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Westinghouse Hanford Company

Protective Barrier Materials Analysis: Fine Soil Site Characterization

G. V. Last
M. A. Glennon

M. A. Young
G. W. Gee

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PROTECTIVE BARRIER MATERIALS
ANALYSIS: FINE SOIL SITE
CHARACTERIZATION

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SUMMARY

The Pacific Northwest Laboratory collected soil samples for the physical characterization of a potential fine-soil quarry site at the McGee Ranch during May and June 1986. This ranch is located approximately 1 km (0.6 mi) northwest of the Hanford Site's Yakima Barricade.

Forty test borings were made using a hollow-stem auger. The boreholes were drilled either to the first significant gravel layer or to a depth of 10 m (32.8 ft), whichever was reached first. Sediment cores were collected from the boreholes at 1.5-m (4.9-ft) intervals via a split-tube sampler. The cores were then described and sampled in the field. The samples were handled so that minimal water was lost through evaporation. The samples were then taken to the laboratory where the field moisture content and grain-size distribution were determined.

The samples were classified into one of 19 sediment classes based on their grain-size distributions. Maps and cross sections were constructed from both the field and laboratory data to delineate the distributions of the various sediment classes. Statistical evaluations were made to determine the variations within the fine-soil fraction of the various sediment classes. Volume estimates were then made of the amounts of soil meeting the preliminary grain-size criteria.

The physical characterization of the fine soils sampled near the McGee Ranch site indicated that approximately 3.4 Mm^3 (million cubic meters) [4.5 Myd^3 (million cubic yards)] of soil met or exceeded the minimum grain-size criteria for the fine soils needed for the protective barriers program.

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(a) Westinghouse Hanford Company has replaced Rockwell Hanford Operations as the contractor for the Department of Energy's Hanford Site.

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INTRODUCTION

Three types of disposals are under consideration by the U.S. Department of Energy (DOE) for permanent disposal of certain classes of Hanford defense waste (USDOE 1986). Each of these alternatives involves the use of protective barriers to isolate waste. A principal objective of protective barriers is to minimize the infiltration of water into and through the waste zone. One type of protective barrier being examined is a multilayer barrier. The basic design of this type of barrier would consist of a layer of fine soil on top of a layer of coarse rock fragments. This barrier would store meteoric water in the fine soil above the coarse rock until it could be removed through evapotranspiration. Water infiltration (drainage) could thus be minimized if the barrier is properly designed. A principal component in the design of the multilayer barrier is the hydraulic properties of fine soil.

In this report, we evaluate a local area (McGee Ranch) for its potential to produce the volume and type of fine soil necessary to construct multilayer barriers. This work was performed by the Pacific Northwest Laboratory for DOE under the direction of Rockwell Hanford Operations.^(a) The objective of the study was to define a volume of acceptable soil equal to or exceeding 1.8 Mm^3 (2.3 Myd^3). The study included 1) drilling and sampling up to 40 boreholes to a depth of approximately 10 m (32.8 ft), 2) performing laboratory analyses on the samples, 3) performing statistical analyses, and 4) determining borehole correlations and volume estimates from the laboratory and field data.

This report contains discussions on why the McGee Ranch site was selected and the sampling and analytical methods used to characterize it. These discussions are followed by evaluations of the acceptability of the soils and the potential volumes available.

(a) Westinghouse Hanford Company has replaced Rockwell Hanford Operations as the contractor for the Department of Energy's Hanford Site.

CONCLUSIONS AND RECOMMENDATIONS

Soils at the McGee Ranch site met or exceeded the grain-size criteria and estimated volume [1.8 Mm^3 (2.3 Myd^3)] needed for topsoil for protective barriers. The estimated volume of soil surpassed the targeted amount by almost a factor of two, indicating that this area is a good source of barrier topsoil. (Note that some areas of the site, however, are more favorable than others.)

Additional laboratory analyses of these soil samples are also recommended. Physical properties of the soil, such as water retention characteristics and hydraulic conductivity as well as particle size, need to be examined to ensure the suitability of the soils for barrier development.

Other soil data acquired by others from the McGee Ranch site should be integrated with this study to enhance and extend the characterization effort. Additional soil samples collected in the primary target area would also help to better define the potential quarry sites and aid in the design of the quarry.

SITE SELECTION

The site originally selected for soil sampling and characterization was referred to as Area 1 by Myers (1985). Myers identified this area as the preferred location for a source of fine soil for barrier construction. The site is located just west of the 200 West Area (Figure 1) and within the Basalt Waste Isolation Project's (BWIP's) reference repository location (RRL). The RRL is an area that is carefully monitored. During the course of the project, it became apparent that quarrying large quantities of fine soil from this area would disrupt the current monitoring efforts there and that another potential source of fine soil should be located.

On May 5, 1986, a reconnaissance survey was made of two other potential areas; one area was south of the RRL and the other area was northwest of the RRL. Samples were collected from four hand-dug holes: two near Goose Egg Hill and two near the McGee Ranch (Figure 1). The particle-size and field moisture content data from these samples can be found in Appendix A. Data indicated that both areas had the potential of producing the type and volume of fine soil required. However, the thickness of the soil at Goose Egg Hill was questionable and access into the area was limited. Thus, the McGee Ranch site was selected for further evaluation.

On May 8 and 9, 1986, six test boreholes were drilled and sampled at the McGee Ranch site. Field and laboratory analyses of these samples indicated that the site was a good candidate source for fine soil. Area 1 was then abandoned, and all field efforts were redirected to the McGee Ranch site. A complete discussion of the six test boreholes and the sample results are included in the discussions that follow.

FIGURE 1. Location Map

METHODS

FIELD OPERATIONS

This section describes the drilling and sampling procedures used in the collection of soil samples at the McGee Ranch site.

Sample Grid

Forty boreholes were located within the study area at 76.2-m (250-ft) and 152.4-m (500-ft) spacings relative to a north-south oriented square grid (Figure 2). Survey control for the grid was supplied by BWIP survey markers located at 76.2-m (250-ft) intervals along three transects of this control grid (Pahl 1980). A brass marker at the McGee well also provided survey control. The grid was established consistent with the north-south lines of the BWIP control grid but was offset 24.4 m (80 ft) north of the east-west lines.

The locations for the first six and the last nine boreholes (No. 1-6 and 32-40) were located by using a Brunton compass for direction and pacing for distance [using methods described in Compton (1962)]. The remaining boreholes were located using a laser theodolite.

Soil Sampling

Soil sampling was performed in two stages. In the first stage, six boreholes were drilled by Rockwell personnel using Rockwell's trailer-mounted, hollow-stem auger rig. In these boreholes, the hollow-stem auger was used to advance the borehole and provide access for sampling. Sediment cores of the undisturbed material were taken just ahead of the auger using split-tube (split-spoon) samplers. After the sampler was retrieved and opened, the exposed sediment core was photographed and scraped clean and its physical properties were described. The core was then carefully partitioned into lithologically similar samples that were placed in glass jars with sealable lids. Sediment cores were taken at 1.5-m (5-ft) intervals. Composite samples were taken per the soil sampling procedure contained in Appendix B. In the second stage, 34 boreholes were drilled by ONWEGO Drilling Company. These holes were drilled and sampled similar to those for the first stage, with the following exceptions:

FIGURE 2. Sampling Grid Used at the McGee Ranch Site

- The first two feet were dug by hand and grab samples were collected.
- Seven of these boreholes were sampled continuously (from top to bottom) throughout their depth.
- Composite samples from the auger spoil piles were not taken.
- Photographs of the cores were rarely taken.

A copy of the soil sampling procedure is provided in Appendix B.

A total of 330 samples were collected. These samples included 290 samples from approximately 189 split-tube cores, 34 hand-dug samples, and 6 composite samples. Thirty-four of the split-tube core samples were duplicates.

Soil Descriptions

Descriptions of the sediment cores and the material brought to the surface during augering were recorded in geologists' logs kept for each borehole. These logs included a general description of the material, approximate grain-size information, color, reaction to 10% HCl, and the approximate lithologies present in the materials. The number of samples collected from each sediment core and other pertinent information on the ease of drilling and representativeness of the sediment cores were also included in the geologists' logs. Copies of these logs are presented in Appendix C.

LABORATORY ANALYSES

This section describes the laboratory procedures used to analyze the physical properties of the soil samples collected at the McGee Ranch site.

Field Moisture Content

The field moisture content was determined for all but a few composite, duplicate, and/or very coarse samples. All samples were collected and described in the field, then immediately placed in glass canning jars or plastic bags and transported to the laboratory at the end of each day. The following morning the samples were logged in and subsamples collected and weighed. The subsamples were oven-dried for 16 h or more at 110°C (230°F) and weighed again to determine moisture content according to ASTM Procedure D 2216 (ASTM 198D). The moisture contents are presented in Appendix D.

Particle Size

Particle-size distributions were analyzed for 276 soil samples. Originally, these samples were to have been dry sieved following the procedure by Uebelacker.^(a) However, results proved unsatisfactory because of the inability of this procedure to adequately disperse the fine soil aggregates into discrete particles. An initial step of wet sieving was thus added to completely break up these soil aggregates. In this step, a sample aliquot was placed in a large, 20.3-cm- (8-in.-) dia, wire mesh sieve with 0.053-mm (0.0021-in.) openings, then the samples were dried, weighed, and slowly rinsed with tap water until the soil aggregates were dispersed and the finest particles [<0.053 mm (0.0021 in.)] had passed through the sieve. The sample retained in the sieve was dried and weighed again. The difference between the two weights was then used to calculate the weight percent of particles less than 0.053 mm (0.0021 in.). Because the finest particles [<0.053 mm (0.0021 in.)] were not recovered in this process, the sample could not be reused. Thus, to preserve more of the sample, small sample aliquots of approximately 50 g (1.8 oz) were used instead of the 150-g (5.3-oz) aliquots specified in the original procedure.

Another modification made to the original procedure was the use of sieve sizes other than those specified. (The sieve sizes are listed in Table 1.) These sizes were used to produce particle-size data that were consistent with existing soil physics studies at the Hanford Site and the particle-size limits used by the U.S. Department of Agriculture (Soil Survey Staff 1975). Following the initial wet sieving of a sample aliquot, the remaining dried sample was dry sieved through a nest of seven small [7.6-cm- (3-in.-) dia] brass sieves. These sieves (listed in Table 1) were shaken using a RoTop mechanical shaker. The portion of the sample retained by each of these sieves and the pan was weighed and recorded. These weights were then used to calculate the weight percent of each size fraction. The resulting particle-size data are provided in table form in Appendix E.

(a) D. L. Uebelacker of Westinghouse Hanford Company, Richland, Washington, developed a procedure to determine the grain-size fractions of sediments.

TABLE 1. Sieve Sizes Used in Determination of Particle-Size Distributions

<u>U.S. Standard Sieve Mesh No.</u>	<u>Sieve Opening in Millimeters</u>
10	2.000
18	1.000
35	0.500
60	0.250
140	0.106
200	0.075
270	0.053

CORRELATION AND DISTRIBUTION OF THE SEDIMENTS

The sediments encountered beneath the McGee Ranch site were correlated into sedimentary units based on geologic logs of the test borings, visual examination of the recovered samples, and particle-size distributions of the samples. These correlations were made to estimate volumes of similar materials and were not intended to infer the depositional history of the site. To aid these correlations, sediment samples were grouped into several classes and assigned a textural name to provide a simpler method of correlating the particle-size distributions. A discussion of the classification scheme used for these correlations and the resulting geologic maps and cross sections follows.

Sediment Classification

The soil samples were quantitatively classified into one of 19 sediment classes based on their particle-size distributions. The sediment classification scheme used for our study was a triangular diagram that described the complete range of particles (gravel, sand, and silt + clay) in the soils. This classification scheme (shown in Figure 3) was modified after Folk (1974), which deemphasized the gravel fraction and placed more importance on the sand and silt + clay fractions (Tallman et al. 1979). The grade scale grain-size nomenclature used in the classification scheme was modified after Wentworth (1922) (Table 2).

Sediment Classification
(Modified After R.L. Folk, 1968)
Gravel

FIGURE 3. Sediment Classification Scheme (after Tallman et al. 1979)

TABLE 2. Grain-Size Nomenclature (Modified From Wentworth 1922)

U.S. Standard Sieve Mesh No.	Sieve Opening in Millimeters	Grain-Size Nomenclature	
10	2.000	Gravel	Very fine pebble and larger
18 35 60 140 200	1.000 0.500 0.250 0.106 0.075	Sand	Very coarse sand
			Coarse sand
			Medium sand
			Fine sand
			Very fine sand
270	0.053	Silt and Clay	Very coarse silt Coarse silt to clay

Two determinations had to be made to categorize the soil samples into one of the sediment classes. First, the gravel fraction had to be determined as a weight percent of the sediment sample. Second, the proportion of sand to silt + clay had to be determined. In the geologic maps and cross sections that follow, the sediment classes, which are predominantly sand-sized material, are further modified using nomenclature of the predominant sand fractions. Table 3 lists the sediment classification symbols used in this report. The sediment classification for each sample is included with the particle-size data in Appendix E.

Geologic Maps

A topographic map of the McGee Ranch site was composed from four sources: 1) the U.S. Geologic Survey's (USGS's) Coyote Rapids, 15-min quadrangle topographic map, 2) digital terrain data available for this area of the Hanford Site, 3) the surveyed elevations of the borehole locations, and 4) a draft copy

TABLE 3. Sediment Classification Symbols

Symbol (a)	Classification Nomenclature
G	Gravel
SG	Sandy gravel
MSG	Silty sandy gravel
MG	Silty gravel
GS	Gravelly sand ^(b)
(M)GS	Slightly silty gravelly sand ^(b)
GMS	Gravelly silty sand ^(b)
GSM	Gravelly sandy silt
GM	Gravelly silt
(G)S	Slightly gravelly sand ^(b)
(MG)S	Slightly silty slightly gravelly sand ^(b)
(G)MS	Slightly gravelly silty sand ^(b)
(G)SM	Slightly gravelly sandy silt
(G)M	Slightly gravelly silt
S	Sand ^(b)
(M)S	Slightly silty sand ^(b)
MS	Silty sand ^(b)
SM	Sandy silt
M	Silt

(a) The symbol "M" and the terms silt or silty refer to both silt- and clay-size particles.

(b) Sand materials are further denoted by the following symbols for the predominant sand fractions:

VC = Very coarse sand

C = Coarse sand

M = Medium sand

F = Fine sand

VF = Very fine sand

The modifiers are placed in brackets immediately preceding the sand (S) designation. For example:

(G)M[F-VF]S = Slightly gravelly silty fine to very fine sand

of a USGS, 7.5-min quadrangle topographic map. A geologic map of the site illustrating the topography and surface geology is shown in Figure 4. The surface geology was generated from examination and analysis of the 0.6-m-(2-ft-) deep samples collected at each borehole.

A layer of fine soil [0.5- to 10-m (1.64- to 32.8-ft) thick] was encountered immediately beneath the surface of the site. This fine soil layer was composed predominantly of two sediment classes: silt (M) and sandy silt (SM). An isopach map of the thickness of this fine soil layer is illustrated in Figure 5. This map was generated by contouring the thicknesses of the fine soil computed for each borehole. A topographic map of the underlying gravel surface (Figure 6) was generated by hand.

Geologic Cross Sections

Five cross sections (located as shown in Figure 7) were generated based on the geologists' logs, sediment classifications of the soil sample, and visual examination of the samples. These cross sections are illustrated in Figures 8 through 12. The terms "silt" or "silty" used in these cross sections and throughout the report refers to the portion of the material that contains both silt- and clay-sized particles, as defined in the grain-size nomenclature in Table 2. These cross sections are considered preliminary, since elevations are not available for all boreholes.

FIGURE 4. Topography and Surface Geology of the McGee Ranch Site

FIGURE 5. Combined Thickness of the M and SM Units

FIGURE 6. Topography of the Gravel Surface

FIGURE 7. Location of Cross Sections A-A' to E to E'

FIGURE 8. Cross Section A - A'

FIGURE 9. Cross Section B - B'

FIGURE 10. Cross Section C - C'

FIGURE 11. Cross Section D - D'

FIGURE 12. Cross Section E - E'

ACCEPTABILITY OF THE SEDIMENTS

This section presents the criteria for and an evaluation of the acceptability of the soils at the McGee Ranch site.

SOIL SELECTION CRITERIA

The soil selection criteria used to evaluate the acceptability of the McGee Ranch site soils are based on the particle-size distribution of the soils. The preliminary selection criteria are 1) soil material having more than 30% "fines" and 2) borrow area(s) on sites having sufficient quantities of suitable material to meet proposed barrier needs.

Determination of Fines

The term fines normally refers to the silt + clay fraction of soil samples. However, as used in this report, the term fines refers to that portion of the sediment particles that is less than 53 μm (0.0021 in.) by wet-sieve basis. This particle size also corresponds to coarse silt + clay, as defined by the modified Wentworth grain-size nomenclature used for correlation purposes (Table 2). Those particles classified as very coarse silt [53 to 75 μm (0.0021 to 0.0030 in.)] are not considered fines.

The normal Wentworth particle-size classification scheme (Wentworth 1922), commonly used at Hanford, places the division between sand and silt at 63 μm (0.0025 in.). This classification has normally been determined by dry sieving a sample through a 63- μm (0.0025-in.) screen. A considerable amount of data are available that use this classification scheme [i.e., the Rockwell grain-size data base (ROCSAN)]. However, this system is typically used for coarser sediments than the soil we have tested at the McGee Ranch site. We found in our initial testing that dry sieving this fine soil often produced spuriously low values because of aggregation of the fine materials. We then elected to use a wet-sieving procedure, which is normally used for USDA particle-size classification (Soil Survey Staff 1975) to test all the samples.

The USDA particle-size classification scheme places the division between sand and silt at 50 μm (0.0020 in.) [i.e., the silt + clay (fines) fraction is

that portion of the sample that is $<50\text{ }\mu\text{m}$ ($<0.0020\text{ in.}$)]. Conventionally, this classification was determined by wet sieving a sample through either a $53\text{-}\mu\text{m}$ (0.0021-in.), 270-mesh or a $47\text{-}\mu\text{m}$ (0.0019-in.), 300-mesh screen, since there are no standard screens with exactly $50\text{-}\mu\text{m}$ (0.0020-in.) openings. We used $53\text{-}\mu\text{m}$ (0.0021-in.), 270-mesh screens.

The wet-sieving (USDA) procedure was compared to the dry sieving (Wentworth) procedure for a selected number of samples. We found reasonable agreement only when small [50 g (1.8 oz)] samples (that had been crushed with mortar and pestle) were dry sieved through a large diameter screen and wet-sieve values were less than 90% fines [$<53\text{-}\mu\text{m}$ (0.0021-in.) wet-sieve basis]. Table 4 shows the correlation between dry sieving through a $63\text{-}\mu\text{m}$ (0.0025-in.), 240 mesh screen and wet sieving through a $53\text{-}\mu\text{m}$ (0.0021-in.), 270-mesh screen derived from 17 samples ranging from 10 to 90% fines (wet-sieve basis). From this correlation, it appears that if proper caution is taken, either procedure can be used to determine the percentage of fines for these soils. The use of dry-sieve analyses may allow us to use the ROCSAN data base for exploration of other potential fine-soil borrow areas (Fecht, Last and Marratt 1978).

Fines and Water Storage

Preliminary studies on soils similar to those found at the McGee Ranch site showed that the higher the percentage of fines, the greater the water retention and water-holding capacity (water storage) values (see Appendix A of Myers 1985). Soils that had less than 30% fines (ranging from 6 to 29%) had low to moderate water-storage values [ranging from 6 to 37 cm (2.4 to 14.6 in.) water for a 150-cm (5-ft) soil depth]. Soils with more than 30% fines had moderate to high water-storage values [ranging from 29 to 57 cm (11.4 to

TABLE 4. Correlation Between Dry- and Wet-Sieve Analyses for 17 Selected Soil Samples

<u>Fine Soil Analysis</u>	<u>Regression Equation</u>	<u>Coefficient of Determination r^2</u>
Dry Sieve (X) versus Wet Sieve (Y)	$Y = 1.06 X - 5.07$	0.90

22.4 in.) of water]. Soils with over 32 cm (12.6 in.) of water storage could reasonably store up to twice the mean annual precipitation [16 cm (6.3 in.)] for the Hanford Site. The selection of a cut-off value of 30% fines was based, in part, on these observations. For the remainder of this report, the term fines will refer to that portion of the soil particles that is smaller than 0.053 mm (0.0021 in.).

We recognize that the ultimate performance of the barrier soil, in terms of protection from water infiltration, will depend on the hydraulic characteristics of the soil, and particle size is only an index of those characteristics. As Fayer et al. (1985) point out

Particle size analysis, although helpful in assessing the potential water storage capacity of a soil, will not be the ultimate test for determining which topsoil materials have suitable hydraulic properties. Measurements of water retention characteristics and in situ hydraulic conductivity functions will likely be the only way to ensure that suitable material has been selected for the barrier system.

The hydraulic properties of these soils need to be determined and definitive correlations established between particle-size and hydraulic properties before the soil selection criteria are finalized. Work has been initiated to obtain these correlations.

Volume of Fine Soil Needed for Barriers

Another important qualifying criterion of fine soil to be used in barriers is the availability of a large volume. It is estimated that 1.8 Mm^3 (2.3 Myd^3) of acceptable fine soil (fine soil that meets the established criteria) will be needed for surface cover materials.

STATISTICAL VARIATIONS

Variations in the percentage of fines [$<0.053 \text{ mm}$ (0.0021 in.) by wet sieving] were made for the two primary sediment classes, silt and sandy silt, using Lotus software on an IBM PC/AT. This software was used to sort the particle-size data by sediment class designation and derive the basic statistics

(minimum, average, maximum, and standard deviation). Table 5 summarizes this information and shows that both the silt and sandy silt soil classes met or exceeded the grain-size criteria.

ZONATION OF ACCEPTABLE SOILS

The McGee Ranch site was zoned into areas of first, second, and third choices with regard to the acceptability of the soil type (Figure 13). This zoning was done by dividing the site into blocks centered around each borehole. The stratification of the soil types was assumed to be uniform throughout each block. The first-choice zone consisted predominantly of silt. The second-choice zone consisted of silt and sandy silt in approximately equal amounts, and the third-choice zone consisted almost entirely of sandy silt.

TABLE 5. Statistical Summary of the Percent of Fines (<0.053 mm) in the Two Primary Sediment Classes

<u>Sediment Class</u>	<u>Minimum</u>	<u>Average</u>	<u>Maximum</u>	<u>Standard Deviation</u>
Silt (M)	59.68	80.80	98.06	9.32
Sandy Silt (SM)	33.12	54.17	75.38	8.32

FIGURE 13. Zonation of the Study Area Based on the Acceptability of the Soils

0 100 200
Feet

FIGURE 13. Location of the Study Area based on the Accessibility of the 1980s

VOLUME ESTIMATES

We estimated the volumes of soil in each of the three zones by assuming a uniform thickness for each of the sampled blocks. The thickness of each block was taken from the distance between the land surface and the top of the gravel layer (refer to Figures 6 and 7). Figure 14 shows the assumed thickness and calculated volume for each block. Table 6 lists the volumes for the first, second, and third choice zones, as well as the total volume.

TABLE 6. Estimated Volumes of Acceptable Soils

<u>Zone</u>	<u>Principal Soil Class</u>	<u>Estimated Volume</u>
1st Choice	silt (M)	1.15 Mm ³ (1.50 Myd ³)
2nd Choice	silt (M) & sandy silt (SM)	1.26 Mm ³ (1.65 Myd ³)
3rd Choice	sandy silt (SM)	1.06 Mm ³ (1.39 Myd ³)
Total		3.47 Mm ³ (4.54 Myd ³)

Based on the sampling and analysis, there is sufficient soil of acceptable quality at the McGee Ranch site to meet the currently defined barrier soil needs.

FIGURE 14. Assumed Thickness and Block-Volume Estimates

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APPENDIX A

PARTICLE-SIZE AND FIELD MOISTURE CONTENT DATA
FOR RECONNAISSANCE SAMPLES

APPENDIX A

PARTICLE-SIZE DATA AND FIELD MOISTURE CONTENT DATA FOR RECONNAISSANCE SAMPLES

TABLE A.1. Particle-Size Data for Reconnaissance Samples

GOOSE EGG #1									
DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS ^(a)
.23-.25	0.18	0.04	0.82	25.20	23.56	9.48	6.30	34.42	M[M-F]S
.56	0.00	0.00	0.61	45.23	32.96	5.51	3.27	12.42	(M)[M-F]S
GOOSE EGG #2									
DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
.25	0.00	0.00	0.33	9.89	24.52	16.88	7.09	41.29	M[F]S
MCGEE RANCH #1									
DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
.25-.28	0.19	0.83	1.63	2.26	22.66	16.60	7.62	48.21	SM
.56	0.00	0.00	0.14	0.75	4.08	6.28	1.82	86.93	M
MCGEE RANCH #2									
DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
.45	0.12	0.18	0.38	1.17	5.69	8.82	6.91	76.73	M
.56	0.21	.53	1.04	1.46	25.66	23.20	5.56	42.34	M[F-VF]S

(a) Symbols for class designation are listed in Table 3 in the body of the report.

NOTE: Bold numbers are particle sizes in millimeters; the values below these numbers are in weight percent moisture.

Table A.2. Field Moisture Content of Reconnaissance Samples

GOOSE EGG #1 =====	DEPTH (M) =====	WEIGHT PERCENT MOISTURE =====
	.23-.25	3.14
	.56	2.44
GOOSE EGG #2 =====	DEPTH (M) =====	WEIGHT PERCENT MOISTURE =====
	.25	5.75
MCGEE RANCH #1 =====	DEPTH (M) =====	WEIGHT PERCENT MOISTURE =====
	.25-.28	4.02
	.56	7.78
MCGEE RANCH #2 =====	DEPTH (M) =====	WEIGHT PERCENT MOISTURE =====
	.45	12.08
	.56	7.78

APPENDIX B

STANDARD PNL OPERATING PROCEDURE FOR SOIL SAMPLING

APPENDIX B

STANDARD PNL OPERATING PROCEDURE FOR SOIL SAMPLING

TITLE: SOIL SAMPLING USING A HOLLOW-STEM AUGER AND A SPLIT-TUBE SAMPLER

1.0 OBJECTIVE

The objective of this procedure is to establish a standard method for the collection of soil samples using a hollow-stem auger and a split-tube sampler.

2.0 APPLICABILITY

When this procedure is selected for implementation by a QA Plan, prepared and approved in accordance with PNL-MA-60 Quality Assurance Manual for License-Related Programs, it is applicable to the collection of soil (sediment) samples from boreholes drilled with a hollow-stem auger drill rig.

3.0 DEFINITIONS

Not applicable

4.0 RESPONSIBILITIES

4.1 Project Manager

- approves standard operating instructions

4.2 QAO Representative (Cognizant QE)

- approves procedure assignment listings
- reviews procedures for compliance to PNL-MA-60 and applicable QA Plan(s).

4.3 Principal Investigator and Cognizant Staff

- prepares or reviews this procedure for technical adequacy

4.4 Site Geologist

- follows these procedures conscientiously
- recommends potential modifications that might improve the procedure

5.0 PROCEDURE

1. The hollow, continuous flight auger shall be advanced to just above the required sample interval [every 1.5 m (5 ft)] and/or lithologic changes). Any soil or residue that entered the auger during drilling shall be removed.
2. A clean split-tube sampler (also referred to as a split-barrel or split-spoon sampler) is then lowered through the auger to the bottom of the clean boring using solid drill-rods.
3. An appropriate drive weight is then used to hammer the sampler into the undisturbed materials (soil) below the boring. The sampler should not be driven a distance greater than the length of the sampler.
4. Remove the sampler from the auger, taking care not to knock the sample out of the sampler, and carefully remove it from the drill rod.
5. Carefully remove the drive shoe and the end cap from the sampler. Lay the sampler flat and remove the top half of the split-tube sampler.
6. With a knife or other suitable object, carefully scrape any smeared material [top 0.3 cm to 1.0 cm (1/8 to 3/8 in.)] off the top half of the sample. If the scraping cannot be done without disturbing the sample, and/or if the sample can easily be described without exposing a fresher surface, then disregard this step.
7. Examine, physically describe, and photograph (optional) the sample. The physical description shall be recorded in black ink in the geologist's log or field notebook and shall include the borehole number, depth of the sample, and date and time the sample was collected. These descriptions shall be done with care and recorded chronologically. The geologist's log (or field notebook) shall be signed and dated at the end of each day.
8. Remove the sample from the sampler and place it in a suitable sample container (bottle or bag). If more than one layer of material is present, the sample shall be carefully partitioned into lithologically similar subsamples that shall then be placed into individual sample containers. Care should be taken to exclude the top portion of the sample thought to be slough or not representative of the sampled material. The sample containers shall be labeled with the borehole identification number, the depth of the sample or subsample, and the date.
9. Clean and reassemble the split-tube sampler.

10. Composite samples can be collected from the auger's spoil pile by collecting all the spoiled material along a little disturbed transect extending from the outer edge of the spoil in towards the auger flight. The collected materials should be placed in a large heavy-gage plastic bag. The bag of collected spoil should then be rolled and tumbled an appropriate length of time (~2-3 min) to ensure thorough mixing. After mixing, two subsamples should be collected from different parts of the bag, ensuring that both subsamples represent a vertical cross section through the bag. These subsamples should be placed in suitable sample containers and appropriately labeled as discussed above.
11. Samples shall be labeled "suspect" and/or discarded if the location and depth of the sample is lost, unknown, or questionable.
12. The samples shall be transported to PNL's Hydrology Section Soils Laboratory in the Sigma V building and hand-delivered to Paula Heller, her representative, or a prearranged location in the laboratory. Paula Heller or her representative will log the samples into a controlled notebook, along with the date and time they were received. The samples will be logged in and identified by the borehole number and depth that is clearly labeled on the sample.

6.0 REFERENCED DOCUMENTS

Not applicable

APPENDIX C

GEOLOGISTS' LOGS

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water A 6000 021 (5/85)

A - Auger HAND - Hand Dig ST - Split-Tube

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 5000 02# (5 85)

A - Auger HAND - Hand Dug ST - Split-Tube

[illegible]

3.

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 6000 021 (5 85)

A - Auger HAND - Hand Dug SI - Split-tube

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A - Auger HAND - Hand Dug SI - Split-lube

[illegible]

D - Drive Barrel H - Hard Tool L - Larnp M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water A 6000 021 (5 RS)

A - Auger HAND - Hand Dig SL - Split-Tube

C. 6

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 6000 021 (5.85)

A - Auger HAND - Hand Dug ST - Split-Tube

C.7

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water A 6000 021 (5.85)

A - Auger HND - Hand Dug ST - Split Tube

DRILL LOG			By M Glennon	Rig Onwego	Well Number Test Hole #8	Computer Number	Project or Work Order No.
			Date 6/12/86	Truck Auger	Depth 0 To 12.5'	Subcontract No.	
Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.		Time	Drilling Comments
	2'	HAND	dry	Silt (some grass) pale brown 10YR 6/3, strong fizz		13:40	Sample
	2-4'	ST	dry	Silt and fine sand (bottom 3") light brownish grey 10YR 6/2		13:55	Sample (2)
				Stopped 14:00 - Augered to 4' need to sample			
		6/13/86		New Day			
	4-6.5'	ST	dry	Silt 5-5'4", then 6" fine sand to very fine sand, then 6" silt Silt - brownish yellow, strong fizz Sand - weak fizz, very pale brown 10YR 7/4		7:30	Sample silt Sample sand
	6.5-9'	ST	dry	Silt with 2" thick layer fine sand and 1/4" layer medium sand strong fizz, very pale brown 10YR 7/4		7:50	Sample (2)
	9-10'	ST	dry	4" silt light yellowish brown 10YR 6/4, very strong fizz, then layer medium sand (1"), then fine to very fine sand, strong fizz		8:05	Sample silt Sample sand
	10-12'	ST	dry	4" fine sand very pale brown (10YR 7/4) strong fizz Then 2" medium sand and pebbles (to 2" diameter) CaCO ₃ (strong fizz), coating on some pebbles then 8" silt, light yellowish brown 10YR 6/4, strong fizz		8:25	Sample Sample
		----		Auger reached another gravel layer at 12'			Sample
	12-12.5'	ST	dry	Silt with pebbles (1/4 - 1/2" diameter) to coarse sand and gravel (1 1/2" - 2" diameter) Basalt clasts, very strong fizz light yellowish brown, 10YR 7/4			
				Augered to 13' - large gravels to 3" diameter could not Auger more			
REMARKS:							

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 6000 021 (5-85)

A - Auger HAND - Hand Dug ST - Split-Tube

DRILL LOG			By M Glennon	Rig Onwego	Well Number Test Hole #9	Computer Number	Project or Work Order No.
			Date 6/12/86	Truck Auger	Depth 0 To 15.5	Subcontract No.	
Total Casing	Depth	Drift Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.		Time	Drilling Comments
	2'	HAND	dry	silt - some grass, very pale brown 10YR 7/4, strong fizz		9:50	Sample
	3-4.5'	ST	dry to moist at 2.7'	Silt with very fine sand layers (thin) one 1/4" layer fine sand Strong fizz, Pale olive SY 6/4		10:00	Sample (2)
	4.5-6.5'	ST	dry	4.5 - 5.0' - fine sand 5.0 - 5.7' - clay and silt with some sand layers then abruptly down to fine sand and then medium sand then abruptly silt and clay (Bottom 2"), all strong fizz, light yellowish brown 10YR 6/4 sands 5.7'-6.3' then silt		10:20	Sample clay Sample fine to medium sands
	6.75-8.5'	ST	dry	6.75 - 7.5' silty sand (fine), one layer 1" thick medium sand strong fizz, yellowish brown 10YR 5/4, 7.5 - 8.5' - clay and silt, strong fizz brown 10YR 5/3		10:40	Sample Sample
	8.5-10'	ST	dry moist	Sands 8.5 - 9.5' fine sand grading to medium, no fizz, very pale brown 10YR 7/4 - clay, strong fizz, dark yellowish brown 10YR 3/6 some silt stringers		10:55	Sample Sample
	10-12'	ST	dry	Silt and clay grading to very fine sand then clay then fine sand (fine sand on inside edge of sampler) strong fizz brown 10YR 5/3		11:10	Sample silt
	12-13.5'	ST	dry to moist	Fine sand ~1" at top then silt and very fine sand layers, weak fizz, dark yellowish brown 10YR 4/6, some layers, more light yellowish brown (weathering?)		11:30	Sample
	13.5-15.5'	ST	dry (top)1' to moist (bottom)1'	13.5 - 14.5' silt and fine sand, some light brown color (weathering?) weak fizz, brown 10YR 5/3		11:45	Sample
REMARKS:							

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 6000 021 (5 85)

A - Auger HAND - Hand Dig ST - Split-Tube

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A 6000 Q21 (5-85)

A - Auger HAND - Hand Dug ST - Split-Tube

C.11

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A 6000 021 (5 85)

A - Auger * HAND - Hand Dig ST - Split-Tube

DRILL LOG			By M. Glennon	Rig Onwego	Well Number Test Hole #11	Computer Number	Project or Work Order No
			Date 6/11/86	Truck Auger	Depth 0 To 11'		Subcontract No
Total Casing	Depth	Drill Method	Wet-Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.		Time	Drilling Comments
	2'	HAND	dry	Fine sand, strong fizz, light yellowish brown 10YR 6/4		9:25	Sample
	2-4'	ST		Sample fell from holder - no sample			
	0-4'	A	dry	Silt and >5% fine sand light, yellowish brown 10YR 6/4, strong fizz		9:40	
	4-6'	ST	dry	Bulk sample of 4-6' - sample holder stuck, silt and fine sand, strong fizz, light yellowish brown 10YR 6/4			
	6-8'	ST	dry	6-7' - coarse sand very pale brown 10YR 7/4, no fizz, pebbles 1/4" diameter		10:30	Sample
				7-8' - silt, strong fizz, light yellowish brown, several pebbles 1" diameter from Auger			1. silt 2. sand
	8-10'	ST	dry	Coarse sand 8-8.5' possibly from previous core, no fizz, light grey silt and clay, 8.5 - 9.5' fine sand, strong fizz, brown 10YR 5/3		10:45	Sample
							1. silt 2. sand
				Stopped at 11 am			
		6/12/86		New Day			
	8-10'	A	dry	Found gravel in spoil ~2" diameter - basalt clasts - matrix - same as ST sample		7:50	
	10-11'	ST	dry	Medium sand into pebbles (1/4" diameter) and fine sand (strong fizz) then silt and fine sand 6" thick, then medium sand and gravel (1 1/2" diameter)		8:00	Sample
				Sand - light yellowish brown 10YR 6/4, no fizz, silt and sand pale brown 10YR 6/3 strong fizz, gravel matrix - light yellowish brown, no fizz, gravels from Auger spoil up to 3" diameter			1. Sand 2. Silt 3. Sand and gravel
				Augered to 10' and couldn't go any more			
REMARKS:							

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 6000 021 (5 85)

A - Auger HAND - Hand Dug ST - Split Tube

C.12

[illegible]

A 6000 021 (5 85)

A - Auger HAND - Hand Dig ST - Split-Tube

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A - Auger HAND - Hand Dug ST - Split-Tube

A 6000 021 (5 85)

[illegible]

A 6000.021 (5.85)

A - Auger HAND - Hand Dug ST - Split-Tube

[illegible]

A 6000 021 (5 85)

A - Auger HAND - Hand Dug ST - Split-Tube

C.18

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water A 6000 021 (5 85)

A - Auger HARD - Hard Plug ST - Split Tube

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 6000 021 (5.85)

A - Auger HAND - Hand Dug ST - Split-Tube

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A - Auger HARD - Hand Dig ST - Split Tube

A 6000 021 (5.85)

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A 6000 021 (5 85)

A - Auger HAND - Hand Dig ST - Split Tube

C.22

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water A 6000 021 (5 85)

[illegible]

A 6000 021 (5.85)

A - Auger HAND - Hand Dug ST - Split-Tube

DRILL LOG			By M. Glennon	Rig Onwego	Well Number Test Hole #24	Computer Number	Project or Work Order No.
			Date 6/4/86	Truck Auger	Depth 0 To 30'	Subcontract No.	
Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.		Time	Drilling Comments
	~2'	HAND	dry	Yellowish brown 10YR 5/6 very fine sand - some medium to coarse strong, fizz with HCL		10:40	Sample
	3-5'	A	dry	Yellowish brown 10YR 5/4 silt to very fine sand, strong fizz HCL		10:41	
	5-6'	ST	dry	Very pale brown 10YR 7/4 on bottom to light yellowish brown 10YR 6/4 top silt, strong fizz to HCL, some fine sand		10:50	sample
	5-10'	A	dry	Very pale brown 10YR 7/4 silt, strong fizz HCL			
	10-11'	ST	dry	Silt and clay with 2 thin layers of fine sand to very fine sand light grey 10YR 7/2, strong fizz		11:02	Sample
	11-12'	ST	dry	Mostly fine sand, some clay layers light brownish grey 10YR 6/2		11:05	Sample
	10-15'	A	dry	Very pale brown 10YR 7/4 silt, strong fizz		11:10	
	15-16'	ST	dry	Some semicompacted layers bottom 5" silt and clay, above 5" - fine sand layer, very pale brown 10YR 7/4, strong fizz		11:15	Sample
	20-21'	ST	dry	Very pale brown silt/clay, strong fizz		12:15	Sample
	21-21.7'	ST	dry	Coarse to medium sand pale brown, 10YR 6/3, slight fizz			Sample
	21.7-22'	ST	dry	Clay/silt light grey 10YR 7/2, strong fizz			Sample
	20-25'	A	dry	Very pale brown silt 10YR 7/4, strong fizz		12:25	
	25-26.5'	ST	dry	Medium to coarse sand with 1 1/2" layers of silt to fine sand pale brown 10YR 6/3, weak fizz		12:35	Sample
	26.5-27'	ST	dry	Light yellowish brown silt/clay, strong fizz			Sample
	25-30'	ST	dry	Very pale brown 10YR 7/3 silt/fine sand, strong fizz			
	29'	A	dry	Gravel, quartzite 1/2 to 3" diameter		12:45	Sample gravel only
	30'	ST	dry	Sand (coarse), pebbles and cobbles to 1" diameter, light yellowish brown		13:00	Sample
REMARKS:							

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 6000 021 (5 85)

A - Auger HAND - Hand Dig ST - Split-Tube

C.27

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A 6000 021 (5-85)

A - Auger HAND - Hand Dig ST - Split-Tube

[illegible]

D - Drive Barrel H - Hard Tooth L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A - Auger HAND - Hand Dig ST - Split Tube

A-6000 021 (5 85)

[illegible]

A 6000 021 (5-85)

A - Auger HAND - Hand Dug ST - Split-tube

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A - Auger HAND - Hand Dug ST - Split-Tube

DRILL LOG			By M. Glennon	Rig Onwego Truck Auger	Well Number Test Hole #28	Computer Number	Project or Work Order No.
			Date 6/16/86	Depth 0 To 32'		Subcontract No.	
Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.		Time	Drilling Comments
	2'	HAND	dry	Silt, strong fizz, pale brown 10YR 6/3		12:30	Sample
	5-6.5'	ST	dry	Brown silt (10YR 5/3) strong fizz, one grey clay stringer observed		12:45	Sample
	5-10'	A	dry to moist	Silt brown 10YR 5/3, strong fizz		12:50	
	10-11.5'	ST	moist then dry	Silt then abruptly fine sand Silt layer ~4" thick, silt - strong fizz		13:00	Sample 1. silt
				Sand - no fizz, silt - brown 10YR 5/3			2. sand
	10-15'	A	dry	Sand - light grey 10YR 7/2			
				Fine sand and silt - medium fizz brown 10YR 5/3		13:05	
	15-16.5'	ST	dry	Fine sand - one clay stringer, light brownish grey 10YR 6/2, very weak fizz		13:10	Sample 1
	15-20'	A	dry	Fine sand, no fizz, brown 10YR 5/3		13:15	
	20-21.5'	ST	dry	Fine sand to very fine sand no fizz to medium fizz, light yellowish brown 10YR 6/4		13:30	Sample 1
	20-25'	A	dry	Fine sand - medium fizz, brown 10YR 5/3		13:35	
	25-27'	ST	dry	Fine sand		13:45	Sample sand 25-26.5'
				26.5-27' CaCO ₃ very moist white clay			Sample sand 26.5-27'
				26.5 - 27' - some fine sand stringers, very strong fizz (grades 25-26.5' from fine sand) - clay! very weak to no fizz, brown 10YR 5/3			
	30-32'	ST	wet (moist)	30-31' white CaCO ₃ clay and very pale brown clay layers - strong fizz (white), weak fizz (brown)		14:30	Sample
				31-32' brown clay w/black sand basalt? no fizz, some orange (rust) stain			Sample
REMARKS:							

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 6000 021 (5.85)

A - Auger HAND - Hand Dug ST - Split-Tube

C.31

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A 6000 021 (5 85)

A - Auger HAND - Hand Dug ST - Split-Tube

C.32

DRILL LOG			By M. Glennon	Rig Onwego Truck Auger	Well Number Test Hole #30	Computer Number	Project or Work Order No.
			Date 6/17/86	Depth 0 To 19.5'		Subcontract No.	
Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.		Time	Drilling Comments
	2'	Hand	dry	Pale brown silt and fine sand, no fizz		8:50	Sample
	2-4'	ST	dry	Light grey silt (10YR 7/2) (some consolidated) then pale brown silt and semiconsolidated silt, strong fizz, some white coating		9:05	Sample (2)
	4-6'	ST	dry	Silt to sandy silt, strong fizz, very pale brown 10YR 7/4		9:15	Sample
	6-8'	ST	dry	Very fine sand (6") then silt with 4-8 sand stringers strong fizz, brown 10YR 5/3		9:25	Sample sand Sample silt
	8-10'	ST	dry	Silt (8") then 2" fine (no fizz) sand then silt then clay (weak fizz) silt - strong fizz, pale brown 10YR 6/3		9:35	Sample
				Silt - (top layer) - sand stringers (10-11) grades to sand			Sample clay
	10-12'	ST	dry	Silt and clay brown 10YR 5/3 then fine sand layer 2"- thick then grading into silt pale brown 10YR 6/3 all - strong fizz		9:15	Sample 10-11' Sample 11-12'
	12-14'	ST	dry	Silt and clay grades into fine sand, then 1/4" medium to coarse sand then abrupting sandy silt, some medium sand layers in topmost silt		10:10	Sample
	14-16'	ST	dry	Silt (14-15') grading into fine sand then moist silt (clay?) (15-16'), no fizz, dark brown 10YR 3/3 top silt - weak fizz, dark brown grades to pale-brown		10:35	Sample 14-15' Sample 15-16'
	16-17.5'	ST	moist	16-17' silt grading to fine sand then abruptly med. sand, strong fizz, brown		10:55	Sample
			dry	17-17.5' medium to coarse sand and gravel up to 1" diameter, CACO ₃ coating on some strong fizz, pebbles.			Sample
	17'	A		Gravel- one clast 5" diameter - most 1" diameter - white CACO ₃ coating also white consolidate CACO ₃		11:10	
	17.5-19.5'	ST	dry	Very fine sand then coarse sand and pebbles to 1/4" then fine sand then gravel and clay			
				Very hard silt gravel 1/4 - 1/2" diameter			Sample
				Silt Strong fizz brown 10YR 5/3			Silt
REMARKS:							

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 6000 021 (5-85)

A - Auger HAND - Hand Dug ST - Split-Tube

[illegible]

A 6000.021 (5 85)

A - Auger HAND - Hand Dig SI - Split-Tube

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A - Auger HARD - Hard Dig ST - Split Tube

A 6000 021 15 851

C.37

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A 6000 021 (5 85)

A - Auger HAND - Hand Dug ST - Split-Tube

DRILL LOG			By M. Glennon	Rig Orwego Truck Auger	Well Number Test Hole #35	Computer Number	Project or Work Order No.
			Date 6/24/86	Depth 0 To 31'		Subcontract No.	
Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.		Time	Drilling Comments
	2'	HAND	dry	Silt and semiconsolidated silt and white (CaCO ₃ ?), strong fizz, pale brown 10YR 6/3		9:50	Sample
	5-6'	ST	dry	Top 2-3" some sand and pebbles (1/4" diameter) then very fine sand to silt with one layer of medium sand brown 10YR 5/3, strong fizz		10:00	Sample 5-5.2' Sample 5.2-6'
	5-10'	A	dry	Fine to very fine sand pale brown 10YR 6/3, strong fizz		10:05	
	10-11.5'	ST	dry	Silt grades to fine sand then grades to silt light grey 10YR 7/2, strong fizz		10:15	Sample
	10-15'	A	dry	Brown (10YR 5/3) fine sand, strong fizz		10:20	
	15-16'	ST	dry	Fine sand then 1" layer medium sand then silt, strong fizz, very pale brown 10YR 7/4		10:25	Sample 15-15.5' Sample 15.5-16'
	15-20'	A	dry	Fine sand light brownish grey 10YR 7/2, strong fizz		10:35	
	20-21.5'	ST	dry	Medium sand (2") then silt 1' then coarse sand and pebbles 1/2" diameter 2", then silt (1-2") very pale brown 10YR 7/3, strong fizz		11:00	Sample 1. Sand 2. Silt
	20-25'	A	dry	Sandy silt light grey 10YR 7/2, strong fizz		11:05	Sample
	25-26'	ST	dry	Silt grading down to fine sand light brownish grey 10YR 6/2, strong fizz		11:10	Sample
	25-30'	A	dry	Gravels - thin layer at ~25' (1-2" diameter) fine to medium sand brown 10YR 5/3 strong fizz		11:20	
	30-31'	ST	dry	Medium to coarse sand then 1" silt then coarse sand and gravel to 1" diameter then silt (1"), no fizz		11:30	Sample
REMARKS:							

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A 6000 021 (5 85)

A - Auger HAND - Hand Dug ST - Split-Tube

DRILL LOG			By M. Glennon	Rig Onwego Truck Auger	Well Number Test Hole #36	Computer Number	Project or Work Order No.
			Date 6/24/86	Depth 0 To 27'3"		Subcontract No.	
Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.		Time	Drilling Comments
	2'	HAND	dry	Sandy silt pale brown 10YR 6/3, strong fizz		12:30	Sample
	5-6'	ST	dry	Fine sand grading to silt pale brown 10YR 6/3, strong fizz		12:45	Sample
	5-10'	A	dry	Very fine sand & silt pale brown 10YR 6/3 strong fizz		12:50	
	10-11'	ST	dry	Silt with a stringer of med. sand light grey 10YR 7/2, strong fizz		12:55	Sample
	10-15'	A	dry	Sandy silt pale brown 10YR 6/3, strong fizz		13:00	
	15-16'	ST	dry	Fine sand then 4" layer silt with stringer medium sand then grades to silt pale brown 10YR 6/3, strong fizz		13:10	Sample
	15-20'	A	dry	Fine silty sand pale brown, strong fizz		13:15	
	20-21.5'	ST	dry	Most sample not recovered 5-6" of fine sand and silt layers some medium sand stringers strong fizz, light brown grey 10YR 6/2 hydraulic line broke at 13:40 6/25/86		1:30	Sample
				6/25/86 New Day			
	20-25'	A	dry	Silty sand strong fizz very pale brown 10YR 7/3		7:31	
	25-26.5'	ST	dry	25-25.5' medium to coarse sand and gravel (1/4-1" diameter) then fine sand 25.5-26.5, very weak fizz, very pale brown 10YR 7/4		7:50	Sample 25-25.5' Sample 25.5-26.5'
	25-27'	A	dry	Gravel beds at just before 25' (thin) 26' (thin) and 27' -(gravels 1/4" to 1" diameter)		8:00	
	27'-27'3"	ST	dry	Med to fine sand and gravel, one clast 2" diameter, strong fizz, pale brown 10YR 6/3		8:15	Sample

REMARKS:

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A-6000-021 (5-85)

A - Auger HAND - Hand Dig ST - Split-Tube

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A - Auger HAND - Hand Dug ST - Split-Tube

C.41

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A - Auger HAND - Hand Dug ST - Split Tube

A-6000.021 (5-B5)

[illegible]

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine _____ Standing Water

A - Auger HARD - Hand Dig ST - Split Tube

A-6000.021 (5-85)

APPENDIX D

SOIL MOISTURE DATA

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#1	0.76-1.22	11.12
	3.05-3.35	9.61
	4.57-4.88	2.33
	4.88	14.48
	6.10-6.40	24.40
	6.40	9.61
	COMPOSITE	8.04

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#2	1.52-1.83	12.86
	3.05-3.35	7.98
	3.35	19.49
	4.57-4.88	10.67
	5.79-6.10 PS1	8.37
	5.79-6.10 PS2	6.26
	COMPOSITE	9.37

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#3	1.52-1.83	3.91
	3.05-3.35	4.95
	4.57-4.72	1.48
	4.72-4.88	2.85
	COMPOSITE	---

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#4	1.60-1.83	3.55
	3.05-3.20	5.47
	3.20-3.35	10.54
	4.65-4.88	13.79
	6.10-6.32	10.15
	6.32-6.40	4.47
	COMPOSITE	---

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#5	1.52-1.83	8.49
	3.05-3.35	20.73
	COMPOSITE	---

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#6	1.52-1.83	11.34
	3.05-3.12	3.89
	3.12-3.35	16.67
	4.57-4.72	16.27
	4.72-4.88	---
	COMPOSITE	---

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#7	0.61	3.19
	1.52-1.98	5.47
	2.13-2.29	5.03

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#8	0.61	9.61
	0.61-1.22	9.84
	1.62-1.77	9.07
	1.77-1.98	12.65
	1.98-2.74	7.60
	2.74-2.83	14.01
	2.87-3.05	5.15
	3.05-3.14	7.77
	3.14-3.20	4.73
	3.20-3.41	17.68
	3.66-3.81	6.52

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#9	0.61	4.82
	0.91-1.37	13.89
	1.52-1.74	14.81
	1.74-1.92	3.57
	2.06-2.29	5.43
	2.29-2.59	16.83
	2.50-2.90	5.45
	2.90-3.05	19.68
	3.05-3.35	8.28
	3.35-3.66	15.98
	3.66-4.11	18.45
	4.11-4.42	14.15
	4.42-4.72	24.90
	4.72-5.11	7.66
	5.11-5.18	13.49
	5.18-5.33	14.34

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#10	0.61	5.14
	1.52-1.83	2.20
	1.83-1.98	2.85
	3.05-3.20	1.53
	3.20-3.35	4.38
	4.27-4.42	2.07

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#11	0.61	4.24
	1.22-1.83	6.72
	1.83-2.13	2.23
	2.13-2.44	12.53
	2.59-2.90	9.59
	2.90-3.05	---
	3.05-3.14	1.58
	3.14-3.29	8.65
	3.29-3.35	4.84

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#12	0.61	4.64
	2.13-2.44	6.28
	2.44-2.59	5.47
	3.05-3.66	10.53
	4.11-4.18	8.88

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#13	0.61	5.33
	0.61-1.22	10.71
	1.22-1.68	13.59
	1.68-1.98	11.88
	1.98-2.59	10.52
	2.59-3.05	11.51
	3.05-3.66	11.55
	3.66-3.81	10.19
	3.81-3.96	3.66

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#14	0.61	5.67
	1.52-1.68	9.04
	1.68-1.83	4.24

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#15	0.61	3.72
	1.52-2.13	9.25
	2.13	3.49

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#16	0.61	4.40
	1.52-1.98	6.53
	3.05-3.66	---
	4.57-4.88	3.95

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#17	0.61	4.12
	1.52-1.83	5.38

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#18	0.61	4.42
	1.52-1.98	8.86
	3.05-3.20	10.11
	3.20-3.51	16.55
	4.57-5.03	13.78
	6.10-6.55	9.16
	7.32	8.08

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#19	0.61	7.53
	1.52-1.98	12.78
	3.05	10.12
	3.66-4.11	3.43
	4.57-4.88	4.68
	4.88-5.18	6.40
	5.18-5.33	5.36

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#20	0.61	3.72
	1.52-1.83	4.41
	3.05-3.66	4.55
	4.57-4.72	2.37
	4.72-5.03	4.71
	6.10-6.40	3.46

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#21	0.61	1.63
	1.52-1.98	8.31
	2.29-2.59	3.86
	2.74-2.90	4.53

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#22	0.61	5.37
	0.76-0.91	2.80
	0.91-1.22	5.19
	1.22-1.52	11.27
	1.52-1.68	6.55
	1.68-2.13	7.58
	2.13-2.44	3.28
	2.44-2.90	12.49
	2.90-2.99	9.24
	2.99-3.11	3.29
	3.35-3.81	3.93
	3.81-3.87	5.19

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#23	1.52-1.68	6.91
	1.68-1.83	6.87

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#24	0.61	3.59
	1.52-1.83	2.94
	3.05-3.35	4.00
	3.35-3.66	2.81
	4.57-4.88	2.34
	6.10-6.40	5.10
	6.40-6.61	1.33
	6.61-6.71	4.51
	7.62-8.08	1.48
	8.08-8.23	4.41
	9.14	2.20

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#25	0.61	4.99
	0.61-1.22	4.71
	1.22-1.83	5.27
	1.83-2.29	6.32
	2.29-2.90	6.25
	2.90-3.35	6.93
	3.35-3.66	10.93
	3.66-3.96	7.43
	3.96-4.42	6.77
	4.42-5.03	9.37
	5.03-5.49	10.36
	5.49-5.94	11.88
	5.94-6.10	4.52
	6.10-6.25	8.84

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#26	0.61	6.12
	1.52-1.83	5.38
	3.05-3.51	9.35
	4.57-5.03	13.40
	6.10-6.55	12.75
	7.01-7.16	6.85

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#27	0.61	5.11
	1.52-1.98	11.20
	3.05-3.51	14.40
	4.57-4.88	7.04
	4.88-5.03	5.43
	6.10-6.16	6.98
	6.16-6.55	5.15
	7.32	9.42

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#28	0.61	4.86
	1.52-1.98	9.40
	3.05-3.14	9.89
	3.14-3.51	4.60
	4.57-5.03	5.51
	6.10-6.55	4.93
	7.62-8.08	4.69
	8.08-8.23	33.59
	9.14-9.45	31.72
	9.45-9.75	22.11

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#29	0.61	5.30
	1.52-1.98	7.45
	3.05-3.20	11.44
	3.20-3.35	23.79

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#30	0.61	4.26
	0.61-1.22	9.03
	1.22-1.83	5.62
	1.83-1.98	5.30
	1.98-2.44	9.82
	2.44-2.65	14.28
	2.65-3.05	23.31
	3.05-3.35	15.40
	3.35-3.66	8.88
	3.66-4.27	12.09
	4.27-4.57	10.46
	4.57-4.88	28.78
	4.88-5.18	19.26
	5.18-5.33	3.31
	5.33-5.94	10.28

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#31	0.61	3.66
	1.52-2.13	8.75
	3.05-3.51	18.37
	4.57-5.03	25.07

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
#32	0.61	2.97
	1.52-1.98	4.01
	3.05-3.51	4.39
	4.57-4.82	3.49
	4.82-5.03	4.22
	6.10-6.40	3.64
	6.40-6.71	5.26
	6.71-6.86	3.38

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#33	0.61	6.66
	1.52-1.98	7.81
	3.05-3.51	4.25
	4.57-5.03	4.02
	6.10-6.40	2.79
	7.01-7.32	2.12
	7.32-7.47	4.32
	8.08-8.23	3.45

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#34	0.61	5.90
	1.52-1.98	8.20
	3.05-3.51	1.88
	4.57-4.88	3.44
	6.10-6.40	1.33
	6.40-6.55	4.72
	7.62-7.77	2.89
	7.77-8.08	4.64
	9.14-9.30	2.19

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#35	0.61	6.68
	1.52-1.58	5.21
	1.58-1.83	3.69
	3.05-3.51	3.12
	4.57-4.72	2.34
	4.72-4.88	5.28
	6.16-6.46	1.51
	6.46-6.52	4.03
	7.62-7.92	2.72
	9.14-9.45	1.11

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#36	0.61	5.85
	1.52-1.83	5.21
	3.05-3.35	4.01
	4.57-4.88	3.01
	6.10-6.55	2.36
	7.62-7.77	1.51
	7.77-8.08	3.16
	8.23-8.38	2.97

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#37	0.61	5.60
	1.52-1.83	3.87
	3.05-3.20	3.07
	3.20-3.35	2.68
	4.57-4.72	1.59
	4.72-4.88	2.15
	6.10-6.40	2.51

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#38	0.61	4.44
	1.52-1.98	3.29
	3.05-3.35	3.40
	4.57-4.88	1.85
	5.79	2.97

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#39	0.61	4.13
	1.52-1.68	2.36
	1.68-1.83	5.11
	3.05-3.66	2.78
	4.57-5.03	1.89
	6.10	3.44

BOREHOLE	DEPTH IN METERS	WT. % MOISTURE
=====	=====	=====
#40	0.61	5.23
	1.52-1.98	8.94
	3.05-3.26	11.10
	3.26-3.51	17.61
	4.57-4.88	12.58
	4.88-5.03	10.46
	6.10-6.55	16.28
	7.01-7.16	11.54

APPENDIX E

PARTICLE-SIZE DATA AND SOIL CLASSIFICATIONS

BOREHOLE #1

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS ^(a)
0.76-1.22	0.00	0.15	0.12	0.14	2.41	5.79	5.05	86.34	M
3.05-3.35	0.11	0.13	0.22	0.29	1.62	5.99	7.78	83.86	M
4.57-4.88	18.13	11.41	28.87	23.14	8.47	2.04	0.92	7.02	GS
4.88	0.00	0.34	0.65	1.03	1.41	4.28	5.70	86.59	M
6.10-6.40	0.00	0.04	0.09	0.40	0.96	1.13	1.21	96.17	M
6.40	34.56	2.13	2.59	3.36	11.57	7.51	3.20	35.08	MG
COMPOSITE	2.48	0.66	2.61	5.05	8.44	7.44	6.41	66.91	SM

BOREHOLE #2

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
1.52-1.83	0.00	0.07	0.20	0.27	5.82	9.47	7.24	76.93	M
3.05-3.35	0.00	0.12	0.40	0.52	11.30	22.08	9.72	55.86	SM
3.35	0.00	0.00	0.08	0.37	2.34	4.67	5.38	87.16	M
4.57-4.88	0.00	0.08	0.16	0.16	2.72	13.09	10.65	73.14	M
COMPOSITE	2.32	0.30	1.41	1.72	5.75	10.92	11.41	66.17	SM

BOREHOLE #3

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
1.52-1.83	0.00	0.13	0.39	0.65	2.01	7.54	3.58	85.70	M
3.05-3.35	0.00	0.00	0.35	1.49	1.13	2.00	3.29	91.74	M
4.57-4.72	45.45	8.79	12.18	15.40	9.51	1.71	1.05	5.91	MSG
4.72-4.88	16.47	0.73	0.66	1.09	6.50	13.87	8.36	52.32	GSM
COMPOSITE	21.94	0.80	2.62	5.61	11.21	12.46	4.04	41.32	GSM

BOREHOLE #4

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
1.60-1.83	0.00	0.11	0.10	0.24	2.80	6.02	4.58	86.15	M
3.05-3.20	0.00	0.21	0.44	0.54	1.86	14.26	7.67	75.02	M
3.20-3.35	0.00	0.02	0.01	0.07	0.62	2.04	2.49	94.75	M
4.65-4.88	0.00	0.00	0.06	0.06	0.60	1.82	3.13	94.33	M
6.10-6.32	0.00	0.07	0.12	0.34	2.09	8.13	8.72	80.53	M
COMPOSITE	0.36	0.40	0.96	0.91	3.37	11.63	7.42	74.95	M

(a) Symbols for class designation are listed in Table 3 in the body of the report.

NOTE: Bold numbers are particle sizes in millimeters; the values below these numbers are in weight percent moisture.

BOREHOLE #5

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
1.52-1.83	0.06	0.33	0.91	2.43	7.20	11.67	2.02	75.38	SM
3.05-3.35	0.00	0.00	0.02	0.12	0.83	3.40	3.88	91.75	M
COMPOSITE	0.00	1.35	4.11	8.81	15.78	12.30	4.49	53.16	SM

BOREHOLE #6

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
1.52-1.83	0.00	0.16	0.37	0.93	6.34	10.00	6.98	75.22	M
3.12-3.35	0.00	0.05	0.00	0.12	1.75	9.62	2.91	85.55	M
4.57-4.72	0.00	0.04	0.36	0.93	7.49	15.02	4.77	71.39	SM
4.72-4.88	0.00	0.00	0.00	0.21	15.55	27.77	9.67	46.80	SM
COMPOSITE	0.00	0.17	0.82	1.66	8.15	17.78	4.56	66.86	SM

BOREHOLE #7

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.00	0.00	0.26	1.44	15.04	16.86	15.36	51.04	SM
1.52-1.98	0.36	0.24	1.68	5.80	22.90	16.10	14.20	38.72	SM
2.13-2.29	71.90	7.32	6.22	3.30	2.68	1.58	1.88	5.12	MSG

BOREHOLE #8

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.00	0.26	1.08	2.78	8.60	11.78	14.62	60.88	SM
0.61-1.22a	0.00	0.06	0.24	1.46	4.98	11.48	15.58	66.20	M
0.61-1.22b	0.00	0.06	0.20	0.46	1.78	6.90	12.56	78.04	M
1.62-1.77	0.00	0.12	0.10	0.28	10.84	16.94	13.24	58.48	SM
1.77-1.98	0.00	0.08	0.16	0.38	2.00	7.94	11.46	77.98	M
1.98-2.74	0.04	0.76	1.24	1.84	4.04	12.88	15.46	63.74	SM
2.74-2.83	0.06	0.06	0.20	0.70	3.92	6.46	9.24	79.36	M
2.87-3.05	0.00	0.16	0.24	0.46	5.96	21.62	22.72	48.84	SM
3.05-3.14	0.58	0.23	0.20	0.48	14.63	17.30	13.18	53.43	SM
3.14-3.20	52.16	2.72	2.06	2.06	11.40	7.44	5.36	16.80	MSG
3.20-3.41	0.06	0.12	0.18	0.10	0.48	1.62	5.62	91.82	M
3.66-3.81	26.25	3.93	6.20	4.32	11.30	8.55	7.10	32.35	GSM

BOREHOLE #9

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.02	0.16	2.66	4.70	9.38	8.10	7.24	67.74	SM
0.91-1.37a	0.00	0.02	0.44	2.18	7.96	4.10	3.96	81.34	M
0.91-1.37b	0.00	0.10	0.24	0.68	2.24	6.06	10.92	79.76	M
1.52-1.74	0.00	0.14	0.18	0.32	0.88	3.06	7.90	87.52	M
1.74-1.92	0.02	0.26	1.76	4.16	8.26	19.42	17.28	48.84	SM
2.06-2.29	0.02	0.24	0.76	6.60	12.26	11.18	13.34	55.60	SM
2.29-2.59	0.00	0.00	0.08	1.50	2.48	1.50	3.28	91.16	M
2.59-2.90	0.00	0.22	1.84	12.26	21.12	12.64	11.58	40.34	SM
2.90-3.05	0.00	0.00	0.20	0.66	1.24	0.98	3.12	93.80	M
3.05-3.35	0.00	0.04	0.18	0.70	3.86	15.12	13.06	67.04	M
3.35-3.66	0.00	0.12	0.44	2.06	5.38	4.40	3.88	83.72	M
3.66-4.11	0.00	0.72	3.20	3.78	3.70	14.28	21.90	52.42	SM
4.11-4.42	0.00	0.06	0.98	2.88	4.52	6.46	11.42	73.68	M
4.42-4.72	0.00	0.00	0.00	0.00	0.44	1.46	3.38	94.72	M
4.72-5.11	0.22	0.06	0.10	0.58	14.90	20.90	14.10	49.14	SM
5.11-5.18	44.62	2.60	3.06	4.98	4.58	1.54	1.88	36.74	MG
5.18-5.33	40.58	3.74	3.70	2.20	3.18	3.00	4.02	39.58	MG

BOREHOLE #10

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.14	0.44	1.44	3.96	11.94	9.56	9.62	62.90	SM
1.52-1.83	0.00	0.14	0.82	1.06	5.12	14.06	14.62	64.18	SM
1.83-1.98	0.04	0.10	0.20	0.28	5.74	26.06	18.90	48.68	SM
3.05-3.20	0.00	0.22	2.80	19.98	41.16	12.86	7.08	15.90	MS
3.20-3.35	0.00	0.08	0.22	0.94	1.34	1.94	7.04	88.44	M
4.27-4.42	23.84	2.46	3.02	8.82	15.30	9.00	7.22	30.34	GMS

BOREHOLE #11

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.22	2.22	5.30	12.54	43.50	16.84	7.46	11.92	(M)S
1.22-1.83	0.04	0.88	3.38	8.54	21.98	11.24	8.44	45.50	SM
1.83-2.13	17.98	3.88	20.32	34.30	13.20	2.04	1.30	6.98	(M)GS
2.13-2.44	0.00	0.18	0.94	1.54	1.84	2.42	4.34	88.74	M
2.59-2.90	0.00	0.48	1.78	2.92	11.08	10.52	12.98	60.24	SM
2.90-3.05	10.40	0.76	13.14	44.12	20.62	2.54	1.80	6.62	GS
3.05-3.14	4.00	0.82	5.82	33.40	24.14	7.90	6.52	17.40	MS
3.14-3.29	0.14	0.30	2.58	11.16	9.70	13.66	13.41	49.05	SM
3.29-3.35	8.10	0.56	5.24	43.96	21.38	3.02	2.66	15.08	(GM)S

BOREHOLE #12

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.08	0.38	1.56	4.94	21.90	14.32	12.46	44.36	SM
2.13-2.44	0.38	0.42	1.16	1.72	2.96	5.18	10.12	78.06	M
2.44-2.59	58.74	4.68	8.72	7.40	5.24	1.86	2.32	11.04	MSG
3.05-3.66	0.00	0.10	0.02	0.12	1.44	5.72	14.70	77.90	M
4.11-4.18	35.28	12.46	12.28	9.00	8.76	3.62	3.24	15.36	MSG

BOREHOLE #13

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.02	0.38	1.48	2.62	7.80	16.58	19.16	51.96	SM
0.61-1.22	0.00	0.10	0.26	0.94	3.60	7.54	17.22	70.34	M
1.22-1.69	0.00	0.04	0.24	0.94	2.48	2.68	4.98	88.64	M
1.69-1.98	0.00	0.06	0.26	0.62	1.44	3.02	7.84	86.76	M
1.98-2.59	0.00	1.00	2.36	2.44	3.06	4.94	10.88	75.32	M
2.59-3.05	0.00	0.00	0.00	0.10	0.46	1.28	4.54	93.62	M
3.05-3.66	0.00	0.06	0.44	1.04	2.40	4.66	10.60	80.80	M
3.66-3.81a	0.00	0.10	0.34	0.80	1.58	4.58	11.12	81.48	M
3.66-3.81b	0.00	0.10	0.38	0.82	1.94	5.48	14.24	77.04	M
3.81-3.96	45.54	3.00	7.62	12.62	10.34	4.84	3.74	12.30	MSG

BOREHOLE #14

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.04	0.52	2.30	6.22	30.62	14.98	8.08	37.24	MS
1.52-1.68	0.00	0.40	1.86	3.32	7.44	11.38	11.44	64.16	SM
1.68-1.83	22.94	3.60	7.22	7.74	11.18	13.80	11.00	22.52	GMS

BOREHOLE #15

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.68	3.56	6.14	6.24	28.38	21.20	11.30	22.50	MS
1.52-2.13	0.42	0.64	1.56	1.84	7.60	15.08	17.76	55.10	SM
2.13	71.02	2.90	1.82	1.74	3.36	3.04	4.22	11.90	MG

BOREHOLE #16

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.04	0.76	2.70	5.08	19.62	12.08	7.20	52.52	SM
1.52-1.98	0.04	0.46	2.34	6.68	17.08	7.72	7.16	58.52	SM
3.05-3.66	0.10	0.52	3.62	6.12	12.14	10.78	11.64	55.08	SM
4.57-4.88	50.32	3.16	5.84	5.94	7.04	3.60	3.20	20.90	MSG

BOREHOLE #17

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.04	0.10	0.36	2.02	27.40	18.48	12.06	39.54	SM
1.52-1.83	37.30	3.68	2.92	5.10	12.04	7.48	6.22	25.26	MG

BOREHOLE #18

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.10	0.76	2.10	2.60	8.32	7.88	6.64	71.60	SM
1.52-1.98	0.00	0.00	0.02	0.54	4.46	15.90	15.58	63.50	SM
3.05-3.20	0.00	0.06	0.16	0.42	1.84	3.24	8.40	85.88	M
3.20-3.51	0.00	0.02	0.02	0.06	0.04	0.50	2.22	97.14	M
4.57-5.03	0.00	0.02	0.02	0.30	2.24	2.30	4.44	90.68	M
6.10-6.55	0.08	0.22	1.12	3.14	9.64	8.52	11.20	66.08	SM
7.32	58.12	1.90	3.20	6.02	5.72	2.78	2.96	19.30	MG

BOREHOLE #19

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.00	1.16	2.64	8.72	12.56	9.38	9.72	55.82	SM
1.52-1.98	0.04	0.30	1.72	2.96	5.34	8.36	10.22	71.06	M
3.05	0.13	1.24	2.48	3.17	5.65	8.85	12.59	65.89	SM
3.66-4.11	0.18	2.62	32.30	23.12	9.88	2.86	3.06	25.98	MS
4.57-4.88	49.26	3.50	10.42	8.14	6.26	2.50	2.80	17.12	MSG
4.88-5.18	60.30	7.04	7.66	6.56	3.86	1.10	0.94	12.54	MSG
5.18-5.33	57.42	4.82	9.72	10.66	5.96	1.14	1.06	9.22	MSG

BOREHOLE #20

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.02	0.24	1.14	1.94	9.10	20.92	18.12	48.52	SM
1.52-1.83	0.00	0.48	3.02	8.90	15.00	7.46	9.12	56.02	SM
3.05-3.66	0.06	0.62	3.80	7.42	9.04	5.66	6.92	66.48	SM
4.57-4.72	0.16	0.14	0.70	7.20	28.04	9.34	8.06	46.36	SM
4.72-5.03	0.04	0.02	0.10	0.10	0.78	4.14	8.98	85.84	M
6.10-6.40	48.84	6.28	7.64	6.98	5.98	3.42	3.04	17.82	MSG

BOREHOLE #21

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.02	0.72	18.48	47.96	16.26	5.36	3.36	7.84	(M)S
1.52-1.98	0.02	0.70	2.02	3.16	4.42	8.50	11.46	69.72	M
2.29-2.59	35.70	2.60	6.52	9.80	7.42	6.08	5.80	26.08	MSG
2.74-2.90	34.44	11.18	13.34	10.48	5.60	2.34	2.64	19.98	MSG

BOREHOLE #22

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.06	0.06	0.34	1.26	5.00	6.90	12.56	73.82	M
0.76-0.91	0.00	0.16	0.40	5.38	52.42	17.32	8.54	15.78	M(F)S
0.91-1.22	0.00	0.18	0.78	1.46	8.40	17.18	17.98	54.02	SM
1.22-1.52	0.00	0.00	0.06	0.14	3.24	7.12	10.76	78.68	M
1.52-1.68	0.00	0.02	0.06	0.12	4.88	15.80	16.40	62.72	SM
1.68-2.13	0.00	0.06	0.10	0.12	3.94	13.68	15.42	66.68	M
2.13-2.44	0.00	0.06	0.16	0.36	19.46	17.58	12.06	50.32	SM
2.44-2.90	0.00	0.00	0.00	0.00	0.92	4.02	9.70	85.36	M
2.90-2.99	0.00	0.02	0.02	0.12	5.84	14.58	13.90	65.52	SM
2.99-3.11	0.00	0.02	0.26	0.76	38.16	23.44	13.00	24.36	M(F-VF)S
3.35-3.81	0.04	0.20	0.60	4.06	29.24	19.36	15.38	31.12	M(F-VF)S
3.81-3.87	58.06	3.76	5.16	6.54	4.16	1.86	2.26	18.20	MSG

BOREHOLE #23

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
1.52-1.68	0.06	0.64	1.41	1.86	3.94	10.32	15.62	66.15	M
1.68-1.83	0.08	0.32	0.90	1.40	3.64	9.26	14.52	69.88	M

BOREHOLE #24

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.32	2.70	11.44	20.10	22.56	14.14	8.22	20.52	MS
1.52-1.83	0.06	0.56	0.82	0.60	8.06	17.56	11.86	60.48	SM
3.05-3.35	0.04	0.16	0.10	0.36	2.62	6.28	8.64	81.80	M
3.35-3.66	0.00	0.34	1.14	2.08	13.32	18.60	13.50	51.02	SM
4.57-4.88	0.00	0.42	1.30	3.10	13.12	17.58	10.74	53.74	SM
6.10-6.40	0.00	0.08	0.32	1.36	2.10	4.98	7.48	83.68	M
6.40-6.61	0.00	0.78	9.66	54.54	24.56	6.38	1.34	2.74	S
6.61-6.71	0.00	0.06	0.68	2.68	2.14	1.26	3.10	90.08	M
7.62-8.08	0.08	0.68	12.12	42.48	23.66	4.74	2.82	13.42	(M)S
8.08-8.23	0.00	0.12	1.20	1.86	2.76	4.96	7.18	81.92	M
9.14	22.68	4.96	20.16	23.58	11.08	2.72	1.86	12.96	(M)GS

BOREHOLE #25

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.04	0.52	1.46	2.72	7.38	10.54	15.18	62.16	SM
0.61-1.22	0.04	0.14	0.76	1.52	20.86	25.46	18.10	33.12	SM
1.22-1.83	0.12	0.38	1.06	1.08	5.72	16.92	16.54	58.18	SM
1.83-2.29	0.00	0.28	0.96	1.16	3.12	10.50	15.54	68.44	M
2.29-2.90	0.00	0.04	0.20	0.32	2.86	16.52	15.26	64.80	M
2.90-3.35	0.12	0.14	0.36	0.50	0.96	3.78	9.64	84.50	M
3.35-3.66	0.00	0.10	0.24	0.30	1.00	3.34	9.12	85.90	M
3.66-3.96	0.00	0.08	0.46	0.54	2.80	12.72	15.46	67.94	M
3.96-4.42	0.00	0.00	0.04	0.14	1.64	14.24	17.42	66.52	M
4.42-5.03	0.16	0.12	0.44	1.08	3.18	6.34	10.70	77.98	M
5.03-5.49	0.10	0.54	1.64	1.26	1.68	4.12	10.16	80.50	M
5.49-5.94	4.10	10.98	24.86	13.86	11.74	4.28	3.88	26.30	MS
5.94-6.10	0.04	0.38	0.60	0.36	0.72	1.56	7.92	88.42	M
6.10-6.25	44.74	7.52	6.50	5.62	6.18	2.56	2.84	24.04	MSG

BOREHOLE #26

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.14	0.92	2.20	3.26	7.44	11.80	14.32	59.92	SM
1.52-1.83	0.04	0.22	0.52	0.80	3.30	11.60	17.26	66.26	M
3.05-3.51	0.00	0.06	0.04	0.34	5.36	20.96	24.20	49.04	SM
4.57-5.03	0.00	0.04	0.12	0.80	3.28	3.50	6.26	86.00	M
6.10-6.55	0.00	0.04	0.20	0.54	1.38	3.84	8.26	85.74	M
7.01-7.16	0.00	0.02	0.16	1.10	4.14	3.40	6.90	84.28	M

BOREHOLE #27

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.46	2.34	7.02	5.40	8.88	11.10	11.50	53.30	SM
1.52-1.98	0.12	0.62	2.90	4.76	9.76	10.34	11.08	60.42	SM
3.05-3.51	0.00	0.02	0.38	1.92	5.66	7.40	10.34	74.28	M
4.57-4.88	0.04	0.04	3.08	15.46	11.44	6.04	11.20	52.70	SM
4.88-5.03	0.00	0.18	6.26	21.30	26.42	8.36	6.56	30.92	MS
6.10-6.16	0.00	0.08	1.20	6.04	11.98	6.06	8.60	66.04	SM
6.16-6.55	0.00	0.00	0.02	0.24	0.84	2.30	9.98	86.62	M
7.32	22.22	10.32	5.68	10.10	16.64	6.64	5.42	22.98	GMS

BOREHOLE #28

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.16	0.48	2.30	3.62	9.44	16.94	18.12	48.94	SM
1.52-1.98	0.22	1.02	1.58	1.32	3.24	8.48	17.82	66.32	M
3.05-3.14	0.06	0.36	0.80	1.06	2.66	7.50	16.22	71.34	M
3.14-3.51	0.00	0.04	0.00	0.08	2.52	14.76	22.92	59.68	M
4.57-5.03	0.02	0.02	0.02	0.04	2.26	9.44	25.98	62.22	M
6.10-6.55	0.00	0.02	0.00	0.12	4.60	17.70	25.10	52.46	SM
7.62-8.08	0.00	0.02	0.40	1.64	18.84	20.50	20.38	38.22	SM
8.08-8.23	0.96	0.46	0.54	1.82	10.96	6.86	5.86	72.54	SM
9.14-9.45	0.20	0.68	1.58	2.46	4.26	2.58	3.86	84.38	M
9.45-9.75	0.02	0.32	0.76	1.54	4.10	7.70	9.36	76.20	M

BOREHOLE #29

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.30	1.44	3.44	4.30	6.30	13.24	15.56	55.42	SM
1.52-1.98	0.02	0.22	0.38	0.66	2.44	5.50	11.56	79.22	M
3.05-3.20	0.04	0.26	0.46	0.42	1.80	7.82	12.28	76.92	M
3.20-3.35	0.02	0.04	0.08	0.12	0.42	0.94	2.98	95.40	M

BOREHOLE #30

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.20	1.02	1.94	2.72	16.72	21.18	11.12	45.10	SM
0.61-1.22	0.00	0.54	5.66	5.48	5.06	5.50	11.54	66.22	SM
1.22-1.83	0.00	0.26	0.66	1.04	8.70	17.20	16.50	55.64	SM
1.83-1.98	0.04	0.18	0.86	0.96	4.62	17.06	17.48	58.80	SM
1.98-2.44	0.06	0.14	0.54	0.66	2.12	10.90	14.00	71.58	M
2.44-2.65	0.12	0.16	0.58	2.66	2.70	4.82	9.42	79.54	M
2.65-3.05	0.02	0.06	0.02	0.32	0.50	0.54	1.38	97.16	M
3.05-3.35	0.00	0.18	0.42	0.62	1.86	6.76	10.50	79.66	M
3.35-3.66	0.06	0.80	1.94	2.44	3.44	11.18	13.86	66.28	M
3.66-4.27	0.04	0.82	2.42	2.18	2.46	9.58	12.76	69.74	M
4.27-4.57	0.00	0.08	0.20	0.24	2.10	13.96	20.40	63.02	M
4.57-4.88	0.00	0.02	0.00	0.06	0.16	0.56	1.46	97.74	M
4.88-5.18	0.00	0.06	0.18	0.52	1.00	3.58	8.82	85.84	M
5.18-5.33	17.80	4.60	28.58	36.36	7.22	0.80	0.44	4.20	GS
5.33-5.94	5.60	0.70	1.18	2.48	7.42	9.48	13.32	59.82	(G)SM

BOREHOLE #31

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.00	0.68	1.76	3.26	19.54	20.38	11.12	43.26	SM
1.52-2.13	0.00	0.16	0.26	0.56	2.28	7.60	13.02	76.12	M
3.05-3.51	0.00	0.00	0.02	0.00	0.14	0.66	2.68	96.50	M
4.57-5.03	0.00	0.00	0.00	0.20	0.28	0.26	1.20	98.06	M

BOREHOLE #32

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.06	1.26	2.66	5.18	30.96	18.40	11.44	30.04	MS
1.52-1.98	0.02	0.30	0.96	2.02	12.68	14.22	13.06	56.74	SM
3.05-3.51	0.04	1.30	3.08	5.66	14.28	13.72	11.58	50.34	SM
4.57-4.82	0.26	0.98	6.82	14.62	12.68	8.32	8.58	47.74	SM
4.82-5.03	0.02	0.10	0.46	1.78	3.54	7.98	11.16	74.96	M
6.10-6.40	0.18	1.12	2.08	9.96	14.42	11.76	9.62	50.86	SM
6.40-6.71	0.40	0.16	0.78	3.68	6.32	3.38	5.98	79.30	M
6.71-6.86	33.42	3.32	5.80	8.12	9.98	4.58	4.50	30.28	MG

BOREHOLE #33

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.02	0.42	1.44	2.78	9.00	13.02	15.64	57.68	SM
1.52-1.98	0.00	0.12	0.10	0.30	3.30	12.62	12.60	70.96	M
3.05-3.51	0.00	0.14	0.24	0.20	2.16	8.26	10.74	78.26	M
4.57-5.03	0.06	0.12	0.28	0.30	2.90	8.22	13.34	74.78	M
6.10-6.40	0.00	0.02	0.90	2.88	21.30	14.38	14.54	45.98	SM
7.01-7.32a	0.00	0.26	0.88	4.00	30.48	20.36	12.60	31.42	MS
7.01-7.32b	0.08	0.50	2.88	14.83	35.98	15.70	7.20	22.85	MS
7.32-7.47	0.00	0.00	0.06	0.32	1.68	4.16	12.40	81.38	M
8.08-8.23	0.00	0.52	2.72	10.90	18.60	5.70	5.08	56.48	SM

BOREHOLE #34

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.06	0.66	4.48	7.48	11.46	15.52	13.76	46.58	SM
1.52-1.98	0.00	0.04	0.22	0.86	1.82	2.90	9.14	85.02	M
3.05-3.51	0.00	0.08	0.22	0.28	18.36	31.58	17.40	32.08	MS
4.57-4.88	0.00	0.18	0.72	0.90	4.86	19.26	15.30	58.78	SM
6.10-6.40	0.00	2.72	31.96	25.18	15.52	5.46	4.42	14.74	(M)S
6.40-6.55	0.00	0.12	0.20	0.30	0.68	1.36	5.18	92.16	M
7.62-7.77	0.00	0.02	0.26	0.68	4.96	18.78	16.56	58.74	SM
7.77-8.08	0.00	0.10	0.14	0.46	2.10	5.86	9.14	82.20	M
9.14-9.30	8.32	3.04	19.50	23.16	9.04	2.38	2.70	31.86	(GM)S

BOREHOLE #35

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.36	0.06	3.00	8.12	11.32	10.26	12.36	54.52	SM
1.52-1.58	0.24	0.44	5.50	8.42	9.88	10.32	12.94	52.26	SM
1.58-1.83	0.42	2.18	2.38	1.90	14.88	14.72	14.54	48.98	SM
3.05-3.51	0.00	0.18	0.44	4.22	10.12	9.68	10.86	64.50	SM
4.57-4.72	0.00	0.16	1.30	8.84	19.16	13.72	10.98	45.84	SM
4.72-4.88	0.00	0.10	0.28	0.60	1.18	1.36	2.88	93.60	M
6.16-6.46	39.36	6.62	20.50	21.64	5.38	0.90	0.52	5.08	SG
6.46-6.52	0.06	0.10	0.64	1.48	2.14	5.04	10.68	79.86	M
7.62-7.92	0.00	0.04	0.16	0.18	3.94	21.44	19.98	54.26	SM
9.14-9.45	15.16	3.88	23.72	40.06	13.30	1.10	0.56	2.22	GS

BOREHOLE #36

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.00	0.08	0.94	3.36	11.04	16.50	15.52	52.56	SM
1.52-1.83	0.00	0.16	0.36	0.68	5.44	5.40	6.92	81.04	M
3.05-3.35	0.00	0.04	0.30	1.70	2.46	3.78	9.16	82.56	M
4.57-4.88	0.00	0.16	0.22	0.24	7.16	20.80	17.86	53.56	SM
6.10-6.55	0.00	0.50	2.70	8.28	13.24	10.70	12.74	51.84	SM
7.62-7.77	5.00	2.74	22.66	36.46	11.72	2.86	3.10	15.46	(GM)S
7.77-8.08	0.00	0.00	0.26	0.52	10.98	23.30	17.82	47.12	SM
8.23-8.38	4.92	2.58	5.88	8.94	20.62	13.38	9.88	33.80	MS

BOREHOLE #37

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	1.64	1.82	5.10	6.34	16.36	10.44	9.52	48.78	SM
1.52-1.83	0.04	0.36	0.84	1.18	5.40	10.74	14.62	66.82	M
3.05-3.20	0.04	0.64	1.62	3.52	14.06	13.48	11.46	55.18	SM
3.20-3.35	0.02	1.32	7.52	15.66	18.02	7.34	9.18	40.94	SM
4.57-4.72	0.12	0.66	5.94	24.40	35.48	5.00	3.62	24.78	MS
4.72-4.88	0.58	6.62	14.90	24.30	16.38	6.70	4.24	26.28	MS
6.10-6.40	0.12	0.18	0.40	1.84	25.18	17.18	14.02	41.08	SM

BOREHOLE #38

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.30	1.02	2.60	4.10	19.82	17.04	11.82	43.30	SM
1.52-1.98	0.02	0.12	0.28	0.56	5.06	19.22	17.76	56.98	SM
3.05-3.35	0.00	0.06	0.14	0.22	3.72	11.54	11.62	72.70	M
4.57-4.88	2.02	2.28	15.74	19.04	21.78	11.64	6.32	21.18	MS
5.79	34.44	20.60	14.00	17.08	6.96	2.70	2.50	1.72	SG

BOREHOLE #39

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	5.80	0.62	1.40	4.04	21.66	12.84	7.94	45.70	(G)SM
1.52-1.68	0.00	0.22	0.34	0.66	10.22	28.86	17.10	42.60	SM
1.68-1.83	0.00	0.02	0.10	0.22	0.78	1.30	4.64	92.94	M
3.05-3.66	0.00	0.26	0.88	1.08	8.90	22.28	14.98	51.62	SM
4.57-5.03	1.42	1.52	5.66	20.46	23.52	2.98	2.60	41.84	MS
6.10	37.50	10.58	9.38	5.82	7.72	4.62	3.90	20.48	MSG

BOREHOLE #40

DEPTH (m)	>2.0	2.0-1.0	1.0-.5	.5-.25	.25-.106	.106-.075	.075-.053	<.053	CLASS
0.61	0.12	0.68	1.36	2.02	9.34	17.94	17.78	50.76	SM
1.52-1.98	0.08	0.36	0.66	0.78	2.56	11.28	14.42	69.86	M
3.05-3.26	0.20	0.70	0.82	0.86	2.38	10.16	11.48	73.40	M
3.26-3.51	0.04	0.18	0.20	0.22	0.72	2.74	6.38	89.52	M
4.57-4.88	0.04	0.00	0.18	1.34	2.62	4.26	9.48	82.08	M
4.80-5.03	0.00	0.04	0.32	2.40	5.42	8.02	12.16	71.64	M
6.10-6.55	0.00	0.02	0.14	0.36	0.74	1.44	6.18	91.12	M
7.01-7.16	32.46	7.36	9.34	9.20	13.46	5.26	4.78	18.14	MSG

100

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