Chapter 11

INSTRUCTIONS FOR LOGGING SOILS

General

All subsurface investigations of soils for construction materials and for most engineering purposes using test pits, trenches, auger holes, drill holes, or other exploratory methods should be logged and described using the standards in USBR 5000 [1] and 5005 [1] (Unified Soil Classification System [USCS]) in accordance with the established descriptive criteria and descriptors presented in chapter 3 and the guidelines presented in this section.

All investigations associated with land classification for irrigation suitability, as well as data collection and analyses of soil and materials related to drainage investigations, should be logged and described using the U.S. Department of Agriculture terminology outlined in appendix I to *Agriculture Handbook No. 436* (Soil Taxonomy), dated December 1975 [2].

Test pits and auger holes may be logged on a form (figure 11-1), or logs may be computer generated. For metric design studies and specifications, information is to be in metric units. For specifications using English units, the written soil description should use metric units for the description of soil particle sizes (millimeters instead of inches). Example word descriptions are shown in figures 11-2 through 11-11.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. _____

FEATURE _____ PROJECT _____
AREA DESIGNATION _____ GROUND ELEVATION _____
COORDINATES N _____ E _____ METHOD OF EXPLORATION _____
APPROXIMATE DIMENSIONS _____ LOGGED BY _____
DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME)		
		3 - 5 in	5 - 12 in	PLUS 12 in

REMARKS:

1/ Report to nearest 0.1 foot

GPO 849-366

Figure 11-1.—Log of test pit or auger hole.

7-1336-A (1-86) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. _____

FEATURE _____ PROJECT _____
AREA DESIGNATION _____ GROUND ELEVATION _____
COORDINATES N _____ E _____ METHOD OF EXPLORATION _____
APPROXIMATE DIMENSIONS _____ LOGGED BY _____
DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 3000, 3005	% PLUS 3 in (BY VOLUME) 3 - 8 in	8 - 12 in	PLUS 12 in
GW 5.2 ft	0.0 to 5.2 ft WELL-GRADED GRAVEL WITH SAND: About 70% coarse to fine, hard, subangular gravel; about 30% coarse to fine, hard, subangular sand; trace of fines; maximum size, 75 mm; moist, brown; hard to auger; no reaction with HCl.			
SP 10.5 ft	5.2 to 10.5 ft POORLY GRADED SAND: About 95% fine to medium sand; about 5% fines; maximum size, medium sand; wet, yellow brown; hard to auger; weak reaction with HCl.			
GP 17.6 ft	10.5 to 17.6 ft POORLY GRADED GRAVEL WITH SAND: About 60% predominantly fine, hard, subangular to subrounded gravel; about 40% predominantly fine sand; trace of fines; maximum size, 40 mm; dry, tan; hard to auger; no reaction with HCl.			
SW 25.3 ft	17.6 to 25.3 ft WELL-GRADED SAND: About 85% coarse to fine, hard, subangular sand; about 10% coarse to fine, hard, subrounded gravel (about 1/3 of gravel particles are flat); about 5% fines; maximum size, 40 mm; wet, brown; hard to auger; weak reaction with HCl.			

REMARKS:

1/ Report to nearest 0.1 foot

GPO 869-306

Figure 11-2.—Clean coarse-grained soils.

7-1336-A (1-86) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. ____

FEATURE ____ PROJECT ____
AREA DESIGNATION ____ GROUND ELEVATION ____
COORDINATES N ____ E ____ METHOD OF EXPLORATION ____
APPROXIMATE DIMENSIONS ____ LOGGED BY ____
DEPTH WATER ENCOUNTERED 1/ ____ DATE ____ DATE(S) LOGGED ____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
CL 4.3 ft	0.0 to 4.3 ft LEAN CLAY: About 90% fines with medium plasticity, high dry strength, medium toughness; about 10% predominantly fine sand; maximum size, coarse sand; moist, brown; hard to auger; no reaction with HCl.			
ML 11.0 ft	4.3 to 11.0 ft SANDY SILT: About 70% nonplastic fines, rapid dilatancy, no dry strength; about 30% fine sand; maximum size, fine sand; wet, gray, faint organic odor; some roots present, easy to auger; weak reaction with HCl.			
CH 17.7 ft	11.0 to 17.7 ft FAT CLAY: About 90% fines with high plasticity, high to very high dry strength, high toughness; about 10% medium to fine sand; trace of gravel; maximum size, 20 mm; dry, reddish-brown; hard to auger; strong reaction with HCl.			
MH 25.5 ft	17.7 to 25.5 ft ELASTIC SILT: About 100% fines with low to medium plasticity, slow dilatancy, medium dry strength, low to medium toughness; trace of fine sand; maximum size, fine sand; wet, black; easy to auger; weak reaction with HCl.			

REMARKS

1/ Report to nearest 0.1 foot

GPO 844-680

Figure 11-3.—Fine-grained soils.

7-1236-A (1-86) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. _____

FEATURE _____ PROJECT _____

AREA DESIGNATION _____ GROUND ELEVATION _____

COORDINATES N _____ E _____ METHOD OF EXPLORATION _____

APPROXIMATE DIMENSIONS _____ LOGGED BY _____

DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 8 in	8 - 12 in	PLUS 12 in
GW (lab classif.) three sack samples 3.2 ft	0.0 to 3.2 ft WELL-GRADED GRAVEL WITH SAND: Sample had 64% coarse to fine, hard, subangular gravel; 34% coarse to fine, hard, subangular sand; 2% fines; maximum size, 75 mm; no reaction with HCl; Cu = 24, Cc = 1.8 IN-PLACE CONDITION: Homogeneous, moist, brown Three 50-lbm sack samples taken for testing from 18-inch-wide sampling trench for entire depth interval on east side of trench. Samples were mixed and quartered.			
CL (lab classif.) one sack sample 7.6 ft	3.2 to 7.6 ft LEAN CLAY WITH SAND: Sample had 84% fines; 16% predominantly fine sand; maximum size, coarse sand; no reaction with HCl; LL = 36, PI = 19. IN-PLACE CONDITION: Firm, homogeneous, moist, yellowish-brown. One-40 lbm sack sample taken for testing from 12-inch-wide sampling trench from 4.7 to 6.8 ft depth.			

REMARKS

1. Report to nearest 0.1 foot

GPO 849-391

Figure 11-4.—Soil classifications based on laboratory test data.

7-1336-A (1-86)
Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. ____

FEATURE ____ PROJECT ____
AREA DESIGNATION ____ GROUND ELEVATION ____
COORDINATES N ____ E ____ METHOD OF EXPLORATION ____
APPROXIMATE DIMENSIONS ____ LOGGED BY ____
DEPTH WATER ENCOUNTERED 1/ ____ DATE ____ DATE(S) LOGGED ____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
SC two sack samples 9.8 ft	0.0 to 9.8 ft CLAYEY SAND WITH GRAVEL: About 50% coarse to fine, hard, subangular to subrounded sand; about 25% fine, hard, subangular to subrounded gravel; about 25% fines with medium plasticity, high dry strength, medium toughness; maximum size, 20 mm; wet, reddish-brown; easy to auger; weak reaction with HCl. Two 50 lbm sack samples obtained by mixing and quartering entire interval.			
	Other typical descriptions of sampling: One 40-lbm sack sample is all soil removed in top 2.5 ft of interval. One 40-lbm sack sample is all soil removed from bottom 2.0 ft of interval. One 50-lbm sack sample obtained by mixing and quartering all soil removed from 3.4 to 7.2 ft in interval.			

REMARKS

1/ Report to nearest 0.1 foot

GPO 949-220

Figure 11-5.—Auger hole with samples taken.

7-13 6-A (1-80) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. _____

FEATURE _____ PROJECT _____

AREA DESIGNATION _____ GROUND ELEVATION _____

COORDINATES N _____ E _____ METHOD OF EXPLORATION _____

APPROXIMATE DIMENSIONS _____ LOGGED BY _____

DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 6 in	6 - 12 in	PLUS 12 in
GP (visual) GW (lab classif) three sack samples	0.0 to 3.2 ft POORLY GRADED GRAVEL WITH SAND: About 70% coarse to fine, hard, subangular gravel; about 30% coarse to fine, hard, subangular sand; trace of fines; maximum size, 75 mm; no reaction with HCl. IN-PLACE CONDITION: Homogeneous, moist, brown LAB TEST DATA: 64% gravel, 34% sand, 2% fines, Cu = 24, Cc = 1.8. Laboratory classification is WELL-GRADED GRAVEL WITH SAND. Three 50-lbm sack samples taken for testing from 18-inch-wide sampling trench for entire depth interval on east side of trench. Samples were mixed and quartered.			
3.2 ft				
CL (lab classif.) one sack sample	3.2 to 7.6 ft LEAN CLAY: About 90% fines with medium plasticity, high dry strength, medium toughness; about 10% predominantly fine sand; maximum size coarse sand; no reaction with HCl. IN-PLACE CONDITION: Firm, homogeneous, moist, yellowish-brown. LAB TEST DATA: 84% fines, 16% sand, LL = 36, PI = 19 One 40-lbm sack sample taken for testing from 12-inch-wide sampling trench from 4.7 to 6.8 ft depth.			
7.6 ft				

REMARKS

1/ Report to nearest 0.1 foot

GPO 849-391

Figure 11-6.—Reporting laboratory classification in addition to visual classification.

7-1330-A (1-86) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. _____

FEATURE _____ PROJECT _____

AREA DESIGNATION _____ GROUND ELEVATION _____

COORDINATES N _____ E _____ METHOD OF EXPLORATION _____

APPROXIMATE DIMENSIONS _____ LOGGED BY _____

DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME)		
		3 - 6 in	6 - 12 in	PLUS 12 in
CL	0.0 to 4.2 ft LEAN CLAY: About 90% fines with medium plasticity, high dry strength, medium toughness; about 10% predominantly fine sand; maximum size, medium sand; strong reaction with HCl. IN-PLACE CONDITION: Soft, homogeneous, wet, brown GEOLOGIC INTERPRETATION: highly weathered Niobrara formation			
4.2 ft				
SC	4.2 to 9.8 ft CLAYEY SAND WITH GRAVEL: About 50% coarse to fine, hard, subangular to subrounded sand; about 25% fine, hard, subangular to subrounded gravel; about 25% fines with medium plasticity, high dry stength, medium toughness; maximum size, 20 mm; weak reaction with HCl. IN-PLACE CONDITION: Firm, homogeneous except for occasional lenses of clean fine sand 1/4 inch to 1 inch thick, moist, reddish-brown GEOLOGIC INTERPRETATION: alluvial fan			
9.8 ft				

REMARKS

1/ Report to nearest 0.1 foot

GPO 888-388

Figure 11-7.—Undisturbed soils.

7-1336-A (1-86) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. ____

FEATURE ____ PROJECT ____
AREA DESIGNATION ____ GROUND ELEVATION ____
COORDINATES N ____ E ____ METHOD OF EXPLORATION ____
APPROXIMATE DIMENSIONS ____ LOGGED BY ____
DEPTH WATER ENCOUNTERED 1/ ____ DATE ____ DATE(S) LOGGED ____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 8 in	8 - 12 in	PLUS 12 in
SM 3.1 ft	0.0 to 3.1 ft SILTY SAND: About 70% coarse to fine, hard, angular sand; about 25% nonplastic fines, rapid dilatancy, no dry strength; about 5% fine, hard, angular gravel; maximum size, 10 mm; moist, brown, faint organic odor; some roots present, easy to auger; no reaction with HCl.			
GC 6.7 ft	3.1 to 6.7 ft CLAYEY GRAVEL: About 75% coarse to fine, hard, subrounded gravel; about 15% fines with medium plasticity, high dry strength, medium toughness; about 10% coarse, hard, subrounded sand; maximum size, 75 mm; dry, brown; hard to auger; strong reaction with HCl.			
SC 9.8 ft	6.7 to 9.8 ft CLAYEY SAND WITH GRAVEL: About 50% coarse to fine, hard, subangular to subrounded sand; about 25% fine, hard, subangular to subrounded gravel; about 25% fines with medium plasticity, high dry strength, medium toughness; maximum size, 20 mm; wet, reddish-brown; easy to auger; weak reaction with HCl.			

REMARKS

1/ Report to nearest 0.1 foot

GPO 84 ...

Figure 11-8.—Coarse-grained soils with fines.

7 1336 A (1 86) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO _____

FEATURE _____ PROJECT _____

AREA DESIGNATION _____ GROUND ELEVATION _____

COORDINATES N _____ E _____ METHOD OF EXPLORATION _____

APPROXIMATE DIMENSIONS _____ LOGGED BY _____

DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

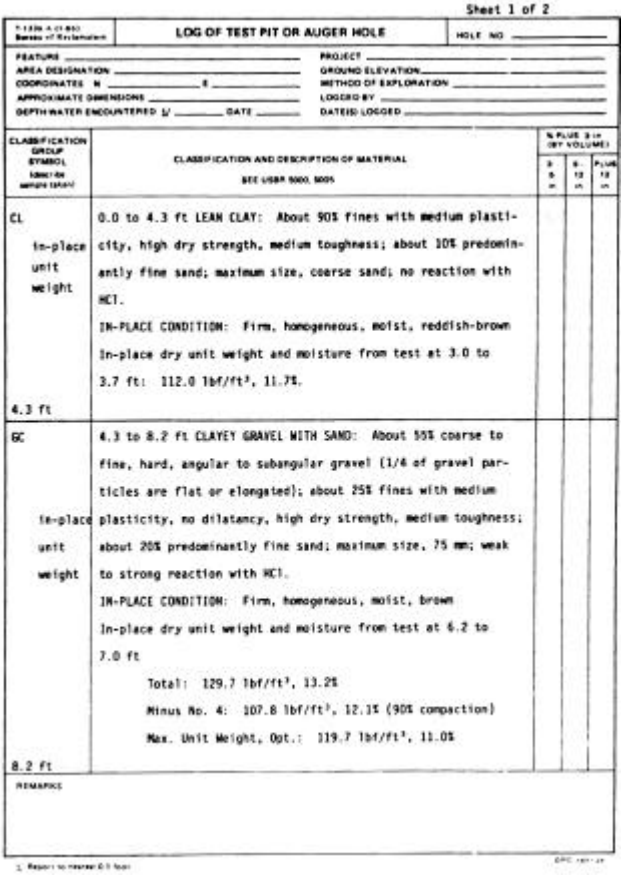
CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME)		
		3 to 5 in	5 to 12 in	PLUS 12 in
GP-GC	0.0 to 7.2 ft POORLY GRADED GRAVEL WITH CLAY AND SAND: About 60% coarse to fine, hard, subangular gravel; about 30% predominantly fine sand; about 10% fines with medium plasticity, high dry strength, medium toughness; maximum size, 75 mm; moist, tan; hard to auger; weak reaction with HCl.			
7.2 ft				

REMARKS

1/ Report to nearest 0.1 foot

GPO 848-240

Figure 11-9.—Coarse-grained soils with dual symbols.



Sheet 1 of 2

Bureau of Reclamation — LOG OF TEST PIT OR AUGER HOLE — HOLE NO. _____

FEATURE _____ PROJECT _____
AREA DESIGNATION _____ GROUND ELEVATION _____
COORDINATES N _____ E _____ METHOD OF EXPLORATION _____
APPROXIMATE DIMENSIONS _____ LOGGED BY _____
DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (and/or sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE USBR 5000, 5005)	% PLUS 3 in (BY VOLUME) 3 to 6 in	6 to 12 in	PLUS 12 in
CL in-place unit weight 4.3 ft	0.0 to 4.3 ft LEAN CLAY: About 90% fines with medium plasticity, high dry strength, medium toughness; about 10% predominantly fine sand; maximum size, coarse sand; no reaction with HCl. IN-PLACE CONDITION: Firm, homogeneous, moist, reddish-brown In-place dry unit weight and moisture from test at 3.0 to 3.7 ft: 112.0 lbf/ft³, 11.7%.			
GC in-place unit weight 8.2 ft	4.3 to 8.2 ft CLAYEY GRAVEL WITH SAND: About 55% coarse to fine, hard, angular to subangular gravel (1/4 of gravel particles are flat or elongated); about 25% fines with medium plasticity, no dilatancy, high dry strength, medium toughness; about 20% predominantly fine sand; maximum size, 75 mm; weak to strong reaction with HCl. IN-PLACE CONDITION: Firm, homogeneous, moist, brown In-place dry unit weight and moisture from test at 6.2 to 7.0 ft Total: 129.7 lbf/ft³, 13.2% Minus No. 4: 107.8 lbf/ft³, 12.1% (90% compaction) Max. Unit Weight, Opt.: 119.7 lbf/ft³, 11.0%			

REMARKS

1/ Report to nearest 0.1 foot

Figure 11-10.—Reporting in-place density tests and percent compaction.

7-1336-A (1-86) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. _____

FEATURE _____ PROJECT _____
AREA DESIGNATION _____ GROUND ELEVATION _____
COORDINATES N _____ E _____ METHOD OF EXPLORATION _____
APPROXIMATE DIMENSIONS _____ LOGGED BY _____
DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 6 in	6 - 12 in	PLUS 12 in
(GW)scb	0.0 to 7.4 ft WELL-GRADED GRAVEL WITH SAND, COBBLES, AND BOULDERS: About 70% coarse to fine, hard, subrounded gravel; about 30% coarse to fine, hard, subangular sand; trace of fines; no reaction with HCl. TOTAL SAMPLE (BY VOLUME): 22% 3- to 5-inch hard, subrounded cobbles; 14% 5to 12-inch hard, rounded cobbles; 2 percent plus 12-inch hard, subrounded boulders; remainder minus 3-inch; maximum dimension, 400 mm. IN-PLACE CONDITION: homogeneous, dry, brown GEOLOGIC INTERPRETATION: alluvial fan	22	14	2
7.4 ft				

REMARKS:

1/ Report to nearest 0.1 foot

GPO 849-384

Figure 11-11.—Soil with measured percentages of cobbles and boulders.

Formats for Test Pits and Auger Hole Logs

General Instructions

The following subsection provides general instructions for log format and descriptions. Refer to chapter 3 for descriptive criteria, classification, and group names and symbols.

• Capitalize the group name. If cobbles and boulders are present, include them in the typical name.

• Describe plasticity of fines as:

"approximately 30 percent (%) fines with high plasticity"
"approximately 60% fines with low to medium plasticity"
"approximately 10% nonplastic fines"

• Give results of hand tests when performed.

• Use "reaction with hydrochloric acid (HCl)."

• Do not give unnecessary information such as "no odor," "no gravel," and "no fines."

However, the negative result of a hand test is positive information and should be reported as "no dilatancy," "nonplastic," "no dry strength," or "no reaction with HCl."

For reporting maximum particle size, use the following:

Fine sand
Medium sand
Coarse sand
5-millimeter (mm) increments from 5 mm to 75 mm
25-mm increments from 75 mm to 300 mm
100-mm increments over 300 mm

For example, “maximum particle size 35 mm” or “maximum particle size 400 mm” are the correct format and size increment.

Table 11-1 is a checklist for log descriptors. Format for descriptions, results, and other information are in the following subsections.

Table 11-1.—Checklist for the description of soils in test pit and auger hole logs

1. Group symbol. - Capitalized and shown in the left-hand column.
2. Depth. - Depths of interval classified, shown in either meters or feet and tenths of units in second column from the left.
3. Identification of sample. - Type and size of sample and origin of sample, shown in third column from the left.
4. Classification and description column. -
    a. First paragraph. -
        (1) Depth of interval classified
        (2) Group name capitalized
        (3) Percent of fines sand and gravel by weight (include trace amounts but not added to percentage which must equal 100 percent)
        (4) Description of particles
            (a) Particle size range: describe as either gravel - fine or coarse, or sand—fine, medium, or coarse
            (b) Hardness of particles (coarse sand and larger)
            (c) Particle angularity (angular, subangular, sub-rounded, or rounded)
            (d) Particle shape (flat, elongated, or flat and elongated)
            (e) Maximum particle size or dimension

(5) Description of fines
(a) Plasticity (nonplastic, low, medium, or high)
(b) Dilatancy (none, slow, or rapid)
(c) Dry strength (none, low, medium, high, or very high)
(d) Toughness (low, medium, or high)
(6) Moisture condition (dry, moist, or wet)
(7) Color (moist color)
(8) Odor (mention only if organic or unusual)
(9) Reaction with HCl (none, weak, or strong)

b. TOTAL SAMPLE (BY VOLUME): second paragraph, if applicable - i.e., more than 50 percent plus 75-mm material
(1) Percent of cobbles and percent of boulders
(2) Same information as item 4.a (4)

c. IN-PLACE CONDITION: third paragraph (second paragraph if less than 50 percent oversize)
(1) Consistency; fine-grained soils only (very soft, soft, firm, hard, or very hard)
(2) Structure (stratified, lensed, slickensided, blocky, fissured, homogeneous)
(3) Cementation (weak, moderate, strong)
(4) Moisture (if an in-place condition paragraph is included, moisture is not described in the first paragraph)
(5) Color (if an in-place condition paragraph is included, color is not described in the first paragraph)
(6) Result of in-place density and/or moisture tests

d. GEOLOGIC INTERPRETATION: (fourth paragraph) geologic description including genetic name, stratigraphic name if known, and any local name.

5. Remarks block. - Provide additional description or remarks such as root holes, other debris found, caving, degree of difficulty to auger or excavate, reason for refusal or reached predetermined depth, and water level information or hole completion.

Figure 11-12 is a field form for logging soils.

Reporting by Method of Classification

Preparation of Logs Based on Visual Classification.—List fines, sand, and gravel in descending order of percent (must add up to 100 percent). For visual classification, estimate percentages to the closest 5 percent. Precede the estimated percentages with "approx.," not "about." If a component is present but is less than 5 percent of the total, use "trace." "Trace" is not included in the 100 percent.

Preparation of Logs Based on Laboratory Classification.—When logs are prepared using laboratory classifications (based on laboratory tests), the information must be presented on the log as shown in figure 11-4. The difference between a laboratory and a visual classification is depicted in figure 11-6.

The visual classification should not be changed, nor should the estimated percentages, plasticity description, or the results of the hand tests (dry strength, dilatancy, and toughness) be changed to reflect laboratory tests results. The visual classification is based on the total material observed; whereas, the laboratory classification is based on a representative sample of the material.

LOGGING SOILS

FIELD FORM—SOIL LOGGING **HOLE NO.** ____

DATE _____ PROJECT _____ FEATURE _____
AREA _____ DRILLER _____ LOGGED BY _____

SAMPLE INTERVAL AND TYPE:

Type Sample Interval _____ Sample Weight (Lbs) _____ Moisture Sample Interval_____

Typical Name _____
Group Symbol _____

SIZE DISTRIBUTION, CHARACTERISTICS:

(5-mm increments from 5 to 75 mm, 255-mm increments from 75 to 300 mm, 100mm increments over 300 mm)

Boulders (>300 mm) __% (vol.) Max. size (mm) __ Hardness __ Angularity _____

Cobbles (75-300 mm) __% (vol.) Max. size (mm) ___ Hardness ___ Angularity ____

Gravel __% Coarse (20-75 mm) __ Fine (5-20 mm) ___ Hardness ___ Angularity __

Sand ___% Coarse ___ Medium ___ Fine ___ Hardness ___ Angularity _____

Fines _____%

Plasticity: Nonplastic _____ Low _____ Medium _____ High _____
Dilatancy: No _____ Slow _____ Rapid _____
Dry Strength: No ____ Low ____ Medium ____ High ____ Very High ____
Toughness: Low _____ Medium _____ High _____

Maximum Size: Fine Sand ____ Medium Sand ____ Coarse Sand ____ ____mm

Moisture: Dry _____ Moist _____ Wet _____

Color _____ Odor _____ Organic Debris and Type _____

Reaction with HCl: None _____ Weak _____ Strong _____

EXCAVATING/AUGERING/DRILLING CONDITIONS:

Hardness: Very Soft _____ Soft _____ Hard _____ Very Hard _____

Penetration Action: Smooth ___ Mod. Smooth ___ Mod. Rough ___ Rough ____

Penetration Rate: Very Fast ____ Fast _____ Slow _____ Very Slow _____

PAGE ___ OF ___

Figure 11-12.—Field form - soil logging.

The specimens for testing are to be samples that represent the entire interval being described (see USBR 7000 and 7010 [1]). The material collected must be split or quartered to obtain the specimen that is to be tested in the laboratory.

Coefficients of uniformity and curvature (C_u and C_c) are to be calculated and reported on the logs for coarse-grained materials containing 12 percent or less fines.

Laboratory gradation percentages and Atterberg limits are to be reported to the nearest whole number.

Procedures for Reporting Laboratory Data in Addition to Visual Classification and Description.—In some instances, gradation analyses and Atterberg limit tests are performed on soil samples in conjunction with preparation of logs of test pits or auger holes. These data should be shown on the logs and clearly identified as laboratory test data.

Specimens for testing are to be from samples that represent the entire interval being described. If this is not possible, the location of the sample should be given as part of the word description. The sample taken should be split or quartered to get the specimen size required for testing (figure 11-5, interval 0.0 to 9.8 feet (ft).

Laboratory test data are to be presented in a separate paragraph. If the test results indicate a different classification, and therefore different group symbol and/or group name than the visual classification, give the laboratory classification symbol and name in this paragraph (figure 11-6).

Note: For logs which incorporate the test results, the statement "Classification by laboratory" should be placed in the "Remarks" portion of the log.

Coefficients of uniformity and curvature (C_u and C_c) are to be calculated and reported on the logs for coarse-grained materials containing 12 percent or less fines.

All laboratory gradation percentages and Atterberg limits are to be reported to the nearest whole number.

Reporting Undisturbed (In-Place) Conditions

List in-place conditions on logs of test pits in a separate paragraph (figure 11-7). Do not give in-place soil conditions (consistency, compactness) on auger hole logs (unless the holes are large enough to inspect). Instead, describe difficulty of augering (figure 11-8). Also describe caving or any other unusual occurrences during drilling of the auger hole.

In-place density tests are often performed in test pits or trenches. When a large quantity of logs are reviewed, density information on the log can save time, even though additional time is required for preparation of the log.

Results of in-place density tests that are performed in test pits or trenches are to be included on the log in the descriptive paragraph on in-place conditions, as illustrated in figure 11-10.

Results of any laboratory compaction tests (Proctor, minimum and maximum density) performed on the material from the in-place density tests or from the pit or trench are to be included on the log.

For pipeline investigations, the percent of the maximum dry density or the percent relative density should be in parentheses on the logs (figure 11-10).

Densities are reported to the nearest 0.1 pound per cubic foot (lb/ft^3) or 1 kilogram per cubic meter (kg/m^3). Moisture content is reported to the nearest 0.1 percent. Percent of laboratory maximum dry density or relative density is reported to the nearest whole number.

Geologic Interpretations

Geologic interpretations should be made by or under the supervision of a geologist. Give geologic interpretation in a separate paragraph (figure 11-7). Interpretation should also be included in the narrative section of the materials portion of the design data submittals.

Description Formats on Test Pit and Auger Hole Logs for Soils with Cobbles and Boulders

If the soil has less than 50 percent cobbles and boulders (by volume), give the group name of the minus 75-mm portion and include cobbles and/or boulders in the group name (figure 11-11). Use two paragraphs to describe soil. Refer to chapter 3 for a more complete discussion of classification and classification group names and symbols.

• Describe the minus 75-mm fraction in the first paragraph. These component percentages are estimated by weight.

• Describe the total sample in a second paragraph. These percentages are estimated by volume. Even if the percentage of cobbles and boulders is determined by measurement, use “approx.” in the word description.

If the soil has more than 50 percent cobbles and boulders (by volume), list cobbles and boulders first in the name (figure 11-13). Do not give a group symbol or group name.

• Describe the total sample in the first paragraph. Percentages are estimated by volume.

• Describe the minus 75-mm fraction in a second paragraph. Percentages are estimated by weight.

Angular particles larger than 75 mm are described as cobbles and boulders, not as rock fragments. A description of their shape should be provided in the word description.

Description of Materials Other than Natural Soils

Materials which are not natural soils are not described or classified in the same manner as natural soils. The section titled "Use of Soil Classification as Secondary Identification Methods for Materials other than Natural Soils", chapter 3, outlines the criteria to be followed and provides example descriptions for test pit and auger hole logs. Refer to appropriate sections in chapter 3 for example format and descriptions. Figures 11-14 through 11-17 show a variety of logs of test pits and auger holes reflecting miscellaneous conditions.

Format of Word Descriptions for Drill Hole Logs

The descriptions of surficial deposits and soil-like materials in geologic logs of exploration holes should use similar descriptive criteria and format established for test pits and auger holes except as noted in the following paragraphs.

7-1336 A (1-86)
Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. _____

FEATURE _____ PROJECT _____
AREA DESIGNATION _____ GROUND ELEVATION _____
COORDINATES N _____ E _____ METHOD OF EXPLORATION _____
APPROXIMATE DIMENSIONS _____ LOGGED BY _____
DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

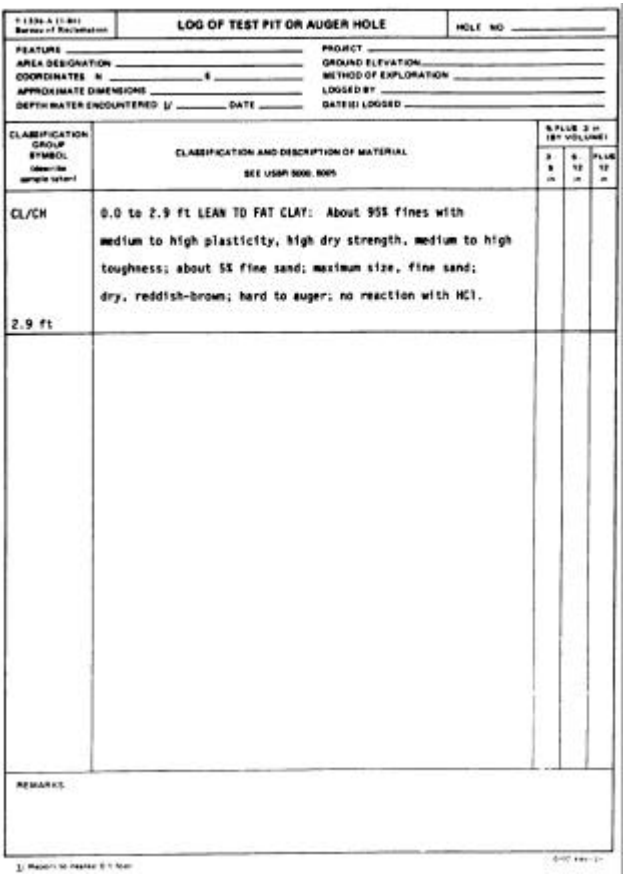
CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 3000, 3006	% PLUS 3 in (BY VOLUME)		
		3 - 8 in	8 - 12 in	PLUS 12 in
Cobbles and Boulders	0.0 to 4.5 ft COBBLES AND BOULDERS WITH SILTY GRAVEL AND SAND: TOTAL SAMPLE (BY VOLUME): About 35% 3- to 5-inch hard, subrounded cobbles; about 30% 5- to 12-inch hard, subangular to subrounded cobbles; about 5% hard, subrounded boulders; remainder minus 3 inch; maximum dimension, 600 mm. MINUS 3-inch FRACTION (BY MASS): About 40% coarse to fine, hard, subrounded gravel; about 30% coarse to fine, hard, subrounded sand; about 30% nonplastic fines; no reaction with HCl. IN-PLACE CONDITION: homogeneous, moist, brown	35	30	5
4.5 ft				

REMARKS

1/ Report to nearest 0.1 foot

GPO 849-361

Figure 11-13.—Soil with more than 50 percent cobbles and boulders.



LOG OF TEST PIT OR AUGER HOLE

HOLE NO. _____

FEATURE _____ PROJECT _____

AREA DESIGNATION _____ GROUND ELEVATION _____

COORDINATES N _____ E _____ METHOD OF EXPLORATION _____

APPROXIMATE DIMENSIONS _____ LOGGED BY _____

DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (Describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 in	6 in	PLUS 12 in
CL/CH	0.0 to 2.9 ft LEAN TO FAT CLAY: About 95% fines with medium to high plasticity, high dry strength, medium to high toughness; about 5% fine sand; maximum size, fine sand; dry, reddish-brown; hard to auger; no reaction with HCl.			
2.9 ft				

REMARKS

1/ Report to nearest 0.1 foot

Figure 11-14.—Borderline soils.

7-1336-A (1-66) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. ____ ____

FEATURE ____ PROJECT ____

AREA DESIGNATION ____ GROUND ELEVATION ____

COORDINATES N ____ E ____ METHOD OF EXPLORATION ____

APPROXIMATE DIMENSIONS ____ LOGGED BY ____

DEPTH WATER ENCOUNTERED 1/ ____ DATE ____ DATE(S) LOGGED ____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 6 in	6 - 12 in	PLUS 12 in
CL three sack samples 4.2 ft	0.0 to 4.2 ft LEAN CLAY: About 90% fines with medium plasticity, high dry strength, medium toughness; about 10% predominantly fine sand; maximum size, medium sand; strong reaction with HCl. IN-PLACE CONDITION: Soft, homogeneous, wet, brown. Three 50-lbm sack samples taken from 12-inch-wide sampling trench for entire interval on north side of test pit. Samples mixed and quartered.			
(SC)g block sample 9.8 ft	4.2 to 9.8 ft CLAYEY SAND WITH GRAVEL: About 50% coarse to fine, hard, subangular to subrounded sand; about 25% fine, hard, subangular to subrounded gravel; about 25% fines with medium plasticity, high dry strength, medium toughness; maximum size, 20 mm; weak reaction with HCl. IN-PLACE CONDITION: Firm, homogeneous except for occasional lenses of clean fine sand 1/4 inch to 1 inch thick, moist, reddish-brown. 12- by 12-inch block sample taken at 6.0 to 7.0 ft depth, at center of south side of test pit.			

REMARKS

1/ Report to nearest 0.1 foot

GPO 849-381

Figure 11-15.—Test pit with samples taken.

9-1336-A (1-66) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. _____

FEATURE _____ PROJECT _____

AREA DESIGNATION _____ GROUND ELEVATION _____

COORDINATES N _____ E _____ METHOD OF EXPLORATION _____

APPROXIMATE DIMENSIONS _____ LOGGED BY _____

DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

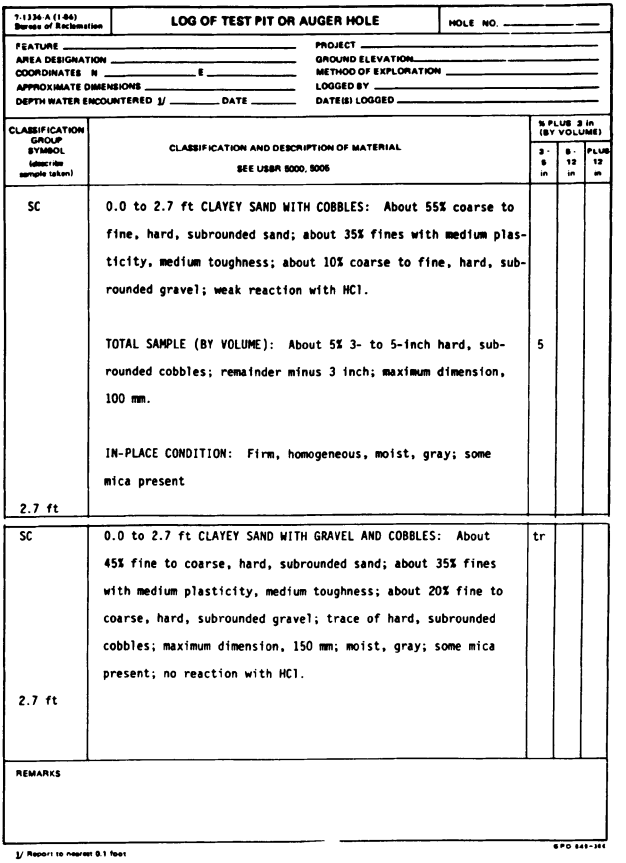
CLASSIFICATION GROUP SYMBOL (Describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 3000, 3006	% PLUS 3 in (BY VOLUME) 3 - 8 in	8 - 12 in	PLUS 12 in
SM 3.1 m	0.0 to 3.1 m SILTY SAND: About 70% coarse to fine, hard, angular sand; about 25% nonplastic fines, rapid dilatancy, no dry strength; about 5% fine, hard, angular gravel; maximum size, 10 mm; moist, brown, faint organic odor; some roots present, easy to auger; no reaction with HCl.			
GC 6.7 m	3.1 to 6.7 m CLAYEY GRAVEL: About 75% coarse to fine, hard, subrounded gravel; about 15% fines with medium plasticity, high dry strength, medium toughness; about 10% coarse, hard, subrounded sand; maximum size, 75 mm; dry, brown; hard to auger; strong reaction with HCl.			
SM/ML 9.7 m	6.7 to 9.7 m SILTY SAND: About 55% medium to fine sand; about 45% nonplastic fines, slow dilatancy; maximum size, medium sand; wet, reddish-brown; easy to auger; no reaction with HCl.			

REMARKS

1/ Report to nearest 0.1 foot

GPO 848-389

Figure 11-16.—Disturbed samples.



7-1336-A (1-86) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. _____

FEATURE _____ PROJECT _____
AREA DESIGNATION _____ GROUND ELEVATION _____
COORDINATES N _____ E _____ METHOD OF EXPLORATION _____
APPROXIMATE DIMENSIONS _____ LOGGED BY _____
DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5006	% PLUS 3 in (BY VOLUME) 3 - 6 in	6 - 12 in	PLUS 12 in
SC	0.0 to 2.7 ft CLAYEY SAND WITH COBBLES: About 55% coarse to fine, hard, subrounded sand; about 35% fines with medium plasticity, medium toughness; about 10% coarse to fine, hard, subrounded gravel; weak reaction with HCl. TOTAL SAMPLE (BY VOLUME): About 5% 3- to 5-inch hard, subrounded cobbles; remainder minus 3 inch; maximum dimension, 100 mm. IN-PLACE CONDITION: Firm, homogeneous, moist, gray; some mica present	5		
2.7 ft				
SC	0.0 to 2.7 ft CLAYEY SAND WITH GRAVEL AND COBBLES: About 45% fine to coarse, hard, subrounded sand; about 35% fines with medium plasticity, medium toughness; about 20% fine to coarse, hard, subrounded gravel; trace of hard, subrounded cobbles; maximum dimension, 150 mm; moist, gray; some mica present; no reaction with HCl.	tr		
2.7 ft				

REMARKS

1/ Report to nearest 0.1 foot

GPO 848-384

Figure 11-17.—Two descriptions from the same horizon. (Top) Undisturbed soil containing estimated percent of boulders. (Bottom) Disturbed soil containing trace of cobbles.

Exceptions to Test Pit and Auger Hole Format and Descriptions for Drill Hole Logs

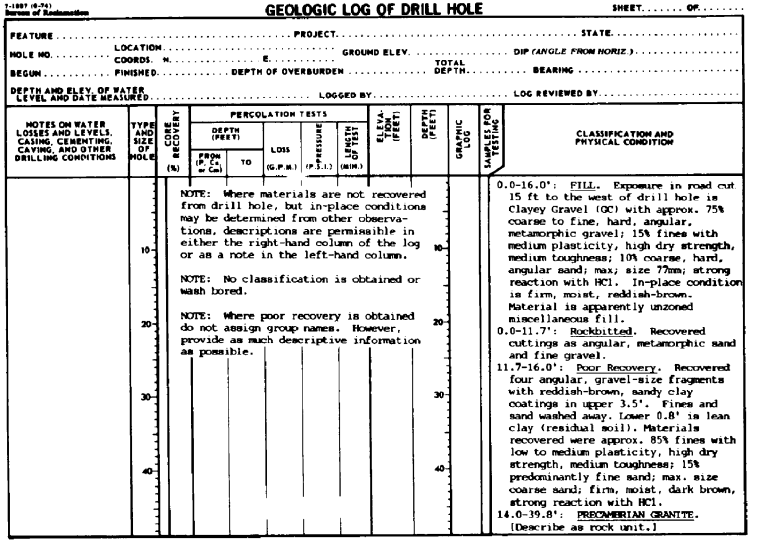
Unlike test pit logs where geologic interpretations may be provided at the bottom of the log form, geologic interpretations are required on drill hole logs. The geologic classification (e.g., Quaternary Alluvium, Quaternary Glacial Outwash, Quaternary Landslide, Tertiary Basin Fill Deposits) should be provided as main headings on the geological drill hole log.

Group names are capitalized in all test pit and auger hole logs. Where capitalization of the group name would conflict with main headings on drill hole logs, capitalize only the first letter of each word of the group name and the group symbol. If the first letter of each word is not capitalized, the group name is considered informal usage only and not a classification.

Classification and word description format for drill hole logs is similar to those used for test pit logs. Also, materials recovered from drill holes are generally considered to represent in-place conditions. These criteria do not apply when samples are not recovered or when poor recovery precludes classification (figure 11-18).

Samples Recovered from Wash Borings or as Cuttings

When drill holes are advanced with a rock bit, water jet, or other nonsampling methods, a group symbol and name or classification of the recovered materials should not be assigned, nor should in-place descriptions, such as consistency, be used. However, descriptive criteria, such as particle size, dry strength, and reaction with HCl, should be provided using the same terminology and format used for auger holes.



7-1697 (6-76)
Bureau of Reclamation

GEOLOGIC LOG OF DRILL HOLE

SHEET..... OF.....

FEATURE..... PROJECT..... STATE.....

HOLE NO..... LOCATION..... GROUND ELEV..... DIP (ANGLE FROM HORIZ.).....
COORDS. N..... E..... TOTAL DEPTH.....

BEGUN..... FINISHED..... DEPTH OF OVERBURDEN..... BEARING.....

DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED..... LOGGED BY..... LOG REVIEWED BY.....

NOTES ON WATER LOSSES AND LEVELS, CASING, CEMENTING, CAVING, AND OTHER DRILLING CONDITIONS	TYPE AND SIZE OF HOLE	CORE RECOVERY (%)	PERCOLATION TESTS: DEPTH (FEET) FROM (P.C. or Cm)	DEPTH (FEET) TO	LOSS (G.P.M.)	PRESSURE (P.S.I.)	LENGTH OF TEST (MIN.)	ELEVATION (FEET)	DEPTH (FEET)	GRAPHIC LOG	SAMPLES FOR TESTING	CLASSIFICATION AND PHYSICAL CONDITION
												0.0-16.0': FILL. Exposure in road cut 15 ft to the west of drill hole is Clayey Gravel (GC) with approx. 75% coarse to fine, hard, angular, metamorphic gravel; 15% fines with medium plasticity, high dry strength, medium toughness; 10% coarse, hard, angular sand; max; size 77mm; strong reaction with HCl. In-place condition is firm, moist, reddish-brown. Material is apparently unzoned miscellaneous fill.
												0.0-11.7': Rockbitted. Recovered cuttings as angular, metamorphic sand and fine gravel.
												11.7-16.0': Poor Recovery. Recovered four angular, gravel-size fragments with reddish-brown, sandy clay coatings in upper 3.5'. Fines and sand washed away. Lower 0.8' is lean clay (residual soil). Materials recovered were approx. 85% fines with low to medium plasticity, high dry strength, medium toughness; 15% predominantly fine sand; max. size coarse sand; firm, moist, dark brown, strong reaction with HCl.
												14.0-39.8': PRECAMBRIAN GRANITE. [Describe as rock unit.]

NOTE: Where materials are not recovered from drill hole, but in-place conditions may be determined from other observations, descriptions are permissible in either the right-hand column of the log or as a note in the left-hand column.

NOTE: No classification is obtained or wash bored.

NOTE: Where poor recovery is obtained do not assign group names. However, provide as much descriptive information as possible.

10
20
30
40

Figure 11-18.—Drill hole advanced by tri-cone rock bit.

Descriptions should be preceded by "Recovered cuttings as . . ." or "Recovered wash samples as. . ." (figure 11-18, interval 0.0-11.7 ft.

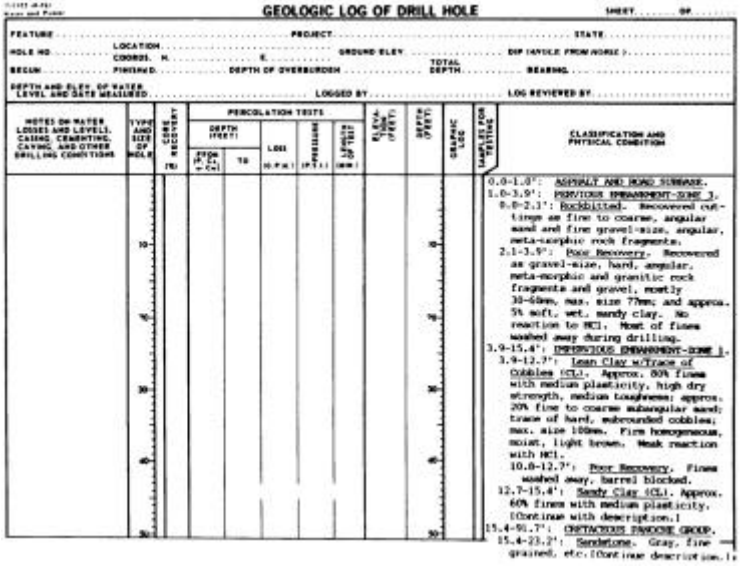
Poor or Partial Recovery

Where poor or partial recovery precludes accurate classification, a primary classification should not be assigned, but as much descriptive information as possible should be provided. Recovered materials, together with drilling conditions, cuttings, and drilling fluid color or losses, may be used to interpret reasons for losses and types of materials lost. However, an appropriate subheading (i.e., "Poor Recovery") should be used (figure 11-19, 2.1 to 3.9 ft.

Materials Other Than Soils and Special Cases

As discussed in chapter 3, "Use of Soil Classification as Secondary Identification Methods for Materials Other Than Natural Soils," exceptions to the test pit and hole classification and format are also applicable to hole logs. These special cases include processed or manmade materials, shells, partially lithified or poorly cemented materials and decomposed bedrock, and shallow surficial deposits or soils. Other special categories of soil-like materials should be classified by USBR 5000 or USBR 5005[1]. These are soil-like slide-failure zones or planes; shear or fault zones; bedrock units which are recovered as soil-like material or consist of soil-like material; and landslides and talus (figures 11-20, 11-21, and 11-22).

Format and classification for these exceptions are described below.



GEOLOGIC LOG OF DRILL HOLE

SHEET ..... OF .....

FEATURE ..... PROJECT ..... STATE .....

HOLE NO. ..... LOCATION ..... GROUND ELEV. ..... DIP (ANGLE FROM HORIZ.) .....

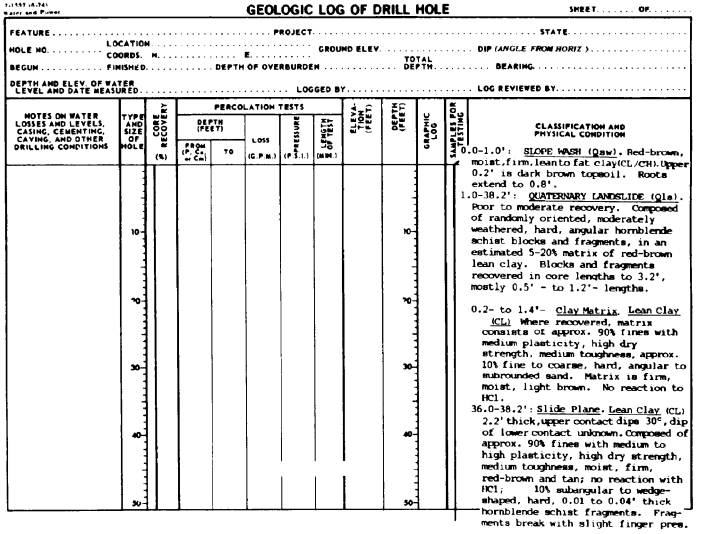
COORDS. N. ..... E. .....

BEGUN ..... FINISHED ..... DEPTH OF OVERBURDEN ..... TOTAL DEPTH ..... BEARING .....

DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED ..... LOGGED BY ..... LOG REVIEWED BY .....

NOTES ON WATER LOSSES AND LEVELS, CASING, CEMENTING, CAVING, AND OTHER DRILLING CONDITIONS	TYPE AND SIZE OF HOLE	CORE RECOVERY (%)	PERCOLATION TESTS: DEPTH (FEET) FROM (ft, in.)	TO	LOSS (U.S.P.M.)	PRESSURE (P.S.I.)	LENGTH OF TEST (MIN.)	ELEVATION (FEET)	DEPTH (FEET)	GRAPHIC LOG	SAMPLES FOR TESTING	CLASSIFICATION AND PHYSICAL CONDITION
									0			0.0-1.0': ASPHALT AND ROAD SUBBASE. 1.0-3.9': IMPERVIOUS EMBANKMENT-ZONE 3. 0.0-2.1': Rockdrilled. Recovered cuttings as fine to coarse, angular sand and fine gravel-size, angular, meta-morphic rock fragments. 2.1-3.9': Poor Recovery. Recovered as gravel-size, hard, angular, meta-morphic and granitic rock fragments and gravel, mostly 30-60mm, max. size 77mm; and approx. 5% soft, wet, sandy clay. No reaction to HCl. Most of fines washed away during drilling. 3.9-15.4': IMPERVIOUS EMBANKMENT-ZONE 1. 3.9-12.7': Lean Clay w/Trace of Cobbles (CL). Approx. 80% fines with medium plasticity, high dry strength, medium toughness; approx. 20% fine to coarse subangular sand; trace of hard, subrounded cobbles; max. size 100mm. Firm homogeneous, moist, light brown. Weak reaction with HCl. 10.0-12.7': Poor Recovery. Fines washed away, barrel blocked. 12.7-15.4': Sandy Clay (CL). Approx. 60% fines with medium plasticity. (Continue with description.) 15.4-91.7': CRETACEOUS PARDEE GROUP. 15.4-23.2': Sandstone. Gray, fine — grained, etc. (Continue description.)
									10			
									20			
									30			
									40			
									50			

Figure 11-19.—Log showing poor recovery.



GEOLOGIC LOG OF DRILL HOLE

SHEET..... OF.....

FEATURE..... PROJECT..... STATE.....

HOLE NO..... LOCATION..... GROUND ELEV..... DIP (ANGLE FROM HORIZ.).....

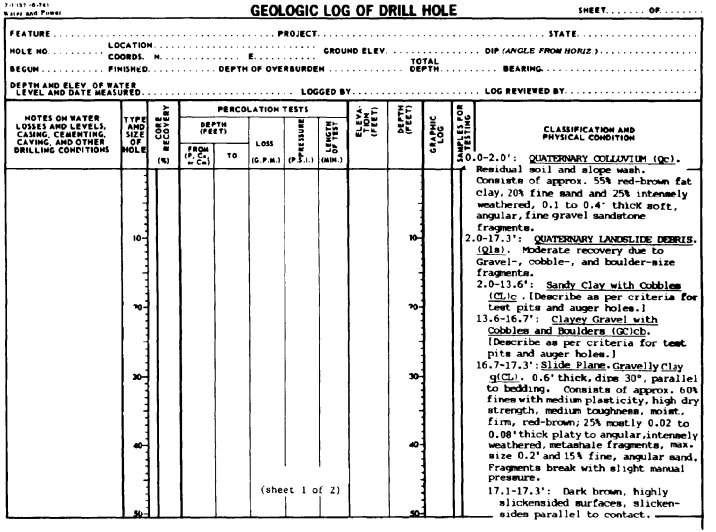
COORDS. N..... E..... TOTAL DEPTH..... BEARING.....

BEGUN..... FINISHED..... DEPTH OF OVERBURDEN.....

DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED..... LOGGED BY..... LOG REVIEWED BY.....

NOTES ON WATER LOSSES AND LEVELS, CASING, CEMENTING, CAVING, AND OTHER DRILLING CONDITIONS	TYPE AND SIZE OF HOLE	CORE RECOVERY (%)	PERCOLATION TESTS: DEPTH (FEET) FROM (Zero = Ck)	DEPTH (FEET) TO	LOSS (G.P.M.)	W PRESSURE (P.S.I.)	LENGTH OF TEST (MIN.)	ELEVATION (FEET)	DEPTH (FEET)	GRAPHIC LOG	SAMPLES FOR TESTING	CLASSIFICATION AND PHYSICAL CONDITION
									0			0.0-1.0': SLOPE WASH (Qsw). Red-brown, moist, firm, lean to fat clay (CL/CH). Upper 0.2' is dark brown topsoil. Roots extend to 0.8'.
									10			1.0-38.2': QUATERNARY LANDSLIDE (Qls). Poor to moderate recovery. Composed of randomly oriented, moderately weathered, hard, angular hornblende schist blocks and fragments, in an estimated 5-20% matrix of red-brown lean clay. Blocks and fragments recovered in core lengths to 3.2', mostly 0.5' - to 1.2'- lengths.
									20			0.2- to 1.4'- Clay Matrix. Lean Clay (CL): Where recovered, matrix consists of approx. 90% fines with medium plasticity, high dry strength, medium toughness, approx. 10% fine to coarse, hard, angular to subrounded sand. Matrix is firm, moist, light brown. No reaction to HCl.
									30			36.0-38.2': Slide Plane. Lean Clay (CL) 2.2' thick, upper contact dips 30°, dip of lower contact unknown. Composed of approx. 90% fines with medium to high plasticity, high dry strength, medium toughness, moist, firm, red-brown and tan; no reaction with HCl; 10% subangular to wedge-shaped, hard, 0.01 to 0.04' thick hornblende schist fragments. Fragments break with slight finger pres.
									40			
									50			

Figure 11-20.—Log of landslide material (a).



GEOLOGIC LOG OF DRILL HOLE

SHEET..... OF.....

FEATURE..... PROJECT..... STATE.....

HOLE NO..... LOCATION..... GROUND ELEV..... DIP (ANGLE FROM HORIZ.)..... TOTAL DEPTH..... BEARING.....

COORDS. N..... E.....

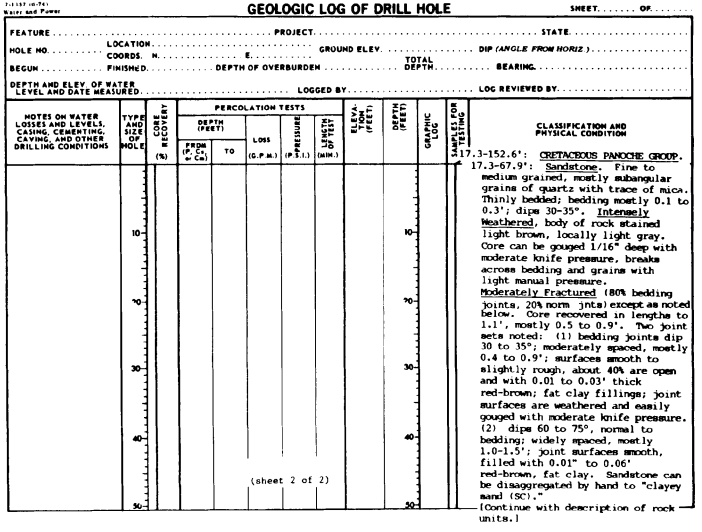
BEGUN..... FINISHED..... DEPTH OF OVERBURDEN.....

DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED..... LOGGED BY..... LOG REVIEWED BY.....

NOTES ON WATER LOSSES AND LEVELS, CASING, CEMENTING, CAVING, AND OTHER DRILLING CONDITIONS	TYPE AND SIZE OF HOLE	CORE RECOVERY (%)	PERCOLATION TESTS: DEPTH (FEET) FROM (P, Cr, C)	DEPTH (FEET) TO	LOSS (G.P.M.)	PRESSURE (P.S.I.)	LENGTH OF TEST (MIN.)	ELEVATION (FEET)	DEPTH (FEET)	GRAPHIC LOG	SAMPLES FOR LABORATORY TESTING	CLASSIFICATION AND PHYSICAL CONDITION
									0			0.0-2.0': QUATERNARY COLLUVIUM (Qc). Residual soil and slope wash. Consists of approx. 55% red-brown fat clay, 20% fine sand and 25% intensely weathered, 0.1 to 0.4' thick soft, angular, fine gravel sandstone fragments.
									10			2.0-17.3': QUATERNARY LANDSLIDE DEBRIS, (Qls). Moderate recovery due to Gravel-, cobble-, and boulder-size fragments.
									20			2.0-13.6': Sandy Clay with Cobbles (CL)c : [Describe as per criteria for test pits and auger holes.]
									30			13.6-16.7': Clayey Gravel with Cobbles and Boulders (GC)cb. [Describe as per criteria for test pits and auger holes.]
									40			16.7-17.3': Slide Plane-Gravelly Clay g(CL). 0.6' thick, dips 30°, parallel to bedding. Consists of approx. 60% fines with medium plasticity, high dry strength, medium toughness, moist, firm, red-brown; 25% mostly 0.02 to 0.08' thick platy to angular, intensely weathered, metashale fragments, max. size 0.2' and 15% fine, angular sand. Fragments break with slight manual pressure.
									50			17.1-17.3': Dark brown, highly slickensided surfaces, slickensides parallel to contact.

(sheet 1 of 2)

Figure 11-21.—Log of landslide material (b).



GEOLOGIC LOG OF DRILL HOLE

SHEET..... OF.....

FEATURE..... PROJECT..... STATE.....

HOLE NO..... LOCATION..... GROUND ELEV..... DIP (ANGLE FROM HORIZ.).....

BEGUN..... COORDS. N..... E..... TOTAL DEPTH..... BEARING.....

FINISHED..... DEPTH OF OVERBURDEN.....

DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED..... LOGGED BY..... LOG REVIEWED BY.....

NOTES ON WATER LOSSES AND LEVELS, CASING, CEMENTING, CAVING, AND OTHER DRILLING CONDITIONS	TYPE AND SIZE OF HOLE	CORE RECOVERY (%)	PERCOLATION TESTS: DEPTH (FEET) FROM (Ft., Cu. m, Cm.)	PERCOLATION TESTS: DEPTH (FEET) TO	PERCOLATION TESTS: LOSS (G.P.M.)	PERCOLATION TESTS: PRESSURE (P.S.I.)	PERCOLATION TESTS: LENGTH OF TEST (MIN.)	ELEVA-TION (FEET)	DEPTH (FEET)	GRAPHIC LOG	SAMPLES FOR TESTING	CLASSIFICATION AND PHYSICAL CONDITION
									10 20 30 40 50			17.3-152.6': CRETACEOUS PANOCHE GROUP. 17.3-67.9': Sandstone. Fine to medium grained, mostly subangular grains of quartz with trace of mica. Thinly bedded; bedding mostly 0.1 to 0.3'; dips 30-35°. Intensely Weathered, body of rock stained light brown, locally light gray. Core can be gouged 1/16" deep with moderate knife pressure, breaks across bedding and grains with light manual pressure. Moderately Fractured (80% bedding joints, 20% norm jnts) except as noted below. Core recovered in lengths to 1.1', mostly 0.5 to 0.9'. Two joint sets noted: (1) bedding joints dip 30 to 35°; moderately spaced, mostly 0.4 to 0.9'; surfaces smooth to slightly rough, about 40% are open and with 0.01 to 0.03' thick red-brown; fat clay fillings; joint surfaces are weathered and easily gouged with moderate knife pressure. (2) dips 60 to 75°, normal to bedding; widely spaced, mostly 1.0-1.5'; joint surfaces smooth, filled with 0.01" to 0.06' red-brown, fat clay. Sandstone can be disaggregated by hand to "clayey sand (SC)." [Continue with description of rock units.]

(sheet 2 of 2)

Figure 11-22.—Log of bedrock.

Processed or Manmade Materials.—Surficial deposits such as tailings, crushed rock, shells, or slag are assigned a genetic name such as filter, bedding, drain material, shells, tailings, or road base, and a classification group name and symbol are assigned in quotation marks, for example: Filter material, "poorly graded sand (SP-SM)." Soil descriptors are then used to describe the materials.

Where drill holes penetrate embankment materials, main headings on the drill hole logs should be a classification of the type of embankment, such as "Zone 3 Miscellaneous Embankment." The materials recovered in each interval are classified, and group names and symbols are provided as subheadings. See 1.0- to 3.9-ft and 3.9- to 15.4-ft intervals shown in figure 11-19.

Partially Lithified or Poorly Cemented Materials and Decomposed Rock.—Descriptions of partially lithified or poorly cemented materials such as siltstone, claystone, sandstone, and shale or decomposed rock which are broken down during drilling or field classification testing should be classified by an appropriate rock unit name or by geologic formation name, if known, of the in-place materials. The materials are then described using descriptors for rock (chapter 4). A soil classification for the broken down materials should be reported in quotation marks on the drill logs and all figures, tables, drawings, or narrative descriptions. The disaggregating mechanism (e.g., drilling or testing) should be specified (figure 11-22, interval 17.3 to 67.9 ft).

Shallow Surficial Deposits.—Surficial deposits such as drill pad or dozer trench fill for drill setups, shallow slope wash, or topsoil materials which will not be used in, or influence, design or construction may be classified by genetic classification (e.g., "fill," "slopewash," or "topsoil"). Complete classification descriptions are not required on drill hole logs; however, a classification name and/or

symbol may be assigned and is often desirable. Although a complete description is not required on each log, an adequate description of these materials should be provided in a general legend or explanation drawing and in the narrative of the report, if not completely described in drill hole logs.

Slide Failure Zones or Planes, Shear or Fault Zones, and Interbeds Recovered as Soil-like Materials.—These features should be described using geologic names as well as behavior and soil classifications.

Landslides and Talus.—Surficial deposits such as landslides and talus should be assigned their genetic geologic name in the main headings of the drill hole log. Landslide debris composed primarily of soils is classified as landslides in the main heading. Soil-like materials should be classified and group names and symbols provided in the headings. The materials are then described using the descriptive criteria for drill hole logs. Where materials are predominantly rock fragments such as talus and block slides, the materials should be logged similar to the method used in figure 11-22.

Equipment Necessary for Preparing the Field Log

The following is a list of equipment for field testing and describing materials.

Required equipment:

- Small supply of water (squirt bottle)—for performing field tests
- Pocket knife or small spatula
- Materials for taking or preserving samples—sacks, jars, labels, cloth, wax, heater, etc.

- Hammer—for hardness descriptors
- Tape measure and/or rule (engineer's scale and metric scale)
- Petrie dish for washing specimens
- Small bottle of dilute hydrochloric acid [one part HCl (10 N) to three parts distilled water. When preparing the dilute HCl solution, slowly add acid into the water following necessary safety precautions. Handle with caution and store safely. If solution comes in contact with skin, rinse thoroughly with water.]
- Rags for cleaning hands
- Log forms

Optional apparatus:

- Small test tube and stopper or jar with lid
- Plastic bags for “calibration samples”
- Hand lens
- Color identification charts
- Paint brush and/or scrub brush and water for cleaning samples
- Marking pens
- Protractor
- Drillers' reports for drill holes
- Comparison samples (in jars): fine gravel—3/4 inch to No. 4 sieve; medium sand—No. 4 to No. 10 sieve; and coarse sand—No. 10 to No. 40 sieve
- Small No. 4 and 200 sieves

Example Descriptions and Format

The examples which follow illustrate the preferred format, description, and organization, and some of the more significant exceptions to typical standards.

Laboratory Classifications in Addition to Visual Classifications

In some instances, laboratory classifications may be determined in addition to the field visual classification. This may be done to confirm the visual classification, particularly when starting work in a new location or because the classification may be critical.

The laboratory data used must be reported in a separate paragraph at the end of the work description, as shown in the examples in figure 11-23. If the laboratory classification is different from the visual classification, as in the upper example, give the group symbol in the left-hand column and the group name in the paragraph on the laboratory data.

DO NOT CHANGE THE VISUAL CLASSIFICATION OR DESCRIPTION. The visual classification is based on a widely observed area in the excavation, whereas the laboratory classification is based on a sample of the material.

If the visual classification was the best judgment of an experienced classifier, both are correct in what they represent.

Page 1 of 3

7-1330-A (1-80) Bureau of Reclamation	LOG OF TEST PIT OR AUGER HOLE	HOLE NO TP-1-TTDL

FEATURE _____ PROJECT _____

AREA DESIGNATION Sta. 191+74 on Centerline GROUND ELEVATION 2770.7

COORDINATES N 438,961 E 766,219 METHOD OF EXPLORATION MF-80 Backhoe

APPROXIMATE DIMENSIONS 16'x4'x6' LOGGED BY _____

DEPTH WATER ENCOUNTERED 1/ See Remarks DATE _____ DATE(S) LOGGED 8/6/87

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 to 6 in	6 to 12 in	PLUS 12 in
(SC)g two 60-lbm sacks 2.0 feet	0.0 to 2.0 ft. CLAYEY SAND WITH GRAVEL AND TRACE OF COBBLES: About 45% coarse to fine, angular to subangular sand; about 40% coarse to fine, angular to subangular, brittle to hard gravel with weak surface coating; about 15% fines with medium to hard plasticity, no dilatancy, medium toughness, medium to high dry strength; max. size, 250 mm; dry, brown; no reaction with HCl. IN-PLACE CONDITION: Dense, homogeneous, root holes, weak cementation, moist to wet. LAB TEST DATA: Two sack samples taken from 2-ft-wide swath at 1.5 ft depth across trench. Material mixed and quartered to get test sample. 35% sand, 51% gravel, 14% fines, LL=53, PI=34. Max. unit weight, opt.: 112.3 lbf/ft^3, 15.6%. Laboratory Classification is Clayey Gravel with Sand (GC)s. (Nondispersive). GEOLOGIC INTERPRETATION: Quaternary Slopewash (Qsw)	T	T	0
(GC)sc two 60-lbm sacks	2.0 to 5.8 ft. CLAYEY GRAVEL WITH SAND AND COBBLES: About 45% coarse to fine, angular to subangular, hard gravel with weak surface coating; about 40% coarse to fine, angular to subangular sand; about 15% fines with medium to high plasticity, slow dilatancy, medium toughness, medium dry strength; weak reaction with HCl. TOTAL SAMPLE (BY VOLUME): About 5% 75 to 125 mm, brittle to hard, angular to subangular cobbles, and boulders; remainder minus 75 mm; max. dimension 550 mm. IN-PLACE CONDITION: Dense, heterogeneous, sand and fines, weakly cemented, dry, brown. LAB TEST DATA: Two 60-lbm sack samples obtained from backhoe bucket from depths of 4.5 to 5.5 ft on northeast side of trench. 43% gravel, 35% sand, 22% fines; LL=50, PI=31. Max. unit weight, opt.: 118.6 lbf/ft^3, 13.3%. (Nondispersive).	5	T	T

REMARKS Moderate ground cover of sagebrush. Maximum size boulder taken from excavation was 550x325x200 mm. Stopped test pit at 6.0 feet unable to excavate further with backhoe. Water encountered only in upper 2.0 ft due to rain from previous three days.

GPO 844 783

Figure 11-23.—Geologic interpretation in test pit (sheet 1).

Word Descriptions for Various Soil Classifications

Figures 11-6 to 11-17 illustrate some typical word descriptions based on the soil classifications.

Logs are generally typed and single spaced. The examples in this manual are presented double spaced for legibility.

Samples Taken

In addition to the brief description of the samples taken under the "classification group symbol" column, a more complete description of any samples taken from each depth interval is included in the word descriptions. The description should include the size of the sample, the location represented by the sample, and how the sample was obtained (e.g., quartering and splitting).

Examples of how to report the sample information for a pit or trench are shown in figures 11-24 through 11-33.

Some examples use the abbreviated method of indicating the group name with the group symbol. This abbreviated method is described in appendix X5 in USBR 5000, "Determining Unified Soil Classification (Laboratory Method)" [1] and chapter 3.

Reporting Laboratory Data

Classifications Based on Laboratory Data

If the soil classification reported on the logs is based on laboratory data and not a visual classification, this should be clearly and distinctly reflected on the log.

Page 2 of 3

9 1 13A A (1 84)
Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE — HOLE NO TP-1-TTDL

FEATURE
AREA DESIGNATION Sta. 191+74 on Centerline
COORDINATES N 438,961 E 766,219
APPROXIMATE DIMENSIONS 16'x4'x6'
DEPTH WATER ENCOUNTERED 1/ See Remarks DATE

PROJECT
GROUND ELEVATION 2770.7
METHOD OF EXPLORATION MF-80 Backhoe
LOGGED BY
DATE(S) LOGGED 8/6/87

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 to 5 in	5 to 12 in	PLUS 12 in
5.8 feet	GEOLOGIC INTERPRETATION: Quaternary Slopewash (Qsw)			
6.0 feet	5.8 to 6.0 ft. Andesite: Gray; porphyritic; phenocrysts consist of white plagioclase laths to 1 cm in length in an aphanitic groundmass; non-porous; weak to no reaction with HCl. See "Geologic Profile on Test Pit No. TP-1-TTDL" for detailed hardness, weathering, and fracture density descriptions. No sample taken. GEOLOGIC INTERPRETATION: Tertiary Shorts Ranch Andesite (Tsa)			

REMARKS

1/ Report to nearest 0.1 foot

Figure 11-24.—Geologic interpretation in test pit (sheet 2).

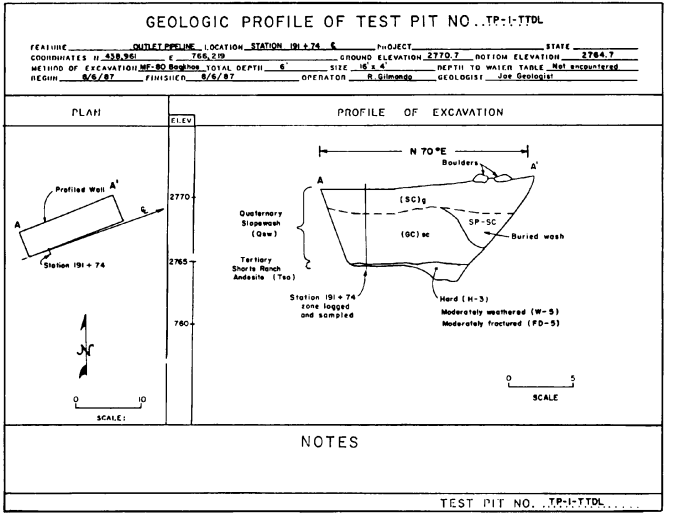


Figure 11-25.—Geologic interpretation in test pit using a geologic profile (1).

Page 1 of 3

9 1336 A (1 86) Bureau of Reclamation	LOG OF TEST PIT OR AUGER HOLE	HOLE NO TP-2-TTDL

FEATURE _____ PROJECT _____

AREA DESIGNATION Sta. 196+01 on Centerline GROUND ELEVATION 2746.8

COORDINATES N 439,095 E 766,624 METHOD OF EXPLORATION MF-80 Backhoe

APPROXIMATE DIMENSIONS 17'x4'x7.5' LOGGED BY _____

DEPTH WATER ENCOUNTERED 1/ Not DATE Encountered DATE(S) LOGGED 8/6/87

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 8 in	8 - 12 in	PLUS 12 in
(SC)g one 45-lbm sacks 0.5 feet	0.0 to 0.5 ft. CLAYEY SAND WITH GRAVEL AND TRACE OF COBBLES: About 50% coarse to fine, angular to subangular sand; about 35% coarse to fine, angular to subangular, brittle to hard gravel with weak surface coating; 15% fines with medium plasticity, slow to no dilatancy, medium toughness, medium dry strength; max. size 100 mm; strong reaction with HCl. IN-PLACE CONDITION: Loose, homogeneous, root holes, weak cementation, dry, brown. LAB TEST DATA: 41% sand, 35% gravel, 24% fines, LL=38, PI=16. Lab max. density, opt.: 116.8 lbf/ft^3, 12.7%. (Nondispersive). GEOLOGIC INTERPRETATION: Quaternary Slopewash (Qsw)	T	0	0
(GP-GC)sc (Lab Classif.) Andesite (Tsa) two 60-lbm sacks	0.5 to 7.5 ft. Andesite; Dry gray; porphyritic, intensely to moderately weathered; non-porous; weak reaction with HCl on body of rock, strong reaction with carbonate coatings on fracture surfaces. See "Geologic Profile of Test Pit No. TP-2-TTDL" for more detailed hardness, weathering, fracture density, and joint descriptions. Very difficult to excavate below 6.5 feet. Excavated materials breaks down as follows: POORLY GRADED GRAVEL WITH SILT, SAND AND COBBLES: About 60% coarse to fine, angular to subangular, brittle to hard gravel with weak surface coating; about 30% coarse to medium, angular to subangular sand; about 10% fines with low plasticity, slow to rapid dilatancy, low toughness, low dry strength; strong reaction with HCl. TOTAL SAMPLE (BY VOLUME): About 40% 75 to 125 mm brittle to hard, angular to subangular cobbles; trace of plus 125 mm brittle to hard, angular to subangular cobbles; remainder minus 75 mm; max. dimension 250 mm.	40	T	0

REMARKS Considerable ground cover of mesquite and paloverde trees, greasewood bushes and cacti. Maximum size cobble taken from excavation was 250x250x200 mm. Stopped test pit at 7.5 feet, unable to excavate further with backhoe.

Figure 11-26.—Geologic interpretation in test pit (sheet 3).

Page 1 of 2

7 133a A (1-80) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE HOLE NO TP-4-TTDL

FEATURE
AREA DESIGNATION Sta. 203+27 on Centerline
COORDINATES N 439,409 E 767,405
APPROXIMATE DIMENSIONS 17'x4'x10'
DEPTH WATER ENCOUNTERED 1/ Not Encountered DATE

PROJECT
GROUND ELEVATION 2722.6
METHOD OF EXPLORATION MF-80 Backhoe
LOGGED BY
DATE(S) LOGGED 8/7/87

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 to 5 in	5 to 12 in	PLUS 12 in
SP-SM two 60-lb sacks 2.0 feet	0.0 to 2.0 ft. POORLY GRADED SAND WITH SILT, GRAVEL AND COBBLES: About 55% coarse to fine, angular to subangular sand; about 35% coarse to fine, angular to subangular, brittle to hard gravel with moderate surface coating; about 10% fines with low plasticity, rapid dilatancy, low toughness, low dry strength; strong reaction with HCl. TOTAL SAMPLE (BY VOLUME): About 5% 75 to 125 mm, brittle to hard, angular to subangular cobbles; trace of plus 125 mm brittle to hard, angular to subangular cobbles; remainder minus 75 mm; max. dimension, 250 mm. LAB TEST DATA: Sack samples taken from spoil pile. 46% gravel, 44% sand, 10% fines; LL=30, PI=10, Cu=88.5, Cc=1.8. Maximum and Minimum Relative Density: 127.3 lbf/ft^3, 99.2 lbf/ft^3; Lab max. density, opt.: 117.4 lbf/ft^3, 13.0%. Laboratory Classification is Well Graded Gravel With Clay and Sand (GW-GC)s. (Nondispersive). IN-PLACE CONDITION: Loose, homogeneous, root holes, moderate cementation, dry, brown. GEOLOGIC INTERPRETATION: Quaternary Slopewash (Qsw)	5	T	0
(SM)gc Andesite (Tsa) two 45-lb sacks	2.0 to 10.0 ft. SILTY SAND WITH GRAVEL WITH TRACE OF COBBLES: About 60% coarse to fine, angular to subangular sand; about 25% coarse to fine, angular to subangular, brittle to hard gravel with moderate surface coating; about 15% fines with low plasticity, rapid dilatancy, low toughness, low dry strength; max. dimension, 250 mm; strong reaction with HCl. LAB TEST DATA: Two sack samples taken from backhoe bucket at 7.0 to 7.5 depth. 54% sand, 29% gravel, 17% fines; LL=34, PI=8. Lab max. density, opt.: 112.2 lbf/ft^3, 15.1%. (Nondispersive).	T	T	0

REMARKS Moderate ground cover of mesquite and paloverde trees, greasewood bushed and maximum size cobble taken from excavation was 400x250x250 mm. Stopped test pit at 10.0 feet, unable to excavate further with backhoe.

1/ Report to nearest 0.1 foot

GPO 849-2..

Figure 11-27.—Geologic interpretation in test pit (sheet 4).

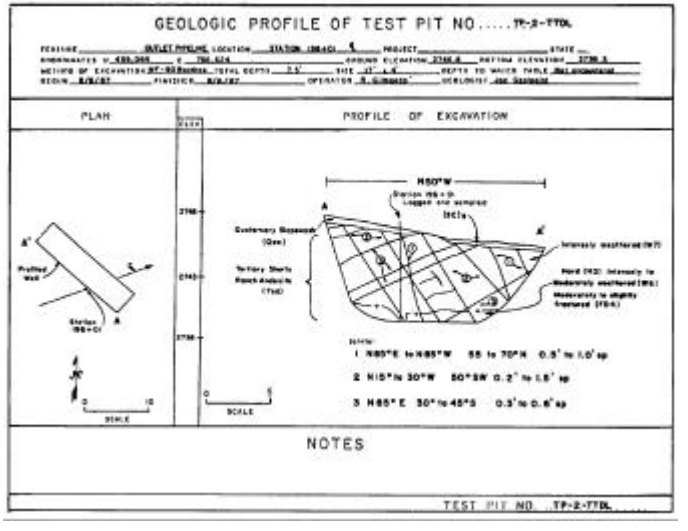


Figure 11-28.—Geologic interpretation in test pit using a geologic profile (2).

7 1336-A (1-86) Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. TP-2-TTDL

FEATURE
AREA DESIGNATION Sta. 196+01 on Centerline
COORDINATES N 439,095 E 766,624
APPROXIMATE DIMENSIONS 17'x4'x7.5'
DEPTH WATER ENCOUNTERED 1/ Not Encountered DATE

PROJECT
GROUND ELEVATION 2746.8
METHOD OF EXPLORATION MF-80 Backhoe
LOGGED BY
DATE(S) LOGGED 8/6/87

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 to 5 in	5 to 12 in	PLUS 12 in
7.5 feet	LAB TEST DATA: 68% gravel, 25% sand, 7% fines; LL=36, PI=12; Cu=53.1, Cc=4.3. Maximum and minimum relative density; 127.9 lbf/ft^3; 96.8 lbf/ft^3; proctor max. density, opt.: 117.9 lbf/ft^3, 13.6%. Laboratory Classification is Poorly Graded Gravel with Clay and Sand (GP-GC)s. (Nondispersive). GEOLOGIC INTERPRETATION: Tertiary Shorts Ranch Andesite (Tsa)			

REMARKS

1/ Report to nearest 0.1 foot

GPO 849-2??

Figure 11-29.—Geologic interpretation in test pit (sheet 5).

Page 2 of 3

7 1336 A (1 86) Bureau of Reclamation	LOG OF TEST PIT OR AUGER HOLE	HOLE NO TP-4-TTDL

FEATURE
AREA DESIGNATION Sta. 203+27 on Centerline
COORDINATES N 439,409 E 767,405
APPROXIMATE DIMENSIONS 17'x4'x10'
DEPTH WATER ENCOUNTERED 1/ Not DATE Encountered

PROJECT
GROUND ELEVATION 2722.6
METHOD OF EXPLORATION MF-80 Backhoe
LOGGED BY
DATE(S) LOGGED 8/7/87

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 6 in	6 - 12 in	PLUS 12 in
10.0 feet	Excavated material in place is: Andesite; Dry; gray; porphyritic; irregular weathering profile, 2.0 to 7.5 ft. decomposed, (W9), very soft (H7), some structure visible, carbonate cementation throughout; 7.5 to 9.8 ft. intensely weathered, (W7), soft (H6), intensely fractured (FD7), carbonate coatings on joint surfaces; 9.8 to 10.0 ft. intensely to moderately weathered (W6), moderately hard (H4), intensely fractured (FD7). Hardness increases with depth. GEOLOGIC INTERPRETATION: Tertiary Shorts Ranch Andesite (Tsa)			

REMARKS

1/ Report to nearest 0.1 foot

GPO 849-...

Figure 11-30.—Geologic interpretation in test pit (sheet 6).

7 133A A (1 80)
Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. TP-FWT-101

FEATURE
AREA DESIGNATION
COORDINATES N E
APPROXIMATE DIMENSIONS 5'x20'x15'
DEPTH WATER ENCOUNTERED 1/ 13.0 DATE

PROJECT Central Utah
GROUND ELEVATION
METHOD OF EXPLORATION John Deere 710B Backhoe
LOGGED BY
DATE(S) LOGGED 6/11/87

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 to 6 in	6 to 12 in	PLUS 12 in
MH (lab. classif.) one 45-lb sack 1.5 feet	0.0 to 1.5 ft. ELASTIC SILT: Sack sample (No. 1) from swath along entire trench at a depth of 1.0 ft had 77% fines; 23% predominantly fine sand; maximum size, medium sand; no reaction with HCl; LL=52, PI=21, Minus #4 SpG. = 2.63. IN-PLACE CONDITION: Homogeneous, moist, soft, dark brown; some roots present. GEOLOGIC INTERPRETATION: Road fill.			
ML (lab. classif.) INTENSELY WEATHERED SHALE 5.0 feet	1.5 to 5.0 ft. SANDY SILT WITH GRAVEL: Recovered predominantly as sandy silt with decomposed to intensely weathered elongated fragments of shale ranging in size from fine sand to fine gravel. Some lenses and pockets of sandy silt are also present. Gravel fragments break easily with slight finger pressure. Sack sample (No. 2) taken from 18-in-wide sample trench from 3.5 to 4.5 ft depth on east wall (see sketch). Sample contained 52% fines; 35% predominantly fine sand; 13% gravel; maximum size 18 mm; moderate reaction with HCl; LL=39, PI=12, Minus #4 SpG. = 2.70. Laboratory Classification is Sandy Silt (ML). IN-PLACE CONDITION: Loose, slightly moist easily excavated, some roots down to 4.0 ft, no cementation between fragments, bedding faintly visible below 4.0 ft, vertical stringers of silty sand fill open joints, gray and green, rapid sloughing of trench walls. GEOLOGIC INTERPRETATION: Tertiary Green River Formation (Tgr)			
GM (lab. classif.) MODERATELY WEATHERED SHALE	5.0 to 10.5 ft. MODERATELY WEATHERED SHALE: Recovered predominantly as moderately weathered gravel to boulder-size angular fragments of shale. Material in trench wall (see sketch) is mostly intensely fractured shale with silt-filled joints. Maximum dimension 18 inches. Many of the larger			

REMARKS Cover; Sagebrush, grass and weeds. Stopped excavation at 14.0 ft. due to backhoe refusal. Unable to penetrate. Excavated near small stream. Geologic descriptions by Joe Geologist.

1/ Report to nearest 0.1 foot

GPO 849-2-1

Figure 11-31.—Geologic interpretation in test pit (sheet 7).

7 133A A (1 86)
Bureau of Reclamation

LOG OF TEST PIT OR AUGER HOLE

HOLE NO. TP-FWT-101

FEATURE _____
AREA DESIGNATION _____
COORDINATES N _____ E _____
APPROXIMATE DIMENSIONS 5'x20'x15'
DEPTH WATER ENCOUNTERED 1/ 13.0 DATE _____

PROJECT Central Utah
GROUND ELEVATION _____
METHOD OF EXPLORATION John Deere 710B Backhoe
LOGGED BY _____
DATE(S) LOGGED 6/11/87

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 6 in	6 - 12 in	PLUS 12 in
one 45-lb sack 10.5 feet	boulder-size fragments broke when dropped from backhoe bucket. Maximum dimension 450 mm. Material excavated with some difficulty below 8.0 ft due to less fracturing. Laboratory sample No. 3 taken from 7.0 to 7.8 ft depth along entire pit floor, material mixed and quartered to get sample. Sample had 71% fine to coarse gravel; 19% fines; 10% predominantly fine sand; trace of cobbles. Strong reaction with HCl. Laboratory Classification is Silty Gravel With Cobbles (GM). IN-PLACE CONDITION: Moist, heterogeneous, mostly gray with green lenses. Predominantly open bedding joints spaced approximately 6 in to 1.5 ft visible in trench wall. Many joints filled with silt, some joints tight, large blocks fell from vertical walls frequently. Some carbonate cementation between beds. Weathering is less intense below 9.0 ft causing difficult excavation. Below 8.0 ft material was mostly cobble and boulder-size fragments which broke when excavated. GEOLOGIC INTERPRETATION: Tertiary Green River Formation (Tgr)			
SHALE 14.0 feet	10.5 to 14.0 ft. SLIGHTLY WEATHERED TO FRESH SHALE: Recovered as slightly weathered to fresh cobble to boulder-size gray angular fragments of shale. Fragments break with slight hammer blow. Material was very difficult to excavate requiring repeated passes with bucket in some layers. Could not excavate below 14.0 ft. Moderately to slightly fractured. Jointing is all vertical or parallel to bedding with approximately 20% silt-filled and most with reddish-brown staining on joint surfaces. Small seeps in trench walls below 13.0 ft. Walls slake slightly after 1 hour of exposure to drying. Very little sloughing occurred during the 1-hour exposure of vertical trench walls. Three-inch-thick bed of harder green shale encountered at bottom of trench. Excavated cobble and boulder-size fragments broke with very heavy hammer blow. No sample taken; no lab. classification. GEOLOGIC INTERPRETATION: Tertiary Green River Formation (Tgr)			

REMARKS

1/ Report to nearest 0.1 foot

GPO 849-725

Figure 11-32.—Geologic interpretation in test pit (sheet 8).

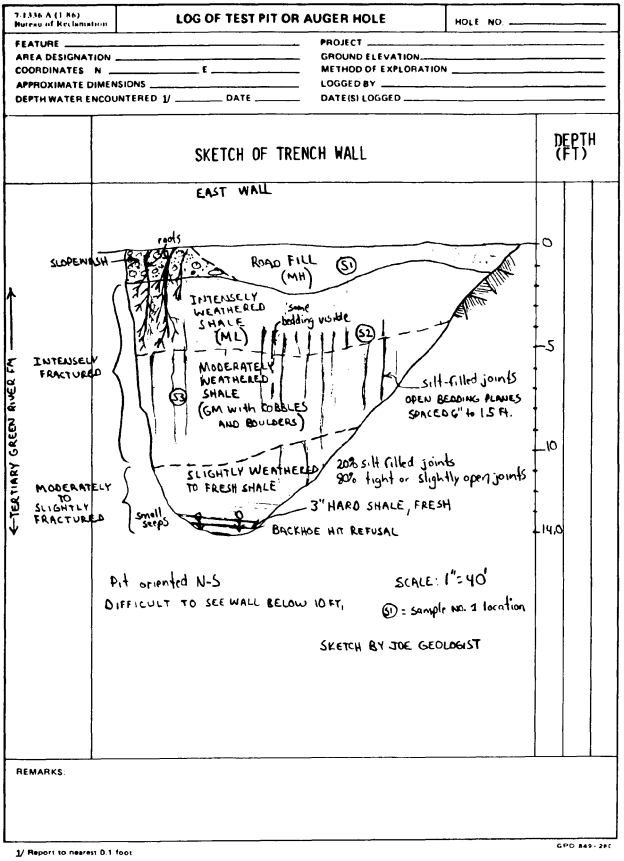


Figure 11-33.—Geologic interpretation in test pit using a geologic profile (3).

The laboratory data should be reported on the log form as shown in the examples in figure 11-4.

The location of the sample and any laboratory tests performed need to be clearly described.

The coefficients of uniformity and curvature (C_u, C_c) are to be calculated and reported for coarse-grained soils containing 12 percent fines or less.

Gradation percentages and Atterberg limits are to be reported to the nearest whole number.

The fact that the classification is a laboratory classification needs to be indicated in the "classification group symbol" column.

The words "about" or "approximately" are not used in the word description.

Soils with More Than 50 Percent Cobbles and Boulders

If the soil contains more than 50 percent (by volume) cobbles and/or boulders:

1. The first paragraph describes the total sample and includes the information on the cobbles and boulders. The information in the paragraph is the same as described previously for cobbles and boulders.

2. The words "COBBLES" or "COBBLES AND BOULDERS" are listed first in the classification group name:

COBBLES WITH POORLY GRADED GRAVEL
COBBLES AND BOULDERS WITH SILTY GRAVEL

3. A classification symbol is *not* given. Where a report or form requires a classification symbol, use the words "cobbles" or "cobbles and boulders" instead.

An example of a word description for a soil with more than 50 percent cobbles and boulders is shown in figure 11-13.

Special Cases for USCS Classification

Some materials that require a classification and description according to USCS should not have a heading that is a classification group name. When these materials will be used in, or have influence on, design and construction, they should be described according to the criteria for logs of tests pits and auger holes, and the classification symbol and group name should be in quotation marks. The heading should be as follows:

TOPSOIL
DRILL PAD
GRAVEL ROAD SURFACING
MINE TAILINGS
UNCOMPACTED FILL
FILL

For example:

Classification symbol	Description
TOPSOIL	0.0 to 1.6-ft TOPSOIL—would be classified as "ORGANIC SOIL (OL/OH)." About 90%

fines with low plasticity, slow dilatancy, low dry strength, and low toughness; about 10% fine to medium sand; soft, wet, dark brown, organic odor; roots present throughout strata; weak reaction with HCl.

Reporting In-Place Density Tests

In-place density tests are sometimes performed in test pits in borrow areas so that in-place densities can be compared with the expected compacted densities for the embankment. The required volume of material needed from the borrow area can also be calculated. The in-place density is also used to evaluate the expansion or collapse potential for certain soils.

The density should be reported in the paragraph on in-place condition. Examples of the format are shown in figure 11-10. The upper example is used when only the density is determined. The lower example is used when a laboratory compaction test is also performed to calculate the percent compaction (or D value if rapid method is used) (USBR 7240, [1]). For cohesionless soils, similar information is reported for the maximum index density, the minimum index density, and the percent relative density.

If the in-place density test hole spans two (or more) depth intervals of classification, the data and comments for the test should be placed in the interval description corresponding to the top of the test hole. At the end of the information reported, the comment (in all capital letters) must be added: "NOTE: TEST EXTENDED INTO UNDERLYING INTERVAL." An in-place density test should not span different materials or layers.

Because the laboratory compaction test is generally performed on the material removed from the test hole, note that the data are for a mixture of intervals by adding, "NOTE: COMPACTION TEST PERFORMED ON MATERIAL MIXED FROM TWO DIFFERENT INTERVALS."

The density units are lb/ft^3 or kilonewtons per cubic meter (kN/m^3).

Samples Taken

In addition to the brief description of the samples taken under the "Classification Group Symbol" column, a more complete description of any samples taken from each depth interval is included in the word description. The description should include the size of the sample, the location represented by the sample, and for each sample, how the sample was obtained (e.g., quartering and splitting).

An example of how to report the sample information for an auger hole is shown in figure 11-17. An example of how to report the sample information for a test pit or trench is shown in the section on word descriptions of undisturbed samples.

The approximate weight of samples should be stated.

Measured Percentages of Cobbles and Boulders

If the percentages of the plus 3-inch particles are measured, not estimated, the percentages are reported to

the nearest 1 percent. In the word description for the plus 3-inch particles, do not use the term "about" before the percentages.

The procedure for measuring the percent by volume of cobbles and boulders is given in the test procedure, USBR 7000, "Performing Disturbed Soil Sampling in Test Pits"[1]. This method is rarely used; percentages are usually estimated. It is not recommended that the percentages be measured for auger holes, since the mass of material recovered is generally insufficient to obtain a reliable gradation of plus 3-inch particles.

Figures 11-23 through 11-33 show a variety of logs of test pits using both the USCS and the geologic interpretation of the parent material. Note that USCS indicates that bedrock has been altered or weathered to a soil-like material. For engineering considerations, use the USCS but present the rock conditions as well.

BIBLIOGRAPHY

[1] Bureau of Reclamation, U.S. Department of the Interior *Earth Manual*, Part 2, third edition, 1990.

[2] U.S. Department of Agriculture, *Agriculture Handbook No. 436*, Appendix I (Soil Taxonomy), December 1975.