

- Drilling, sampling and logging of a total of 11 Geotechnical Borings (hollow stem), three to a depth of approximately 91.5 feet and the remaining eight to a depth of approximately 21.5 feet for geotechnical testing.
- Laboratory testing (geotechnical) of representative soil samples obtained from environmental and geotechnical borings.
- Engineering analysis (geotechnical only) of the collected field and laboratory data.
- Preparation of this report presenting our findings, conclusions and recommendations.

The locations of borings are shown in Figure 2. The logs of borings and the laboratory test results are presented in Appendix A and Appendix B, respectively.

## 1.3 Site Description

The existing fire training area is located in the central area of the D-M AFB. It includes roughly a triangular shaped area measuring about 500 feet on a side. Three circular-shaped fire training areas are situated at west, southwest and north corners of the site. Each fire training area consists of a relatively flat, unvegetated ground surface surrounded by a low earthen berm. In addition to fire training areas, site contains waste fuel storage facility, fire pit, old cars, drums filled with fire retardant and a concrete pad housing a building used for fire fighting purposes. The site is currently being used for fire fighting practice.

## 1.4 Proposed Development

The general configuration of the proposed grading for the FTF site is shown in Figure 2. Grading plan indicates that the site will be developed by a relati-

vely minor conventional cut and fill grading by using locally available soils to create approximately 300 foot diameter and 3-foot high soil fill berm with a double lined containment pit on the top, access road to connect soil berm (FTF-site) to Ramsgate Road, various concrete pads, approximately 3-foot deep double lined effluent holding pond, and other minor support facilities including pit drain line, oil separator, electrical services, and storage buildings.

# 2.0 FIELD AND LABORATORY INVESTIGATIONS

## 2.1 Field Investigations

Earth Technology performed a subsurface investigation consisting of drilling a total of 16 hollow-stem auger borings between August 31, 1987 and September 4, 1987. The field investigation was performed by a geologist under the direct supervision of a registered civil engineer. Boring locations are shown on Boring Location Plan, Figure 2. Boring logs including sampling methods and procedures followed, both for environmental and geotechnical borings, are presented in Appendix A.

Five Environmental Borings, BH-01 through BH-05, were drilled first to a depth of 37.5 feet and sampled both for environmental/chemical (E/C) and geotechnical testing. Drilling work complied with all applicable Environmental Protection Agency (EPA), Air Force Office of Safety and Health, Occupational Health and Safety Administration, and State of Arizona regulations and procedures concerning safety during drilling, sampling, and analytical testing activities. Prior to commencement of the drilling, the site had been classified as a Level-D Hazardous Waste Project. Contamination levels were continuously monitored by ORNL safety officers and were found to be very slight to slight, therefore, no precautionary measures were warranted. Geotechnical samples and E/C samples (approximately at 5 foot intervals) were obtained using a 2.5-inch diameter California ring sampler and standard split spoon sampler as directed by ORNL site project manager.

Upon completion of the five combination environmental/geotechnical borings, the

remaining 11 geotechnical borings, GT-1 through GT-11, (3 to a depth of 91.5 feet, and 8 to a depth of 21.5 feet) were drilled also using a hollow-stem auger rig. Geotechnical borings were sampled at 5 foot intervals using a California ring sampler and/or split spoon sampler. No E/C sampling was required for these holes. ORNL representatives were present during all drilling operations.

During drilling and sampling Standard Penetration Test (SPT) blow counts for driving the split spoon sampler and the blow counts to drive the California ring sampler by 12 inches were recorded for each sample interval. All borings were logged by a geologist. Materials were visually classified in accordance with the Unified Soil Classification System (USCS). SPT's were performed in accordance with ASTM D1586. Upon completion of drilling, the borings were backfilled with drill cuttings.

## 2.2 Laboratory Testing (Geotechnical)

The following laboratory tests (geotechnical) were performed on representative soil samples using the applicable ASTM standards:

- 27 in-situ dry density determinations
- 54 in-situ moisture content tests
- 15 gradation analysis
- 14 Atterberg limits tests
- 3 consolidation tests
- 2 pH
- 1 soluble sulfates

Laboratory test results including testing procedures are presented in Appendix B, (on Table B-1 and in Figures B-1 through B-22).

# 3.0 GEOTECHNICAL CONDITIONS

## 3.1 General Geology and Physiography

D-M AFB is situated in the Tucson Basin within the southern part of the Basin and Range physiographic providence. The Tucson Basin is typical of this region; it is a broad alluvial basin with adjacent hills and high mountains composed mainly of crystalline rocks (Reference 4).

Rocks in this area show evidence of igneous intrusions, sea advancement, metamorphism, uplifts, faulting and erosion. No outcropping of rocks was seen in the immediate study area, but in the nearby mountain ranges the rock ages range from Precambrian to Quaternary. Old precambrian rocks, mostly granite and related crystalline intrusive rocks, are exposed in the Rincon and Tortolita Mountains. Cretaceous rocks found around the study area are mostly shale, sandstone, conglomerate, limestone (some locally metamorphosed) showing evidence of sea advancement. (This can be seen in the Tucson, Rincon and Empre Mountains).

The mountains surrounding the study area were uplifted during the Laramide Orogeny of the Tertiary age, which is common throughout western North America. The early Tertiary period brought about metamorphism which produced granitic gneisses; these were derived from igneous and sedimentary rocks ranging from Precambrian through Cretaceous in age (mostly seen in the Rincon mountains). The middle and late Tertiary period produced mostly granites, latite and andesites. Evidence of this is predominant in the majority of the surrounding mountains. The alluvial valleys within the basin contain Quaternary gravel, sand,

silt and clay. Thickness of these units may exceed thousands of feet. Some of these strata are aquifers which are a major water supply source for the Tucson area.

## 3.2 Faulting and Seismicity

The mountainous areas around the Tucson area have seen most of the seismic activity. Faulting has occurred in the mountain ranges: Tucson, Sierrita, Rincon and Empre which are approximately 10, 17, 20 and 25 miles from the project area, respectively, (Reference 1). These faults are considered inactive. No active faults have been observed within the proposed project site.

Arizona is a region with infrequent earthquakes and only a few seismograph stations have been operated in the state. As a result, readings at stations from surrounding areas have been necessary to determine earthquake locations and magnitudes. Figure 3 presents the earthquake immensities reported between 1852 abd 1977. Some small earthquakes, about Magnitude 3 and less, have probably occurred in Arizona, but were not large enough to be adequately registered at the regional seismograph stations, and thus do not appear in the seismicity catalogs. The reports of felt earthquakes can imply locations only in the area of community experiencing the strongest effects, which is not necessarily the area of the epicenter. For these reasons, the seismicity data in Arizona are not adequate for correlation to specific faults (Reference 3).

The project site is located within the Uniform Building Code Seismic Zone 2 (Reference 8).

## 3.3 Site and Subsurface Conditions

Based on the information gathered from Geotechnical Borings (GT-1 through GT-11) and Environmental Borings (BH-01 through BH-05), the characterization of the surface and subsurface soil conditions at the proposed site is presented as follows:

### 3.3.1 Surficial Materials

The general area of the site is at an elevation of about 2,700 feet. The ground surface slopes approximately 7 feet from the southeast end to the northwest end of the site. The natural vegetation cover at the site consists mostly of grasses and small desert plants less than five inches tall. Surficial deposits consisting of alluvium (silty sand with gravel and traces of clay) are present throughout the site. No bedrock materials are exposed over the site and none were encountered during drilling.

### 3.3.2 Alluvium

Information obtained from the borings indicates the presence of alluvium throughout the site to a depth of at least 91.5 feet, the maximum depth investigated by borings. The alluvium consists of light brown silty sand with gravel and traces of clay (SM), light brown sandy clay (CL), orange brown sand to silty sand (SP-SM), light brown clayey sand with silt (SC), orange brown to light brown sandy silt (ML) and light brown silty clayey sand (SM-SC). Calcareous cementation was found throughout the sampling. In general, the alluvium is slightly moist and medium dense to very dense where sampled. The sand particle

sizes range from fine to coarse with occassional medium gravel, with a subangular to subrounded grain shape. Generalized stratification for the soils at the site is as follows:

| | |
|---|---|
| 0-15 feet | Sandy Silty Clay (CL) to Clayey Sand with Silt (SC) |
| 15-83 feet | Sand to Silty Sand (SP-SM) |
| 83-91.5 feet | Sandy Silt (ML) |

Cementation in the alluvial soils is generally slight to moderate. Typical geotechnical cross sections A-A', B-B' and C-C', based on the results of field investigation, are presented in Figures 4 and 5.

### 3.4 Hydrologic Conditions

No ground water was encountered in any of the borings. The static ground water table is anticipated to be located at a depth of about 300 feet or greater.

Surface drainage is generally by sheetflow down from southeast to northwest. Runoff is then carried northwesterly to the property boundary.

### 3.5 Compressibility

In general, the onsite soils encountered in the exploratory borings within the upper 15 feet are clayey silty sands, medium dense to very dense and sandy silty clays ranging in consistency from stiff to hard. The remaining alluvial sediments located approximately below 15 feet are silty sands with occasional lenses of silty clays and are dense to very dense at increasing depths with slight to moderate cementation.

Consolidation tests on relatively undisturbed samples indicate that subsurface

soils within the upper 15 feet have a relatively low compressibility and a medium to high degree of expansion potential on addition of water. This may be observed on consolidation test results presented in Appendix B, Figures B-20 and B-21. The collapse potential observed for one of the three samples, Figure B-22, is attributed to the possible sample disturbance which might have occurred during transportation of samples from site to our laboratory, and is not considered to be a representative characterization of the alluvium in view of the very high blow counts recorded during drilling.

### 3.6 Expansion Potential, pH and Resistivity

In general, laboratory testing of selected samples and our visual observations indicate that the onsite soils located within the upper 15 feet have a medium to high expansion potential. Materials occurring at finish grade levels are expected to contain variable amounts of expansive clayey soils. Near-surface soils should be tested upon completion of grading to properly evaluate the expansion potential and determine the mitigative measures.

Laboratory pH testing of selected near-surface samples indicated moderately to highly alkaline soils with possible corrosion potential to buried utilities. Near-surface soils should be tested for resistivity and corrosion potential after completion of grading.

### 3.7 Soluble Sulfates

Based on laboratory testing of soils located within the upper 5 feet, the near-surface soils exhibit low soluble sulfate content and use of Type II cement may be adequate for concrete in contact with site soils. This should be verified by testing of near-surface soils upon completion of grading.

## 3.8 Liquefaction Potential

The site lies within Seismic Zone 2 of the Uniform Building Code. Secondary effects of seismic shaking, such as liquefaction, seismically induced settlement and ground lurching are phenomena usually associated with relatively strong seismic shaking, shallow ground water, and the presence of loose sandy soils or alluvial deposits. Because of the absence of loose sandy soils and a great depth to ground water level, the liquefaction potential is considered to be very low.

# 4.0 CONCLUSIONS AND RECOMMENDATIONS

## 4.1 General

Based on the results of our investigation, it is our opinion that the proposed development is feasible from a geotechnical viewpoint, provided the conclusions and recommendations of this report are incorporated in the design and construction of the project. The conclusions and recommendations presented herein may be utilized for evaluating the site suitability and selecting final structure locations. The site and structure-specific recommendations should consider the structure type and loading. These were not available at the time of preparation of this report.

The general recommendations for grading and foundation preparation are provided below.

## 4.2 Recommendations

### 4.2.1 Site Preparation

Prior to grading, the site should be cleared of all vegetation and debris which should be disposed offsite. All existing abandoned utility lines and improvements should be located and removed. Excavations resulting from the removal of buried obstructions and utilities and from removals of any uncertified material should be backfilled with controlled compacted fill.

In general, all areas receiving fill or other surface improvements should be cleared of all loose and uncontrolled fill materials. The surface should be scarified to a minimum depth of six inches, brought to near-optimum moisture

content, and compacted to at least 95 percent compaction relative to ASTM D1557. For the cut areas, the exposed surface should be compacted with a heavy roller so that at least 95 percent compaction relative to ASTM D 1557 is achieved to a depth of one foot below the grade.

Should any loose material be exposed in the cut areas near the finish grade, such material should be removed to the level of competent surface and the overexcavated area replaced with compacted fill.

### 4.2.2 Removal, Overexcavation and Recompaction

Following the site preparation, the areas underneath the proposed buildings, effluent pond, containment pit and pit drain line should be overexcavated to remove potentially expansive clayey soils and recompacted with non-expansive granular soils. On site non-expansive cohesionless soils are anticipated to be located at depths greater than 15 to 20 feet, and its excavation as a borrow source would not be economical. We therefore recommend that non-expansive granular soils be imported from an offsite source. Any import material should be tested and approved by the geotechnical engineer prior to its being placed as fill.

Overexcavation/removal depths are directly proportional with the existing expansive soil depths. The actual depth of overexcavation should be based on field observations and testing during site grading. However, for planning purposes the following overexcavation depths may be assumed:

Building Areas

To provide satisfactory support for the foundation and slab, overexcavate and recompact to such a depth that at least 4 feet of

non-expansive compacted fill will be present below the bottom of footing. The overexcavation and recompaction should extend a minimum of 5 feet beyond the outside edges of the footings. Slab-on-grade areas should be overexcavated and recompacted to a depth of 2 feet below the base of the slab or to firm material, whichever is greater.

Effluent Pond and Containment Pit

To provide satisfactory support for these double lined retention basins overexcavate and recompact to such a depth and extent that at least 4 feet of non-expansive compacted fill will be present below the bottom of the basin. The overexcavation should extend at least 5 feet beyond the perimeter of the basin.

Pit Drain Line

To provide suitable support for the drain line and to prevent excessive differential movement along the alignment overexcavate and recompact to such a depth that at least 3 feet of non-expansive compacted fill will be present below the bottom of the proposed drain line. The overexcavation and backfill should extend a minimum of 2 feet beyond the outside edges of the drain line.

### 4.2.3 Fill Placement and Compaction

The onsite nonexpansive soils are generally suitable for use as compacted structural fill provided that they are free of organic material and debris, except in the areas discussed above where non expansive fill is required. Any imported fill soils should be approved by geotechnical engineer before fill placement. Imported fill should consist of clean soils with low expansion potential (preferably an expansion index less than 20). All fill soils should be placed in horizontal lifts, not exceeding 8 inches in loose thickness, moisture-conditioned as necessary to near-optimum moisture content and compacted to a minimum of 95 percent relative compaction as determined by ASTM Test Method D 1557.

### 4.2.4 Shallow Foundations

Conventional continuous (wall) and/or spread footings may be used to support the anticipated building loads. Footings should be founded in firm compacted soils. An allowable bearing capacity values of 2,000 psf and 2,400 psf may be used to size wall and spread footings, respectively. The recommended bearing pressure value is a net value and the weight of the foundation and soil above it may be neglected. Wall footings should be a minimum of 12 inches in width and embedded at least 18 inches below lowest adjacent finish grade. Interior spread footings should be embedded a minimum of 24 inches below lowest adjacent grade (top of the floor slab) and should be a minimum of 24 inches in width. Total and differential settlements for the above requirements should be within tolerable limits, (less than ½ inch). The allowable bearing pressures may be increased by one-third for short term wind or seismic loading conditions.

### 4.2.5 Floor Slabs

Slab-on-grade may be used for all structures. The foundation below the slab should be overexcavated and recompacted as discussed above. Slab thickness and reinforcement requirements should be provided by the structural engineer. Where conventional light floor loading conditions exist, the following recommendations should be considered for minimum design.

- A minimum slab thickness of four inches (nominal). Welded wire mesh (6 x 6 - 10/10 WWF) placed at mid-height on the slab for control of potential temperature cracking.
- A moisture (visqueen) barrier placed beneath slabs consisting of a plastic membrane (6-mil thick minimum) and a sand blanket (two-inch thick minimum) placed between the slab and a plastic membrane where moisture-sensitive floor covering is planned.

- A sand layer (two-inch thick minimum) placed beneath the plastic membrane to protect the visqueen barrier from puncturing.
- A moisture-conditioned slab subgrade (optimum moisture content plus minimum 5 percent) by presoaking to a depth of at least 12 inches below the slab or as approved by the geotechnical engineer.

Design parameters listed above are based on a low expansion potential import soils and should be confirmed by testing prior to construction of floor slabs.

### 4.2.6 Lateral Earth Pressures

Retaining walls (if any) should be designed using the following lateral earth pressures. These values are for a level backfill with a unit weight of 120 pcf and free drainage conditions. Should a variation in backfill material occur or if sloping backfill is used, these parameters should be reevaluated by the geotechnical engineer.

| | |
|---|---|
| Active Equivalent Fluid Pressure: | 40 pcf |
| Passive Equivalent Fluid Pressure: | 300 pcf |
| At-Rest Equivalent Fluid Pressure: | 60 pcf |
| Coefficient of Friction (Concrete on Soil): | 0.3 |
| Allowable Bearing Capacity: | 2,400 psf |

If passive earth pressure and friction are combined to provide required resistance to lateral forces, the value of the passive pressure should be reduced to two-thirds of the above recommendation. These values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

A properly outletted subdrain system, consisting of 4-inch diameter perforated

pipe surrounded by a minimum of one cubic foot (per lineal foot) of filter material (1:1 mixture of pea gravel to washed concrete sand, or approved equivalent) should be provided behind structural retraining walls to avoid buildup of hydrostatic pressure.

### 4.2.7 Soil Corrosivity and Cement Type

Onsite soils are possibly corrosive to ferrous metals such as reinforcing steel and underground piping. It is recommended that all utility pipes be non-metallic and corrosive resistant. If metallic pipes are used they should be protected against corrosion. Corrugated metal pipe culverts, if used, should be bituminous coated.

Based on sulfate test results, water soluble sulfates are not present in sufficient quantities to require use of specialized cement for concrete, and Type II cement may be used. However, following the completion of grading the representative samples of near-surface soils should be tested and final recommendation for cement type be provided at that time.

### 4.2.8 Drainage and Erosion Prevention

We recommend that the pad grades be designed such that all surface runoff is directed off the site, toward approved drainage devices to the street, and away from the building foundation areas. Site runoff should not be permitted to run over slopes. To minimize erosion, we recommend that site slopes (both cut and fill) should be covered with coarse gravel and should be planted as soon as practical with a drought-tolerant vegetation.

### 4.2.9 Construction Observation

The recommendations provided in this report are based on preliminary design information for the proposed facilities, field observations, and subsurface conditions observed and interpreted during the field and laboratory investigations. Subsurface conditions described are the result of interpolation between widely spaced borings, and should be checked in the field during construction. Significant differences between the described and actual subsurface conditions should be brought to the attention of Earth Technology.

All foundation excavations, removals, overexcavations, fill placement and compaction operations should be observed and tested by Earth Technology to determine that recommendations provided herein are incorporated during construction. A final as-graded geotechnical report should be prepared to summarize the conditions encountered and any field modifications to the recommendations provided herein.

## REFERENCES


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9. United States Department of Agriculture Soil Conservation Service, (1980), "General Soil Map, Pima County, Arizona", March 1974, reprinted July 1980.

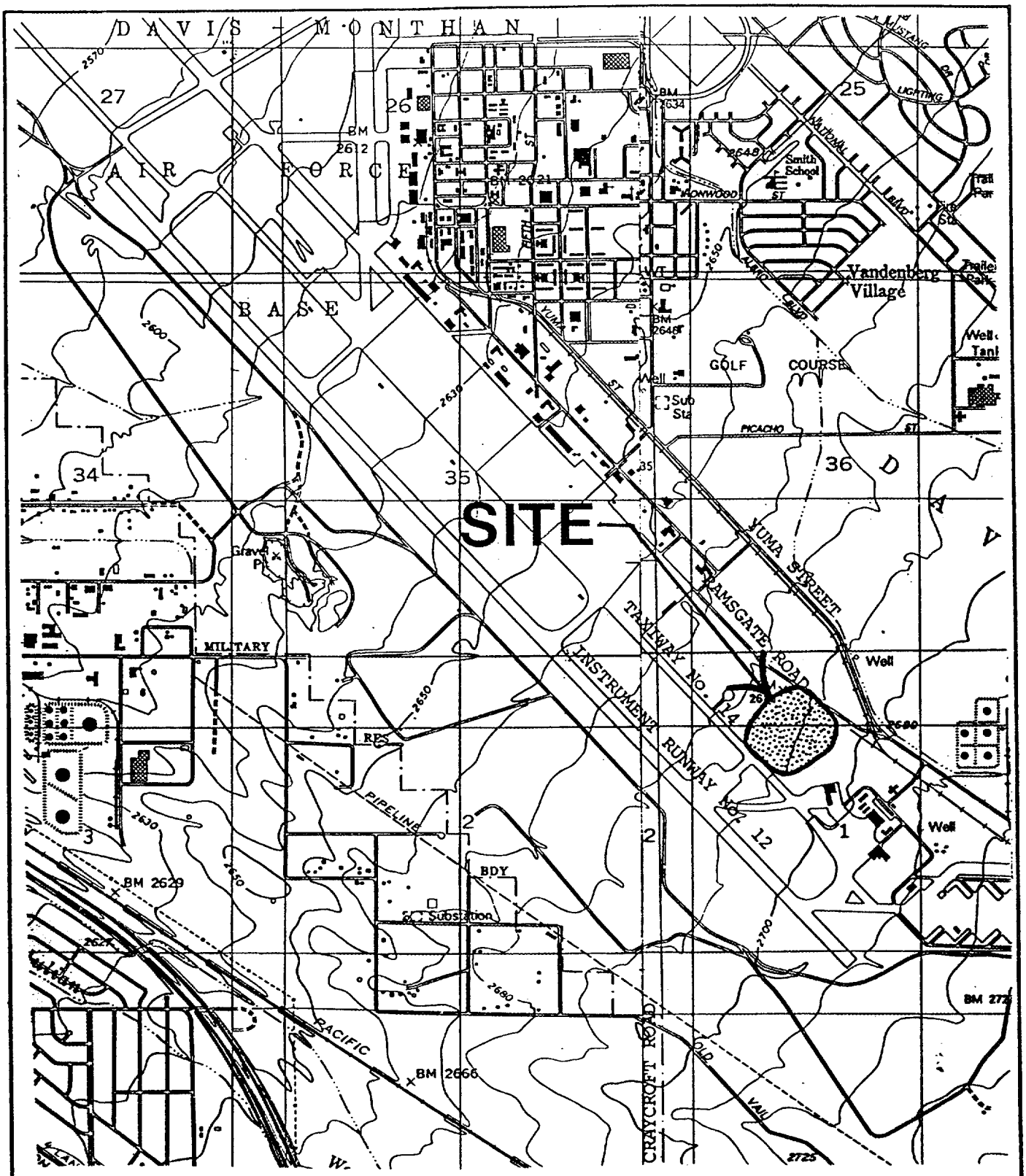
10. United States Department of Agriculture Soil Conservation Service, Economic Research Service, Forest Service, (1977), "Santa Cruz-San Pedro River Basin, Arizona, Resource Inventory", in cooperation with the Arizona Water Commission, August.

Approved by

Checked by

Drawn by

Compiled by




SCALE 1:24000

NORTH

Base Map: 7½ Minute USGS
Tucson and Tucson East Quadrangles

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Project No.: 87 – 853

Fire Training Facility

LOCATION MAP

9 – 87

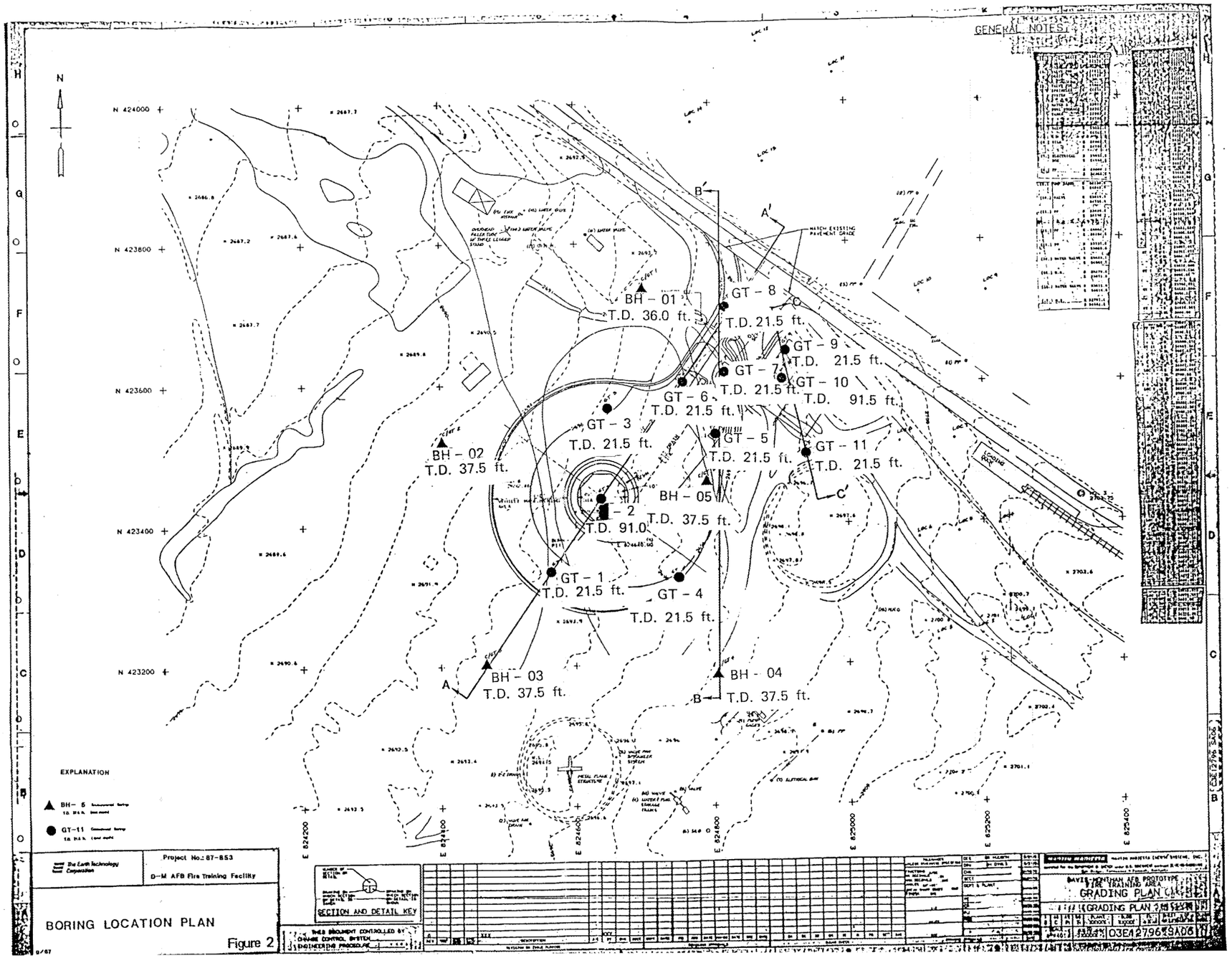
Figure 1

## 5.0 LIMITATIONS

The conclusions and recommendations presented in this report for the proposed Fire Training Facility Site located in Davis-Monthan Air Force Base in Tucson, Arizona were developed by Earth Technology for Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, in accordance with generally accepted geologic and geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

The data, conclusions and recommendations contained herein should be considered to relate only to the specific project and location discussed herein. Earth Technology is not responsible for any conclusions or recommendation that may be made by others, unless we have been given an opportunity to review such conclusions or recommendations and concur in writing.

This report has not been prepared for use by parties other than Martin Marietta Energy Systems, Inc. It may not contain sufficient information for the purposes of other parties or other uses. If any changes are made in the project as outlined in this report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions and recommendations of this report are modified or approved in writing by Earth Technology.


N
N 424000
N 423800
N 423600
N 423400
N 423200
E 824200
E 824400
E 824600
E 824800
E 825000
E 825200
E 825400
BH - 01
T.D. 36.0 ft.
BH - 02
T.D. 37.5 ft.
BH - 03
T.D. 37.5 ft.
BH - 04
T.D. 37.5 ft.
BH - 05
T.D. 37.5 ft.
GT - 1
T.D. 21.5 ft.
GT - 2
T.D. 91.0
GT - 3
T.D. 21.5 ft.
GT - 4
T.D. 21.5 ft.
GT - 5
T.D. 21.5 ft.
GT - 6
T.D. 21.5 ft.
GT - 7
T.D. 21.5 ft.
GT - 8
T.D. 21.5 ft.
GT - 9
T.D. 21.5 ft.
GT - 10
T.D. 91.5 ft.
GT - 11
T.D. 21.5 ft.
A
A'
B
B'
C
C'
EXPLANATION
BH- 5
GT-11
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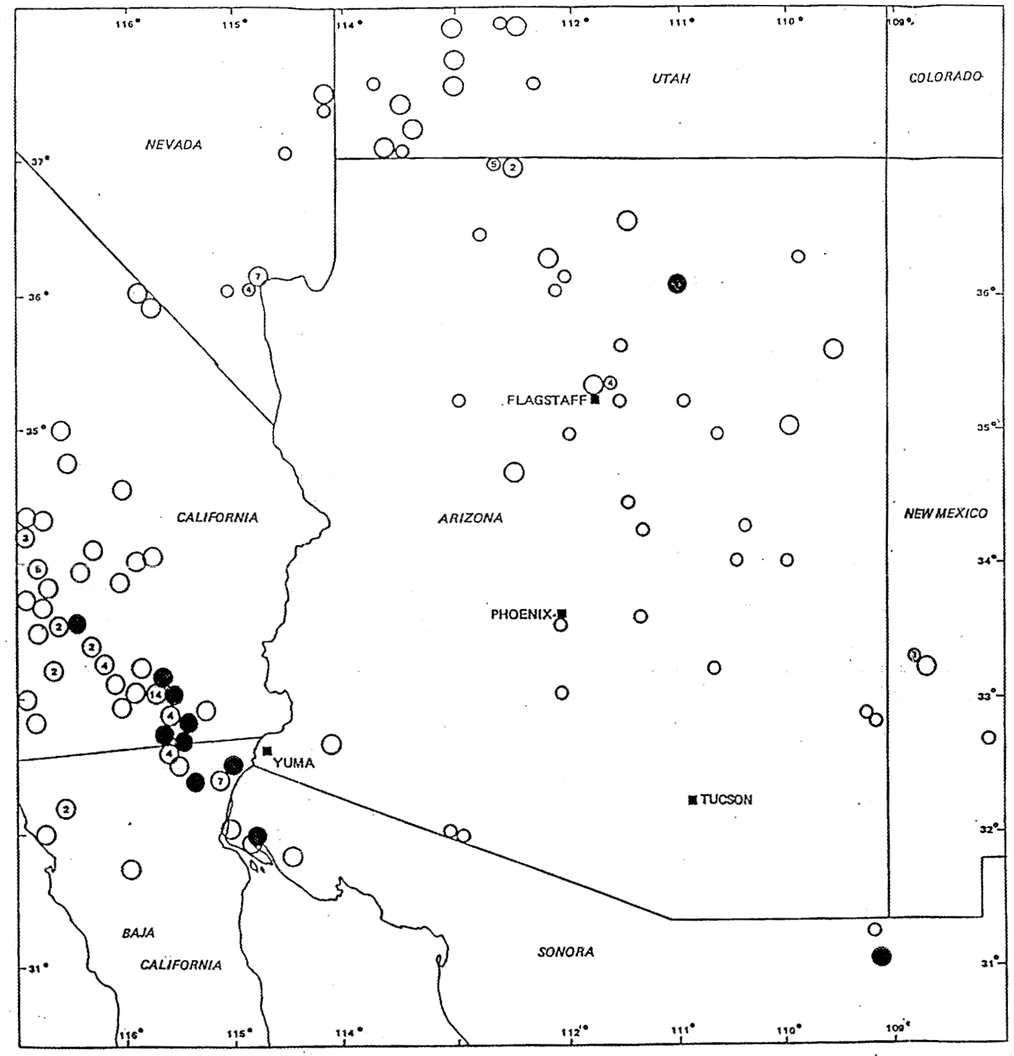
D-M AFB Fire Training Facility
BORING LOCATION PLAN
Figure 2
SECTION AND DETAIL KEY
GENERAL NOTES
DAVIS-MONTHAN AFB PROTOTYPE FIRE TRAINING AREA
GRADING PLAN
03EA2796SA06




EXPLANATION

INTENSITIES
- ○ GREATER THAN OR EQUAL TO IV
- ◯ GREATER THAN OR EQUAL TO VI
- ● GREATER THAN OR EQUAL TO VIII

(7) NUMBER IN CIRCLE INDICATES NUMBER OF REPORTS WHERE MORE THAN ONE REPORT WAS AVAILABLE. INTENSITIES LESS THAN VI NOT SHOWN IN CALIFORNIA AND BAJA, CALIFORNIA

COMPILED FROM:
STURGUL AND IRWIN (1971)
COFFMAN AND VON HAKE (1973)
REAL ET AL (1978)
TOPPOZADA ET AL (1978)
NAT. EQ. INFORMATION SERVICE (1978)

0 50 100 MILES

0 50 100 KILOMETERS

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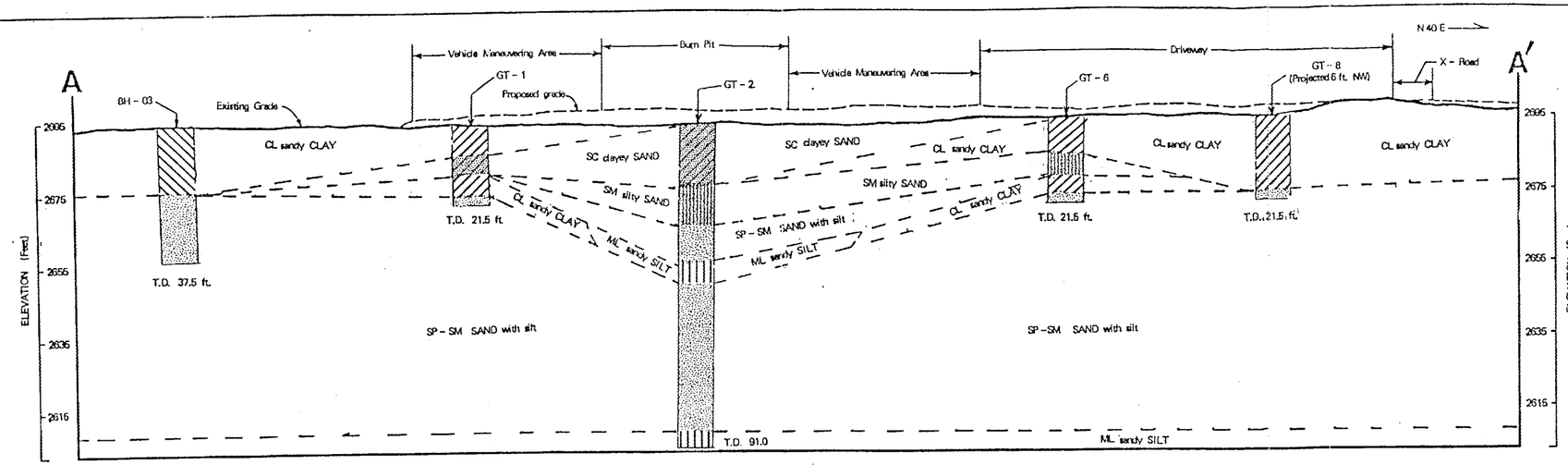
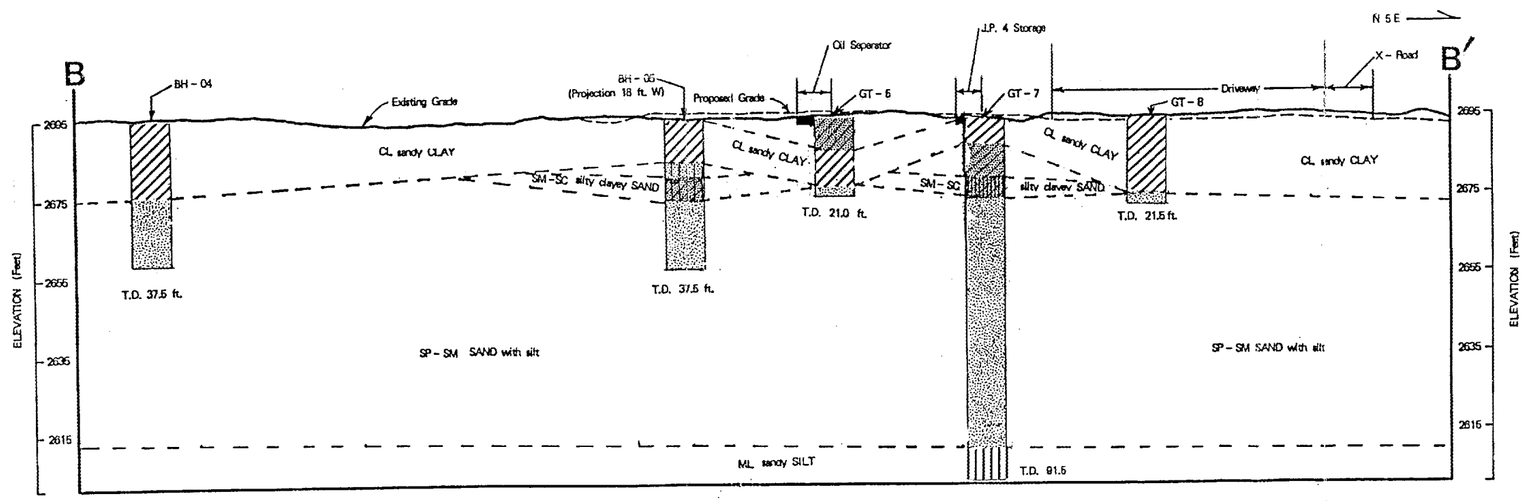
EARTHQUAKE INTENSITIES REPORTED
1852 THROUGH 1977

FIGURE 3




EXPLANATION

- SP - SM : Orange to light Brown damp - moist medium dense to very dense fine - coarse SAND with silt.
- SC : Light Brown moist dense to very dense clayey medium to fine SAND.
- SM : Orange Brown moist very dense silty medium SAND.
- CL : Light Brown very moist stiff to hard fine to medium sandy CLAY.
- ML : Light Brown very moist very dense fine sandy SILT.
- T.D. Total Depth

SCALE: 1 inch = 40 feet Horizontal
1 inch = 20 feet Vertical

NOTES:

(1) Subsurface conditions on the boring logs or profiles represent conditions at the location and dates completed. They may not be represented of conditions at other dates and times.
(2) Boring locations and elevations were surveyed by RGA.
(3) Refer to Appendix A for detailed soil descriptions.

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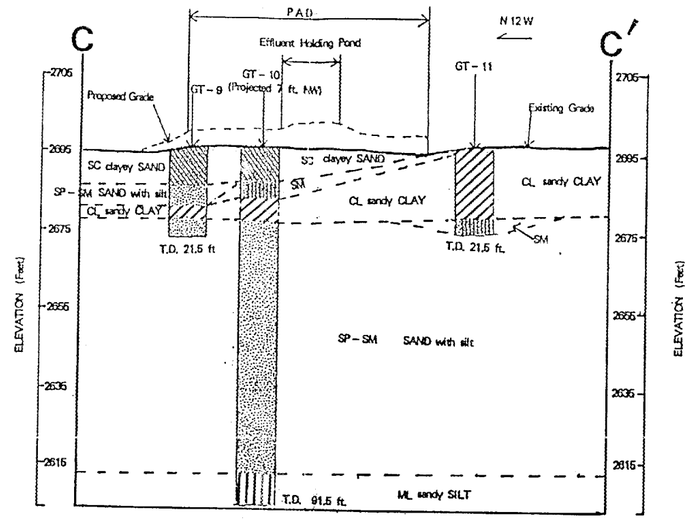
Project No.: 87 - 853
D - M AFB Fire Training Facility

GEOTEHNICAL CROSS SECTIONS

9 - 87

Figure 4




EXPLANATION

- SP - SM : Orange to light Brown damp - moist medium dense to very dense fine - coarse SAND with silt.
- SC : Light Brown moist dense to very dense clayey medium to fine SAND.
- SM : Orange Brown moist very dense silty medium SAND.
- CL : Light Brown very moist stiff to hard fine to medium sandy CLAY.
- ML : Light Brown very moist very dense fine sandy SILT.

T.D. Total Depth

SCALE : 1 inch = 40 feet Horizontal

1 inch = 20 feet Vertical

NOTES :

(1) Subsurface conditions on the boring logs or profiles represent conditions at the location and dates completed. They may not be represented of conditions at other dates and times.
(2) Boring locations and elevations were surveyed by RGA.
(3) Refer to Appendix A for detailed soil descriptions.

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D - M AFB Fire Training Facility

GEOTECHNICAL CROSS SECTION

9 - 87

Figure 5

# APPENDIX A

## FIELD INVESTIGATIONS

## FIELD INVESTIGATIONS

### Location of Exploration Sites

Boring locations were chosen by the Oak Ridge National Laboratory (ORNL) site project manager (SPM) after all utility lines had been marked. All boring locations were approved by Air Force personnel and were surveyed before the start of the field investigation. The approximate locations of the borings are shown on the boring location plan.

The basic components of the field investigations were: (1) soil borings and sampling for environmental considerations and (2) soil borings and sampling for geotechnical considerations.

### Environmental Borings

Environmental borings were drilled for environmental/chemical (E/C) testing as well as obtaining soil samples for geotechnical purposes and logging the depth and characteristics of the subsurface materials. Environmental borings were drilled using a CME 75 truck mounted hollow-stem auger rig prior to the geotechnical borings. To avoid the potential of cross-contamination for E/C analysis, all drilling and sampling equipment were decontaminated prior to the start of drilling and between each environmental boring. Sampling equipment was decontaminated between to each sampling interval. ORNL SPM, health and safety officer and representatives were present at all times during field investigations and monitored all drill holes for organic vapors and combustable gas (OV/CG) to insure safe working conditions in accordance withe the site health

and safety plan and to determine if the site soils were contaminated.

Personnel from ORNL conducted the E/C sampling. The OV/CG in the head-space of the hollow-stem auger was monitored using an HNU meter and recorded by an ORNL representative before each auger flight was added to the drill stem. Operation of control decontamination area was under the direction of the ORNL representative and consisted of a suitable plastic container which was utilized to contain all rinse water and material rinsed from the auger flights and other drilling equipment. Decontamination procedures consisted of a thorough high pressure steam/hot water washing with detergent followed by a potable water rinse, deionized water rinse and a final rinse with pesticide grade isopropyl alcohol. Steel 55 gallon drums were brought to the site for containment of hazardous material in the event that contaminated hazardous materials were generated. Since safe levels of contamination were found, rinse water was disposed of at the site.

Field Observations

HNU readings that were conducted suggested that safe levels of contamination were in the soil. ORNL representatives collected soil samples at designated intervals (every 5 feet). These samples were placed in glass jars or containers and then sealed with teflon lined tight fitting covers. These specimens were packed and shipped to the K-25 Analytical Chemistry Division laboratory in Oak Ridge, Tennessee for detailed analysis. It is our understanding that ORNL will prepare a separate Environmental Assessment Report.

## Geotechnical Borings

Exploratory geotechnical borings were drilled for the purpose of obtaining soil samples and logging the depth and characteristics of the subsurface materials. Borings were drilled using a truck mounted hollow-stem auger rig. The decontamination procedures described for the environmental borings were not applied to the geotechnical borings. Standard penetration testing (SPT) was done during drilling in accordance with procedures outlined in ASTM Test Method D 1586.

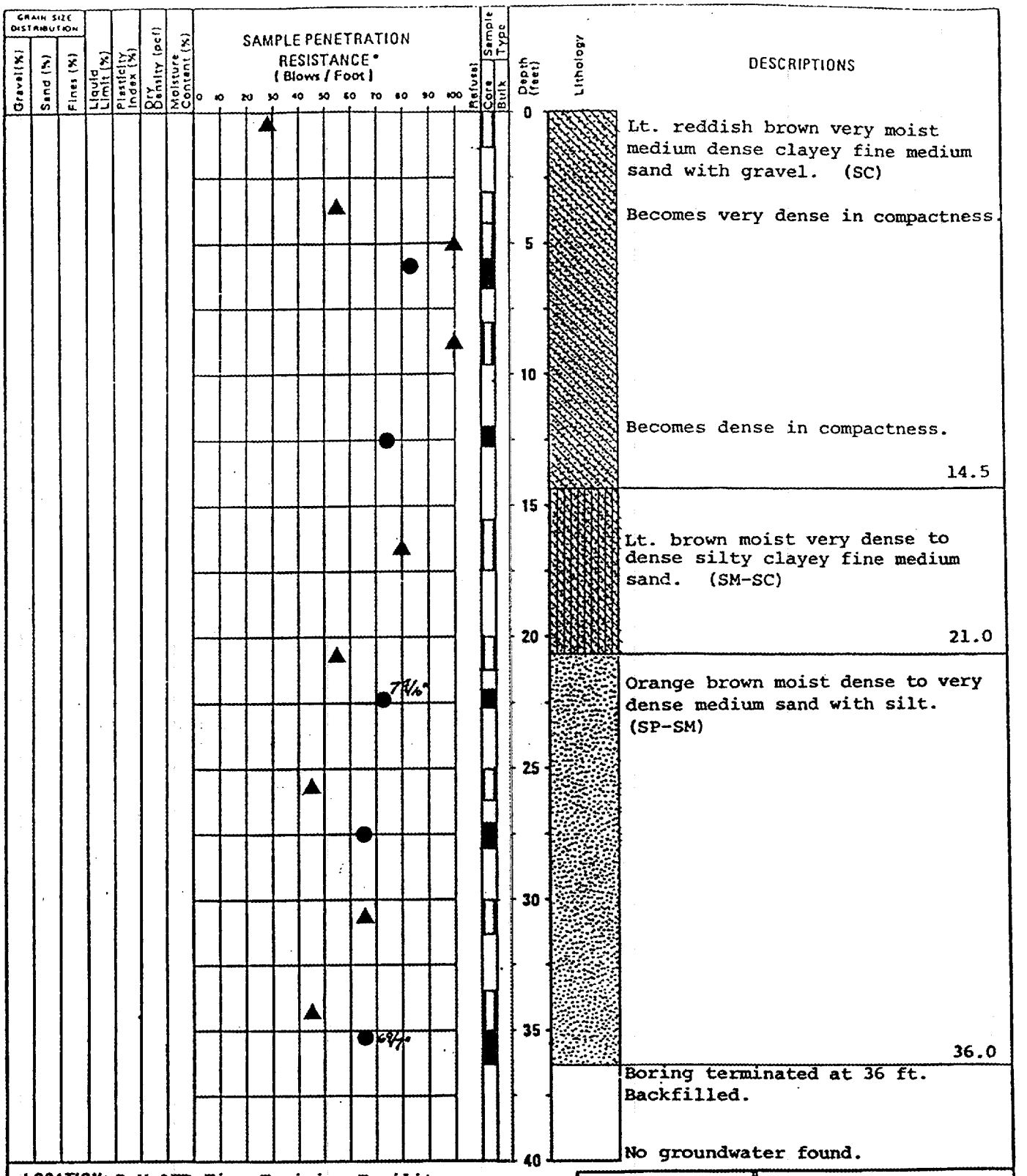
## Sampling Methods

Relatively undisturbed drive (D) samples were obtained using a 3-inch outside diameter California sampler lined with brass rings, each one-inch long and 2 1/2-inch inside diameter, by conducting a penetration test. The test is performed by driving the sampler using successive blows of a 140-pound hammer falling 30 inches. The number of blows (N) required to drive the sampler the final 12 inches are recorded on the boring logs and used to estimate the consistency or relative density of the soil.

A split-barrel sampler, 2-inch outside (1 3/8-inch inside) diameter and 27 inches long was used to obtain split spoon soil samples. The sampler was driven into the ground by a 140-pound hammer dropping in free fall from a height of 30 inches. The number of blows to advance the sampler each 6 inches of penetration was recorded. The blow counts required to drive the sampler for the last 12 inches was recorded as the Standard penetration resistance (N-Value) and plotted on the boring logs as an index of the consistency or relative density of the sampled soil materials, (ASTM D 1586).

All brass rings were removed from the California drive sampler and were transferred into a plastic tube and sealed. Split spoon samples were also sealed into plastic bags immediately upon extraction from the split-barrel sampler. All geotechnical samples were transported to the geotechnical laboratory for testing. ORNL representatives collected, sealed and shipped the E/C samples to the analytical laboratory.

The logs of environmental (BH-01 to BH-05) and geotechnical (GT-1 to GT-11) borings accompany this Appendix. Stratification lines on the logs represent the approximate boundary between predominate soil types. Minor layers of differing material types may be contained within the strata and a gradual transition should be experienced between strata. Geologic and engineering descriptions and material classification used on the boring logs are in accordance with the Unified Soil Classification System (USCS).




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger (SPT samples were collected for E/C testing by ORNL)
ELEVATION: 2693'
DATE DRILLED: 8-31-87

* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

NR No Recovery
Water Level Measured in Boring
R Refusal (blowcount greater than 100/ft.)

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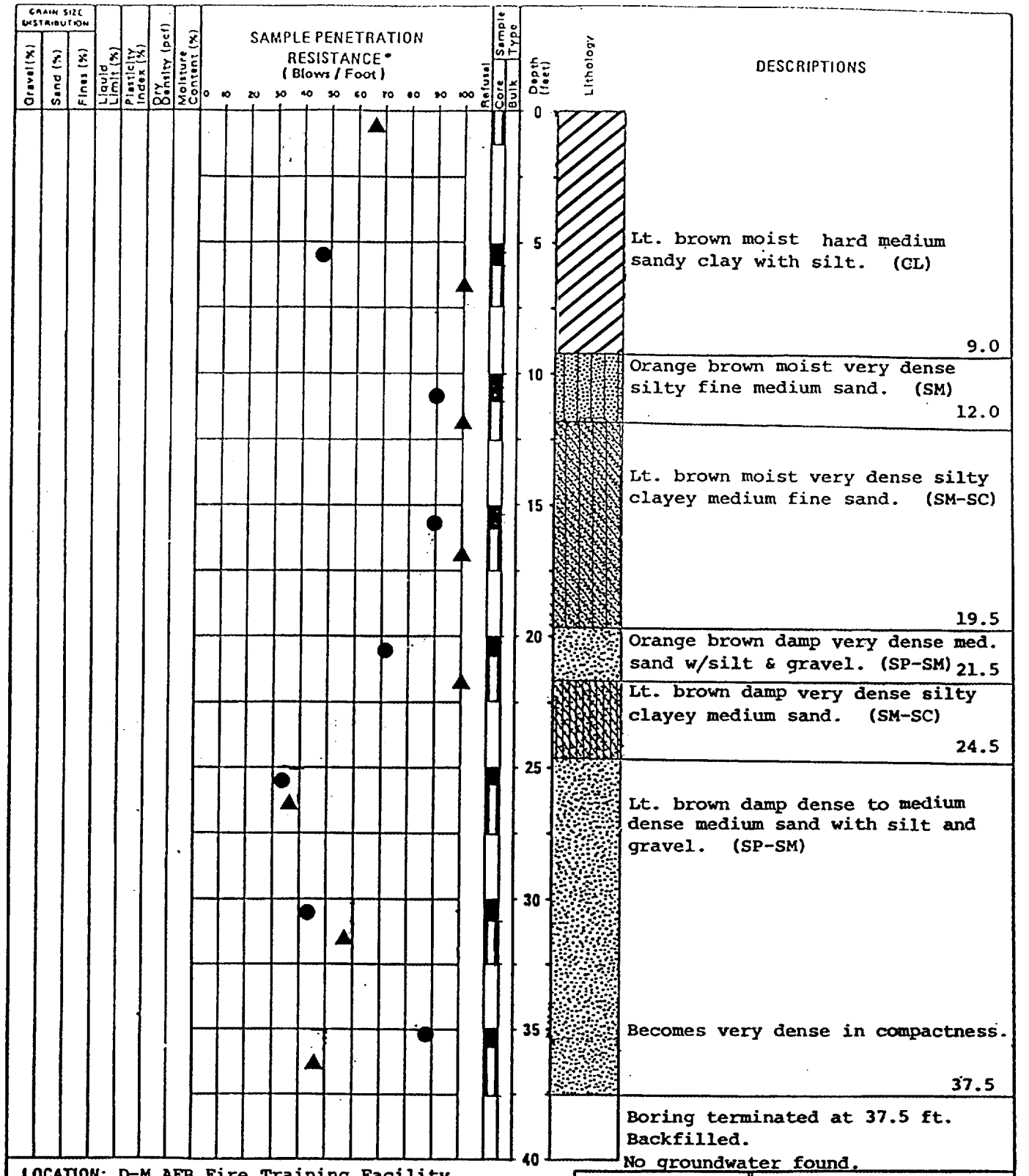
| | |
|---|---|
| | LOG OF BORING |
| | BORING NO. BH-01 |
| Drawn By: BK<br>Checked By: KR | PROJECT NO. 87-853 |
| Date: 9/18/87 | FIGURE A-1 |

▲ Standard blow counts ● Blow counts for ring samples




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger (SPT samples were collected for E/C testing by ORNL)
ELEVATION: 2691'
DATE DRILLED: 8/31/87

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

▲ Standard blow counts ● Blow counts for ring samples

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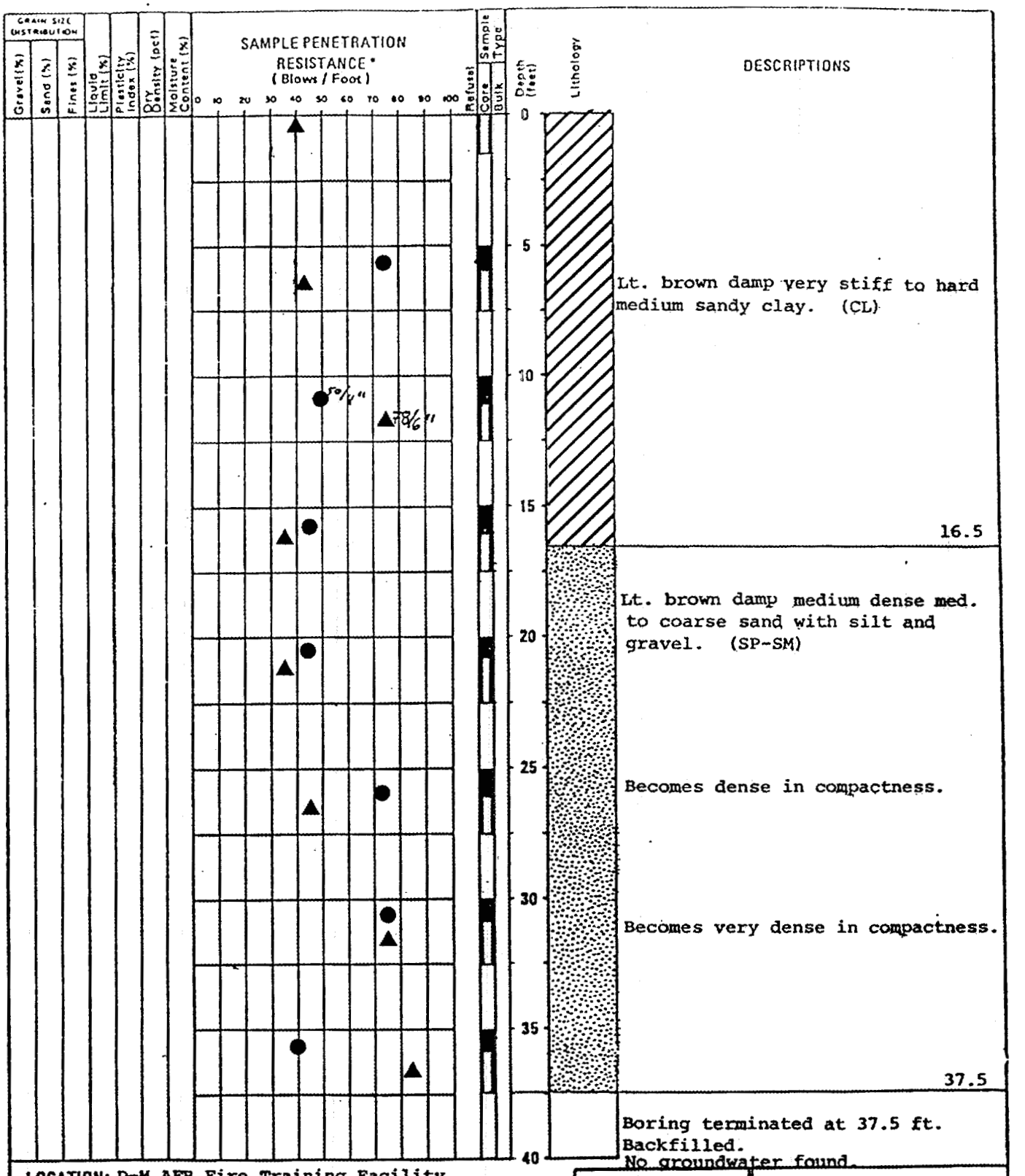
| | |
|---|---|
| LOG OF BORING | |
| BORING NO. BH-02 | |
| Drawn By: BK<br>Checked By: KR<br>Date: 9/17/87 | PROJECT NO. 87-853 |
| | FIGURE A-2 |




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger (SPT samples were collected for E/C testing by ORNL)
ELEVATION: 2693'
DATE DRILLED: 9/1/87

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured in Boring
R Refusal (blowcount greater than 100/ft.)

The Earth Technology Corporation

LOG OF BORING

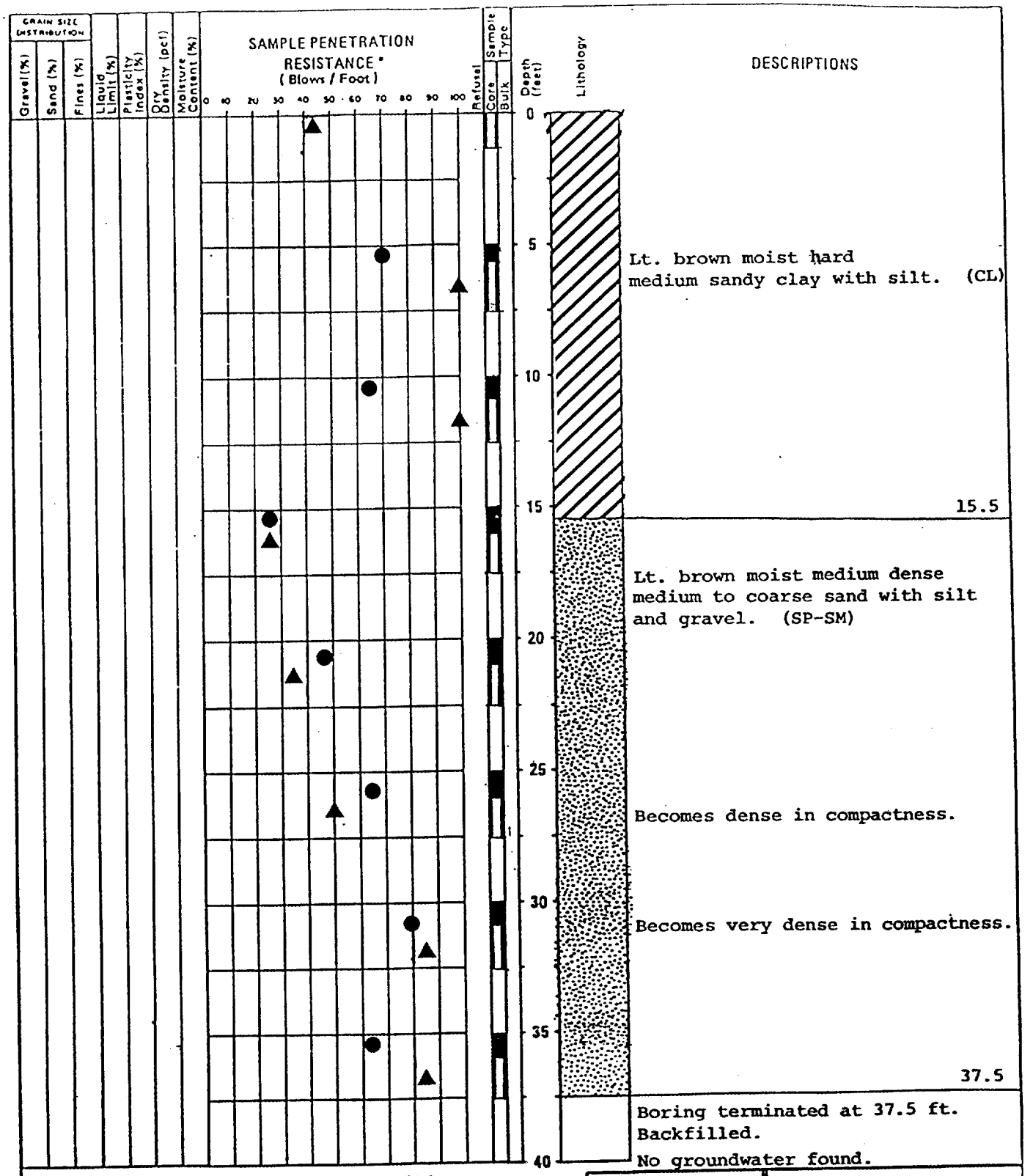
BORING NO. BH-03

Drawn By: BK
Checked By: KR
Date: 9/17/87

PROJECT NO. 87-853

FIGURE A-3

▲ Standard blow counts ● Blow counts for ring samples




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger (SPT samples were collected for E/C testing by ORNL)
ELEVATION: 2696'
DATE DRILLED: 9/1/87

* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

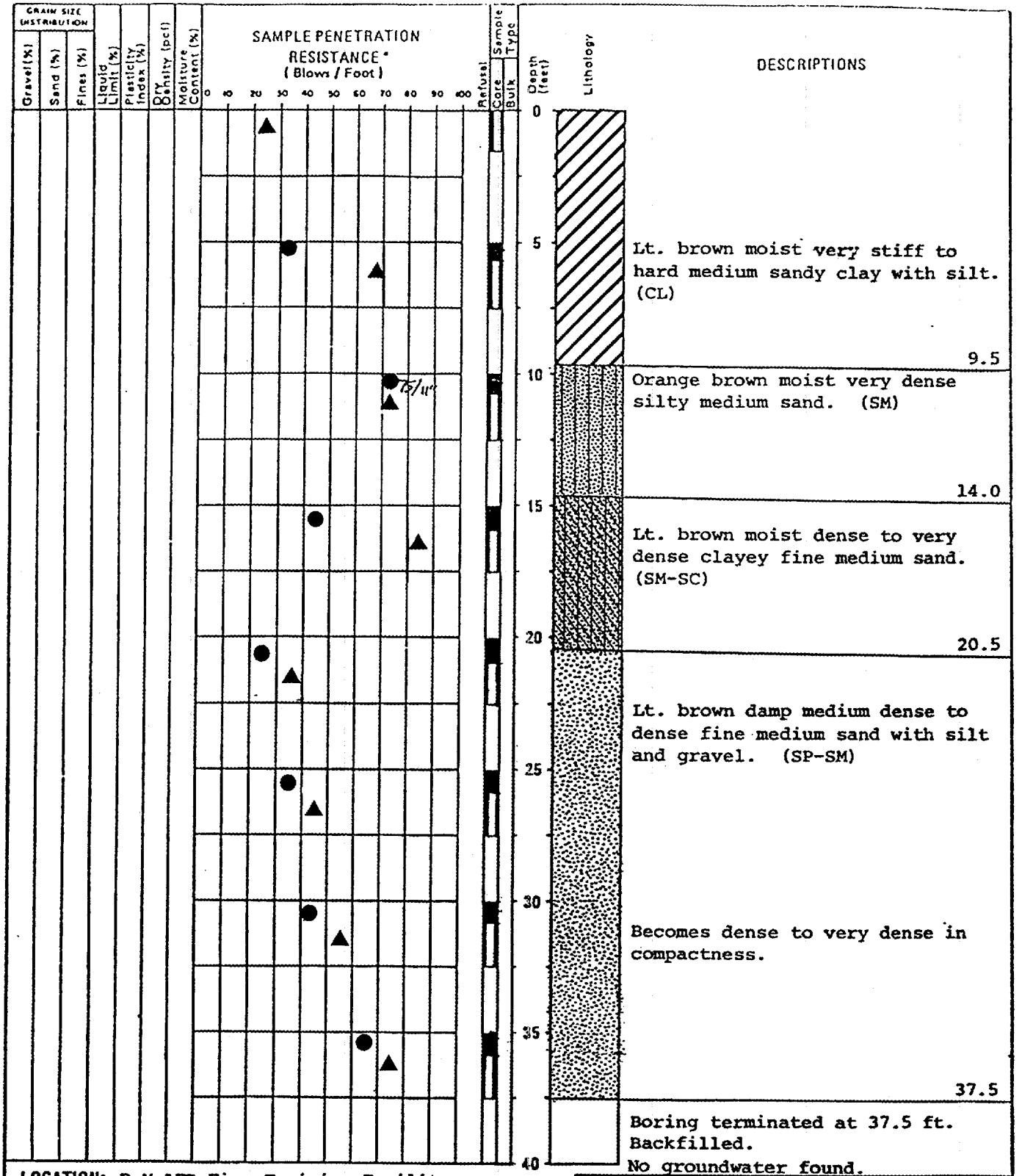
The Earth Technology Corporation

LOG OF BORING
BORING NO. BH-04

Drawn By: BK
Checked By: KR
Date: 9/17/87

PROJECT NO. 87-853
FIGURE A-4

▲ Standard blow counts ● Blow counts for ring samples




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2695'
DATE DRILLED: 9/1/87

(SPT samples were collected for E/C testing by ORNL)

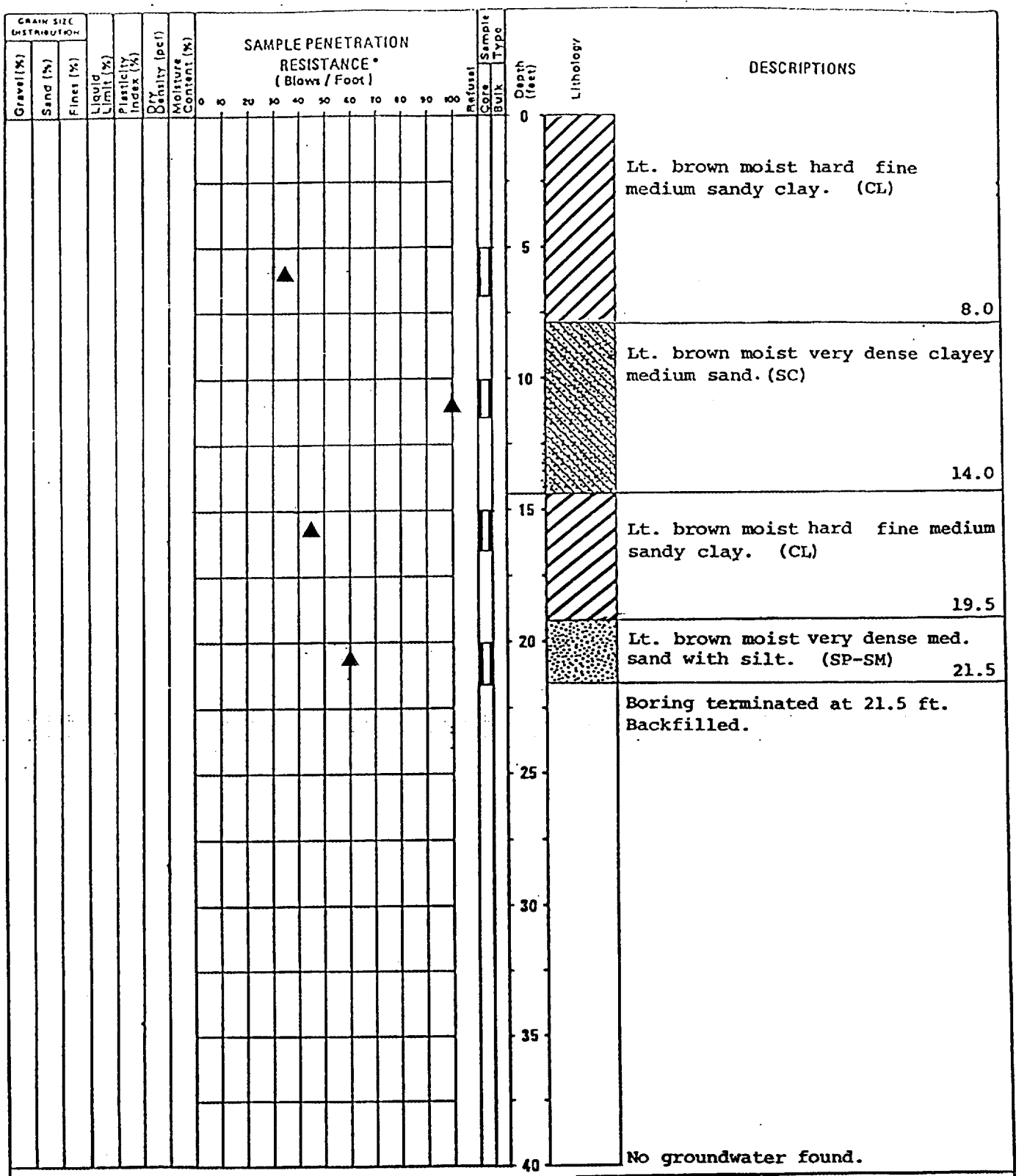
Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured in Boring
R Refusal (blowcount greater than 100/ft.)

The Earth Technology Corporation

| | |
|---|---|
| LOG OF BORING | |
| BORING NO. | BH-05 |
| Drawn By: BK<br>Checked By: KR | PROJECT NO. 87-853 |
| Date: 9/17/87 | FIGURE A-5 |

▲ Standard blow count ● Blow counts for ring samples



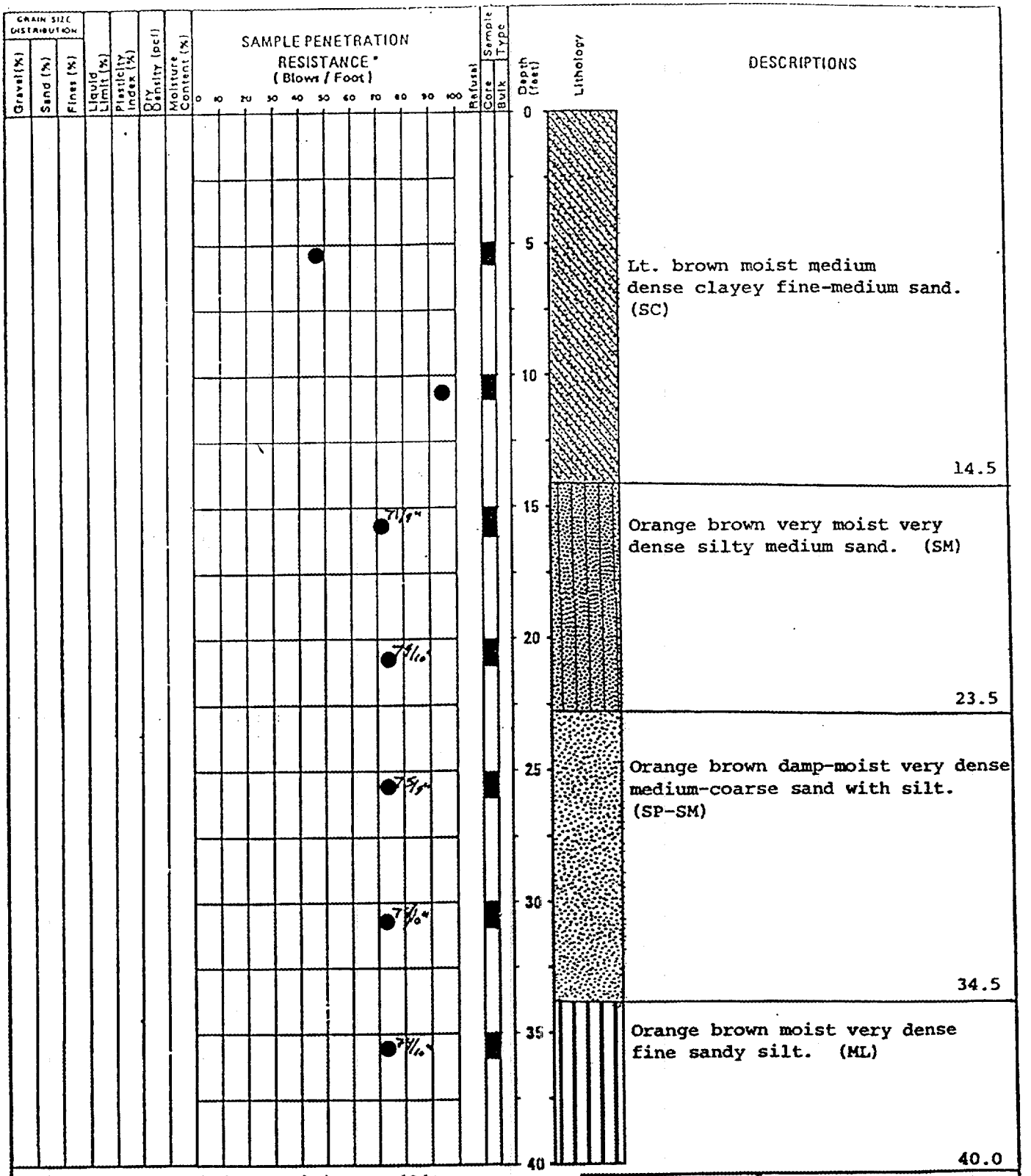

LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2693'
DATE DRILLED: 9/4/87

▲ Standard blow counts
● Blow counts for ring samples
• 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured in Boring
R Refusal (blowcount greater than 100/ft.)

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

The Earth Technology Corporation

| | |
|---|---|
| LOG OF BORING | |
| BORING NO. GT-1 | |
| Drawn By: BK<br>Checked By: KR | PROJECT NO. 87-853 |
| Date: 9/17/87 | FIGURE A-6 |



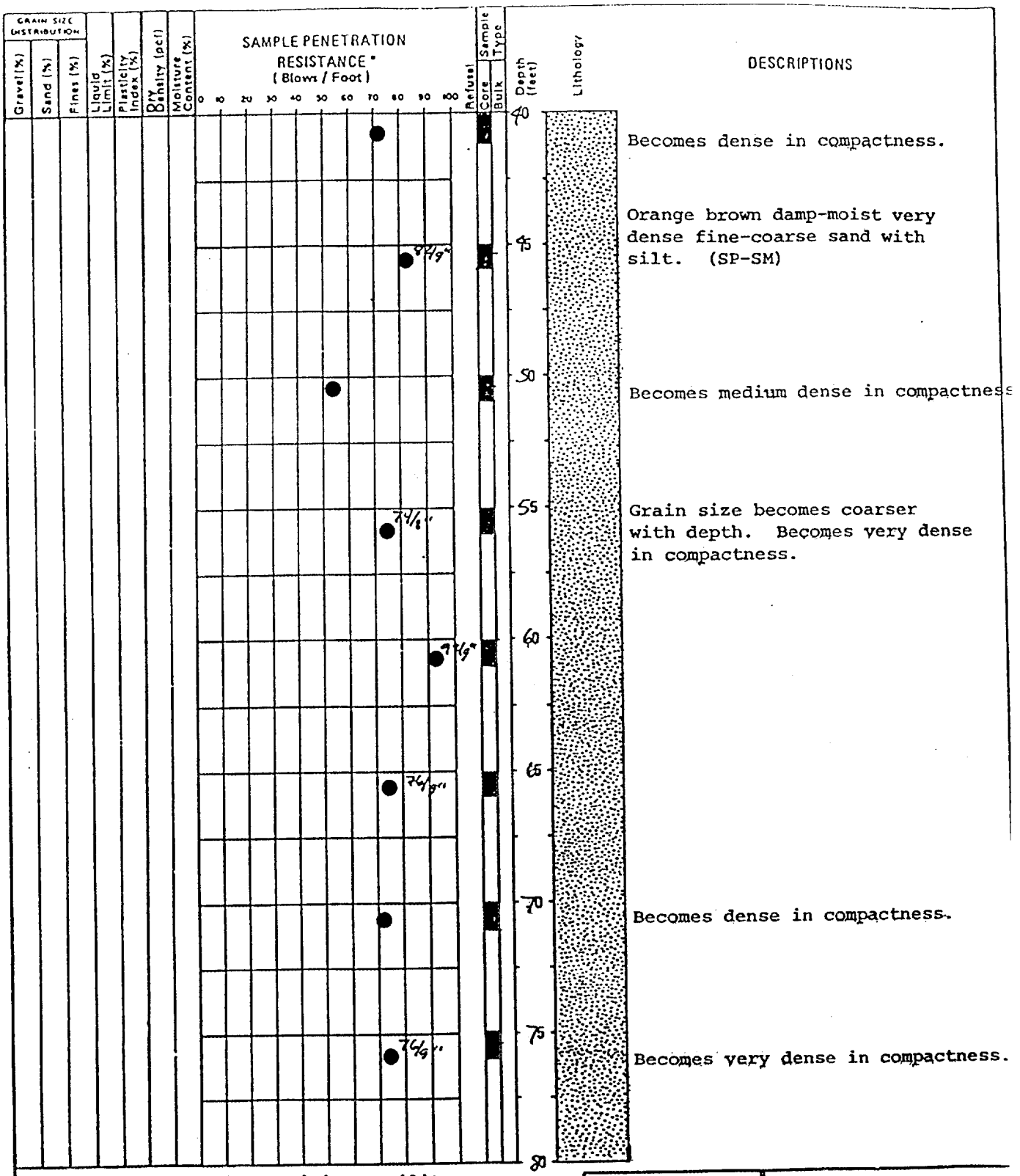

LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2693.5'
DATE DRILLED: 9/2/87

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

The Earth Technology Corporation

| | |
|---|---|
| LOG OF BORING | |
| BORING NO. GT-2 | |
| Drawn By: BK<br>Checked By: KR | PROJECT NO. 87-853 |
| Date: 9/17/87 | FIGURE A-7 |




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2693.5'
DATE DRILLED: 9/2/87

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

The Earth Technology Corporation

LOG OF BORING
BORING NO. GT-2

Drawn By: BK
Checked By: KR
Date: 9/17/87

PROJECT NO. 87-853
FIGURE A-7

| Grain Size Distribution: Gravel (%) | Sand (%) | Fines (%) | Liquid Limit (%) | Plasticity Index (%) | Dry Density (pcf) | Moisture Content (%) | Sample Penetration Resistance* (Blows / Foot) | Refusal | Sample Type: Core | Bulk | Depth (feet) | Lithology | Descriptions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 80 | | |
| | | | | | | | | | | | | | 83.0 |
| | | | | | | | | | | | 85 | | Lt. brown moist dense fine sandy silt. (ML) |
| | | | | | | | | | | | | | 91.0 |
| | | | | | | | | | | | 90 | | Boring terminated at 91.0 ft. Backfilled. |
| | | | | | | | | | | | 95 | | |

No groundwater found.

LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2693.5'
DATE DRILLED: 9/2/87

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
▼ Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

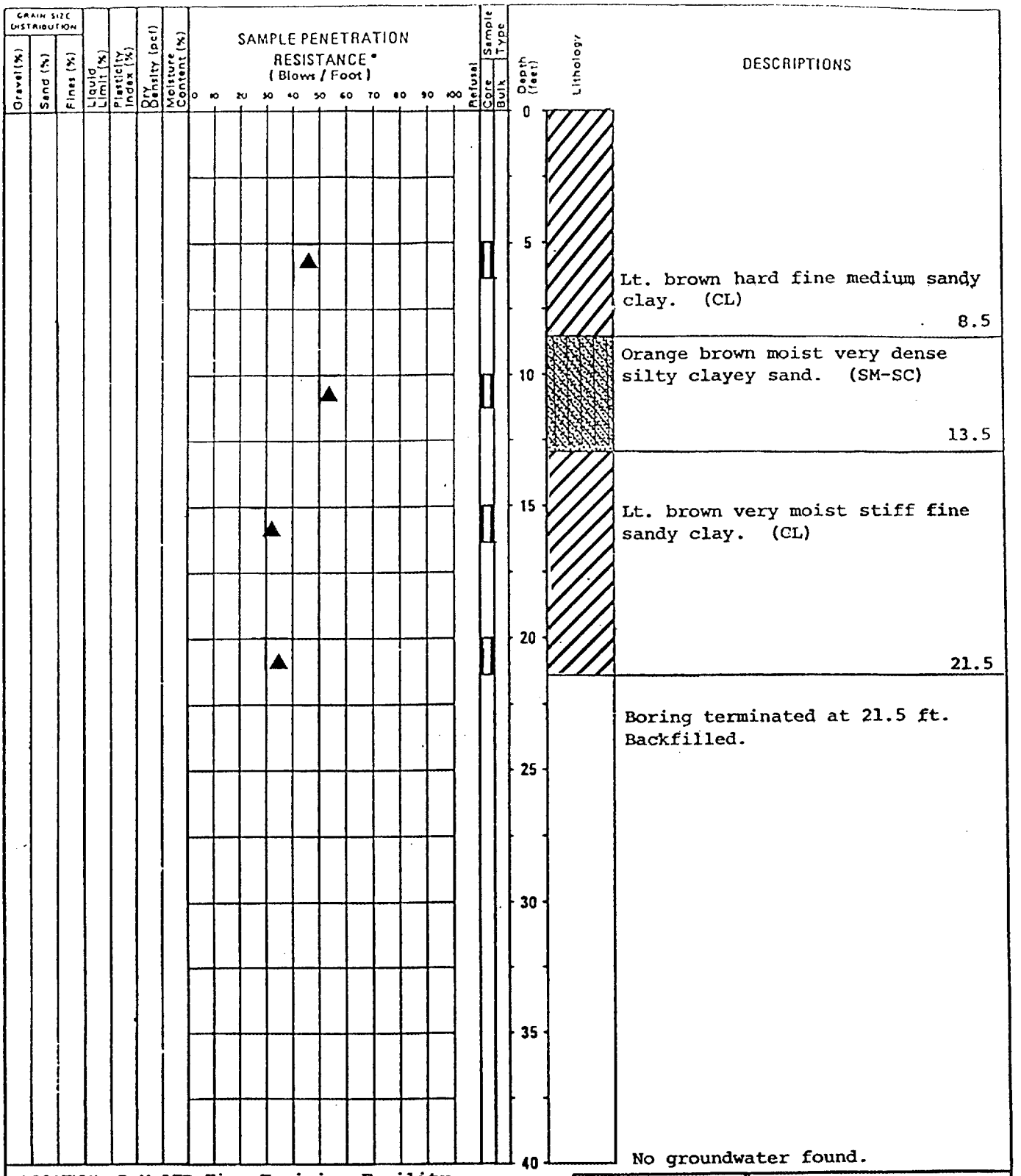
The Earth Technology Corporation

LOG OF BORING
BORING NO. GT-2

Drawn By: BK
Checked By: KR
Date: 9/17/87

PROJECT NO. 87-853

FIGURE A-7




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2693'
DATE DRILLED: 9/4/87

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

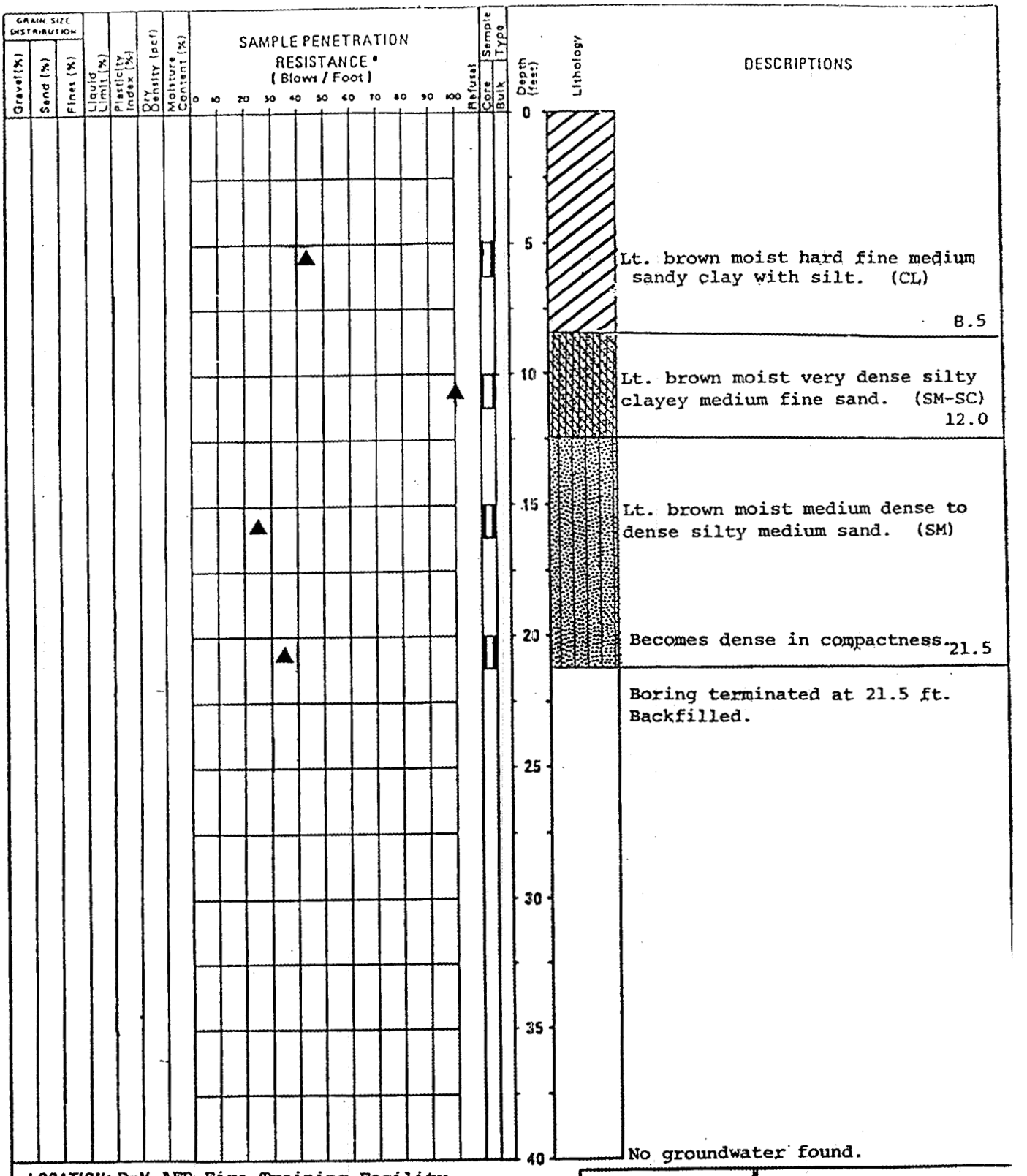
The Earth Technology Corporation

LOG OF BORING
BORING NO. GT-3

Drawn By: BK
Checked By: KR
Date: 9/17/87

PROJECT NO. 87-853

FIGURE A-8



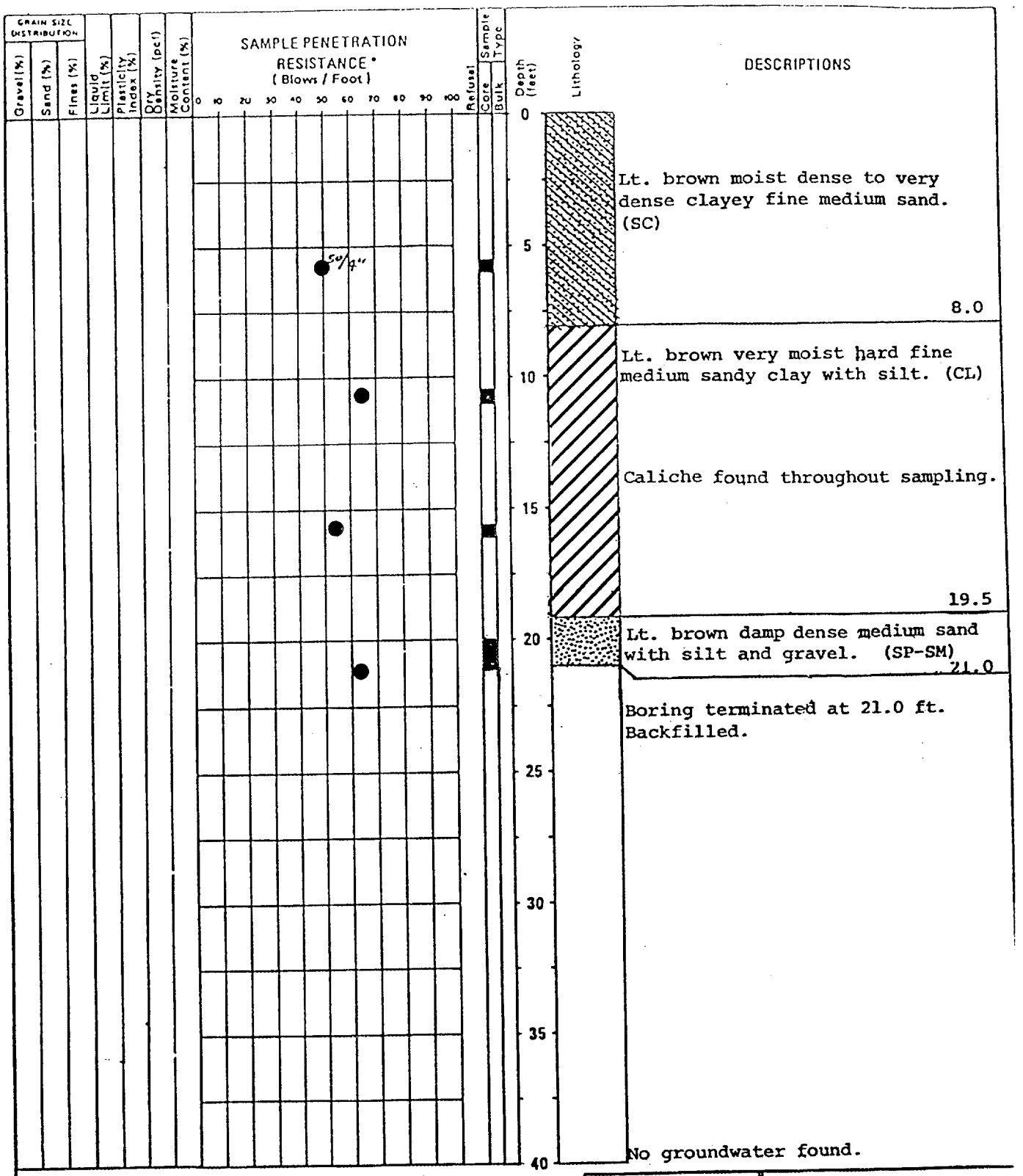

LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2695'
DATE DRILLED: 9/4/87

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

The Earth Technology Corporation

| | |
|---|---|
| LOG OF BORING | |
| BORING NO. GT-4 | |
| Drawn By: BK<br>Checked By: KR | PROJECT NO. 87-853 |
| Date: 9/17/87 | FIGURE A-9 |




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2695.5'
DATE DRILLED: 9/1/87

▲ Standard blow counts
● Blow counts for ring samples
• 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

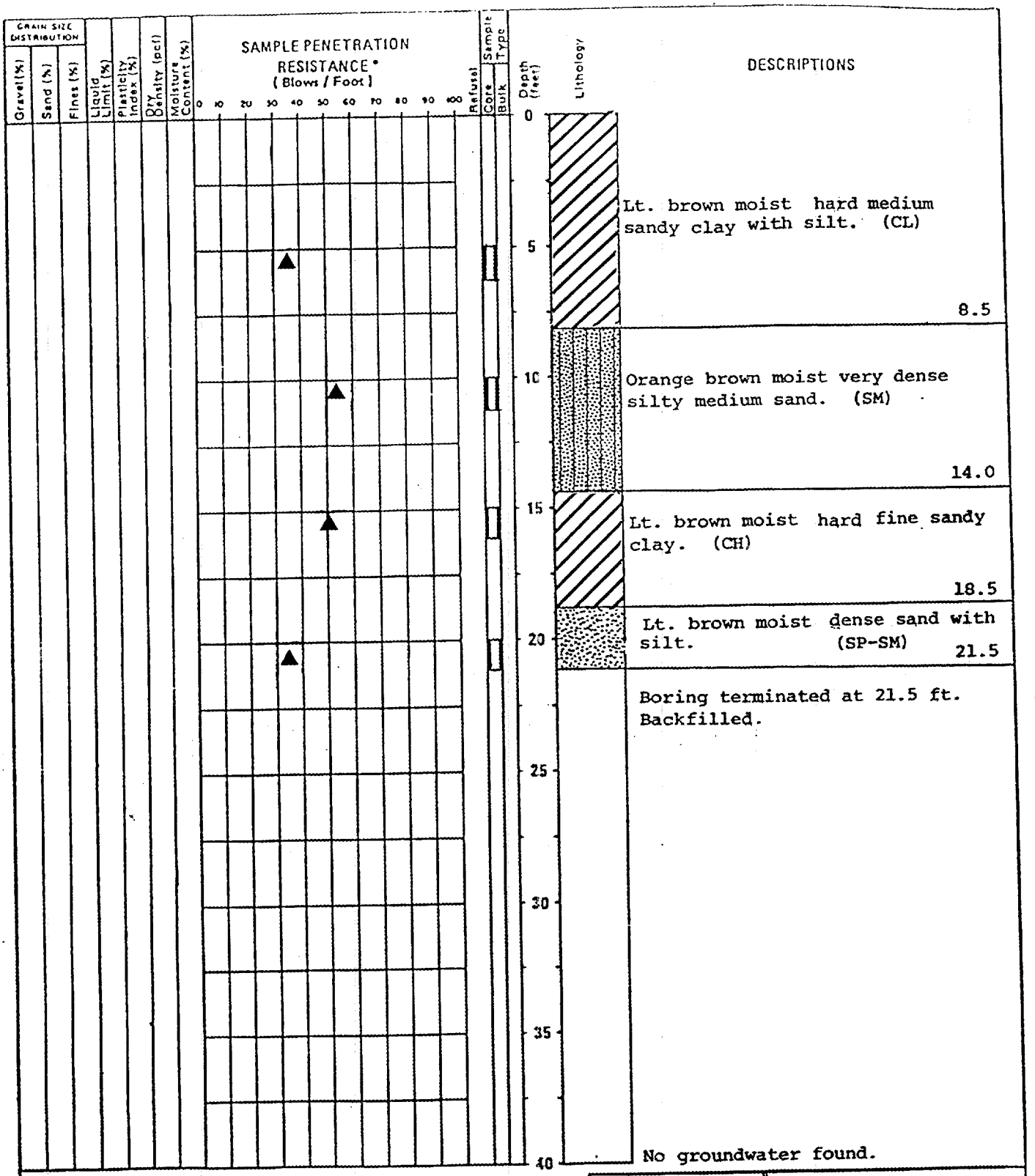
The Earth Technology Corporation

LOG OF BORING
BORING NO. GT-5

Drawn By: BK
Checked By: KR
Date: 9/17/87

PROJECT NO. 87-853

FIGURE A-10




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2695'
DATE DRILLED: 9/3/87

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

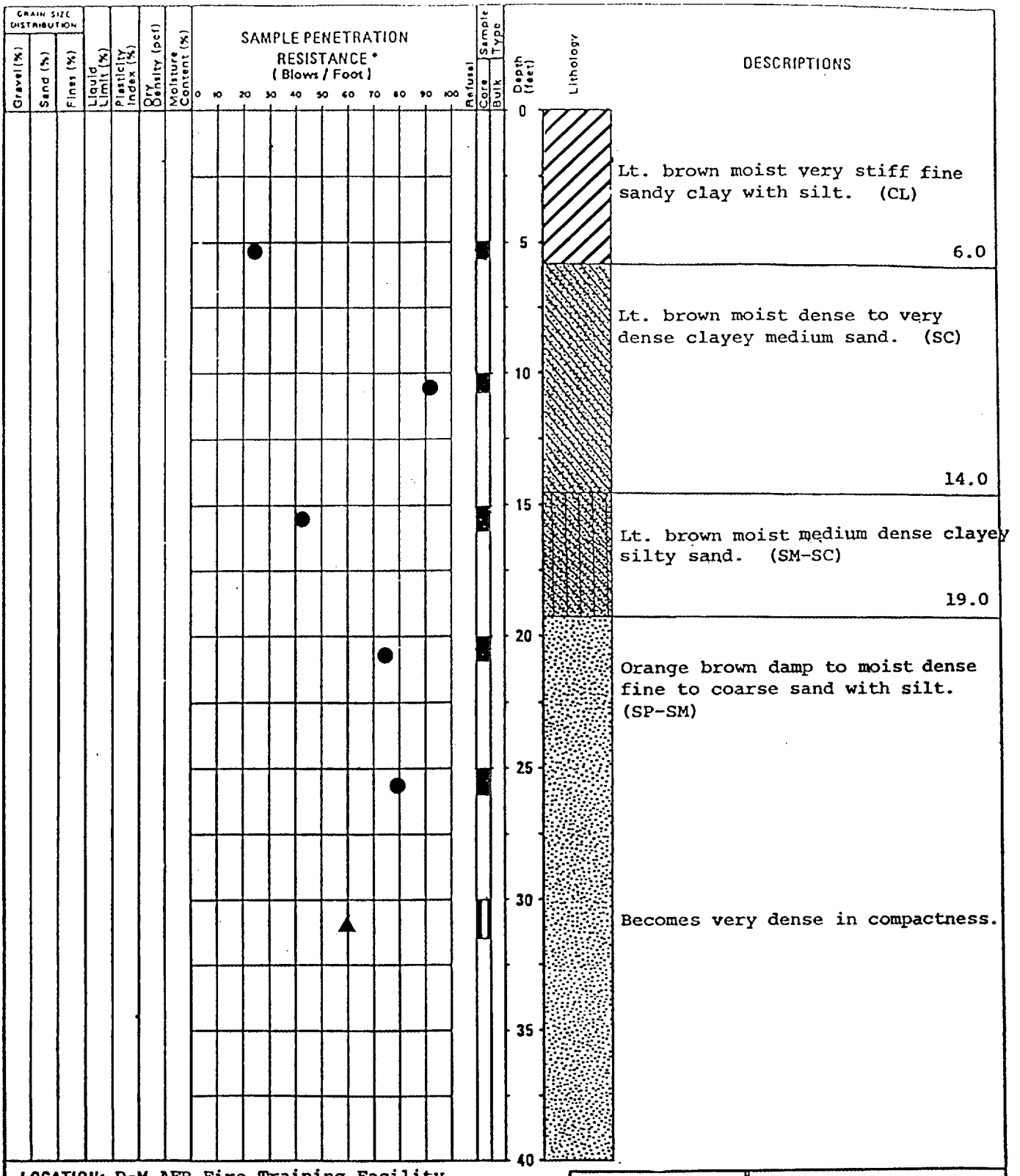
▲ Standard blow counts
● Blow counts for ring samples
• 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

The Earth Technology Corporation

LOG OF BORING
BORING NO. GT-6

Drawn By: BK
Checked By: KR
Date: 9/17/87

PROJECT NO. 87-853
FIGURE A-11




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2695'
DATE DRILLED: 9/2, 9/3/87

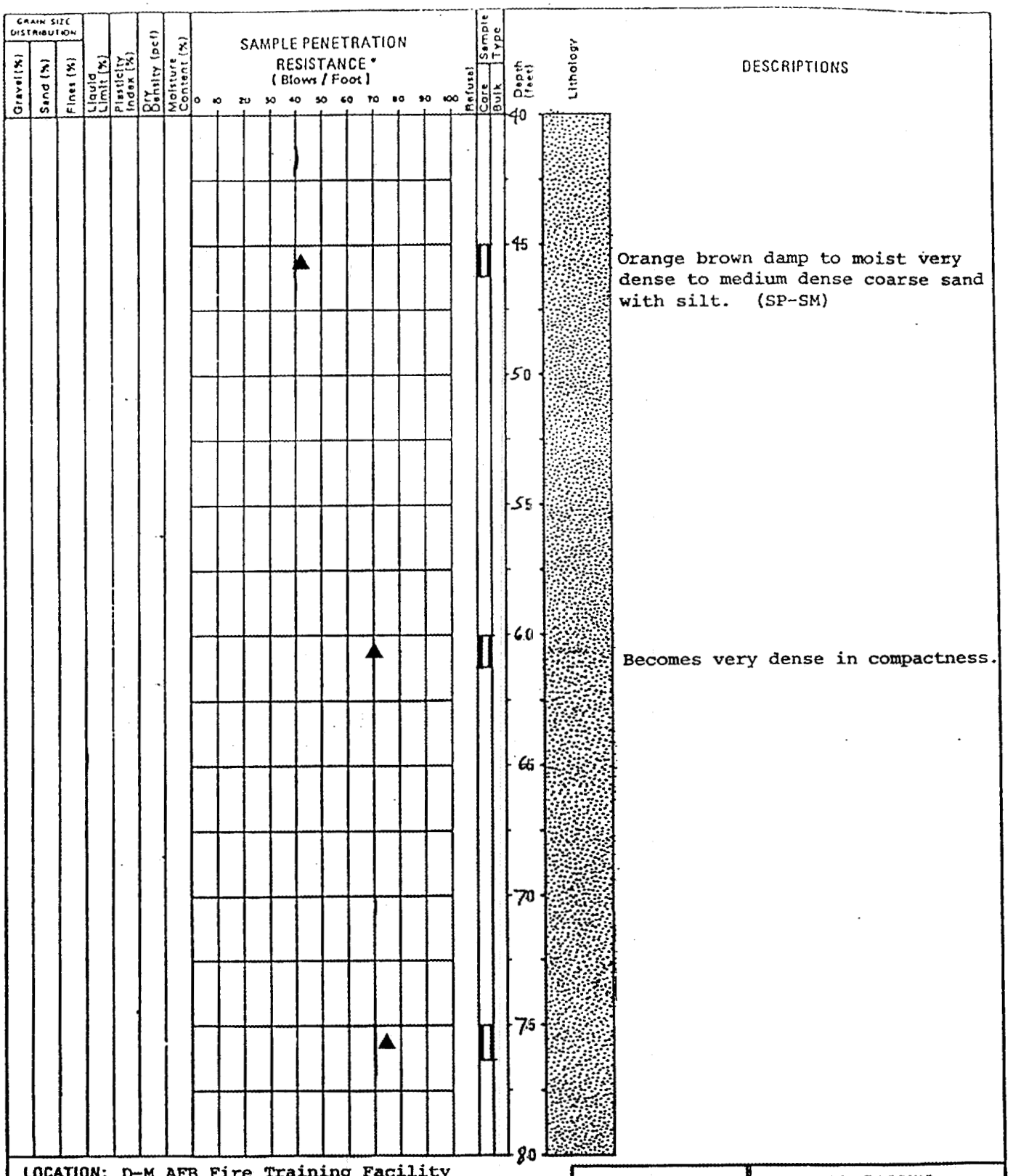
▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

NR No Recovery
Water Level Measured in Boring
R Refusal (blowcount greater than 100/ft.)

The Earth Technology Corporation

| | |
|---|---|
| LOG OF BORING | |
| BORING NO. GT-7 | |
| Drawn By: BK<br>Checked By: KR<br>Date: 9/17/87 | PROJECT NO. 87-853 |
| | FIGURE A-12 |




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2695'
DATE DRILLED: 9/2, 9/3/87

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, " A " Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

The Earth Technology Corporation

| | |
|---|---|
| LOG OF BORING | |
| BORING NO. GT-7 | |
| Drawn By: BK<br>Checked By: KR | PROJECT NO. 87-853 |
| Date: 9/17/87 | FIGURE A-12 |

| Gravel (%) | Sand (%) | Fines (%) | Liquid Limit (%) | Plasticity Index (%) | Dry Density (pcf) | Moisture Content (%) | Sample Type: Core | Sample Type: Bulk | Depth (feet) | Lithology | DESCRIPTIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 80 | | 83.0 |
| | | | | | | | | | 85 | | Lt. brown very moist very dense fine sandy silt. (ML) |
| | | | | | | | | | 90 | | 91.5 |
| | | | | | | | | | 95 | | Boring terminated at 91.5 ft. Backfilled. |
| | | | | | | | | | | | No groundwater found. |

SAMPLE PENETRATION RESISTANCE* (Blows / Foot)

0 10 20 30 40 50 60 70 80 90 100

Refusal

LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2695'
DATE DRILLED: 9/2, 9/3/87

▲ Standard blow counts
● Blow counts for ring samples
140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

The Earth Technology Corporation

LOG OF BORING

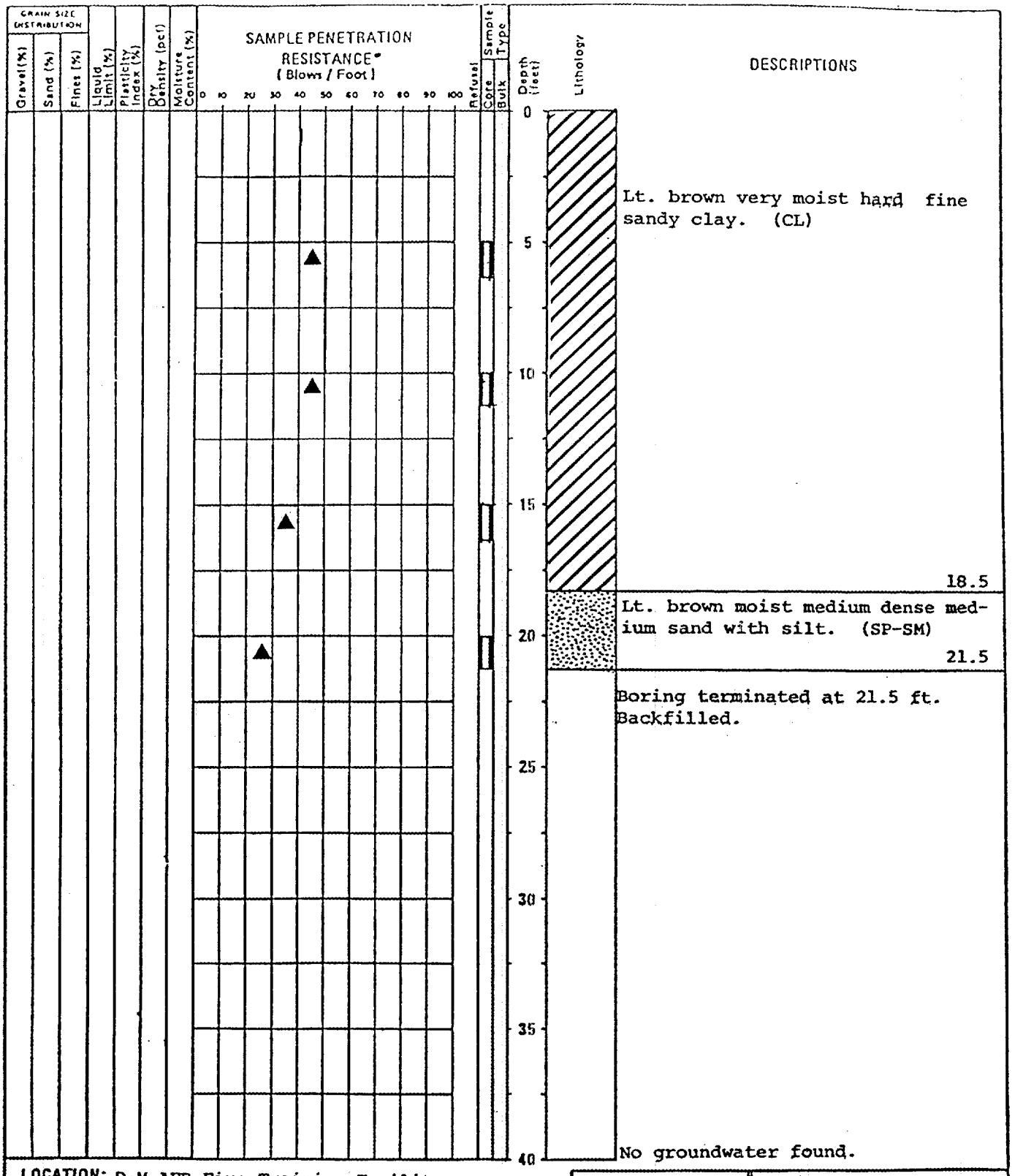
BORING NO. GT-7

Drawn By: BK
Checked By: KR

PROJECT NO. 87-853

Date: 9/17/87

FIGURE A-12




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2694.5'
DATE DRILLED: 9-3-87

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

The Earth Technology Corporation

LOG OF BORING

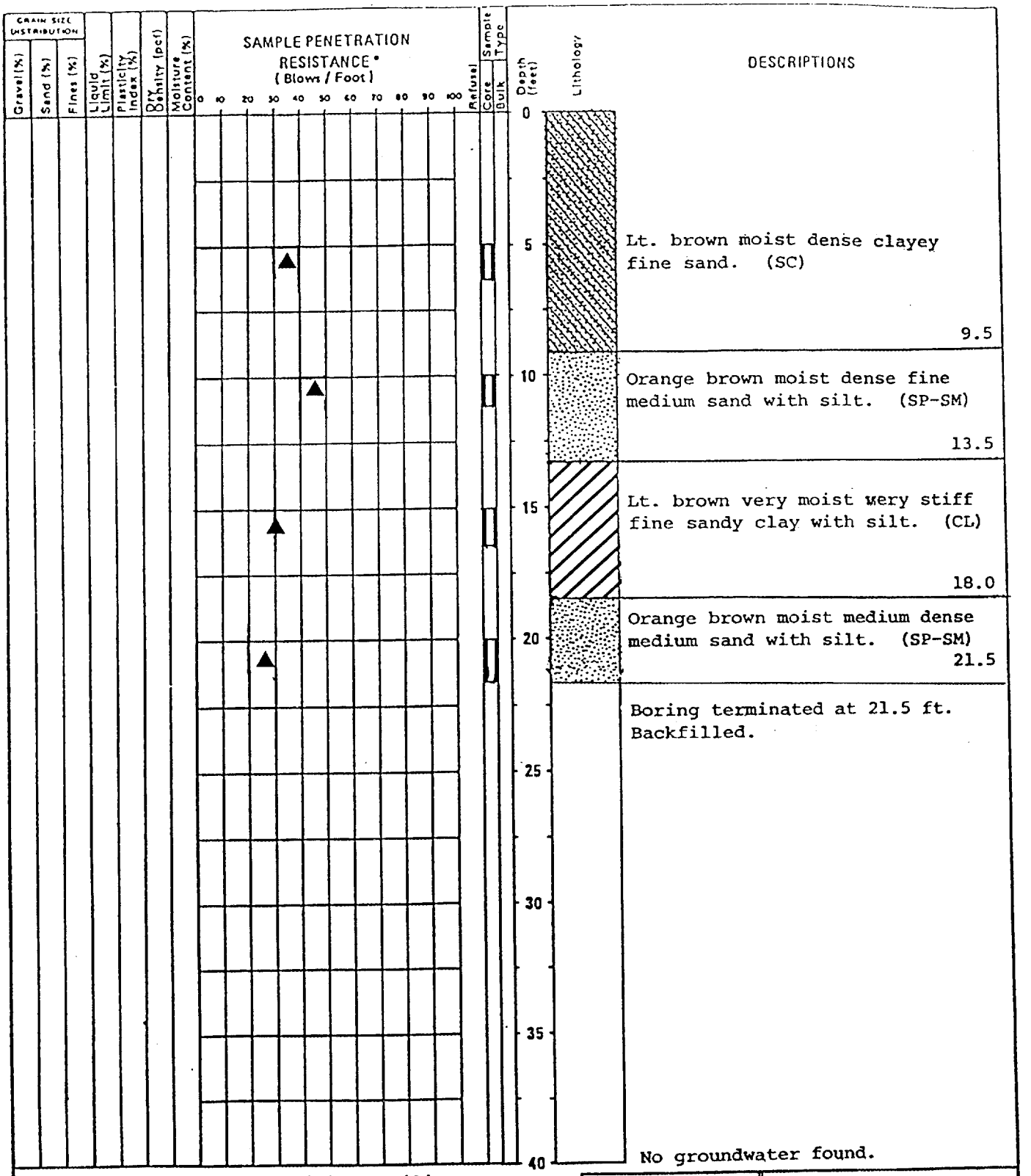
BORING NO. GT-8

Drawn By: BK
Checked By: KR

Date: 9/17/87

PROJECT NO. 87-853

FIGURE A-13




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2696'
DATE DRILLED: 9/3/87

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

● Blow counts for ring samples
▲ Standard blow counts
* 140(b. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

The Earth Technology Corporation

LOG OF BORING

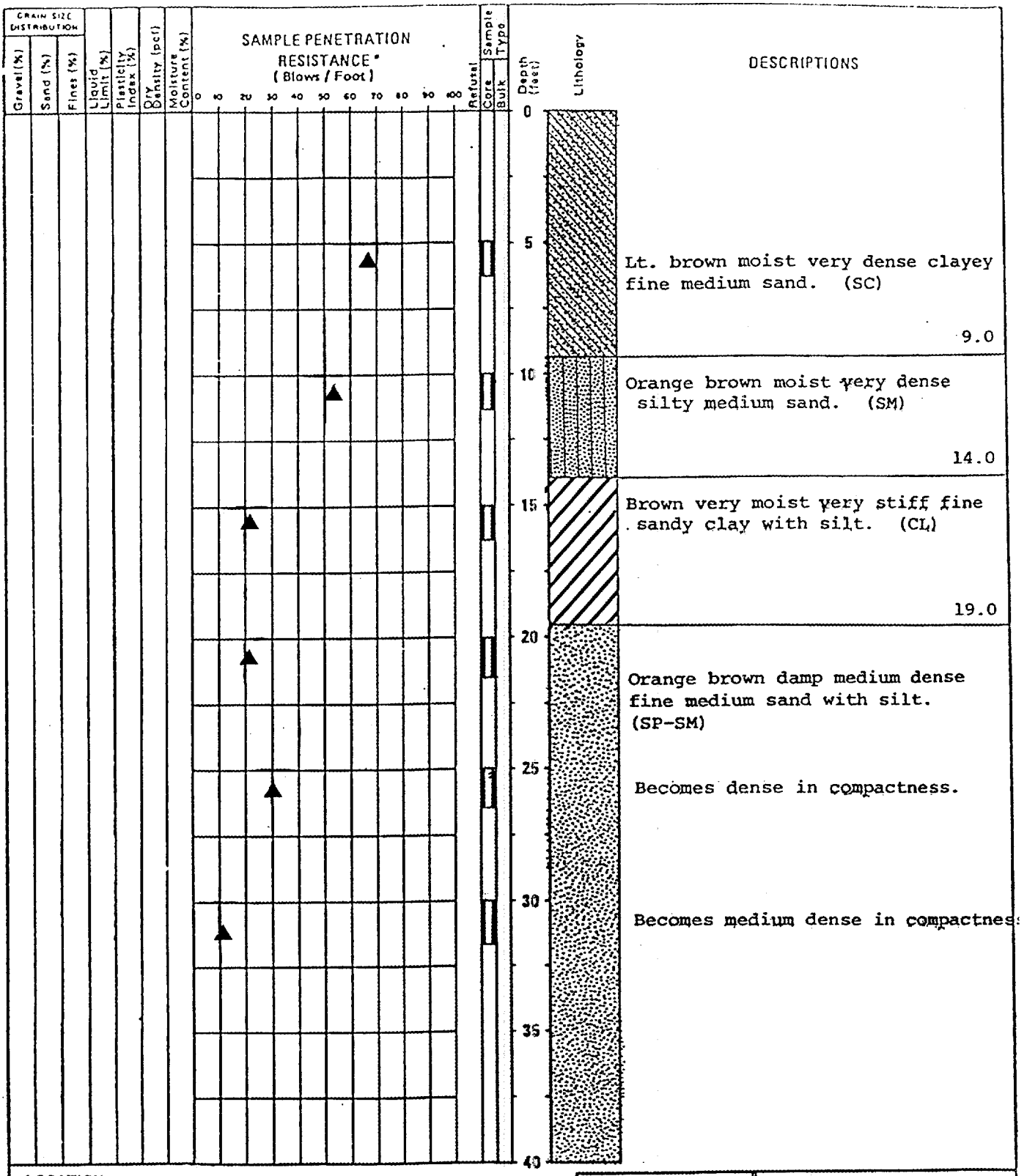
BORING NO. GT-9

Drawn By: BK
Checked By: KR

PROJECT NO. 87-853

Date: 9/17/87

FIGURE A-14




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2696'
DATE DRILLED: 9/3/87

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
▼ Water Level Measured in Boring
R Refusal (blowcount greater than 100/ft.)

The Earth Technology Corporation

LOG OF BORING

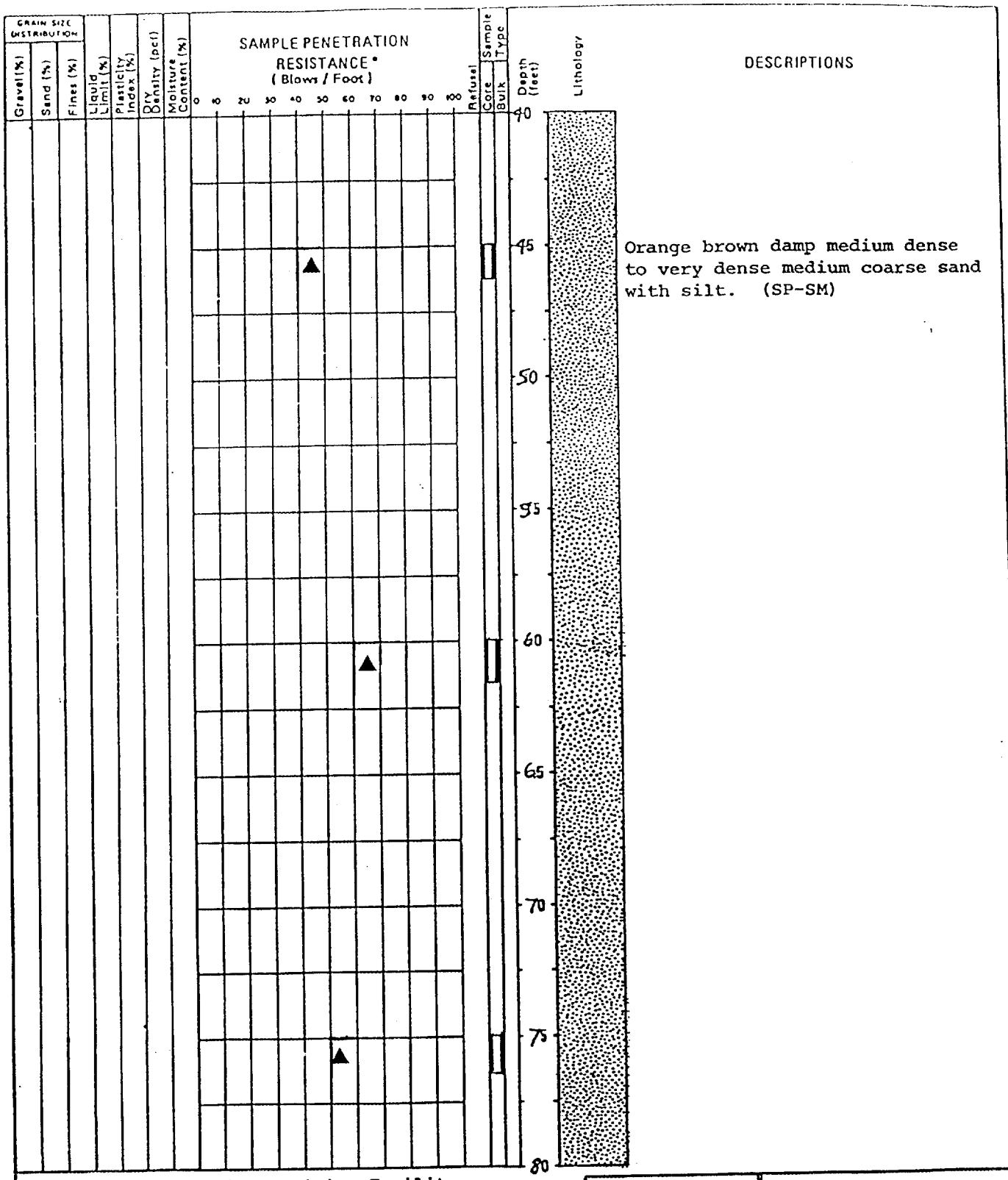
BORING NO. GT-10

Drawn By: BK
Checked By: KR

PROJECT NO. 87-853

Date: 9/17/87

FIGURE A-15




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2696'
DATE DRILLED: 9/3/87

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

The Earth Technology Corporation

| | |
|---|---|
| LOG OF BORING | |
| BORING NO. | GT-10 |
| Drawn By: BK<br>Checked By: KR | PROJECT NO. 87-853 |
| Date: 9/17/87 | FIGURE A-15 |

| Grain Size Distribution: Gravel (%) | Sand (%) | Fines (%) | Liquid Limit (%) | Plasticity Index (%) | Dry Density (pcf) | Moisture Content (%) | Sample Type: Refusal | Core | Bulk | Depth (feet) | Lithology | DESCRIPTIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 80 | | |
| | | | | | | | | | | | | 82.5 |
| | | | | | | | | | | 85 | | Lt. brown very moist very dense fine sandy silt. (ML) |
| | | | | | | | | | | 90 | | 91.5 |
| | | | | | | | | | | | | Boring terminated at 91.5 ft. Backfilled. |
| | | | | | | | | | | 95 | | |
| | | | | | | | | | | | | No groundwater found. |

SAMPLE PENETRATION RESISTANCE * (Blows / Foot)

0 10 20 30 40 50 60 70 80 90 100

LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2696'
DATE DRILLED: 9/3/87

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured In Boring
R Refusal (blowcount greater than 100/ft.)

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

The Earth Technology Corporation

LOG OF BORING

BORING NO. GT-10

Drawn By: BK
Checked By: KR

PROJECT NO. 87-850

Date: 9/17/87

FIGURE A-15

# APPENDIX B

# GEOTECHNICAL

# LABORATORY TESTING

## GEOTECHNICAL LABORATORY TESTING

The results of geotechnical laboratory testing performed in conjuction with this project accompany this appendix. The following laboratory tests were performed on representative samples in accordance with the applicable American Society for Testing and Materials (ASTM) latest standards.

### Moisture and In Place Density

The field moisture content and in place dry density determinations were performed on relatively undisturbed samples obtained from the test borings. The moisture content is obtained in accordance with ASTM Test Method D 2216. The in place dry density is computed using the net weight of the entire (ring) sample. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples. The results of these tests are presented on Table B-1.

### Classification

Soils were classified with respect to the Unified Soil Classification System (USCS) in accordance with ASTM Test Methods D 2487 and D 2488. The soil classification is presented in the test data.

### Soluble Sulfate, pH

The concentrations of water soluble sulfate ions of selected soil samples were determined in accordance with the California Division of Highways Method No. 417. In addition, soil pH values were also determined in accordance with the

ASTM G 51. The results of soluble sulfate and pH testing are presented on Table B-1 (Test Results) accompanying this appendix.

## Atterberg Limits

The relative plasticity of a soil, the liquid limit, the plastic limit and plasticity index, were determined in accordance with ASTM Test Method D 4318. The results are presented on Table B-1 accompanying this appendix and in the test data (Figures B-1 through B-19).

## Particle Size Analysis

Grain size distribution of soil samples were obtained in accordance with ASTM Test Method D 422. The distribution of particle sizes retained on the No. 200 sieve was determined by sieving. The results of particle size analysis are graphically presented on the gradations curves accompanying this appendix (Figures B-1 through B-19).

## Consolidation Tests

The consolidation tests were performed on selected relatively undisturbed soil samples in accordance with procedures outlined in ASTM Test Method D 4186. Samples were placed in a consolidometer and loads were applied incrementaly in geometric progression. The sample (2 1/2 inches in diameter and one inch in height) was permitted to consolidate under each load increment until the slope of the characteristic linear secondary compression portion of the thickness versus log of time plot was apparent.

The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original one inch height. Hydroconsolidation (collapse) and expansion characteristics were also evaluated by monitoring the change in volume with the addition of water while the specimen was confined under an in-situ constant normal stress. The consolidation test results are graphically presented and included in this appendix (Figures B-20 through B-22).

TABLE B-1 TEST RESULTS

| BORING NO. | DEPTH (feet) | SAMPLE TYPE [1] | DRY DENSITY (pcf) | WATER CONTENT (%) | % – 200 SIEVE | ATTERBERG LIMITS | | | UNCONFINED COMPRESSION STRENGTH (psf) | pH | RESISTIVITY (ohms-cm) | SOLUBLE SULFATES (%) | ADDITIONAL TESTS [2] | SOIL DESCRIPTION (USCS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | LL | PL | PI | | | | | | |
| GT-1 | 5-6.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist fine med. sandy clay (CL) |
| GT-1 | 10-11.5 | S | - | 7.3 | 29 | 45 | 21 | 24 | - | - | - | - | - | Lt. brn. moist clayey med. sand. (SC) |
| GT-1 | 15-16.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist fine med. sandy clay. (CL) |
| GT-1 | 20-21.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist sand with silt. (SP-SM) |
| GT-2 | 5-6 | D | 90.2 | 6.4 | 35 | 53 | 28 | 25 | - | - | - | - | - | Lt. brn. moist clayey fine med. sand. (SC) |
| GT-2 | 10-11 | D | - | - | - | 47 | 17 | 30 | - | - | - | - | SC | Lt. brn. moist clayey fine med. sand. (SC) |
| GT-2 | 15-16 | D | 117.4 | 8.6 | - | - | - | - | - | - | - | - | - | Or. brn. very moist silty med. sand. (SM) |
| GT-2 | 20-21 | D | - | 4.3 | 27 | - | - | - | - | - | - | - | - | Or. brn. very moist silty med. sand. (SM) |
| GT-2 | 25-26 | D | 108.7 | 1.2 | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |
| GT-2 | 30-31 | D | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |
| GT-2 | 35-36 | D | 102.8 | 5.8 | - | - | - | - | - | - | - | - | - | Or. brn. moist fine sandy silt. (ML) |
| GT-2 | 40-41 | D | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |
| GT-2 | 45-46 | D | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |
| GT-2 | 50-51 | D | 104.3 | 1.3 | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |
| GT-2 | 55-56 | D | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |
| GT-2 | 60-61 | D | 115.8 | 2.2 | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |
| GT-2 | 65-66 | D | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |

NOTE 1 – SAMPLE TYPE

Auger Sample – A
Bag Sample – B
Core Sample – C
Drive Sample – D
Hand Drive – H
Remolded Sample – R
Standard Split Barrel – S
Thin Wall Tube Sample – T

NOTE 2 – ADDITIONAL TEST RESULTS ATTACHED

Consolidation Test – C
Direct Shear – DS
Gradation Analysis – G
Moisture Density (Compaction) – MD
Pocket Penetrometer – P
R – Value Test – R
Swell – Consolidation Test – SC
Triaxial Test – T
Vane Shear – V

TABLE B-1 TEST RESULTS

| BORING NO. | DEPTH (feet) | SAMPLE TYPE[1] | DRY DENSITY (pcf) | WATER CONTENT (%) | % – 200 SIEVE | ATTERBERG LIMITS | | | UNCONFINED COMPRESSION STRENGTH (psf) | pH | RESISTIVITY (ohms-cm) | SOLUBLE SULFATES (%) | ADDITIONAL TESTS[2] | SOIL DESCRIPTION (USCS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | LL | PL | PI | | | | | | |
| GT-2 | 70-71 | D | 121.7 | 1.3 | 5 | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |
| GT-2 | 75-76 | D | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |
| GT-2 | 80-81 | D | 108.4 | 4.5 | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist med. coarse sand w/silt (SP-SM) |
| GT-2 | 85-86 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist fine sandy silt. (ML) |
| GT-2 | 90-91 | D | 106.3 | 7.1 | - | - | - | - | - | - | - | - | - | Lt. brn. moist fine sandy silt. (ML) |
| GT-3 | 5-6.5 | S | - | 9.0 | - | - | - | - | - | - | - | - | - | Lt. brn. very moist fine med. sandy clay. (CL) |
| GT-3 | 10-11.5 | S | - | 5.9 | 26 | - | - | - | - | - | - | - | - | Or. brn. moist silty clayey sand. (SM-SC) |
| GT-3 | 15-16.5 | S | - | 12.1 | - | - | - | - | - | - | - | - | - | Lt. brn. very moist fine sandy clay. (CL) |
| GT-3 | 20-21.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. very moist fine sandy clay. (CL) |
| GT-4 | 5-6.5 | S | - | 6.3 | - | - | - | - | - | - | - | - | - | Lt. brn. moist med. sand clay with silt. (CL) |
| GT-4 | 10-11.5 | S | - | 6.2 | 36 | - | - | - | - | - | - | - | - | Lt. brn. moist silty clay fine med. sand. (SM-SC) |
| GT-4 | 15-16.5 | S | - | 3.0 | - | - | - | - | - | - | - | - | - | Lt. brn. moist silty med. sand. (SM) |
| GT-4 | 20-21.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist silty med. sand. (SM) |
| GT-5 | 5-6 | D | 107.3 | 6.9 | 39 | 41 | 19 | 22 | - | - | - | - | SC | Lt. brn. moist clayey fine-med. sand (SC) |
| GT-5 | 10-11 | D | 106.5 | 3.9 | 55 | 43 | 16 | 27 | - | - | - | - | - | Lt. brn. moist to very moist fine med. sandy clay with silt. (CL) |
| GT-5 | 15-16 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist to very moist fine med. sandy clay with silt. (CL) |
| GT-5 | 20-21 | D | 107.5 | 1.5 | - | - | - | - | - | - | - | - | - | Lt. brn. damp med. sand with silt (SP-SM) |

NOTE 1 – SAMPLE TYPE

Auger Sample – A
Bag Sample – B
Core Sample – C
Drive Sample – D
Hand Drive – H
Remolded Sample – R
Standard Split Barrel – S
Thin Wall Tube Sample – T

NOTE 2 – ADDITIONAL TEST RESULTS ATTACHED

Consolidation Test – C
Direct Shear – DS
Gradation Analysis – G
Moisture Density (Compaction) – MD
Pocket Penetrometer – P
R – Value Test – R
Swell – Consolidation Test – SC
Triaxial Test – T
Vane Shear – V

TABLE B-1 TEST RESULTS

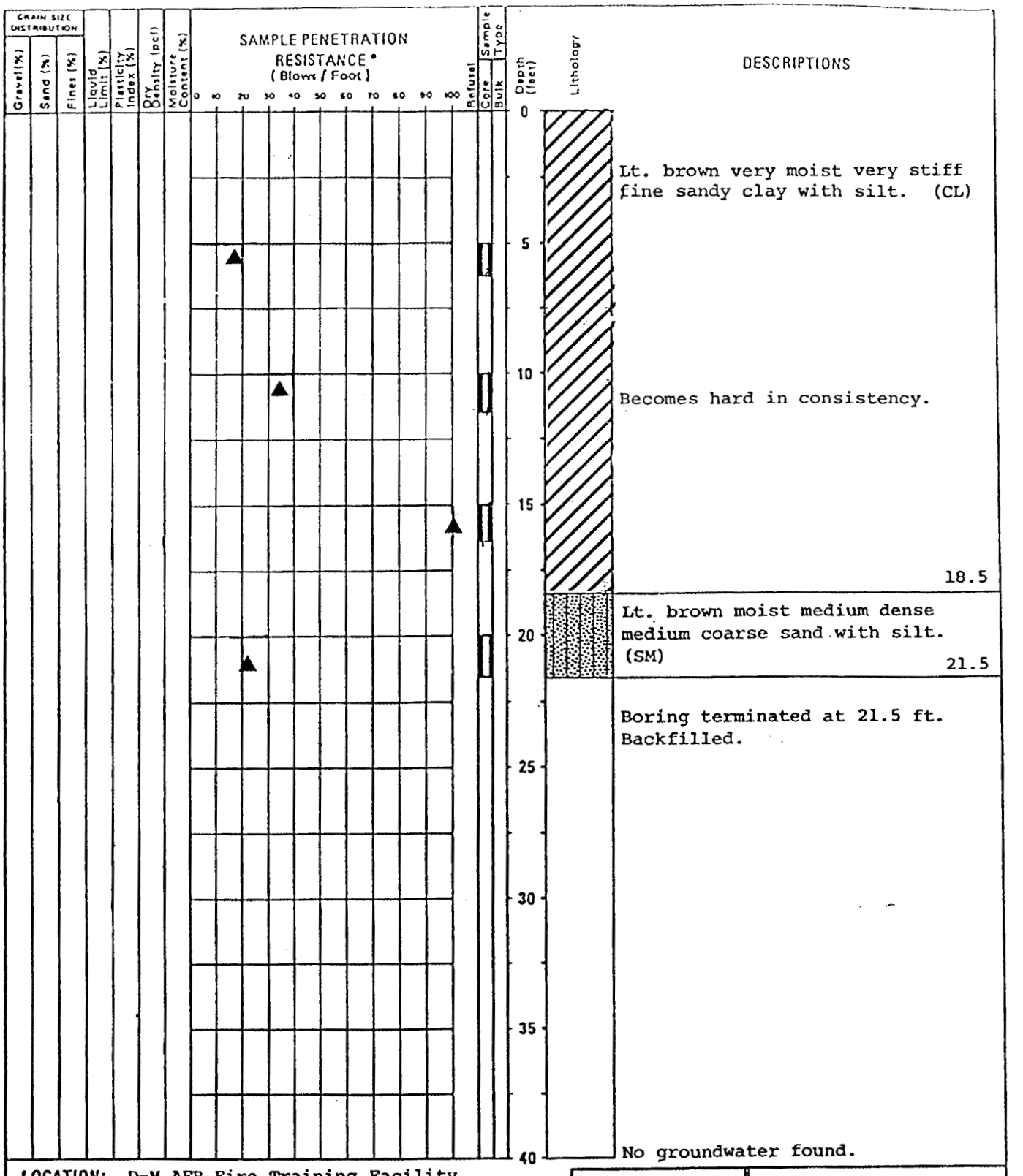
| BORING NO. | DEPTH (feet) | SAMPLE TYPE[1] | DRY DENSITY (pcf) | WATER CONTENT (%) | % – 200 SIEVE | ATTERBERG LIMITS | | | UNCONFINED COMPRESSION STRENGTH (psf) | pH | RESISTIVITY (ohms-cm) | SOLUBLE SULFATES ppm | ADDITIONAL TESTS[2] | SOIL DESCRIPTION (USCS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | LL | PL | PI | | | | | | |
| GT-6 | 5-6.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist med. sandy clay with silt. (CL) |
| GT-6 | 10-11.5 | S | - | 4.1 | 16 | - | - | - | - | - | - | - | - | Or. brn. moist silty med. sand. (SM) |
| GT-6 | 15-16.5 | S | - | - | - | 63 | 24 | 42 | - | - | - | - | - | Lt. brn. moist fine sandy clay (CH) |
| GT-6 | 20-21.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist sand with silt. (SP-SM) |
| GT-7 | 5-6 | D | 103.4 | 6.2 | - | - | - | - | - | 9.3 | - | 225 | - | Lt. brn. moist fine sandy clay with silt. (CL) |
| GT-7 | 10-11 | D | - | 5.0 | 16 | 32 | 16 | 16 | - | - | - | - | SC | Lt. brn. moist clayey med. sand. (SC) |
| GT-7 | 15-16 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist clayey silty sand. (SM-SC) |
| GT-7 | 20-21 | D | 115.8 | 5.0 | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist fine coarse sand with silt. (SP-SM) |
| GT-7 | 25-26 | D | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist fine coarse sand with silt. (SP-SM) |
| GT-7 | 30-31.5 | S | - | 1.3 | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist fine coarse sand with silt. (SP-SM) |
| GT-7 | 45-46.5 | S | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist fine coarse sand with silt. (SP-SM) |
| GT-7 | 60-61.5 | S | - | 2.5 | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist fine coarse sand with silt. (SP-SM) |
| GT-7 | 75-76.5 | S | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp-moist fine coarse sand with silt. (SP-SM) |
| GT-7 | 90-91.5 | S | - | 8.6 | - | - | - | - | - | - | - | - | - | Lt. brn. very moist fine sandy silt. (ML) |
| GT-8 | 5-6.5 | S | - | 8.1 | - | - | - | - | - | - | - | - | - | Lt. brn. very moist fine sandy clay. (CL) |
| GT-8 | 10-11.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. very moist fine sandy clay. (CL) |
| GT-8 | 15-16.5 | S | - | 12.3 | 90 | 48 | 21 | 27 | - | - | - | - | - | Lt. brn. very moist fine sandy clay. (CL) |

NOTE 1 – SAMPLE TYPE

Auger Sample – A
Bag Sample – B
Core Sample – C
Drive Sample – D
Hand Drive – H
Remolded Sample – R
Standard Split Barrel – S
Thin Wall Tube Sample – T

NOTE 2 – ADDITIONAL TEST RESULTS ATTACHED

Consolidation Test – C
Direct Shear – DS
Gradation Analysis – G
Moisture Density (Compaction) – MD
Pocket Penetrometer – P
R – Value Test – R
Swell – Consolidation Test – SC
Triaxial Test – T
Vane Shear – V




LOCATION: D-M AFB Fire Training Facility
TYPE OF BORING: 7" H.S. Auger
ELEVATION: 2697'
DATE DRILLED: 9/4/87

▲ Standard blow counts
● Blow counts for ring samples
* 140lb. Hammer, 30" Freefall, "A" Rod Used Throughout.
NR No Recovery
Water Level Measured in Boring
R Refusal (blowcount greater than 100/ft.)

Standard Split Spoon Sample
2½" Drive Sample
Bulk Sample
Thin Wall Tube Sample

The Earth Technology Corporation

LOG OF BORING
BORING NO. GT-11

Drawn By: BK
Checked By: KR
Date: 9/17/87

PROJECT NO. 87-853

FIGURE A-16

TABLE B-1 TEST RESULTS

| BORING NO. | DEPTH (feet) | SAMPLE TYPE [1] | DRY DENSITY (pcf) | WATER CONTENT (%) | % – 200 SIEVE | ATTERBERG LIMITS LL | PL | PI | UNCONFINED COMPRESSION STRENGTH (psf) | pH | RESISTIVITY (ohms-cm) | SOLUBLE SULFATES (%) | ADDITIONAL TESTS [2] | SOIL DESCRIPTION (USCS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GT-8 | 20-21.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. med. sand with silt. (SP-SM) |
| GT-9 | 5-6.5 | S | - | 3.5 | 39 | 45 | 21 | 24 | - | - | - | - | - | Lt. brn. moist clayey fine sand. (SC) |
| GT-9 | 10-11.5 | S | - | - | - | - | - | - | - | - | - | - | - | Or. brn. moist fine med. sand with silt. (SP-SM) |
| GT-9 | 15-16.5 | S | - | 13.5 | - | - | - | - | - | - | - | - | - | Or. brn. very moist fine sandy clay with silt. (CL) |
| GT-9 | 20-21.5 | S | - | - | - | - | - | - | - | - | - | - | - | Or. brn. moist med. sand with silt. (SP-SM) |
| GT-10 | 5-6.5 | S | - | 6.4 | 19 | 47 | 22 | 25 | - | - | - | - | - | Lt. brn. moist clayey fine med. sand. (SC) |
| GT-10 | 10-11.5 | S | - | 4.6 | - | - | - | - | - | 9.2 | - | - | - | Or. brn. moist silty med. sand. (SM) |
| GT-10 | 15-16.5 | S | - | 12.7 | - | - | - | - | - | - | - | - | - | Brn. very moist fine sandy clay with silt. (CL) |
| GT-10 | 20-21.5 | S | - | 1.4 | 7 | NP | NP | NP | - | - | - | - | - | Or. brn. damp fine med. sand with silt. (SP-SM) |
| GT-10 | 25-26.5 | S | - | 1.1 | - | - | - | - | - | - | - | - | - | Or. brn. damp fine med. sand with silt. (SP-SM) |
| GT-10 | 30-31.5 | S | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp fine med. sand with silt. (SP-SM) |
| GT-10 | 45-46.5 | S | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp fine med. sand with silt. (SP-SM) |
| GT-10 | 60-61.5 | S | - | 1.9 | - | - | - | - | - | - | - | - | - | Or. brn. damp fine med. sand with silt. (SP-SM) |
| GT-10 | 75-76.5 | S | - | - | - | - | - | - | - | - | - | - | - | Or. brn. damp fine med. sand with silt. (SP-SM) |
| GT-10 | 90-91.5 | S | - | 10.5 | - | - | - | - | - | - | - | - | - | Lt. brn. very moist fine sandy silt. (ML) |
| GT-11 | 5-6.5 | S | - | 7.7 | - | - | - | - | - | - | - | - | - | Lt. brn. very moist fine sandy clay w/silt. (CL) |
| GT-11 | 10-11.5 | S | - | 7.2 | 54 | 38 | 18 | 20 | - | - | - | - | - | Lt. brn. very moist fine sandy clay w/silt. (CL) |

NOTE 1 – SAMPLE TYPE

Auger Sample – A
Bag Sample – B
Core Sample – C
Drive Sample – D
Hand Drive – H
Remolded Sample – R
Standard Split Barrel – S
Thin Wall Tube Sample – T

NOTE 2 – ADDITIONAL TEST RESULTS ATTACHED.

Consolidation Test – C
Direct Shear – DS
Gradation Analysis – G
Moisture Density (Compaction) – MD
Pocket Penetrometer – P
R – Value Test – R
Swell – Consolidation Test – SC
Triaxial Test – T
Vane Shear – V

TABLE B-1 TEST RESULTS

| BORING NO. | DEPTH (feet) | SAMPLE TYPE[1] | DRY DENSITY (pcf) | WATER CONTENT (%) | % – 200 SIEVE | ATTERBERG LIMITS | | | UNCONFINED COMPRESSION STRENGTH (psf) | pH | RESISTIVITY (ohms-cm) | SOLUBLE SULFATES (%) | ADDITIONAL TESTS[2] | SOIL DESCRIPTION (USCS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | LL | PL | PI | | | | | | |
| GT-11 | 15-16.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. very moist fine sandy clay with silt(CL |
| GT-11 | 20-21.5 | S | - | 3.1 | - | - | - | - | - | - | - | - | - | Lt. brn. moist med.-coarse sand with silt(SP-SM) |

NOTE 1 – SAMPLE TYPE

Auger Sample – A
Bag Sample – B
Core Sample – C
Drive Sample – D
Hand Drive – H
Remolded Sample – R
Standard Split Barrel – S
Thin Wall Tube Sample – T

NOTE 2 – ADDITIONAL TEST RESULTS ATTACHED

Consolidation Test – C
Direct Shear – DS
Gradation Analysis – G
Moisture Density (Compaction) – MD
Pocket Penetrometer – P
R – Value Test – R
Swell – Consolidation Test – SC
Triaxial Test – T
Vane Shear – V

TABLE B-1 TEST RESULTS

| BORING NO. | DEPTH (feet) | SAMPLE TYPE[1] | DRY DENSITY (pcf) | WATER CONTENT (%) | % – 200 SIEVE | ATTERBERG LIMITS LL | PL | PI | UNCONFINED COMPRESSION STRENGTH (psf) | pH | RESISTIVITY (ohms-cm) | SOLUBLE SULFATES (%) | ADDITIONAL TESTS[2] | SOIL DESCRIPTION (USCS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BH01 | 0-1.5 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. red brn v. moist clayey fine-med sand(SC) |
| BH01 | 4.5-6 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. red brn. v. moist clayey fine-med sand(SC) |
| BH01 | 6-7 | D | 97.6 | 9.4 | - | 54 | 19 | 35 | - | - | - | - | - | Lt. red brn v. moist clayey fine-med sand(SC) |
| | | | | | | | | | | | | | | |
| BH01 | 12-13 | D | - | - | - | 46 | 17 | 29 | - | - | - | - | - | Lt. red brn v. moist clayey fine med sand(SC) |
| BH01 | 22-23 | D | - | - | - | - | - | - | - | - | - | - | - | Orn brn moist med sand with silt (SP-SM) |
| BH01 | 26.5-27.5 | D | - | - | - | - | - | - | - | - | - | - | - | Orn brn moist med sand with silt (SP-SM) |
| BH01 | 35-36 | D | - | - | - | - | - | - | - | - | - | - | - | Orn brn moist med sand with silt (SP-SM) |
| | | | | | | | | | | | | | | |
| BH02 | 5-6 | D | 110.7 | 6.3 | - | - | - | - | - | - | - | - | - | Lt. brn moist med sandy clay with silt (CL) |
| BH02 | 10-11 | D | 103.6 | 3.8 | - | - | - | - | - | - | - | - | - | Orn brn moist silty fine-med sand(SM) |
| BH02 | 15-16 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn moist silty calyey fine-med sand(SM-SC) |
| BH02 | 20-21 | D | 124.7 | 1.5 | - | - | - | - | - | - | - | - | - | Orn brn damp sand with silt and gravel(SP-SM) |
| BH02 | 25-26 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn damp med. sand with silt (SP-SM) |
| BH02 | 30-31 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn damp med. sand with silt (SP-SM) |
| BH02 | 35-36 | D | 121.1 | 1.6 | - | - | - | - | - | - | - | - | - | Lt. brn damp med. sand with silt (SP-SM) |
| | | | | | | | | | | | | | | |

NOTE 1 – SAMPLE TYPE

Auger Sample – A
Bag Sample – B
Core Sample – C
Drive Sample – D
Hand Drive – H
Remolded Sample – R
Standard Split Barrel – S
Thin Wall Tube Sample – T

NOTE 2 – ADDITIONAL TEST RESULTS ATTACHED

Consolidation Test – C
Direct Shear – DS
Gradation Analysis – G
Moisture Density (Compaction) – MD
Pocket Penetrometer – P
R – Value Test – R
Swell – Consolidation Test – SC
Triaxial Test – T
Vane Shear – V

TABLE B-1 TEST RESULTS

| BORING NO. | DEPTH (feet) | SAMPLE TYPE[1] | DRY DENSITY (pcf) | WATER CONTENT (%) | % – 200 SIEVE | ATTERBERG LIMITS | | | UNCONFINED COMPRESSION STRENGTH (psf) | pH | RESISTIVITY (ohms-cm) | SOLUBLE SULFATES (%) | ADDITIONAL TESTS[2] | SOIL DESCRIPTION (USCS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | LL | PL | PI | | | | | | |
| BH03 | 5-6 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. Brn. damp med. sandy clay(CL) |
| BH03 | 10-11 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. damp med. sandy clay (CL) |
| BH03 | 15-16 | D | 118.5 | 1.6 | - | - | - | - | - | - | - | - | - | Lt. brn. damp med. sandy clay (CL) |
| BH03 | 20-21 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. Brn. damp med.-coarse sand and gravel(SP-SM |
| BH03 | 25-26 | D | 115.8 | 0.8 | - | - | - | - | - | - | - | - | - | Lt. brn. damp med.-coarse sand (SP-SM) |
| BH03 | 30-31 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. damp med-coarse sand (SP-SM) |
| BH03 | 35-36 | S | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. damp med.-coarse sand (SP-SM) |
| BH04 | 5-6 | D | 95.0 | 3.9 | - | - | - | - | - | - | - | - | - | Lt. brn. moist med. sandy clay with silt(CL) |
| BH04 | 10-11 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist med. sandy clay with silt(CL) |
| BH04 | 15-16 | D | 112.5 | 2.9 | - | - | - | - | - | - | - | - | - | Lt. brn. moist med.-coarse sand with silt(SP-S |
| BH04 | 20-21 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist med.-coarse sand with silt(SP-S |
| BH04 | 25-26 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist med-coarse sand with silt (SP-S |
| BH04 | 30-31 | D | 122.2 | 1.1 | - | - | - | - | - | - | - | - | - | Lt. brn. moist med-coarse sand with silt (SP_S |
| BH04 | 35-36 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist med-coarse sand with silt (SP-S |
| BH05 | 5-6 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist med sandy clay with silt(CL) |
| BH05 | 10-11 | D | 103.4 | 6.5 | - | - | - | - | - | - | - | - | - | Orn. brn. moist silty med. sand (SM) |
| BH05 | 15-16 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn. moist silty clayey fine-med sand(SM-S |

NOTE 1 – SAMPLE TYPE

Auger Sample – A
Bag Sample – B
Core Sample – C
Drive Sample – D
Hand Drive – H
Remolded Sample – R
Standard Split Barrel – S
Thin Wall Tube Sample – T

NOTE 2 – ADDITIONAL TEST RESULTS ATTACHED

Consolidation Test – C
Direct Shear – DS
Gradation Analysis – G
Moisture Density (Compaction) – MD
Pocket Penetrometer – P
R – Value Test – R
Swell – Consolidation Test – SC
Triaxial Test – T
Vane Shear – V

TABLE B-1 TEST RESULTS

| BORING NO. | DEPTH (feet) | SAMPLE TYPE[1] | DRY DENSITY (pcf) | WATER CONTENT (%) | % – 200 SIEVE | ATTERBERG LIMITS | | | UNCONFINED COMPRESSION STRENGTH (psf) | pH | RESISTIVITY (ohms-cm) | SOLUBLE SULFATES (%) | ADDITIONAL TESTS[2] | SOIL DESCRIPTION (USCS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | LL | PL | PI | | | | | | |
| BH05 | 20-21 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn damp fine-med sand with silt(SP-SM) |
| BH05 | 25-26 | D | 123.0 | 0.8 | - | - | - | - | - | - | - | - | - | Lt. brn damp fine-med sand with silt(SP-SM) |
| BH05 | 30-31 | D | - | - | - | - | - | - | - | - | - | - | - | Lt. brn damp fine-med sand with silt(SP-SM) |
| BH05 | 35-36 | D | 117.0 | 4.7 | - | - | - | - | - | - | - | - | - | Lt. brn damp fine-med sand with silt(SP-SM) |

NOTE 1 – SAMPLE TYPE

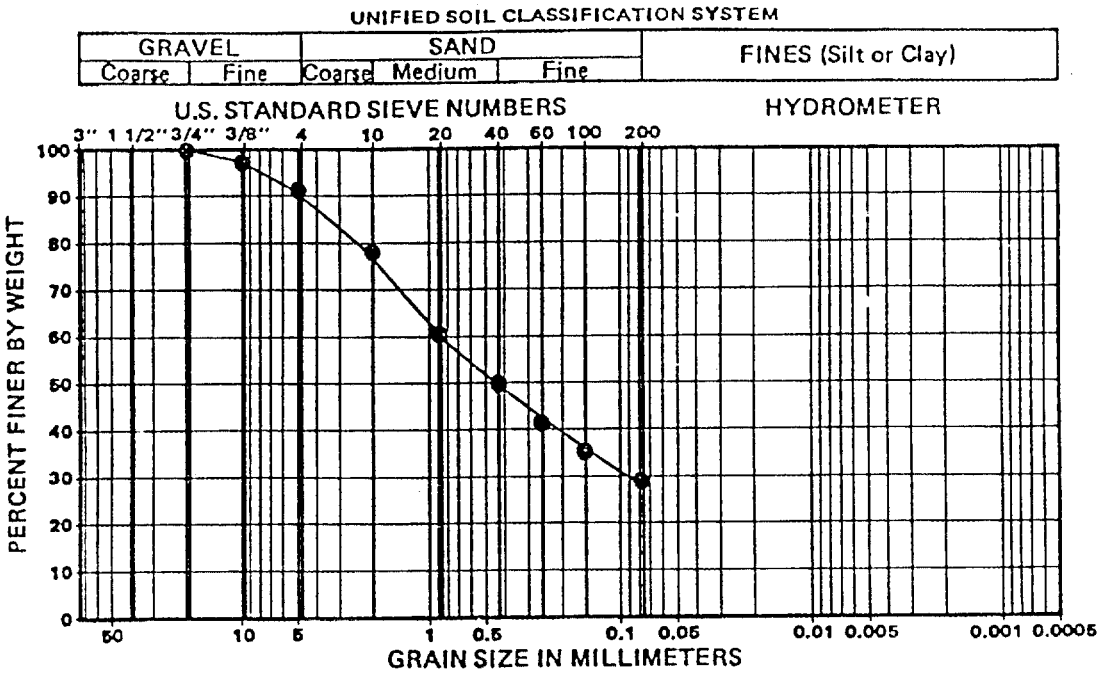
Auger Sample – A
Bag Sample – B
Core Sample – C
Drive Sample – D
Hand Drive – H
Remolded Sample – R
Standard Split Barrel – S
Thin Wall Tube Sample – T

NOTE 2 – ADDITIONAL TEST RESULTS ATTACHED

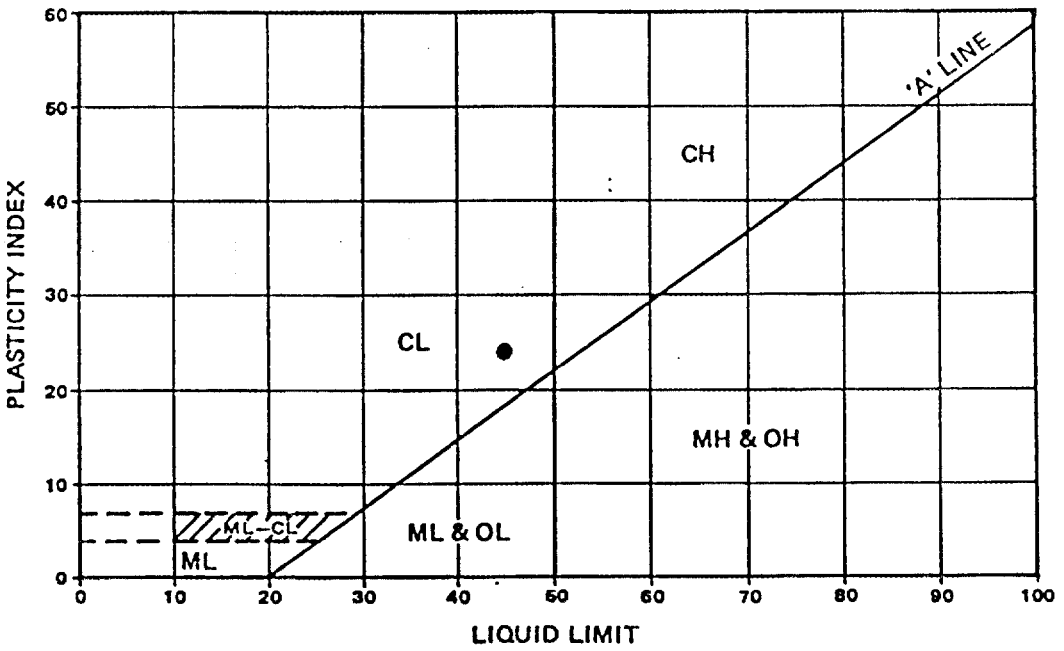
Consolidation Test – C
Direct Shear – DS
Gradation Analysis – G
Moisture Density (Compaction) – MD
Pocket Penetrometer – P
R – Value Test – R
Swell – Consolidation Test – SC
Triaxial Test – T
Vane Shear – V

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-1 | 2 | 10-11.5 | 7.3 | 45 | 21 | 24 | Lt. brown clayey med. sand (SC) |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-1

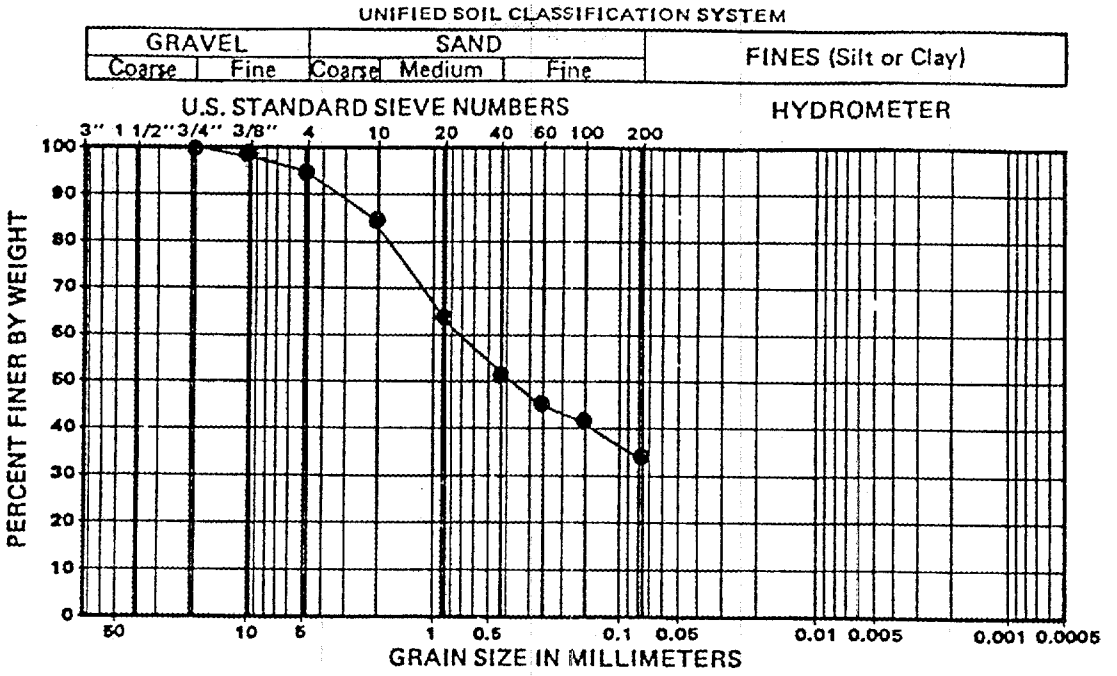
FIGURE

7-86

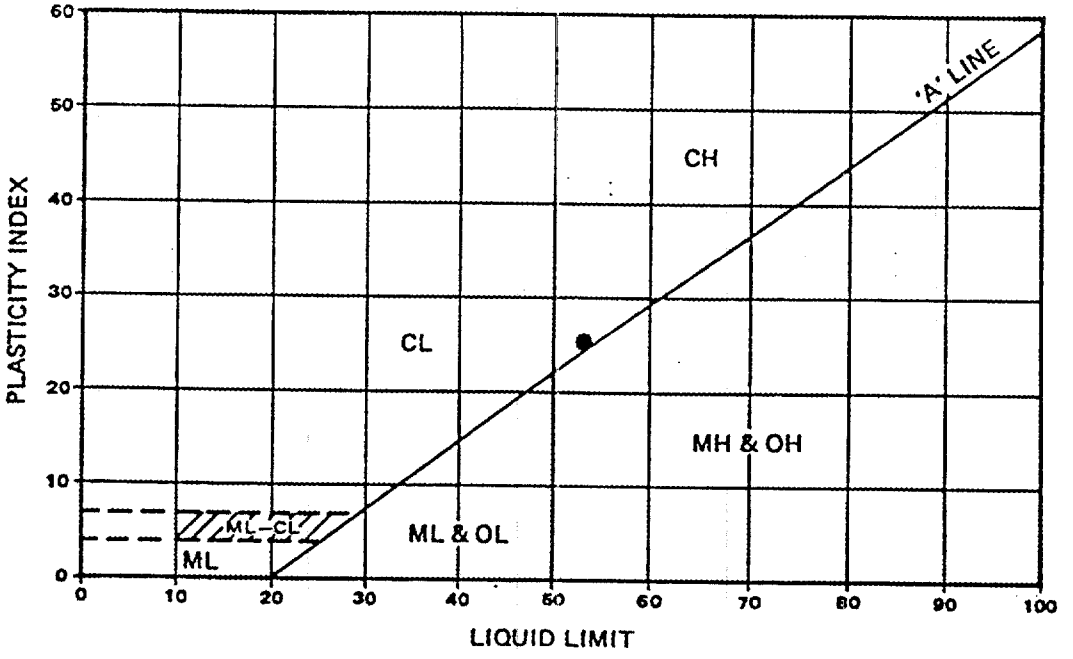
DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-2 | 1 | 5-6 | 6.4 | 53 | 28 | 25 | Lt. brn. clayey fine med sand (SC) |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-2

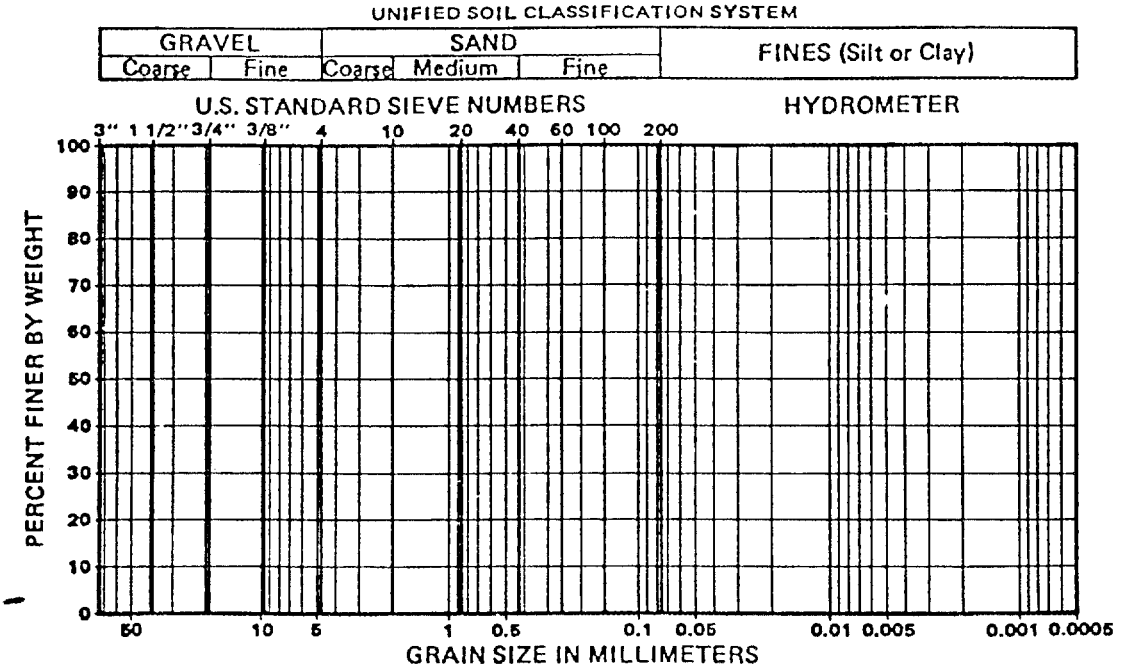
7-86

FIGURE

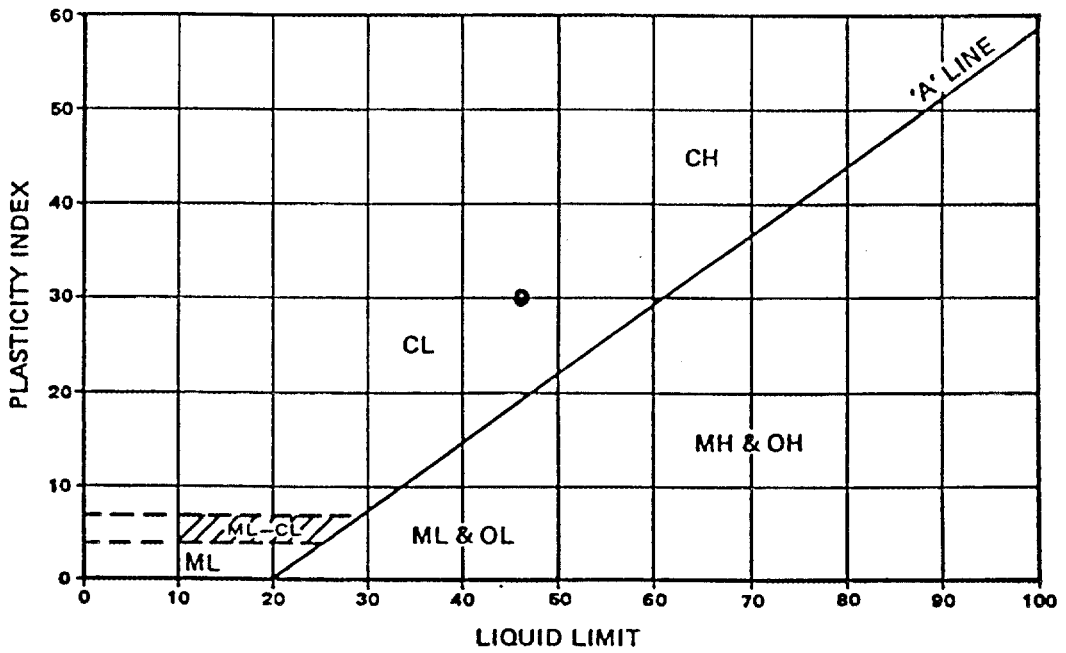
DRAWN BY ____ DATE ____ CHECKED BY ____ DATE ____ APPROVED BY ____ DATE ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-2 | 2 | 10-11 | N/A | 47 | 17 | 30 | Lt. brn. clayey fine med. sand (SC) |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-3

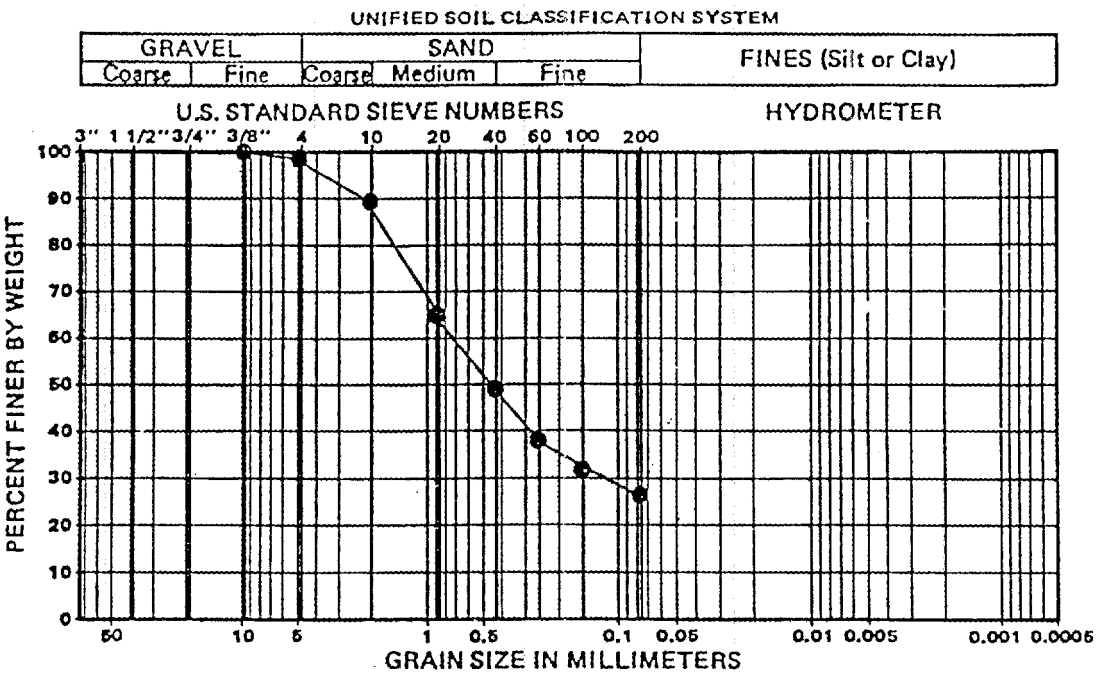
FIGURE

7-86

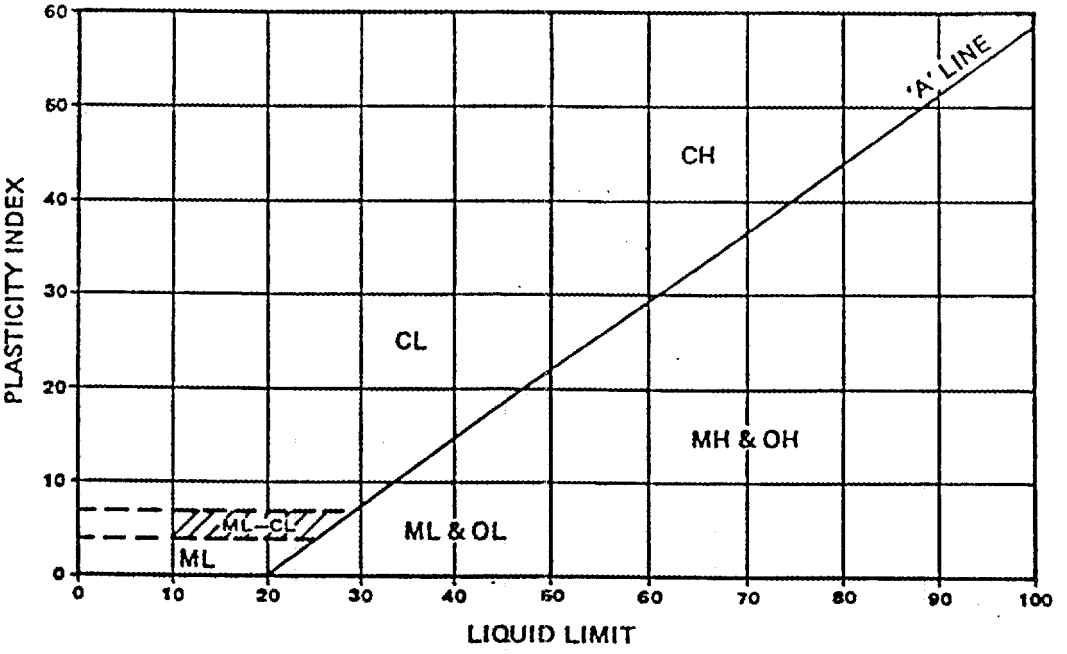
DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-2 | 4 | 20-21 | 4.3 | - | - | - | Or. brn. moist silty sand SM |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-4

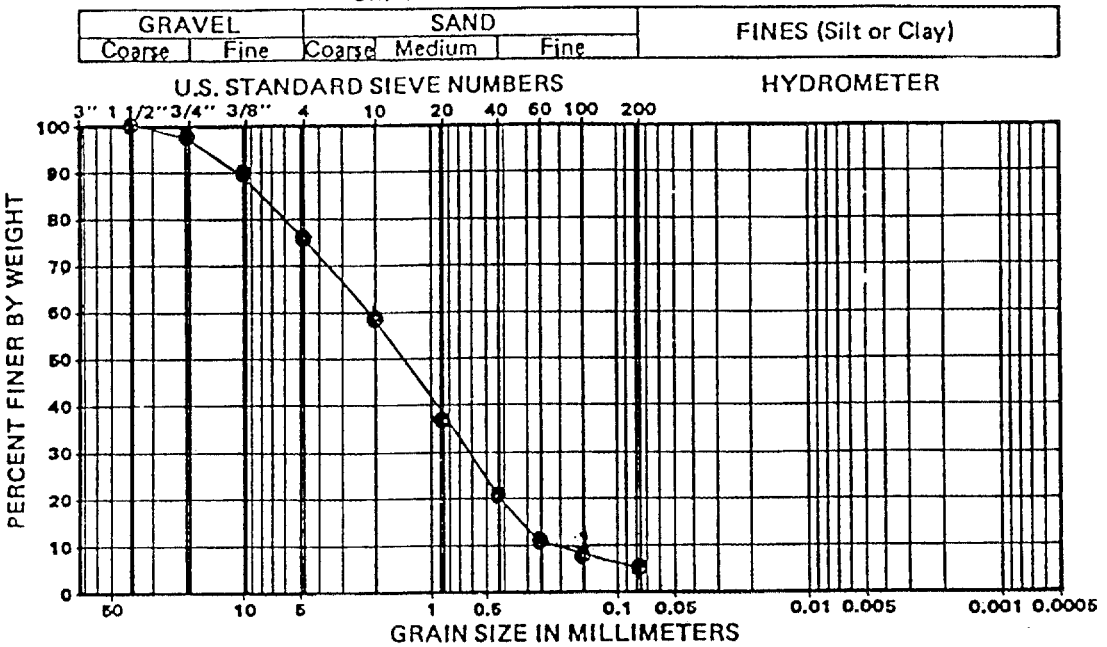
7-86

FIGURE

DRAWN BY ____ DATE ____ CHECKED BY ____ DATE ____ APPROVED BY ____ DATE ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

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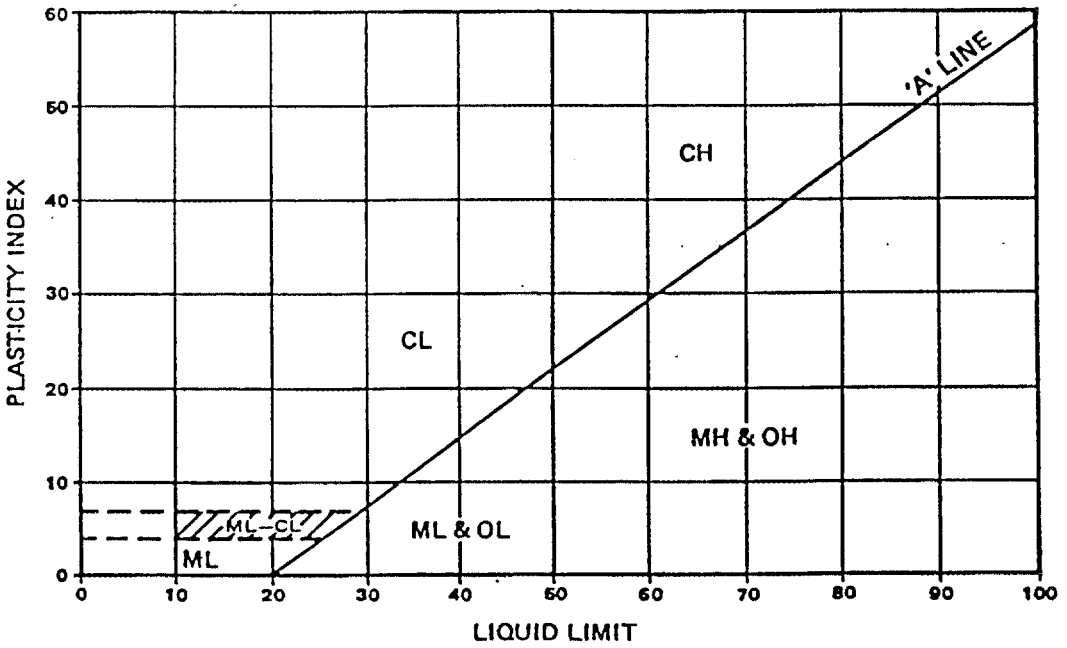



| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-2 | 14 | 70-71 | 1.3 | - | - | - | Or. brn. poorly graded damp sand with silt & gravel SP-SM |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-5

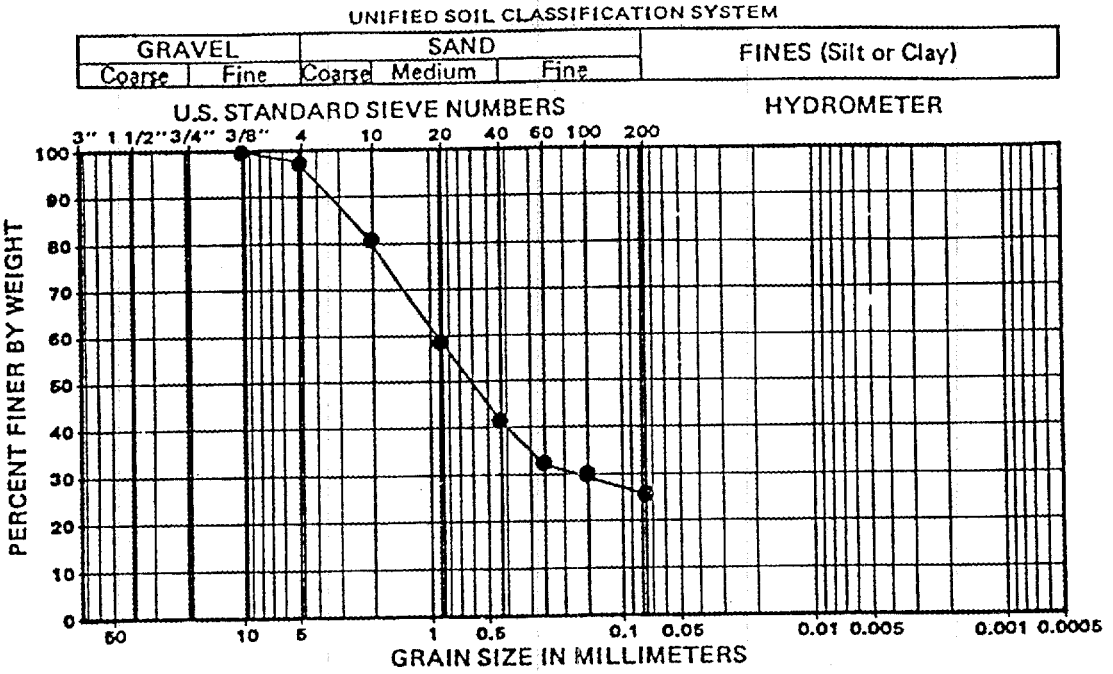
FIGURE

7-86

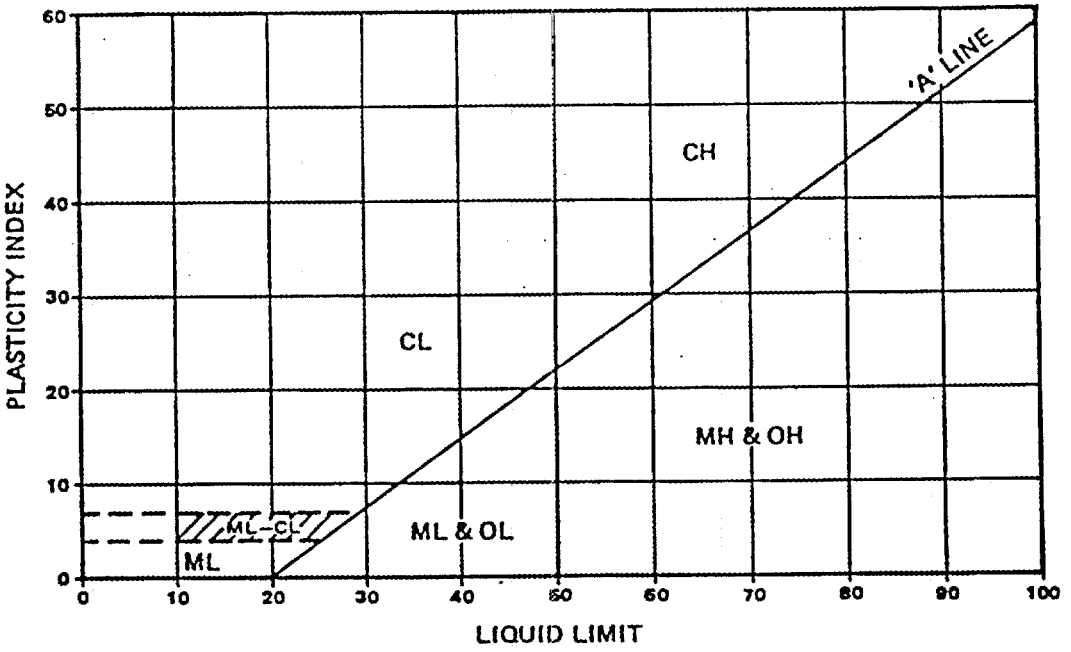
DRAWN BY ____ DATE ____ CHECKED BY ____ DATE ____ APPROVED BY ____ DATE ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-3 | 2 | 10-11.5 | 5.9 | - | - | - | Or. brn. moist silty clayey sand SM-SC |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-6

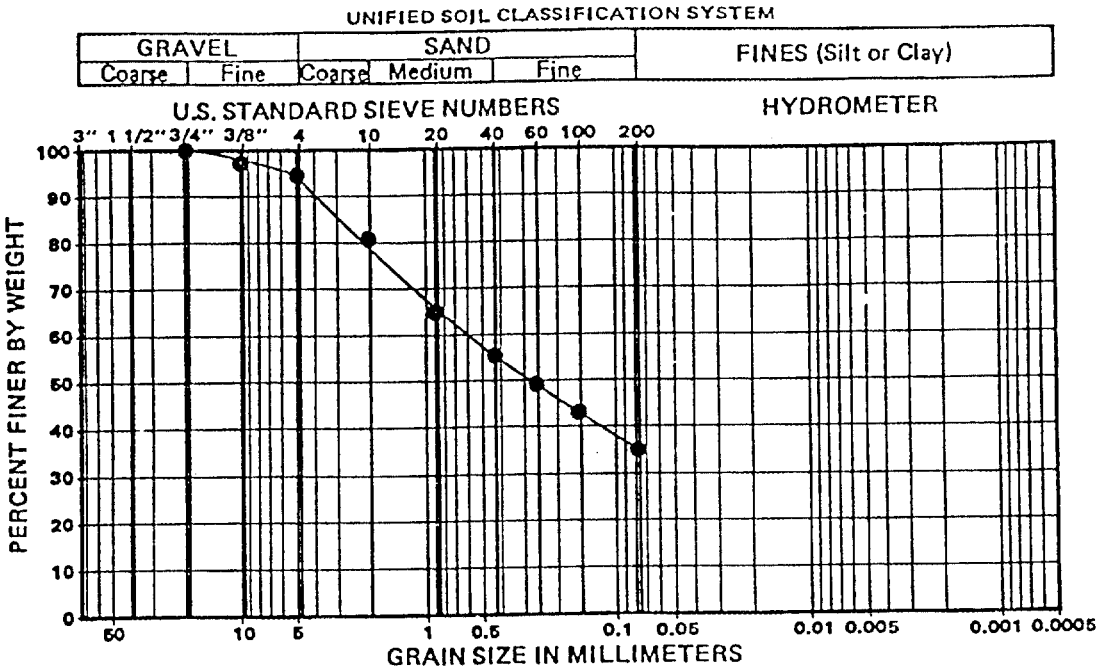
FIGURE

7-86

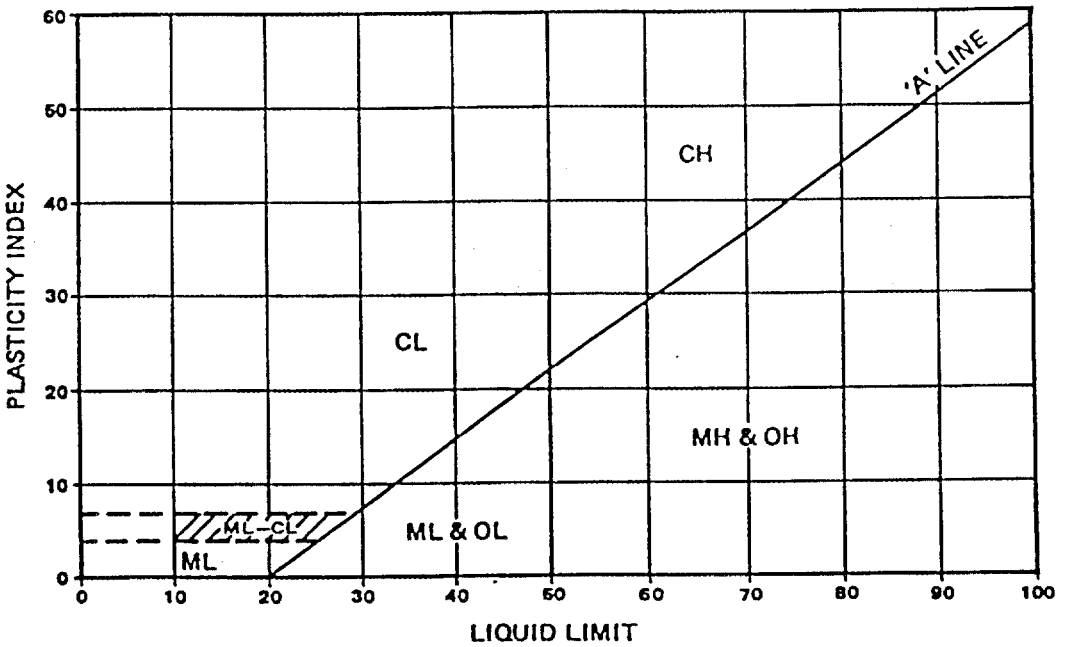
DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-4 | 2 | 10-11.5 | 6.2 | - | - | - | Lt. brn. moist silty clayey sand SM-SC |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-7

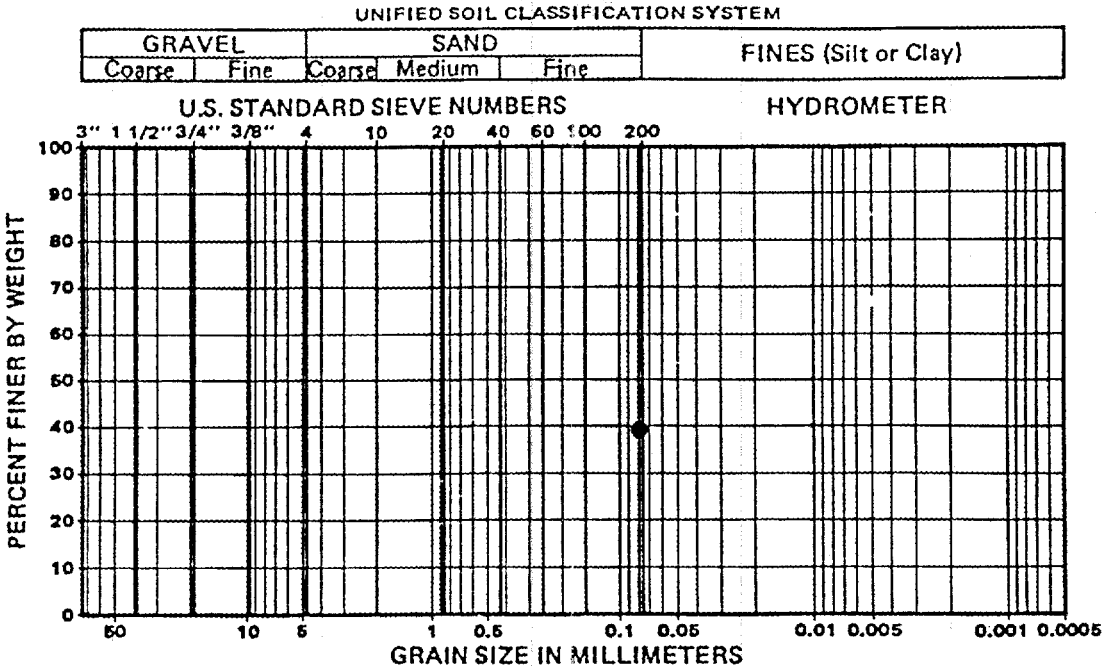
FIGURE

7-86

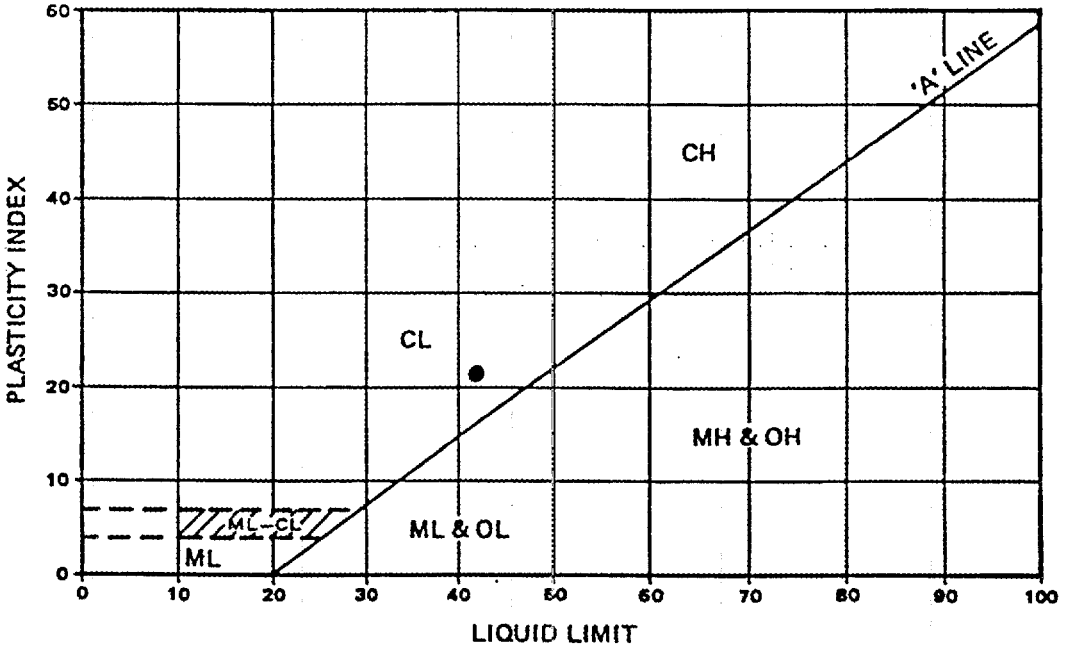
DRAWN BY ____ DATE ____ CHECKED BY ____ DATE ____ APPROVED BY ____ DATE ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-5 | 1 | 5-6 | N/A | 41 | 19 | 22 | Lt. brn. moist clayey fine med. sand (SC) |

The Earth Technology Corporation

PROJECT NO.: 87 - 853

UNIFIED SOIL CLASSIFICATION

B-8

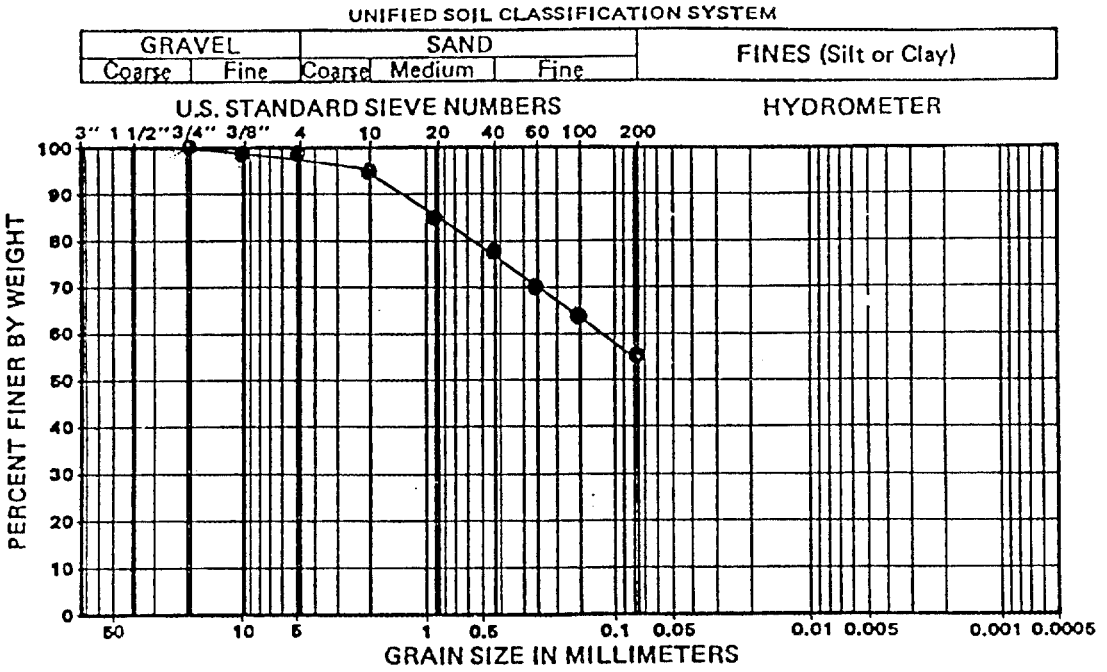
FIGURE

7-86

DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

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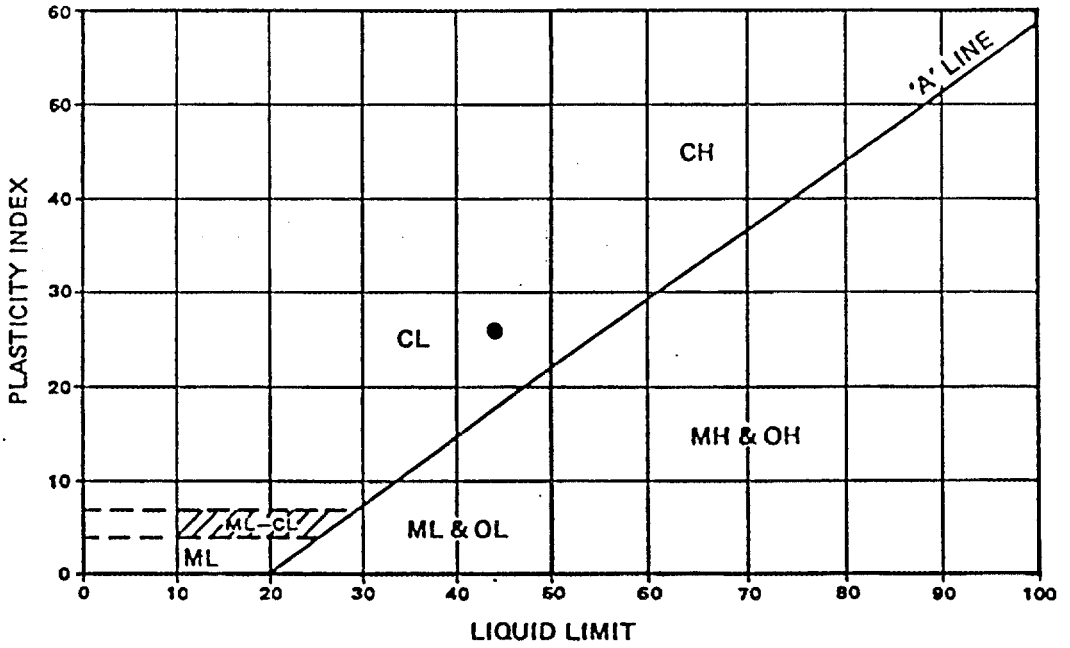



| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-5 | 2 | 10-11 | 3.9 | 43 | 16 | 27 | Lt. brn. moist sandy clay with silt (CL) |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-9

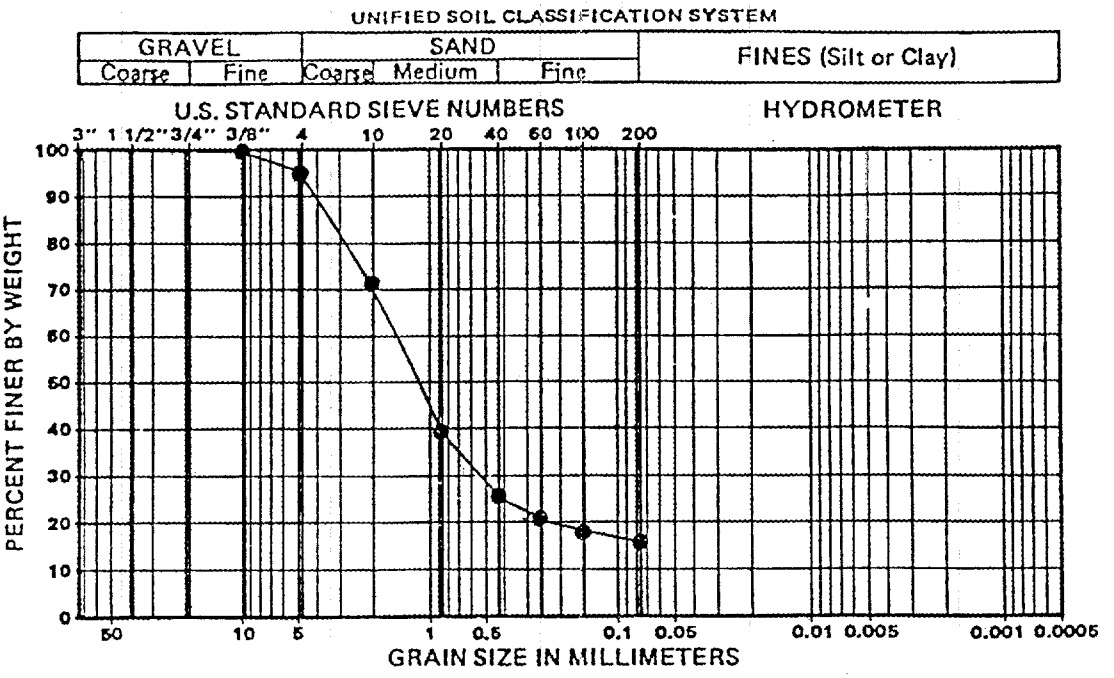
FIGURE

7-86

DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

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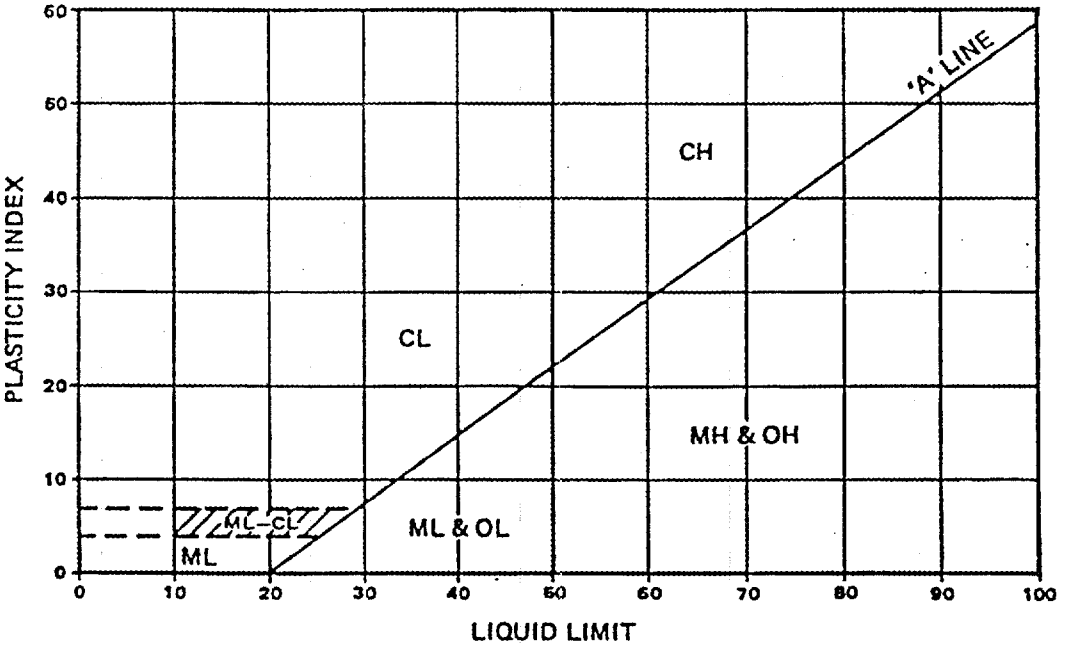



| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-6 | 2 | 10-11.5 | 4.1 | - | - | - | Or. brn. moist silty sand SM |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-10

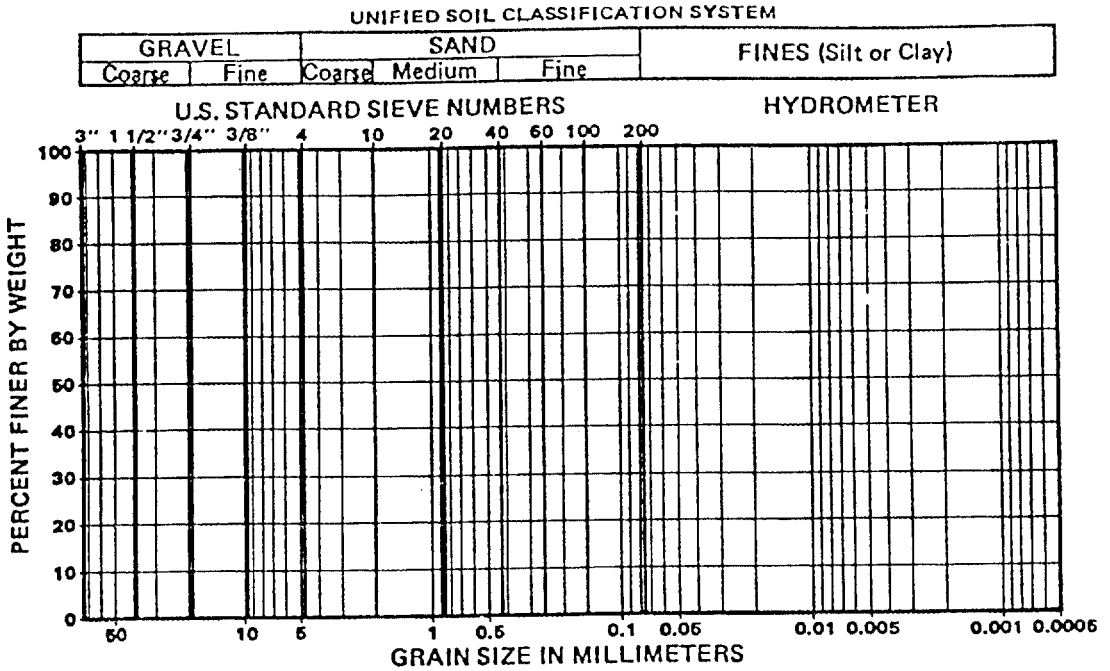
FIGURE

7-86

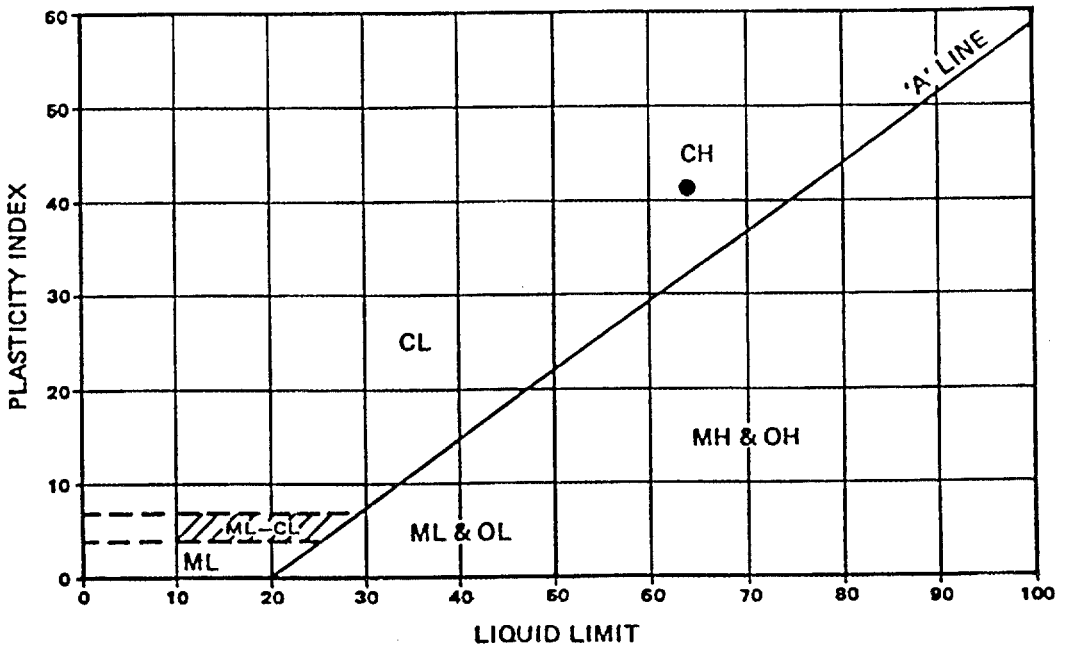
DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-6 | 3 | 15-16.5 | -- | 63 | 24 | 42 | Lt. brn. fine sandy clay CH |

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PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

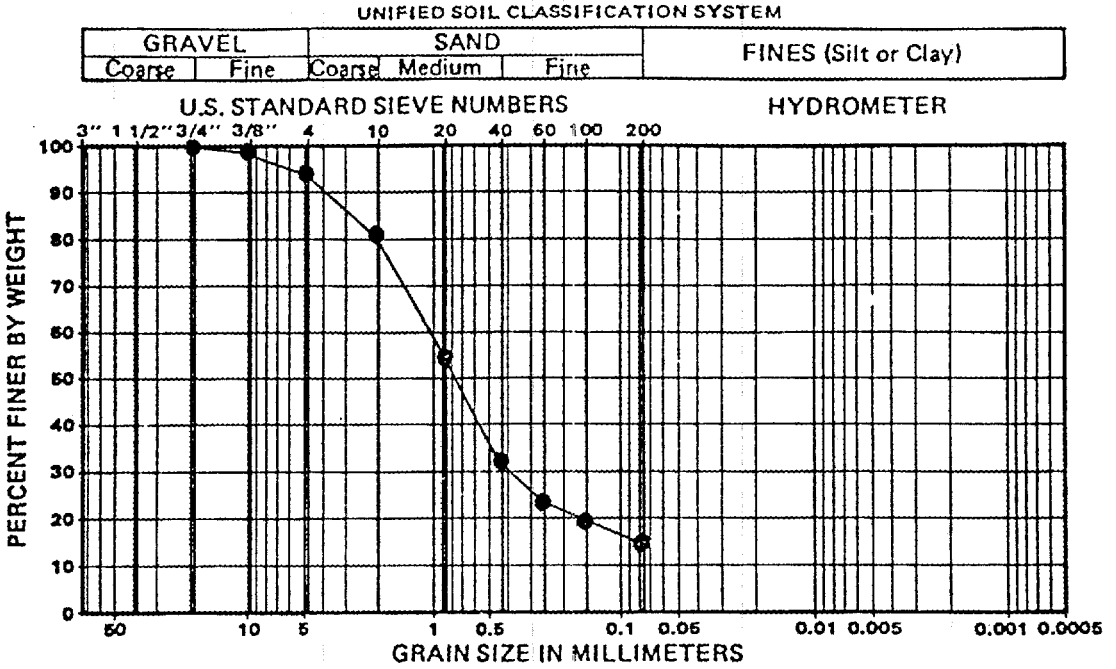
B-11
FIGURE

7-86

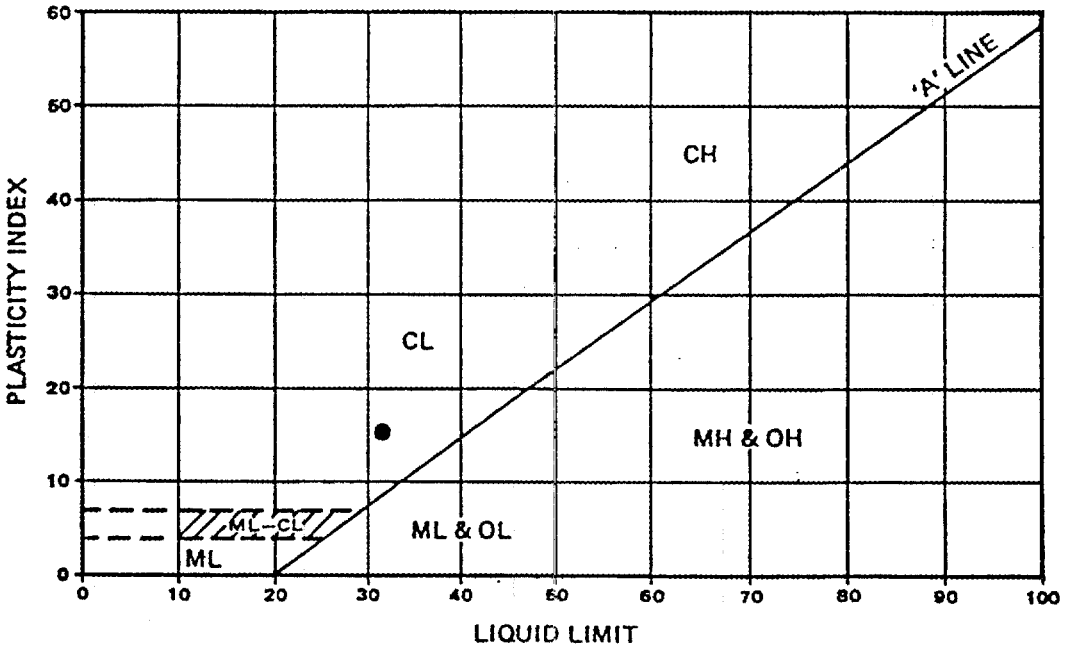
DRAWN BY ____ DATE ____ CHECKED BY ____ DATE ____ APPROVED BY ____ DATE ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-7 | 2 | 10-11 | 5.0 | 32 | 16 | 16 | Lt. brn. clayey med. sand (SC) |

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PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

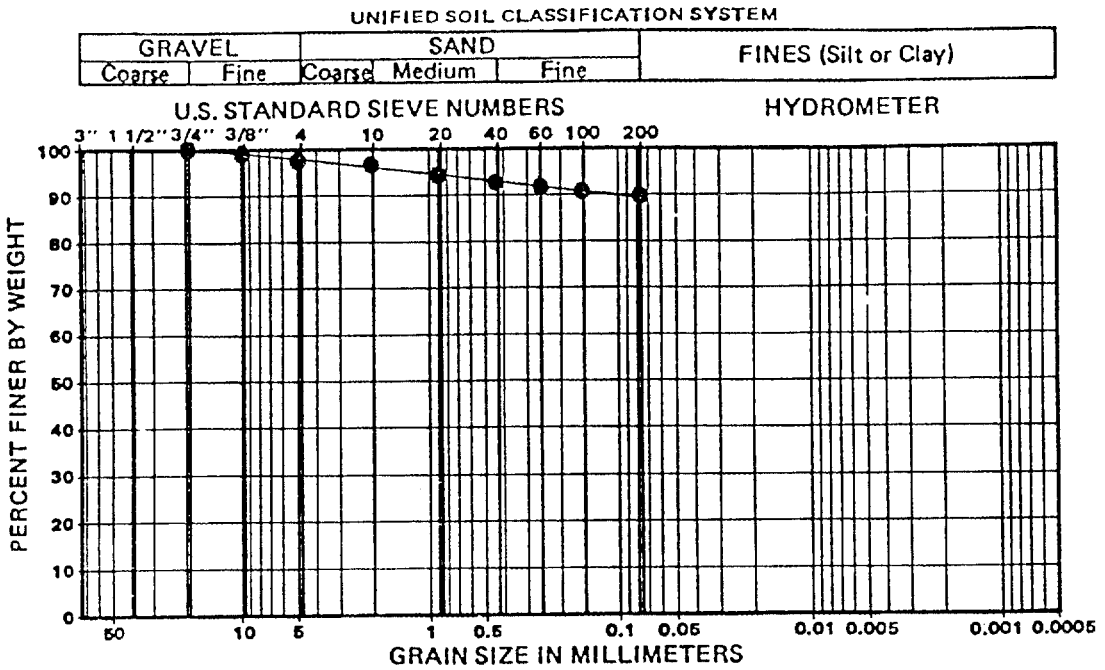
B-12
FIGURE

7-86

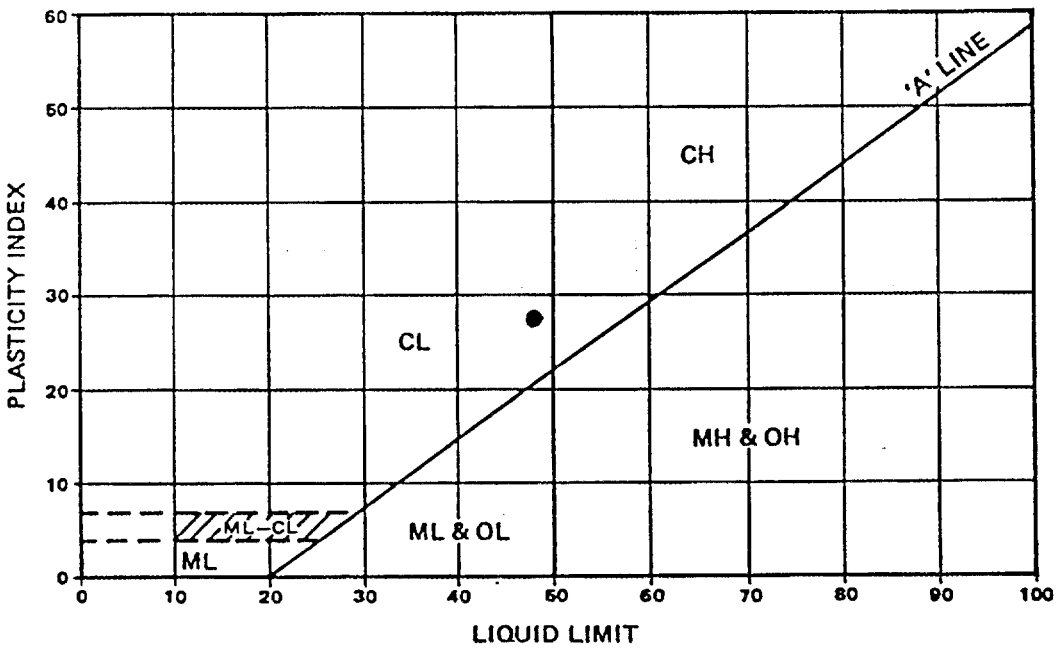
DRAWN BY ____ DATE ____ CHECKED BY ____ DATE ____ APPROVED BY ____ DATE ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-8 | 3 | 15-16.5 | 12.3 | 48 | 21 | 27 | Lt. brn. fine sandy clay (CL) |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-13

FIGURE

7-86

DATE

APPROVED BY

DATE

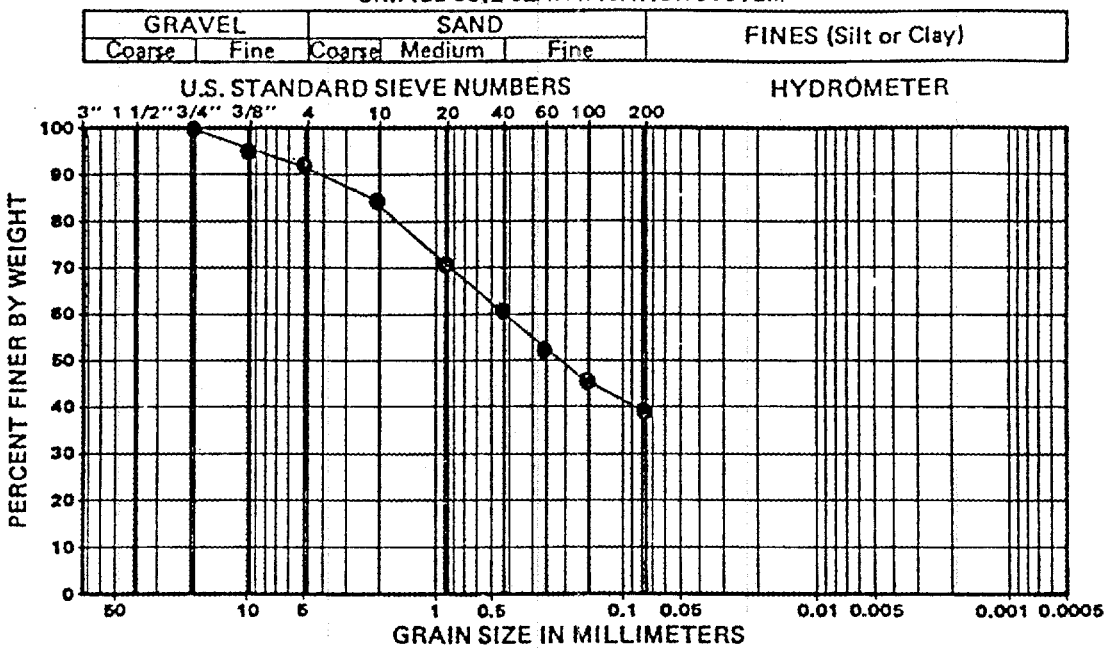
CHECKED BY

DATE

DRAWN BY

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

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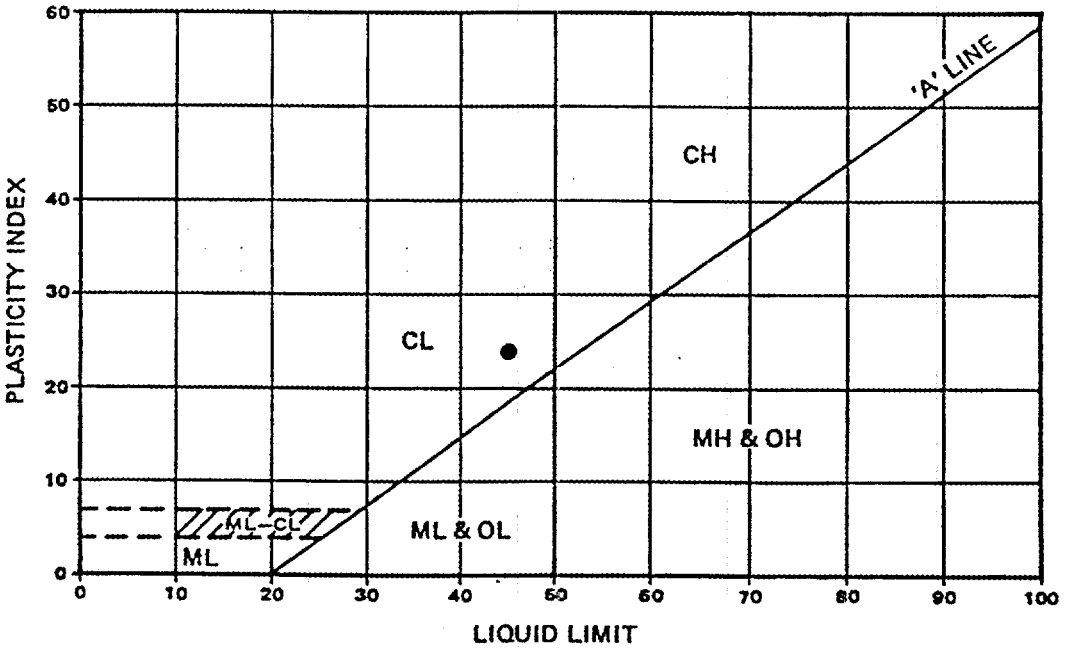



| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-9 | 1 | 5-6.5 | 3.5 | 45 | 21 | 24 | Lt. brn. clayey fine sand (SC) |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

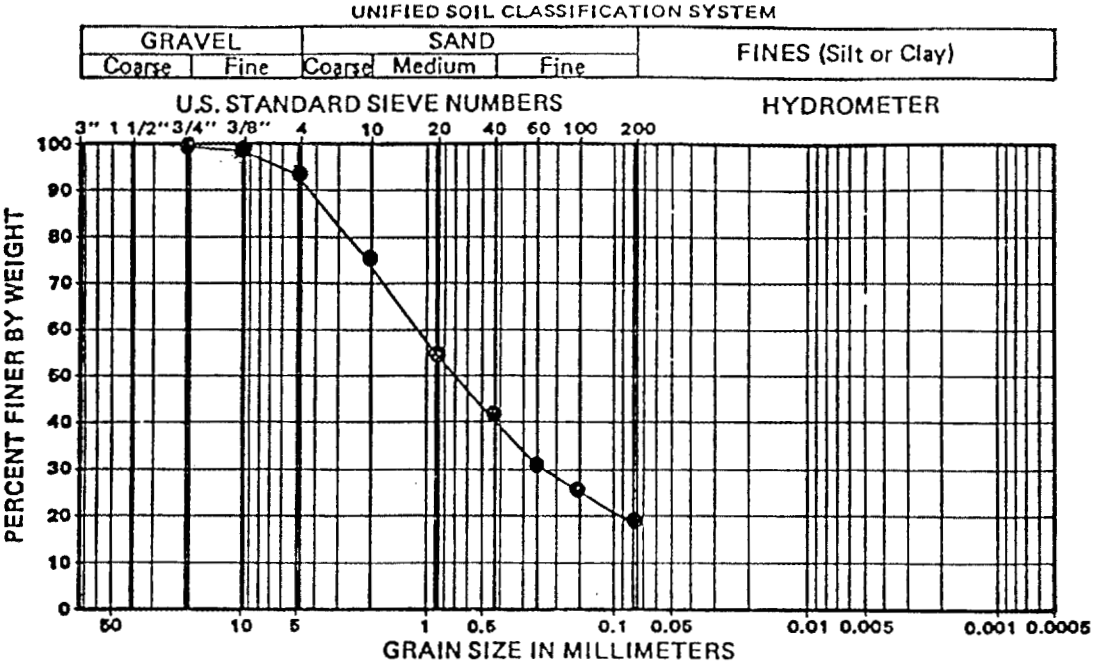
7-86

B-14
FIGURE

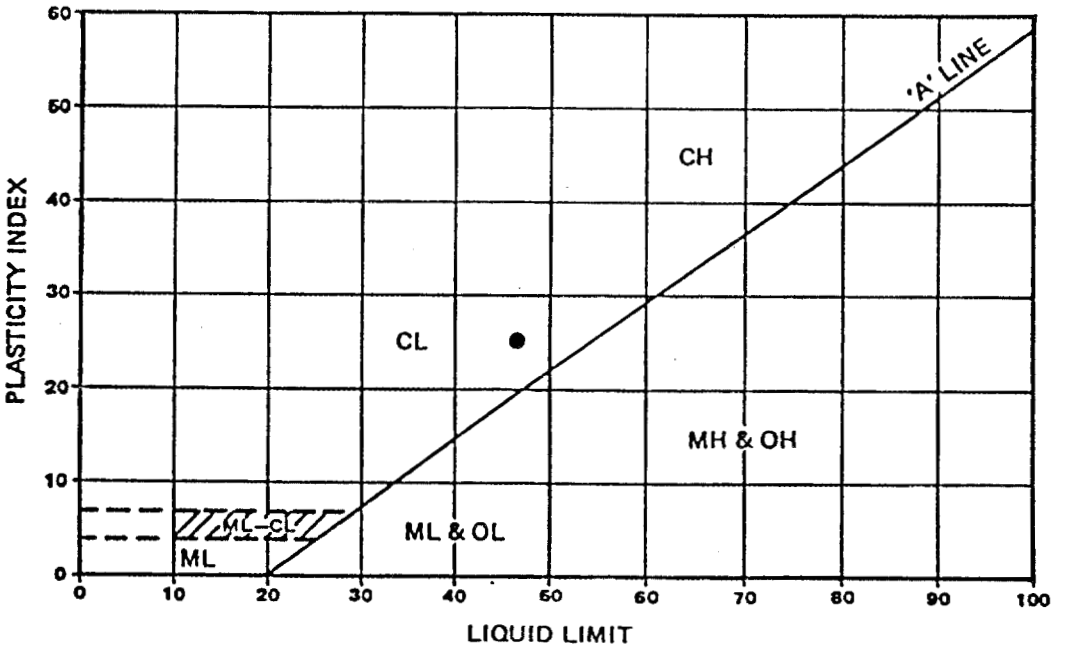
DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-10 | 1 | 5-6.5 | 6.4 | 47 | 22 | 25 | Lt. brn. clayey fine-med. sand (SC) |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-15

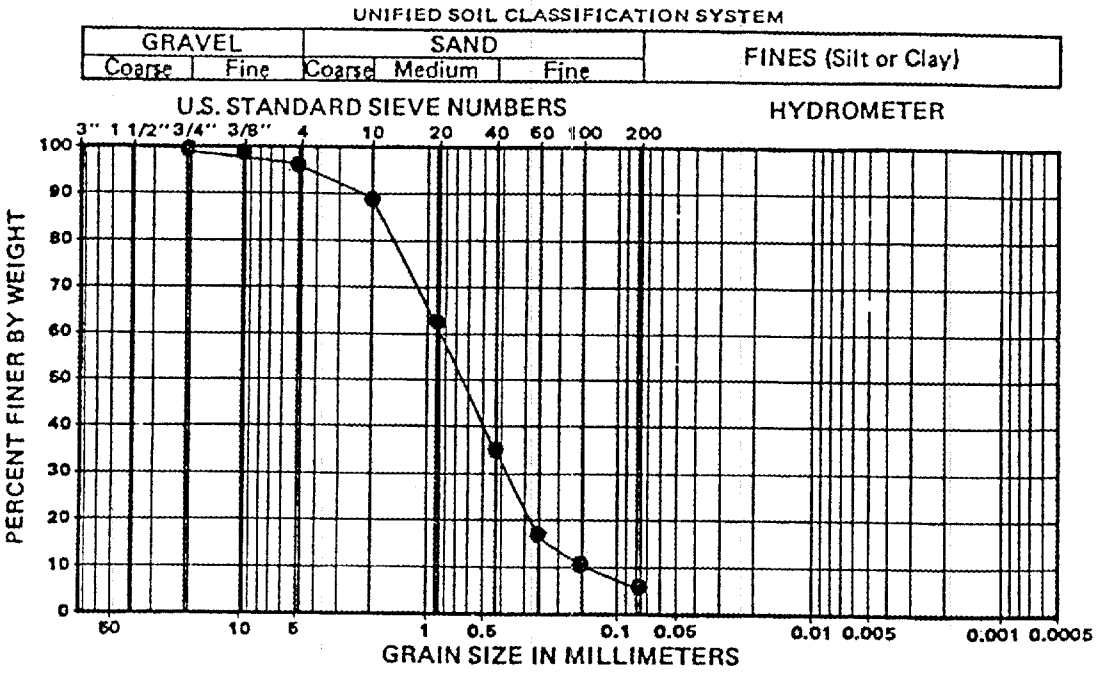
FIGURE

7-86

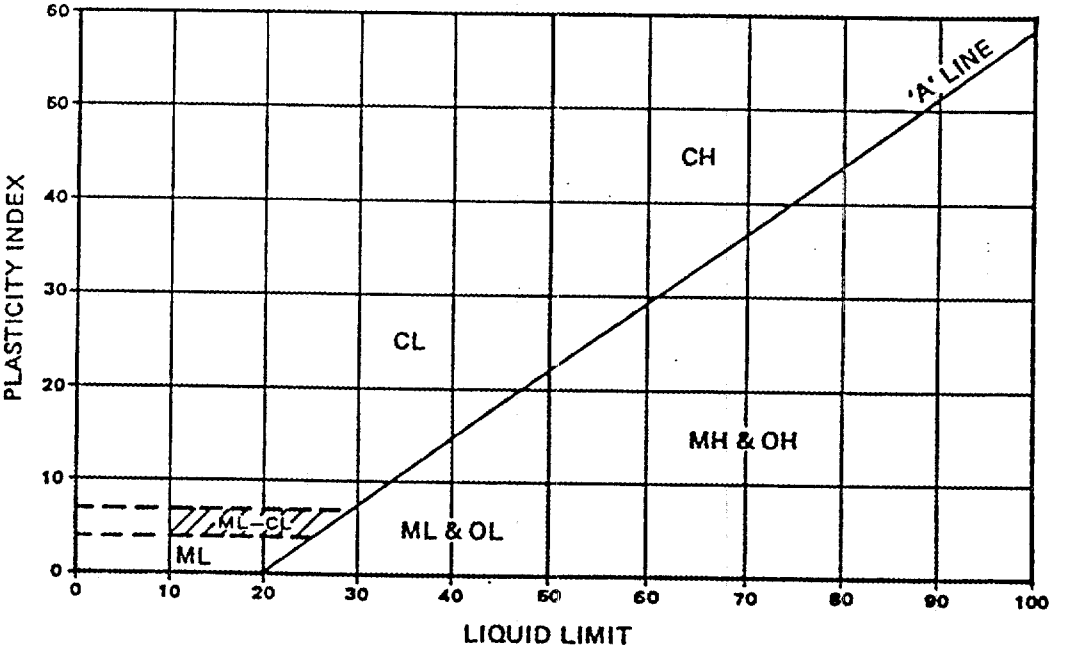
DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-10 | 4 | 20-21.5 | 1.4 | NP | NP | NP | Or. Brn. fine med. sand with silt. (SP-SM) |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B – 16

7-86

FIGURE

DATE

APPROVED BY

DATE

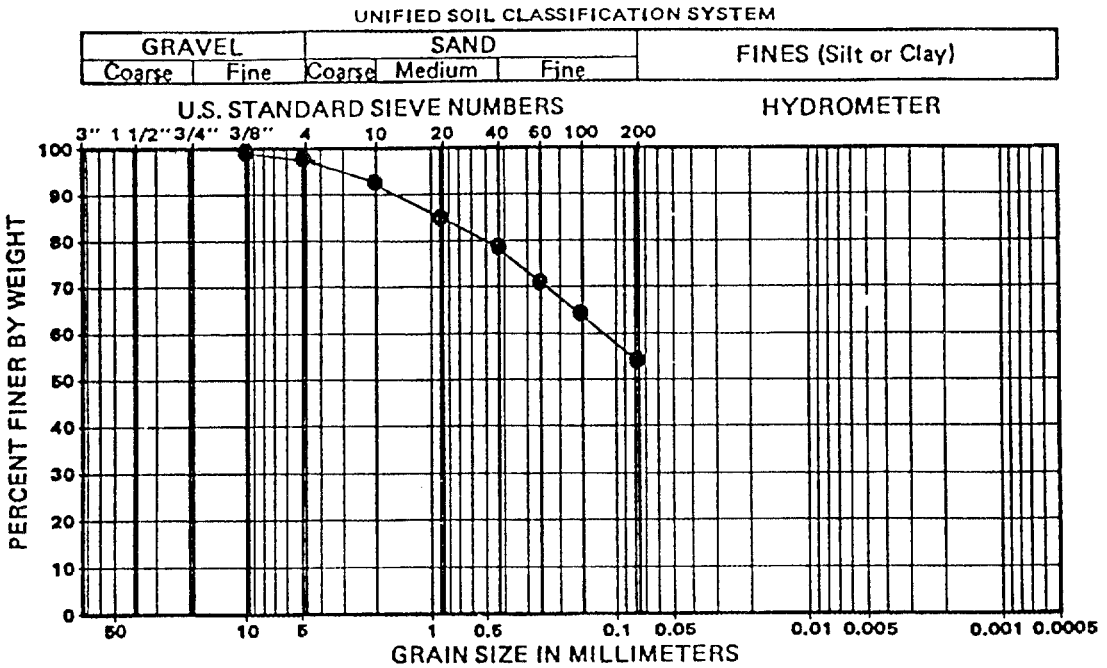
CHECKED BY

DATE

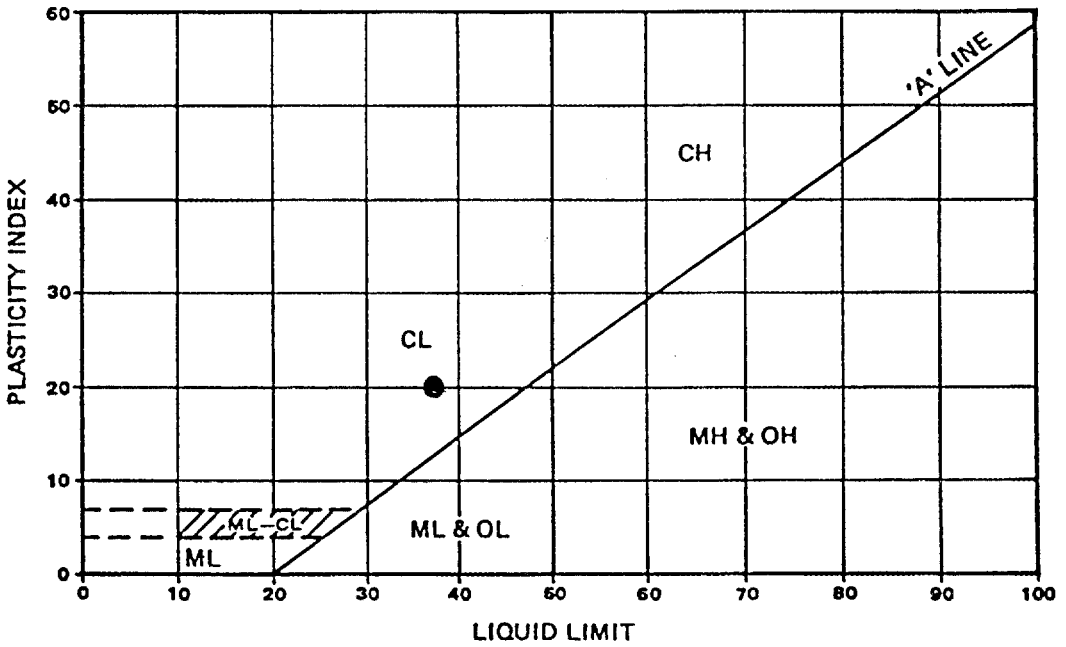
DRAWN BY

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM




## PLASTICITY CHART




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | GT-11 | 2 | 10-11.5 | 7.2 | 38 | 18 | 20 | Lt. brn fine med. sandy clay. (CL) |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-17

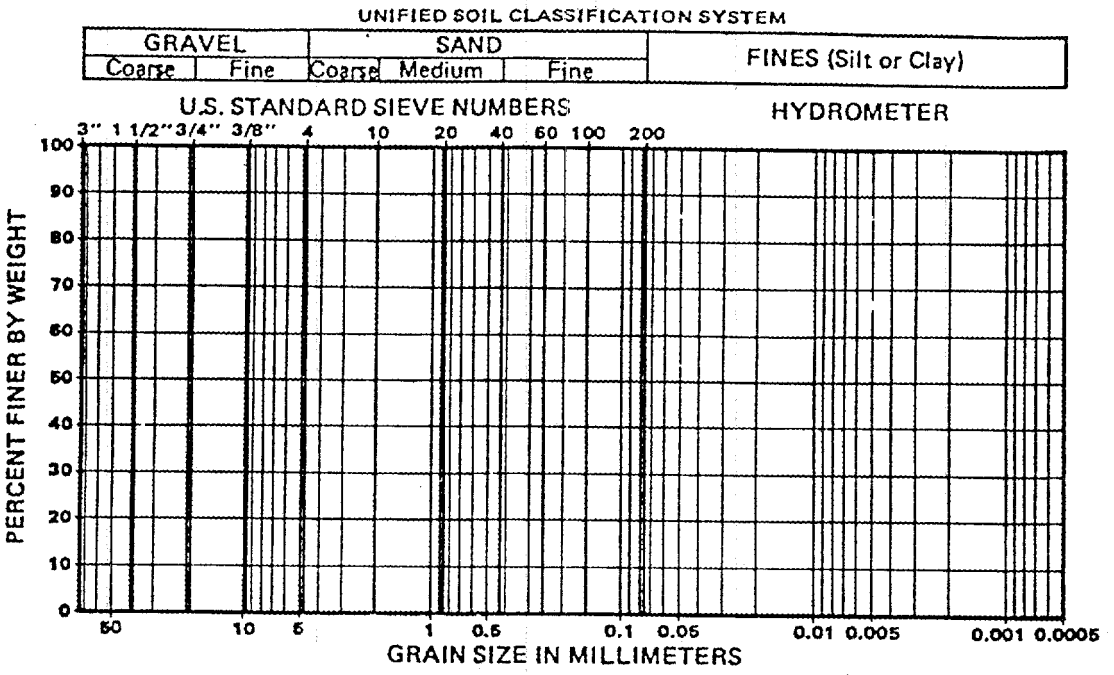
FIGURE

7-86

DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

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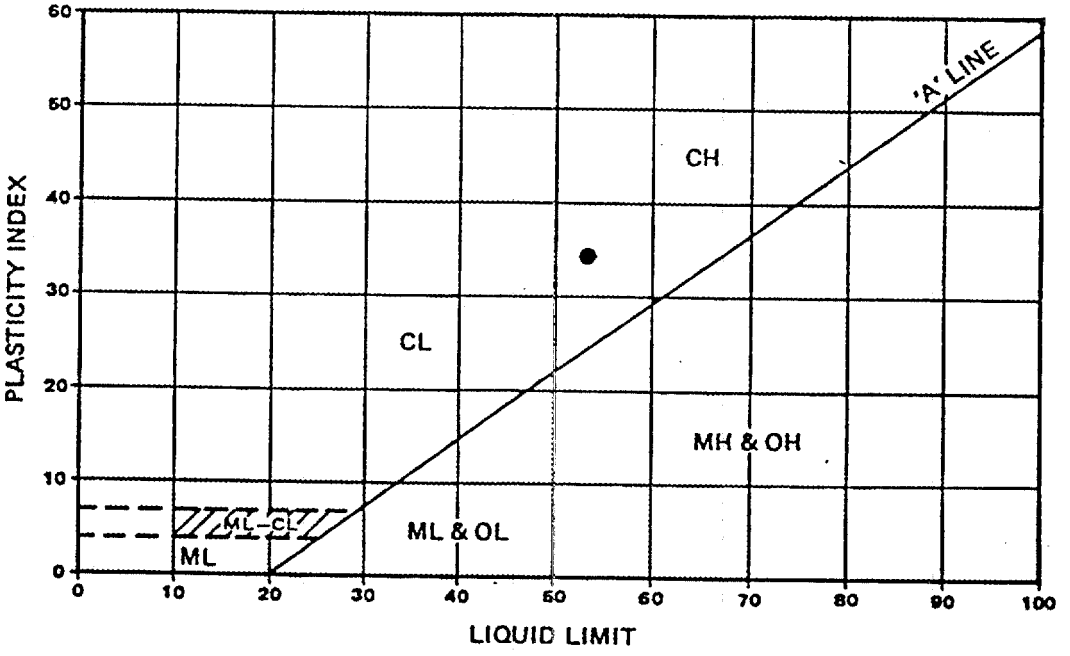



| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | BH-01 | 2A | 6-7 | -- | 54 | 19 | 35 | Lt. reddish brown moist clayey med. fine sand SC |

The Earth Technology Corporation

PROJECT NO.: 87-853

UNIFIED SOIL CLASSIFICATION

B-18

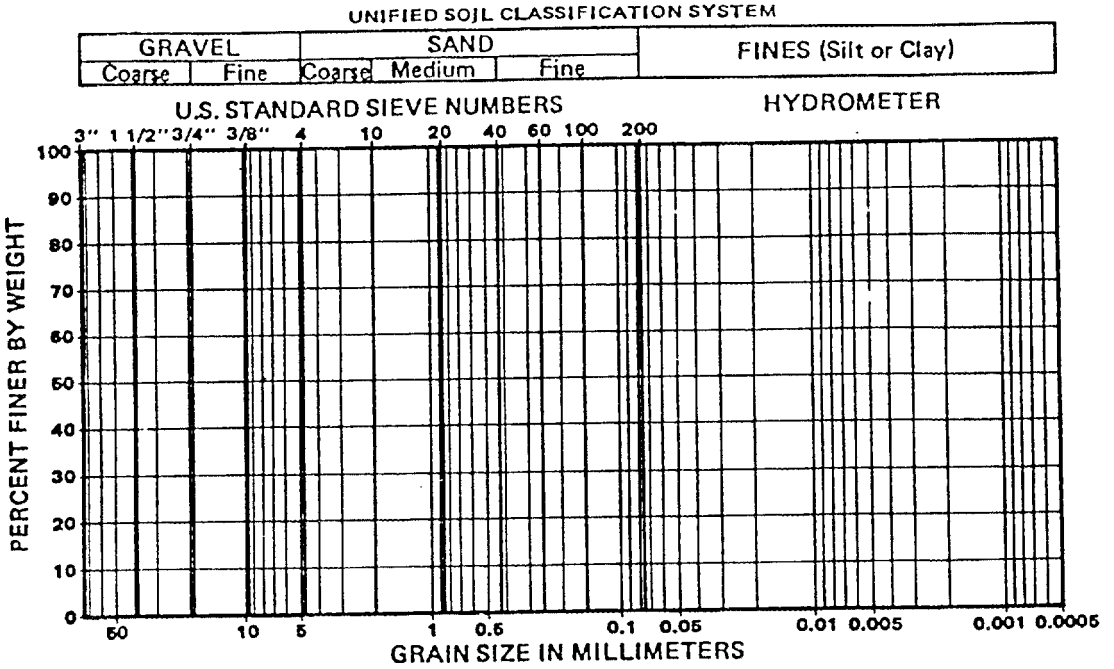
7-86

FIGURE

DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____

## GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

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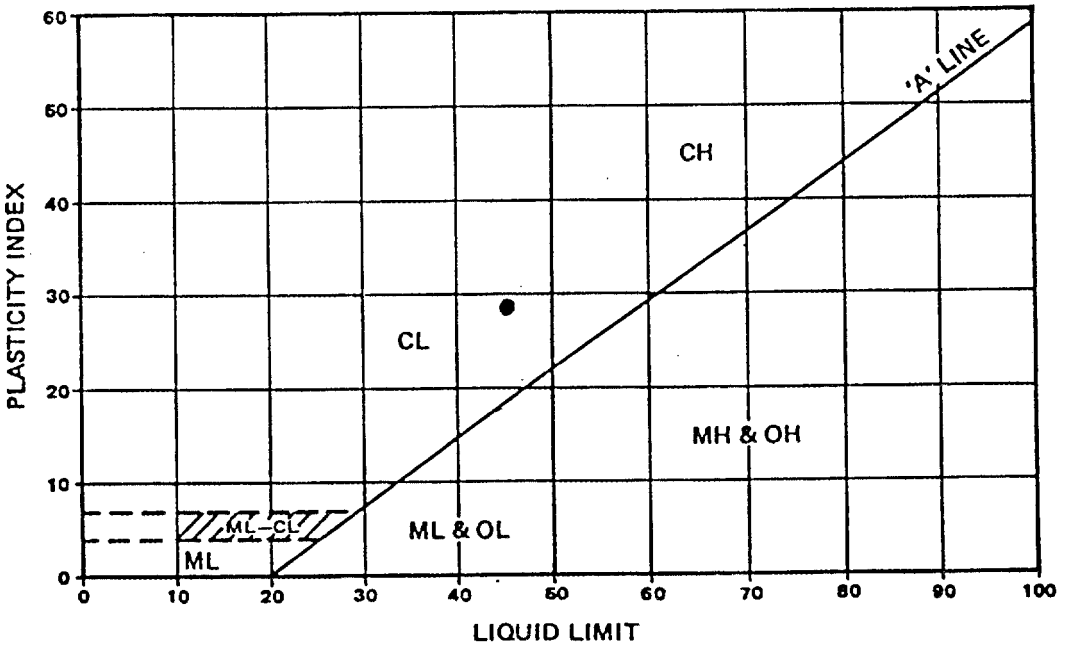



| SYMBOL | BORING NUMBER | SAMPLE NUMBER | DEPTH (FEET) | NATURAL W/C (%) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|
| ● | BH-01 | 3A | 12-13 | N/A | 46 | 17 | 29 | Lt. brn. clay fine med. sand (SC) |

The Earth Technology Corporation

PROJECT NO.: 87-853

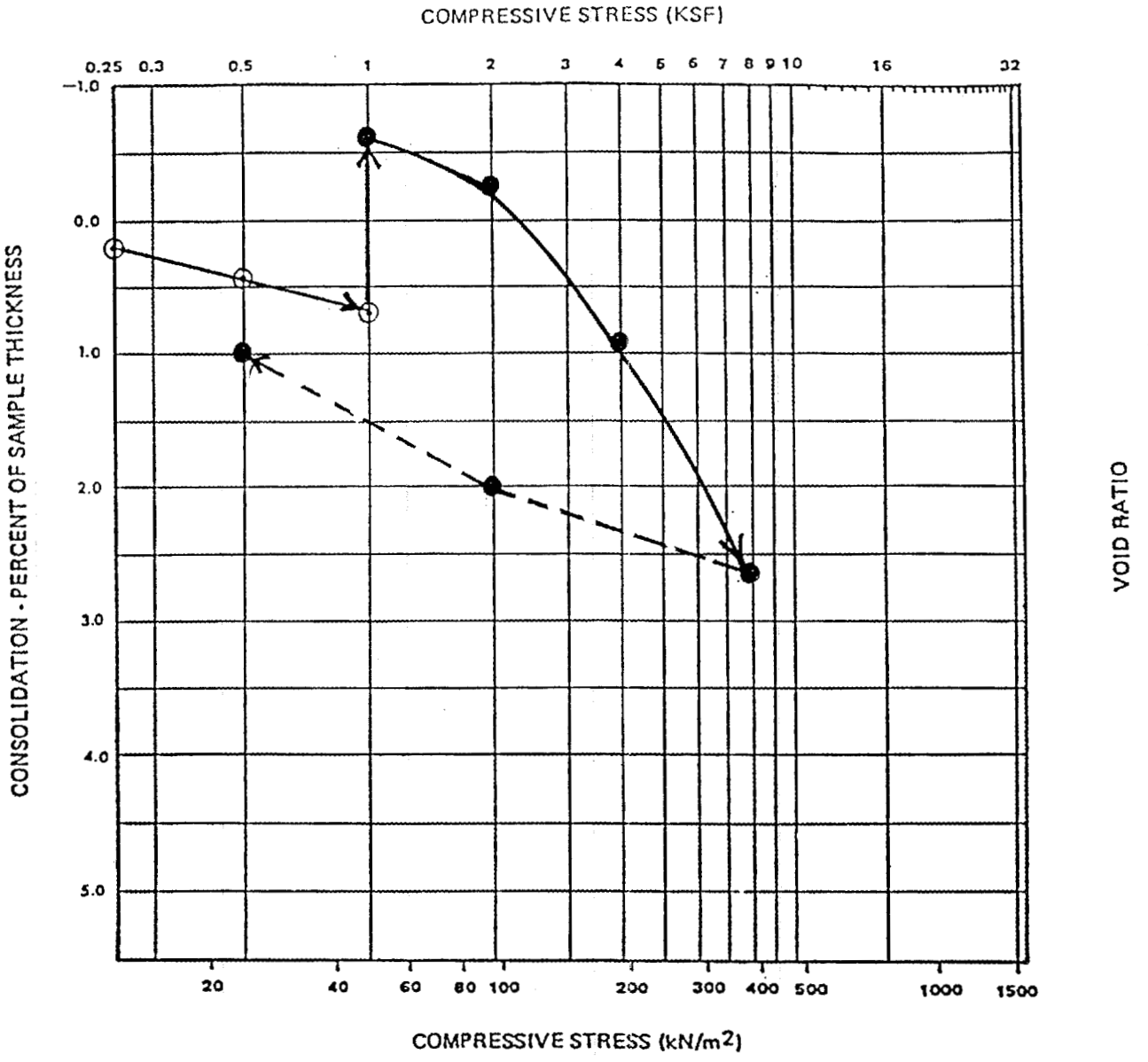
UNIFIED SOIL CLASSIFICATION

B-19

FIGURE

7-86

DATE ____ APPROVED BY ____ DATE ____ CHECKED BY ____ DATE ____ DRAWN BY ____




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | SAMPLE INTERVAL | | SOIL TYPE | INITIAL DRY DENSITY | | INITIAL MOISTURE CONTENT (%) | INITIAL VOID RATIO | INITIAL DEGREE OF SATURATION (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | FEET | METERS | | PCF | KG/M³ | | | |
| ○ ● | GT-2 | 2 | 10-11 | - | SC | 115.6 | - | 8.5 | 0.458 | 50.2 |
| | | | | | | | | | | |
| | | | | | | | | | | |

○ AT FIELD MOISTURE

● AFTER ADDITION OF WATER

——— COMPRESSION

– – – REBOUND

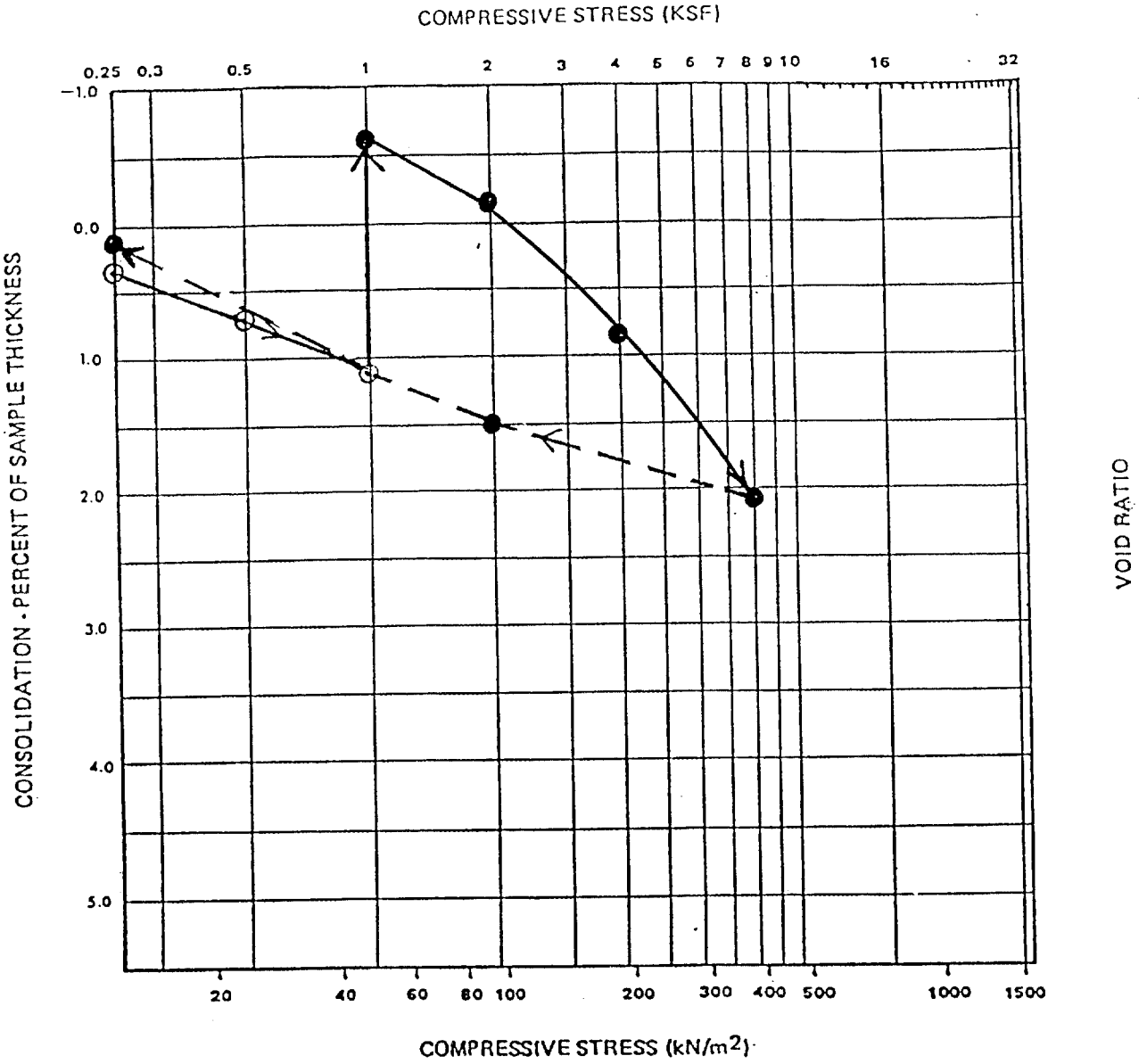
The Earth Technology Corporation

Project No.: 87 – 853

CONSOLIDATION TEST

9-86

Figure B – 20




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | SAMPLE INTERVAL | | SOIL TYPE | INITIAL DRY DENSITY | | INITIAL MOISTURE CONTENT (%) | INITIAL VOID RATIO | INITIAL DEGREE OF SATURATION (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | FEET | METERS | | PCF | KG/M3 | | | |
| ○ ● | GT-5 | 1 | 5-6 | - | SC | 125.6 | - | 8.5 | 0.342 | 67.2 |
| | | | | | | | | | | |
| | | | | | | | | | | |

○ AT FIELD MOISTURE

● AFTER ADDITION OF WATER

——— COMPRESSION

– – – REBOUND

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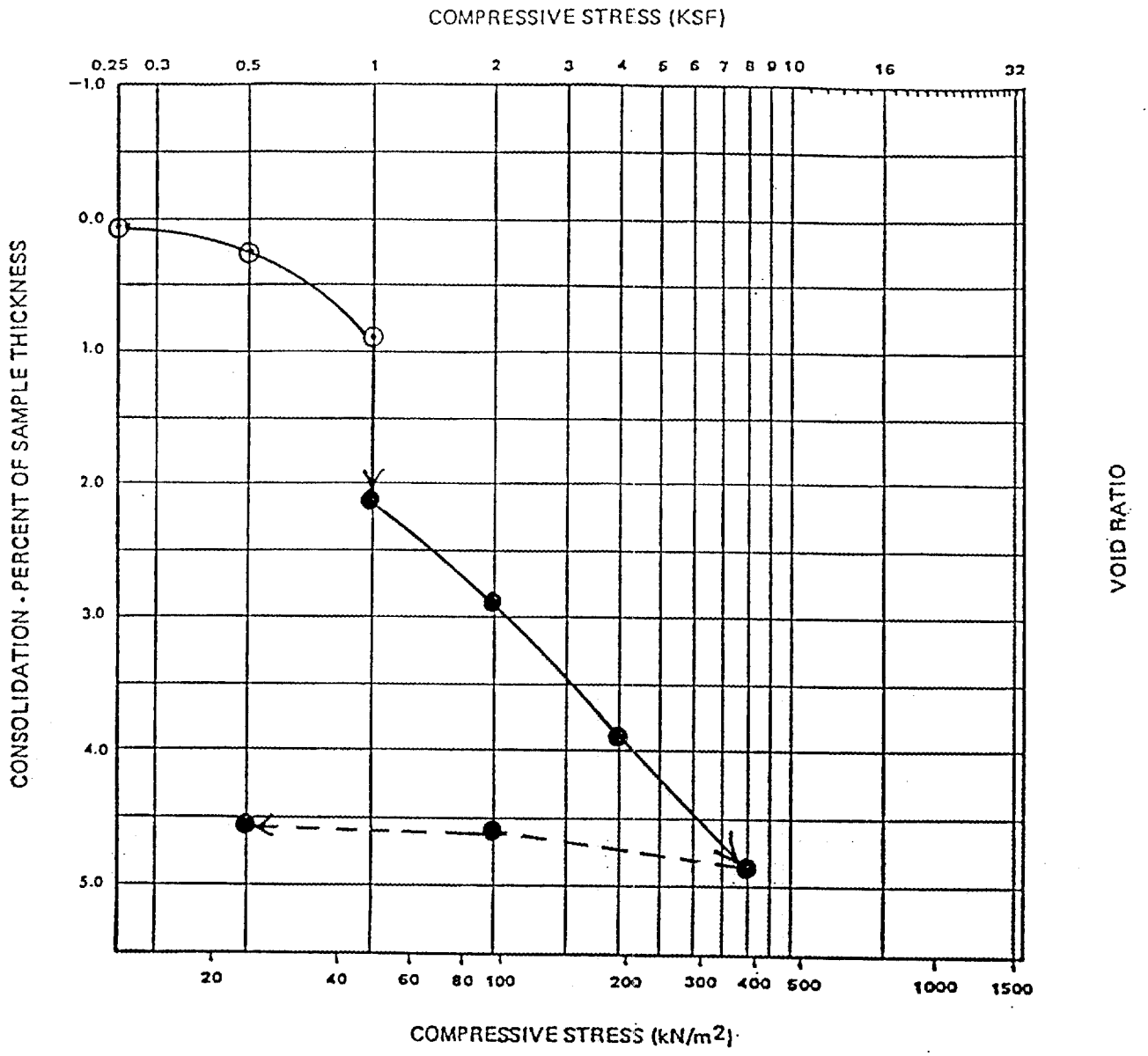
CONSOLIDATION TEST

9-86

Figure B – 21




| SYMBOL | BORING NUMBER | SAMPLE NUMBER | SAMPLE INTERVAL | | SOIL TYPE | INITIAL DRY DENSITY | | INITIAL MOISTURE CONTENT (%) | INITIAL VOID RATIO | INITIAL DEGREE OF SATURATION (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | FEET | METERS | | PCF | KG/M3 | | | |
| ○ ● | GT-7 | 2 | 10-11 | - | SC | 116.3 | - | 4.94 | 0.449 | 29.7 |
| | | | | | | | | | | |
| | | | | | | | | | | |

○ AT FIELD MOISTURE

● AFTER ADDITION OF WATER

—— COMPRESSION

– – – REBOUND

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CONSOLIDATION TEST

Figure B - 22

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