Soil Stockpile Characterization Plan
SWMU 0-016, Inactive Small Arms Firing Range

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Introduction

Sampling activities will be conducted at the inactive small arms firing range, SWMU 0-016, to determine if the berm and back-area material stockpiled on the site contain elevated levels of leachable lead. A statistical analysis of historical analytical data indicates that there is a high probability that the stockpiled soils, as a unit, will not exceed the TCLP limit for hazardous waste determination. Samples will be analyzed for TCLP metals and the results will be averaged over the entire stockpile to characterize the soil as a unit.

Description Of Material

The soils in the stockpiles consist of the original-berm material and the back-area material. The original-berm material consists of two piles as shown on Figure 1. The larger pile is on the west side of the site and has an estimated volume of 3645 cubic yards (yd^3). The smaller pile is to the east of the larger pile and has an estimated volume of 1440 yd^3. The back-area materials are stockpiled against the west side of the larger pile of original-berm material. This material can be distinguished from the original-berm material by the difference in color and the abundance of organic matter. The back area materials have an estimated volume of 1588 yd^3. The back-area materials will be characterized separately from the original-berm materials because there origin and composition are significantly different.

Sampling Approach

Ten composite soil samples consisting of four grabs each will be collected from the stockpiled soils for waste characterization. Each of these ten samples will be split for duplicate analysis, resulting in a total of 20 samples. Six samples will be collected from the larger pile and two from the smaller pile for characterization of all the original-berm material. Two samples will also be collected from the back-area portion of the larger pile. The stockpiles will be divided into equal sections and one composite sample will be collected from each of the sections. The original-berm material portion of the larger pile will be divided into six sections and the smaller pile will be divided into two sections. The back-area material portion of the larger berm will also be divided into two sections (Figure 1).

Four grabs will be collected with a hand auger from each of the ten sections of the stockpiles and composited. The grabs will be collected from inside the four corners of each section, equidistant from the corner and the center of the section. Each grab will be collected at a discrete depth interval within the pile. The distance from the top of the pile to the ground surface in each section will be divided equally into four

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vertical zones within the pile. One grab in each section will be collected from within each of these zones (Figure 1).

Sample Collection and Analysis

The four grabs collected from each section of the soil piles will be composited by mixing thoroughly in an aluminum pan to achieve homogeneity. The mixture will then be split into two samples for identical laboratory analysis. Samples will be placed on ice in a cooler and transported under chain-of-custody to the LANL Sample Management Office for subsequent transmittal to a fixed analytical laboratory. Samples will be analyzed for TCLP metals by SW 846 Method 1311. Sampling activities will be conducted in accordance with applicable LANL ER Project procedures.

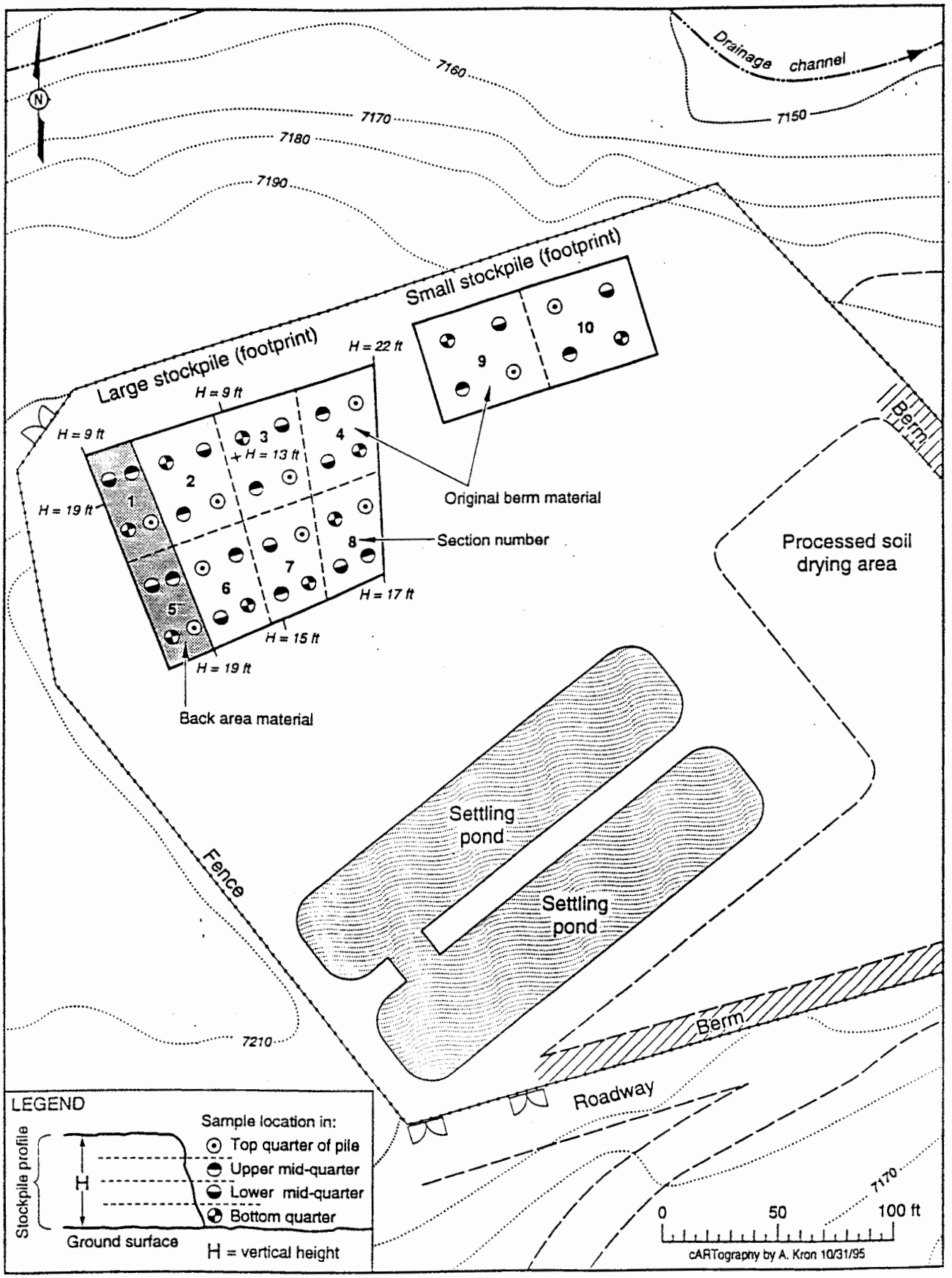
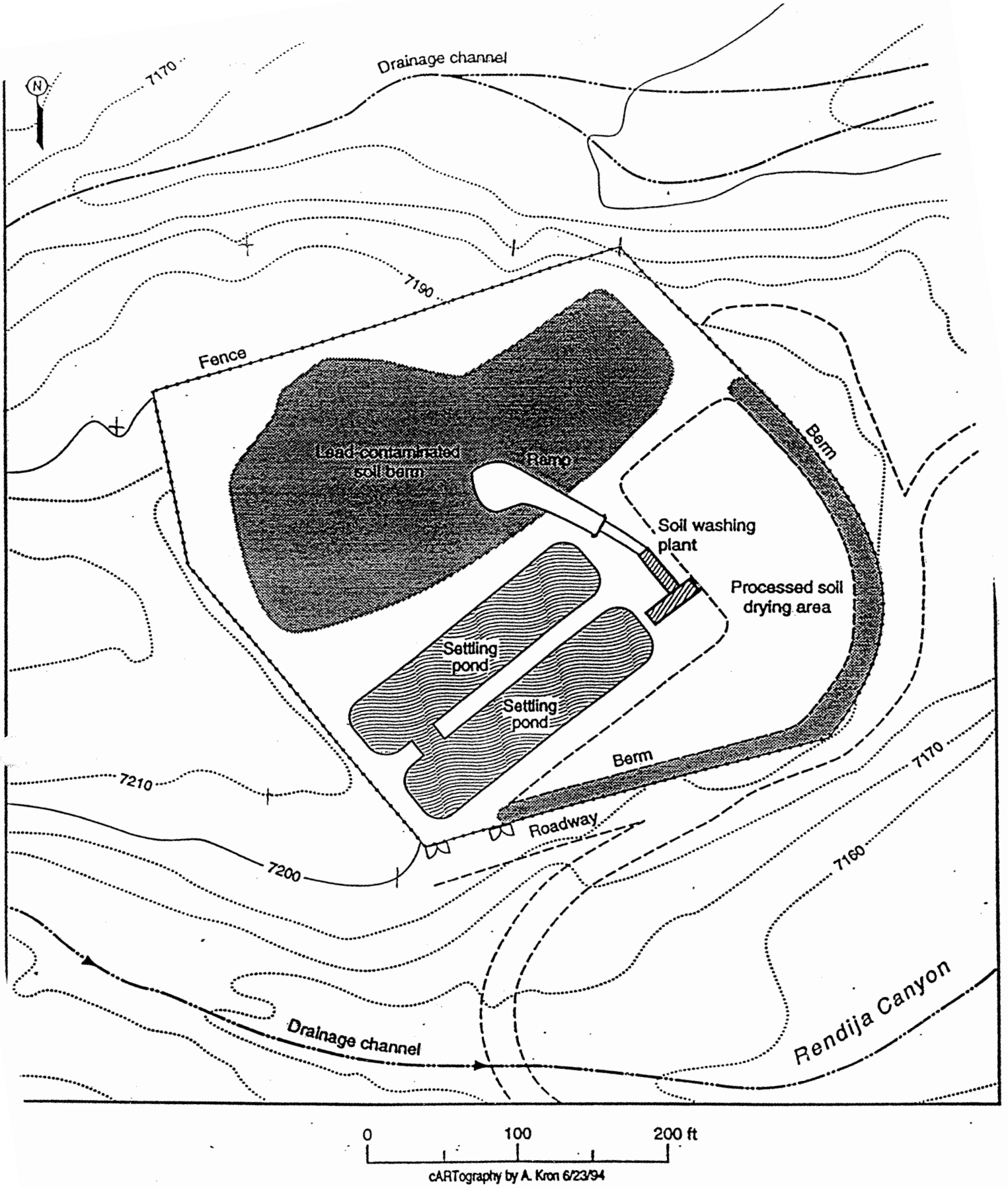


Figure 1. Soil stockpile characterization sample locations, SWMU 0-016.



Soil washing site within Inactive Firing Range, SWMU 0-016 (OU 1071)

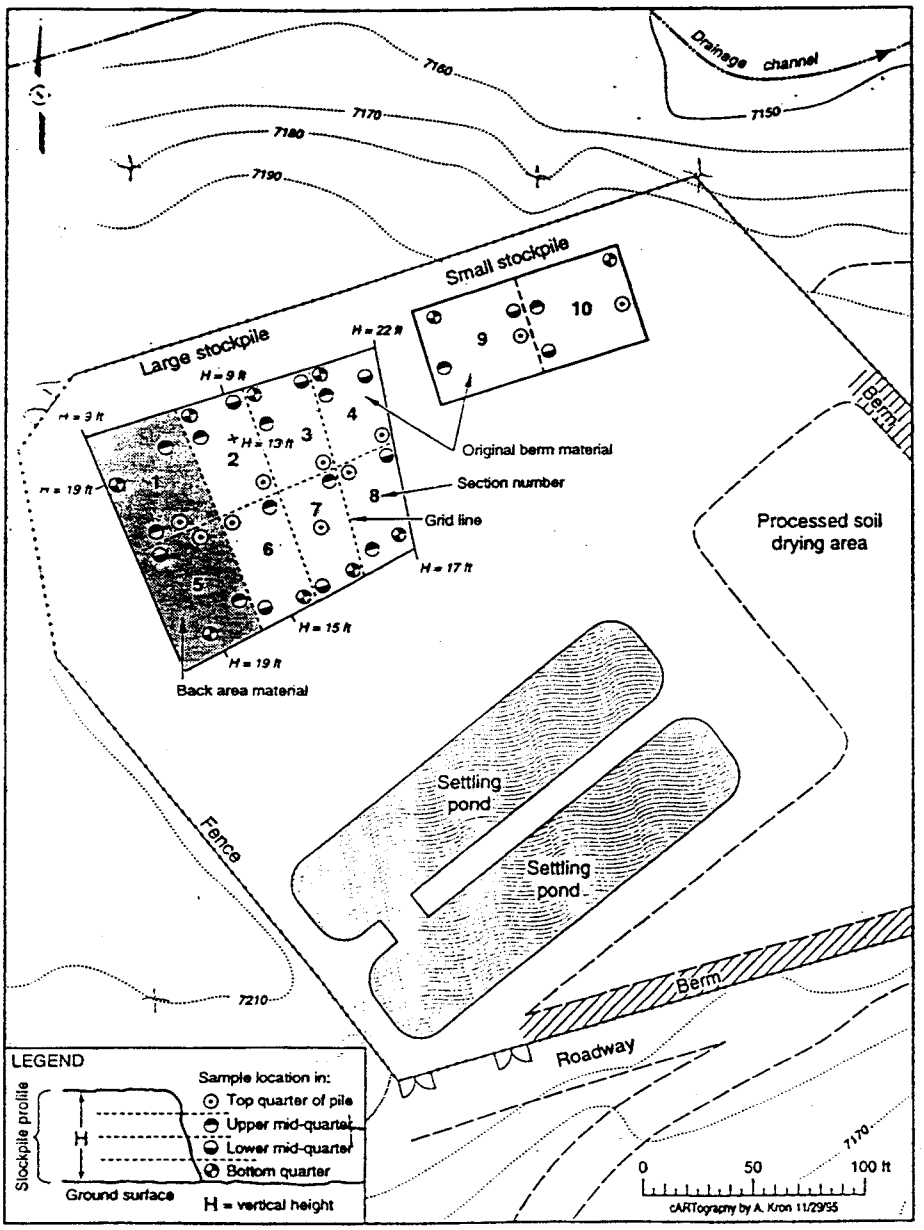


Figure 1. Soil stockpile characterization sample locations, SWMU 0-016.

Presentation and Statistical Analysis of Lead TCLP Waste Characterization Results for the Inactive Firing Range Soil Piles

Twenty soil samples were collected from the soil piles created during the soil washing operation, and all of the individual lead TCLP results are less than the 5 mg/L regulatory limit, as are the UCLs calculated for the subareas and the complete set of lead data. Thus, the waste should not be considered hazardous by the leachability standard.

The lead TCLP results for the Inactive Firing Range berms are presented in Table 1. The statistics for these data are presented for each of three subareas and for the overall berm volume. The rationale for these divisions of the piles is based on expected or potential differences in lead concentrations. For example, the 'back area' soil may have been part of berms at one time, but not when the VCA work began. Thus, these subgroups were intended to create more homogeneous waste streams. The statistical calculations follow the guidance presented in USEPA (1987), which is also know as SW846. SW846 Chapter 9 presents the statistical strategy for designing a waste characterization sampling plan, and the subsequent analysis of waste characterization data. The basic premise is that waste classification decisions will be based on the average characteristics of a waste stream. Specifically, the 80% upper confidence limit (UCL) of the mean should be calculated. The 80% UCL is presented as equation 6 on p. NINE-3, and is reproduced below:

$$\text{UCL} = \text{mean} + t_{0.20} * \text{standard error}$$

$$\text{Standard error} = \text{standard deviation/square root(number of waste analyses)}$$

The $t_{0.20}$ is a quantile of the Student t-test, and is presented in Table 9-2 of SW846. The t-values used to calculate the UCLs in Table 1 of this document are as follows: $t_{0.20}$=1.638 for 4 waste analyses, $t_{0.20}$=1.363 for 12 analyses, and $t_{0.20}$=1.328 for 20 analyses.

In summary, all of the individual lead TCLP results are less than the 5 mg/L regulatory limit, as are the UCLs calculated for the subareas and the complete set of lead data. Thus, the waste should not be considered hazardous by the leachability standard.

Reference:

USEPA. 1987. "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods," (SW846), December 1987.

Table 1
Summary of Lead TCLP Data for Inactive Firing Range Berms

Sample ID	Location	Group	Result	Result where ND was replaced by the DL
95-1151	Section 1	Back area	ND (0.011)	0.011
95-1152	Section 1 Dup.	Back area	0.059	0.059
95-1153	Section 5	Back area	0.0141	0.0141
95-1154	Section 5 Dup.	Back area	ND (0.011)	0.011
		Back area statistics	count	4
			mean	0.024
			st. dev.	0.024
			80% UCL	0.043
95-1155	Section 6	Large pile	0.0547	0.0547
95-1156	Section 6 Dup.	Large pile	0.1156	0.1156
95-1157	Section 2	Large pile	0.0292	0.0292
95-1158	Section 2 Dup.	Large pile	0.1009	0.1009
95-1159	Section 3	Large pile	0.1287	0.1287
95-1160	Section 3 Dup.	Large pile	0.8722	0.8722
95-1161	Section 4	Large pile	0.1222	0.1222
95-1162	Section 4 Dup.	Large pile	0.5214	0.5214
95-1163	Section 8	Large pile	2.814	2.814
95-1164	Section 8 Dup.	Large pile	1.2854	1.2854
95-1165	Section 7	Large pile	0.3203	0.3203
95-1166	Section 7 Dup.	Large pile	0.1514	0.1514
		Large pile statistics	count	12
			mean	0.535
			st. dev.	1.053
			80% UCL	0.848
95-1167	Section 9	small pile	1.755 (a)	1.755 (a)
95-1168	Section 9 Dup.	small pile	1.1984	1.1984
95-1169	Section 10	small pile	0.0321	0.0321
95-1170	Section 10 Dup.	small pile	0.0676	0.0676
		Small area statistics	count	4
			mean	0.763
			st. dev.	0.855
			80% UCL	1.463
		All data statistics	count	20
			mean	0.483
			st. dev.	0.748
			80% UCL	0.705

ND - non-detect, and the detection limit (DL) is noted in parentheses
(a) - this value is the average of the laboratory duplicate reanalysis. The lab duplicate reanalysis values were 1.54 and 1.97 mg/L. The original, and apparently erroneous value was reported 119.0840 mg/L.
st. dev. - standard deviation
80% UCL - the 80% upper confidence limit of the mean, which is the statistic recommended for waste classification in EPA SW846, Chapter 9.

MEMORANDUM

ERM/GOLDER LOS ALAMOS PROJECT TEAM

To: Carl Newton, EES-3

From: Andrew J. Crowder

Date: 30 November 1995

Subject: LOCATIONS OF CHARACTERIZATION SAMPLES WITHIN SOIL STOCKPILES AT THE INACTIVE FIRING RANGE, SWMU 0-016

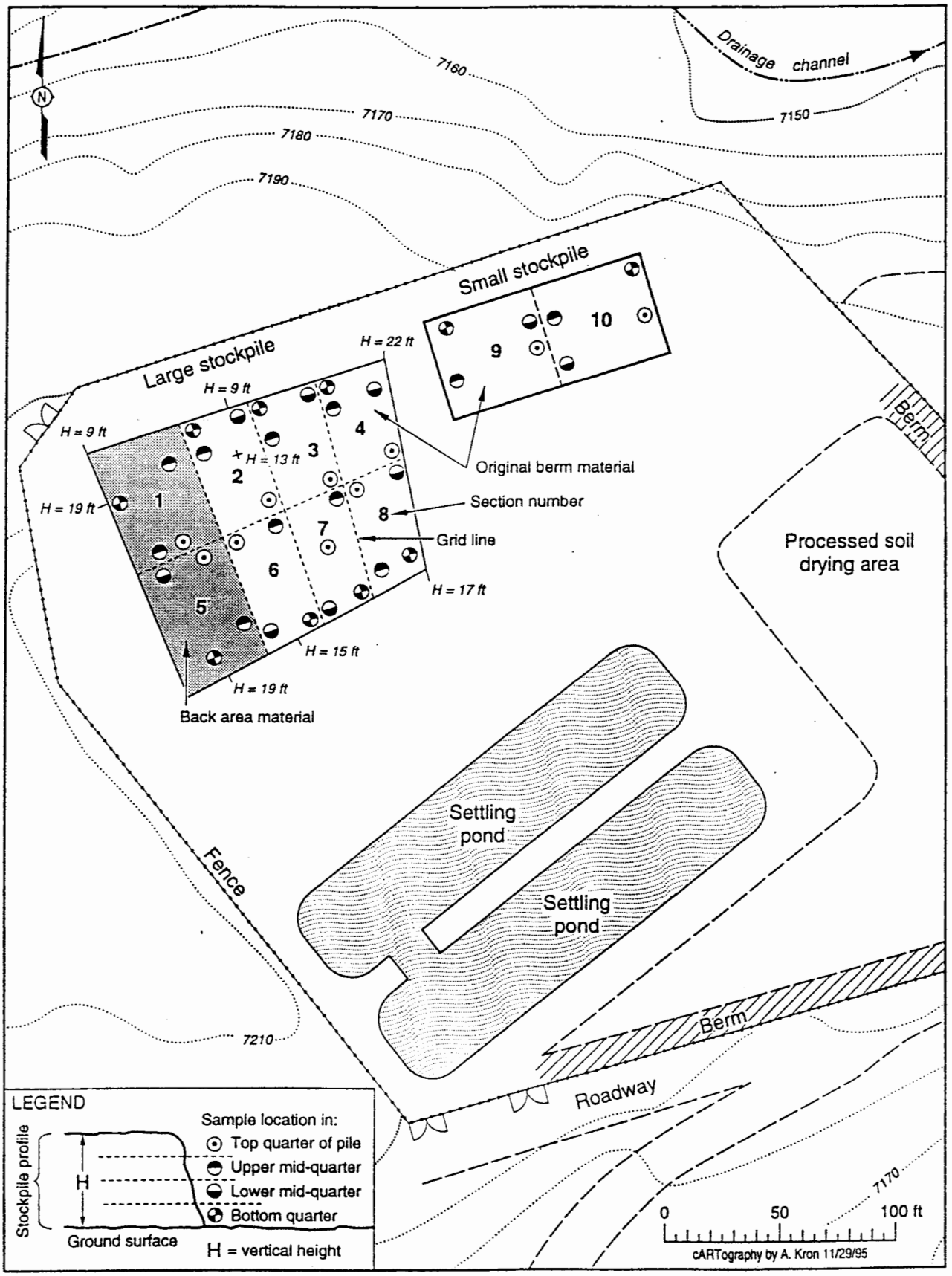
The following table presents a list of sample locations, their respective height (H) above the ground surface, and the distance (D) that the hand auger was advanced into the stockpile. The actual locations are shown on Figure 1. One grab sample was collected from each of the four quadrants in each section and composited. The quadrants are designated northwest, northeast, southwest, and southeast. Each grab within a section was collected at a different depth within the pile (Figure 1). All boreholes were advanced a minimum of 1-foot into the stockpile. Samples near the bottom of the stockpile were collected by hand-augering horizontally into the side of the stockpile and others were collected by hand augering vertically into the top of the stockpile, as indicated in the list. Some sample locations within the sections deviated slightly from the Soil Stockpile Characterization Plan due to the berm configuration and the consistency of the soils. Because of the abundance of rocks and other obstacles within the stockpiles, hand-augering was very difficult and auger refusal was encountered frequently at very shallow depths. In order to access the desired depths within the stockpiles, the topography of the piles was used to obtain samples from desired locations and depths (e.g., soil samples from the bottom of the pile were collected by hand-augering horizontally into the base of the pile).

Table 1. List of sample locations and depths within soil stockpiles.

Section of Stockpile	Stockpile Description	Quadrant Within Section where Grab Sample Collected	Height of Sample from Ground Surface (feet)	Distance into Soil Pile (feet)	Borehole Orientation
Section 1	Large Pile, Back-Area Material	Northwest	1 to 1.25	1	horizontal
		Northeast	6.75 to 7	2.25	vertical
		Southwest	13.75 to 14	1	vertical
		Southeast	19 to 19.25	1	vertical
Section 2	Large Pile, Original Berm Material	Northwest	1.75 to 2	1	horizontal
		Northeast	5.75 to 6	1	horizontal
		Southwest	8 to 8.5	1.5	vertical
		Southeast	14 to 14.5	1	vertical

Table 1. List of sample locations and depths within soil stockpiles (continued).

Section of Stockpile	Stockpile Description	Quadrant Within Section where Grab Sample Collected	Height of Sample from Ground Surface (feet)	Distance into Soil Pile (feet)	Borehole Orientation
Section 3	Large Pile, Original Berm Material	Northwest	1.75 to 2	1	horizontal
		Northeast	5.75 to 6	1	horizontal
		Southwest	8 to 8.5	1	vertical
		Southeast	14 to 14.5	1	vertical
Section 4	Large Pile, Original Berm Material	Northwest	1.75 to 2	1	horizontal
		Northeast	5.75 to 6	1	horizontal
		Southwest	8 to 8.5	1	vertical
		Southeast	14 to 14.5	1	vertical
Section 5	Large Pile, Back-Area Material	Northwest	8.75 to 9	1	vertical
		Northeast	19.5 to 20	1	vertical
		Southwest	2.75 to 3	1	horizontal
		Southeast	14 to 14.5	1	vertical
Section 6	Large Pile, Original Berm Material	Northwest	16 to 17	1	vertical
		Northeast	14 to 14.5	1	vertical
		Southwest	5.5 to 5.75	1	horizontal
		Southeast	2.75 to 3	1	horizontal
Section 7	Large Pile, Original Berm Material	Northwest	13 to 13.5	2	vertical
		Northeast	11 to 11.5	4	vertical
		Southwest	5.75 to 6	1.5	horizontal
		Southeast	2.75 to 3	1	horizontal
Section 8	Large Pile, Original Berm Material	Northwest	14 to 14.5	1	horizontal
		Northeast	5.75 to 6	1	vertical
		Southwest	10.75 to 11	1	horizontal
		Southeast	1.75 to 2	1	horizontal
Section 9	Small Pile, Original Berm Material	Northwest	1.5 to 2.5	1	vertical
		Northeast	7.5 to 8.5	1	vertical
		Southwest	10 to 11	1	vertical
		Southeast	17 to 18	1	vertical
Section 10	Small Pile, Original Berm Material	Northwest	10.5 to 11.5	1	vertical
		Northeast	1 to 2	1	vertical
		Southwest	6 to 7	1	vertical
		Southeast	17 to 18	1	vertical



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