CLOSURE REPORT

SWMU 69, Pond by Chromic Acid Treatment Tanks
Radford Army Ammunition Plant, Virginia
Task Order No. 4
(DRAFT)

Prepared for:

U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland 21010-5401
Contract No. DAAA15-90-D-0015

DAMES & MOORE
2807 N. Parham Road, Suite 114, Richmond, VA 23294

August 30, 1994

DAMES & MOORE

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August 31, 1994

Harry R. Kleiser
U.S. Army Environmental Center
Installation Restoration Division
Building E4480
Aberdeen Proving Ground, MD 21010-5401

Re: Revised VI Section Report
SWMU Closure Report
Radford Army Ammunition Plant, VA

Dear Harry:

Enclosed are one revised section report for the VI at RAAP and the closure report for SWMU 69; one bound and one unbound for each report. These reports include the 1993 data collected at SWMU 39 (Section 11.0) and the documentation for excavating SWMU 69 and landfilling the soil at the RAAP Fly Ash Landfill. Please review these draft documents and provide comments as necessary. A copy of the SWMU 69 report was sent to Bill Hendon (RAAP) for his review. Revised section reports for SWMU O and SWMUs 10/35 are being prepared now and should be out in a week or two. Our plan is still to send the revised section reports to you for comment, give you a week or so to review them and have them returned to us for a final draft of each to be prepared before the end of September. We plan on providing the study on using the onsite soils data to create background concentrations to you in late September.

Please call to discuss any changes or extras to the reports. I will contact you within the next few days if I do not get a call from you or Dennis.

Sincerely,

DAMES & MOORE, INC.

Anthony J. Duda
Sr. Hydrogeologist

Enclosures

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Submitted to:

Commander, U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland 21010-5401

Contract No. DAAA15-90-D-0015

Prepared by:

Dames & Moore
2807 N. Parham Road, Suite 114
Richmond, Virginia 23294

August 30, 1994

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ACRONYMS AND ABBREVIATIONS

bgs	Below Ground Surface
HBN	Health Based Number
msl	Mean sea level
RAAP	Radford Army Ammunition Plant
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
TOX	Total Organic Halogen
ug/g	Micrograms per gram
ug/L	Micrograms per Liter
USAEC	U.S. Army Environmental Center
USEPA	U.S. Environmental Protection Agency
VI	Verification Investigation
XRF	X-Ray Fluorescence

1.0 BACKGROUND INFORMATION

Solid Waste Management Unit (SWMU) 69 was a retention facility at Radford Army Ammunition Plant (RAAP), Virginia identified in the RAAP Resource Conservation and Recovery Act (RCRA) Facility Assessment (USEPA,1987) as having the potential for releasing contaminants into the environment and was included in the RCRA Permit for Corrective Action and Incinerator Operation (USEPA, 1989) issued to RAAP by the U.S. Environmental Protection Agency as warranting investigation. The actions undertaken by Dames & Moore at SWMU 69 were authorized by the U.S. Army Environmental Center (USAEC) under Contract No. DAAA15-90-D-0015, Task Order 4.

In accordance with the RCRA Permit for Corrective Action and Incineration Operation, a Verification Investigation (VI) was performed in 1992. As part of the VI, samples were collected from the surface water and sediment located in SWMU 69 and analyzed to evaluate whether hazardous constituents were present from discharges associated with the chromium tanks at SWMU 68, approximately 25 feet upgradient and southeast of SWMU 69. Additional soil samples were collected downgradient of the retention facility to evaluate the presence of hazardous constituents transported through overflows of the retention facility. (See Figure 1 for VI sample locations). Soil and sediment samples were analyzed for pH and Target Analyte List (TAL) metals. The water sample was analyzed for pH, TAL metals, Total Organic Carbon (TOC) and Total Organic Halogen (TOX).

The sediment and soil sample results from the 1992 VI indicated concentrations of antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, and thallium exceeding (HBN) criteria. The laboratory analyses of the surface water in the pond indicated that antimony, cadmium, chromium, cobalt, copper, lead, manganese, nickel and zinc exceeded the permit HBNs. The recommendations of the VI report included the removal of all accumulated water, sediment and surficial soils associated with SWMU 69 that are known to be adversely impacted. RAAP personnel collected additional samples of the pond sediment for chemical analysis and demonstrated that these materials were compatible to the flyash being disposed into Fly Ash Landfill No. 2 (FAL No. 2). Based on this demonstration, the Virginia Department of Environmental Quality modified the permit for FAL No. 2 to allow the sediment and soil at

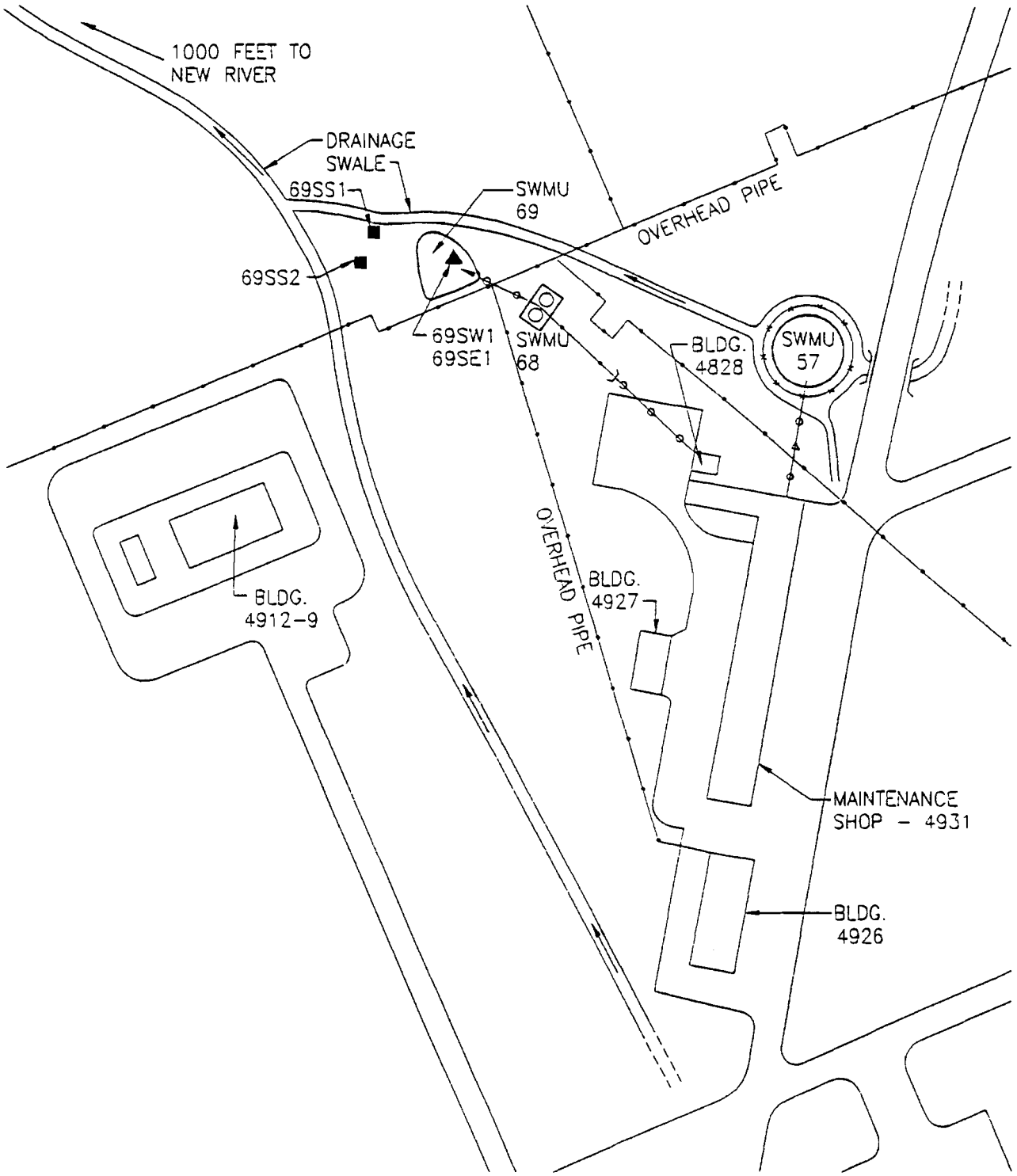

FIGURE 1
LOCATION MAP
SWMU 69—POND BY CHROMIC ACID TREATMENT TANKS
RADFORD ARMY AMMUNITION PLANT, VA

Dames & Moore

SWMU 69 to be disposed of into the landfill. The excavation activities were initiated after the permit modifications were approved.

2.0 ENVIRONMENTAL SETTING

The topography in the area of SWMU 69 is moderately sloping towards the northwest. The area further north of SWMU 69 is moderately steeply sloping toward the west. The elevation at SWMU 69 is approximately 1,790 to 1,800 feet above mean sea level (msl). There are buildings, paved roads, and overhead pipes in the vicinity of SWMU 69. The topographic survey of conditions prior to excavation activities was performed by Anderson and Associates, Blacksburg, VA. Insert 1 presents the topographic survey of the site and adjacent areas. Figure 2 presents the pond and areas to be disturbed from the excavations.

No site-specific groundwater conditions have been investigated in this area. However, groundwater is likely found at a depth of 20 to 40 feet below ground surface (bgs) with flow northwestward and discharge into the New River.

Based on topography, the surface water in the area of SWMU 69 appears to flow westward towards a tributary to the New River. The tributary flows north and discharges into the New River which is approximately 1,400 feet from SWMU 69. Based on the review of RAAP utility maps, no manholes, catch basins, or storm drains were evident in the immediate vicinity of SWMU 69. Overflow from the pond traveled through a weir which discharges to the northwest.

3.0 EXCAVATION AND SOIL SCREENING PROGRAM

In accordance with the recommendation included in the final draft VI report for SWMU 69, interim measures were undertaken at SWMU 69 to remove impacted soil. An X-Ray fluorescence (XRF) method was selected as the appropriate field method to delineate the limits of the area to be excavated. Lead was selected as the indicator for field screening of soils due to excessive levels present in pond sediment and ease of testing using the XRF method. The corrective action consisted of developmental sampling, excavation and disposal of contaminated sediment and soils, on-site sampling and analysis during excavation activities, confirmatory sampling and analysis, and backfilling and grading operations.

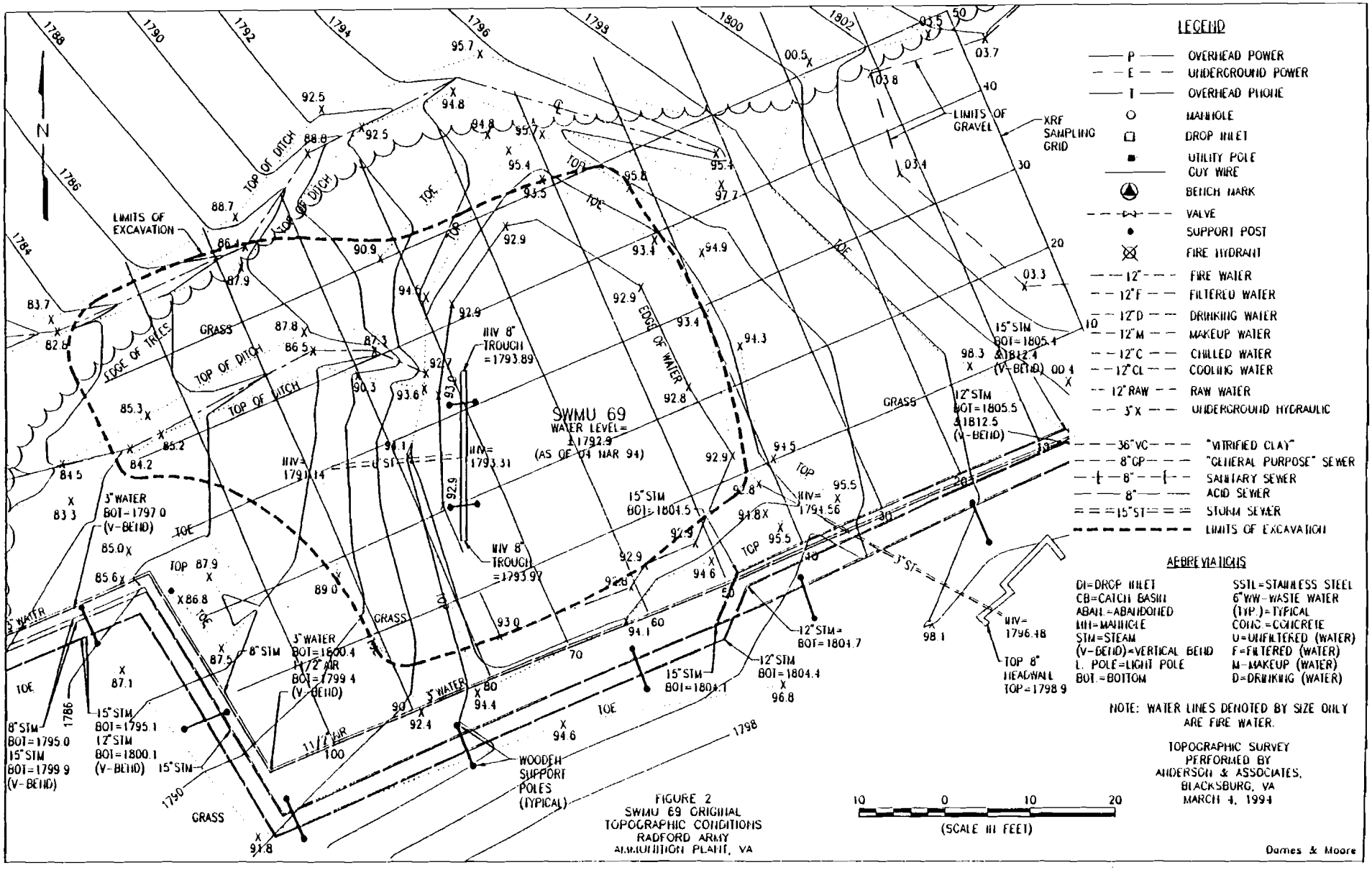

FIGURE 2
SWMU 69 ORIGINAL TOPOGRAPHIC CONDITIONS
RADFORD ARMY AMMUNITION PLANT, VA

3.1 Developmental Sampling

Prior to undertaking the excavation activities, developmental sampling activities took place to establish a lead XRF standard to be utilized for analysis of samples collected during excavation activities.

3.1.1 XRF Instrumentation

The XRF instrument used for the soils screening was the MAP 3, manufactured by Scitec Corporation. The instrument uses a radioactive cadmium^{109} source to excite the elements in the samples, causing the elements to emit their own characteristic (in terms of wavelength and energy) fluorescent x-radiation. The instrument detector sorts the fluorescent x-rays by energies, and the concentrations of the elements are calculated by comparing the fluorescent intensities in the sample unknowns to those in standard samples. The form of the metal analyte in the samples is unimportant (e.g., amorphous versus crystalline, organically versus inorganically bound, silicate versus oxide, etc.). Analytical accuracy is greatly enhanced if the matrix composition of the sample unknowns is similar to that of the standards (in terms of bulk elemental composition), and similar particle size distributions also contribute to improved accuracy.

3.1.2 Lead XRF Standard Preparation

Site-specific lead calibration standards were prepared from "clean" soil collected in the immediate vicinity of the pond. Two sets of standards were made using two different soil types identified at the site (one soil appeared to contain more clay than the other). An analysis of the two soils for metals content revealed the concentrations presented in Table 1. Elementally, the two soils are not substantially different; the lead contents were 38 and 17 micrograms/gram (ug/g). The standards were made by doping the soils with lead atomic absorption reference solutions (1,000 ug/g and 10,000 ug/g) to yield soil lead concentrations scanning the expected

Table 1
Summary of Analytical Results for Calibration Soils
SWMU 69, Pond by Chromic Acid Treatment Tanks
RAAP, Virginia

Metal Analyte	Metals Concentrations (micrograms/grams) Soil No. 1	Soil No. 2
Silver	BDL	BDL
Aluminum	36,800	34,200
Arsenic	1,990	6,350
Barium	285	248
Beryllium	3	3
Calcium	581	1,080
Cadmium	BDL	BDL
Cobalt	9	11
Chromium	161	347
Copper	23	22
Iron	22,400	23,600
Potassium	6,090	9,340
Magnesium	1,410	2,480
Molybdenum	BDL	BDL
Sodium	864	1,090
Nickel	47	41
Lead	38	17
Antimony	170	200
Selenium	250	261
Silicon	228,000	26,500
Thallium	248	299
Vanadium	63	51
Zinc	73	50

BDL = Below Detection Limit.

concentration range of lead in the sample unknowns (0 to 2,500 ug/g). The samples were air-dried and then homogenized and placed in plastic zip-lock bags.

3.1.3 XRF Calibration

The exact calibration procedures for the MAP 3 are proprietary. In general terms, the sample standards were analyzed with the XRF unit to generate fluorescence yield data for lead. The standard samples were analyzed through the walls of the plastic zip-lock bags. The fluorescence yields and the known lead concentrations were used to develop calibration curves (models) for lead in the two soils; the models were simply linear (or near linear) plots of fluorescence yield versus lead concentration. The two models were stored in the MAP 3 internal computer for use in the field. Based on the linear plots of the laboratory derived lead calibration standards, the lead concentrations of the field samples could be estimated to plus or minus 25 ug/g.

3.2 Onsite Sampling and Analysis

The objective of the XRF screening of soils was to identify soils for which lead concentrations were greater than the permit specified HBN of 200 ug/g. Soils were collected and screened before excavation began in order to establish a baseline database to define areas from which soils needed to be removed. The soils continued to be screened during excavation so that the areas needing excavation could be continously redefined based on the detected lead concentrations. Once an area yielded soil with lead concentrations consistently below the HBN, soil excavation was discontinued and excavation begun on the adjacent soils. This process of screening soils, adjusting excavation areas and final screening of soils was continued until the area needing soil removal was defined and fully excavated.

3.2.1 Soil and Sampling Locations

During the excavation process, samples were collected to determine and limit the excavation process. Samples were collected and located on a locally developed grid coordinate pattern, (see Figure 2 for grid layout). The samples shown on Table 2 are identified by their westing coordinate followed by their northing coordinate. The sample coordinates were

Table 2
Summary of XRF Lead Results
SWMU 69, Pond by Chromic Acid Treatment Tanks
RAAP, Virginia

Sample Identification	Estimated Lead Concentrations (micrograms/grams) Model 1	Model 2
Samples Screened Prior to Excavation		
69SE2	1910	1729
69SO1-2	131	112
69SO2-2	244	213
Red/upslope	99	84
Brown/downslope	182	158
100W10N	148	128
100W20N	191	166
100W30N	233	203
100W40N	205	178
100W50N	329	288
40W10N	139	119
40W20N	131	113
40W30N	150	129
40W40N	128	109
40W50N	89	75
80W50N	148	127
80W60N	257	225
90W50N	160	138
90W60N	440	388
100W60N	330	290
90W10N	124	106
90W20N	0	0
90W30N	62	52
90W40N	34	27