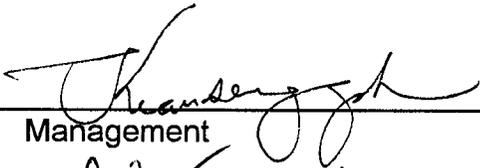


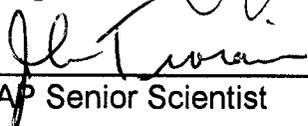
STANDARD OPERATING PROCEDURE
Soil Bulk Density Determination

KEY WORDS-

Soil; Madera Bulk Density Soil Sampler

APPROVALS

APPROVED BY:  DATE: 3/9/99
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EHAP Senior Scientist

APPROVED BY:  DATE: 2/24/99
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Environmental Hazards Assessment Program (EHAP) organization and personnel such as management, senior scientist, quality assurance officer, project leader, etc. are defined and discussed in SOP ADMN002.

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Soil Bulk Density Determination

1.0 INTRODUCTION

1.1 Purpose

This SOP defines the method for taking a soil sample to determine soil bulk density using the Madera Bulk Density Soil Sampler. A gravimetric method (SOP METH001.00) is used in which a known volume of undisturbed soil sample is dried and weighed. The result is the density for a volume of soil as it exists naturally including air space and organic matter.

2.0 EQUIPMENT

- 2.1** Madera Bulk Density Soil Sampler, Including;
 - 2.1.1** Sample barrel
 - 2.1.2** Extension
 - 2.1.3** Handle crossbar
- 2.2** Two 1 1/4" Putty Knives
- 2.3** Shovel
- 2.4** Rubber mallet
- 2.5** Bucket Auger
- 2.6** Prelabelled, pre-tared (to 0.1g) sample jars (1/2 pint wide mouth mason jars)
- 2.7** Balance (accurate to 0.1g)
- 2.8** EHAP Soil Analysis Data Sheets (see attached)

3.0 PROCEDURE

- 3.1** Assemble sampler by locking sample barrel onto extension.
- 3.2** Slip handle crossbar into one of the sets of holes in extension.
- 3.3** Place sampler at site and advance sample barrel to the desired depth by applying pressure and turning handle clockwise (to keep the sample barrel locked onto the extension). If needed strike the top of the extension with a rubber mallet to advance the sampler.

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- 3.4 Bring the sampler out of the hole by pulling straight up on the handle while turning clockwise. Abrupt movements may cause the sample to fall out of the barrel.
- 3.5 Place the sampler in a horizontal position. Insert one putty knife into each of the two slots on the sample barrel, trapping the soil between the two knives. Pull the sampler into a vertical position with the knives in place. Discard any soil below the bottom knife by tapping the sample barrel with the rubber mallet.
- 3.6 Place the sample jar below the sample barrel and remove the bottom knife. Tap the sample barrel to move all soil that was trapped between the knives to the sample jar.
- 3.7 Move the sampler away from the sample jar and remove the upper knife. Tap the barrel to discard the soil that was trapped above the knife.
- 3.8 After the first sample is collected use the bucket auger to clean out the first depth.
- 3.9 Take the second sample following steps 3.1 - 3.7. After taking the bulk density sample from each depth, enlarge the hole with the bucket auger to prepare for the next bulk density sample. Repeat this method to the desired depth.

4.0 WEIGHING AND RECORDING DATA

- 4.1 Weigh the empty sample jars (without lids) and record the weight in the tare weight column of the EHAP Soil Analysis Data Sheet.
- 4.2 After placing the soil samples in the jars weigh the jars (without lids) and record the weight in the wet weight column on the Soil Analysis Data Sheet .
- 4.3 Cap the jars and store at room temperature until ready to proceed.
- 4.4 Follow SOP METH001 for the lab procedure instructions for Soil Water Content Determination.

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5.0 CALCULATION

$$\text{Bulk Density (g/cm}^3\text{)} = M_d / V$$

M_d = Mass of dry soil sample (dry weight - tare weight) (grams)

V = soil volume (cm³)

6.0 EXPECTED VALUES

Approximate range of expected bulk density values:

1.0g/cm³ for clay soils to 1.8g/cm³ for sandy or compacted soils.

7.0 REFERENCE

Miller R.W. and Donahue R.L., *Soils, An Introduction to Soils and Plant Growth*.
Page 60. Sixth Edition 1990. Prentice-Hall Inc., Englewood Cliffs, New Jersey.