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Los Alamos National Laboratory

Environmental Restoration Project

EXPEDITED CLEANUP PLAN

for

SOLID WASTE MANAGEMENT UNIT 22-015(c)

RECEIVED
HAZARDOUS WASTE
PROGRAM

June 1995
Revision 0

Environmental
Restoration

2141

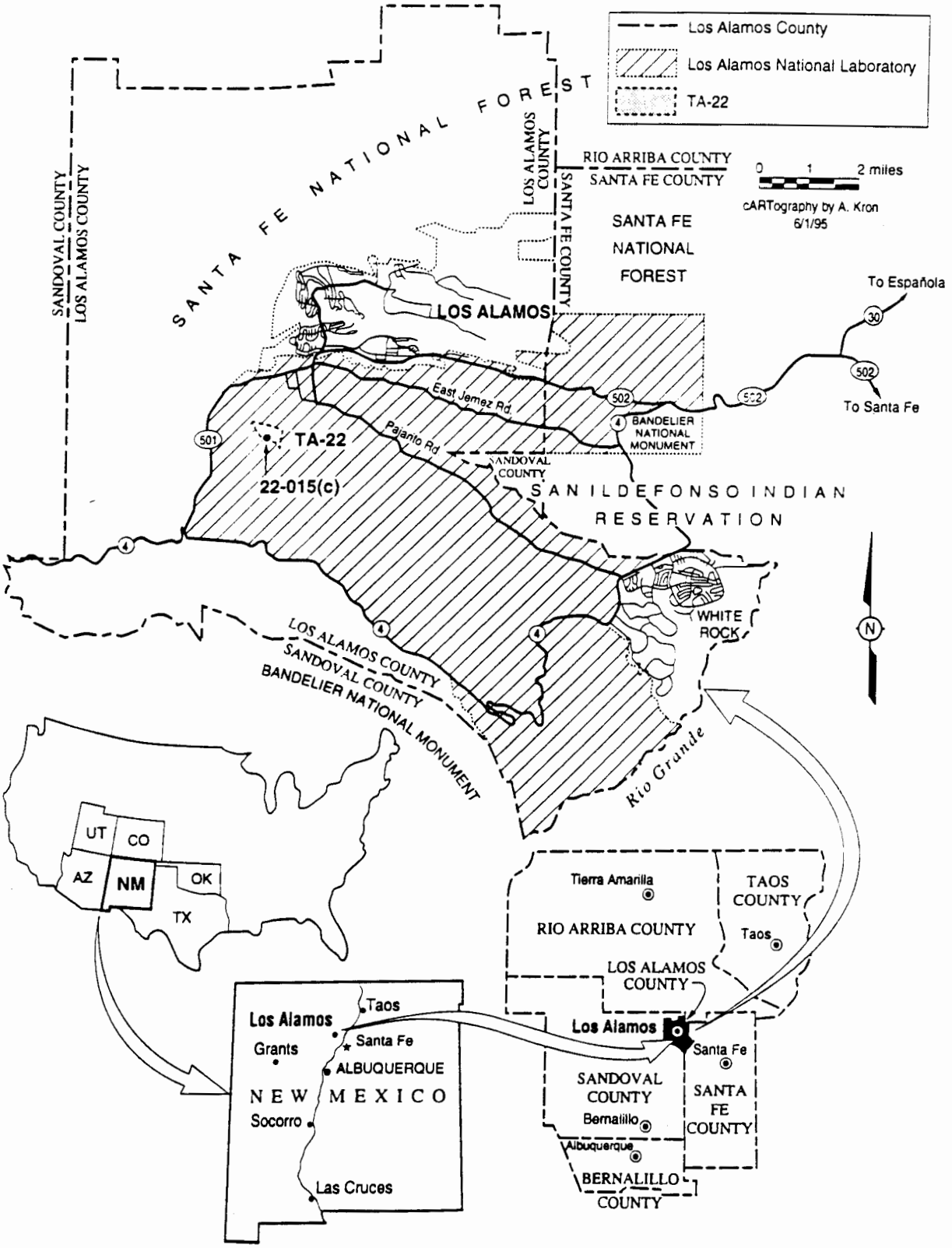

Figure 1-1. Regional location map.

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

2.1 Detailed Description of SWMU 22-015(c)

SWMU 22-015(c) is a former outfall and related runoff area originating from a floor drainage system in Building TA-22-52, a plating and circuit etching shop that operated from approximately 1953 to 1977. The site is shown on Figure 2-1. Floor drains within the shop reportedly received spills from plating baths and rinse tank overflow. The SWMU is comprised of a drainage channel leading to a former pond area (a depression in the land surface where effluent and stormwater collect) located near the edge of the mesa; an overflow drainage channel from the pond area that flowed downhill to a wagon road; and two channels that flowed across the road and discharged over a rock cliff to Pajarito Canyon. The former pond area is filled with sediments and presently contains no water.

2.1.1 Operational History

SWMU 22-015(c) is believed to have received spilled plating liquids containing gold, copper, nickel, chromium, silver, cadmium, rhodium, zinc, and platinum. The basic plating process was as follows: metal parts were plated, suspended over the plating bath to drip dry, and then rinsed in a water bath. Hazardous chemicals used in the process included sulfuric, chromic, hydrochloric, nitric, hydrofluoric, and phosphoric acids; benzene; trichloroethylene; percloroethylene; sodium thiosulfate; hydrogen peroxide; and sodium hydroxide. The rinse water containing dilute concentrations of plating chemicals is believed to have been the primary contributor of contaminants to the outfall.

In 1956, an irradiated reactor part was stripped of a gold coating and then plated. Radiation monitoring of the part before striping and plating indicated that a low level of radioactivity was present, probably neutron activation products with short half-lives. In 1974, standard, printed circuit board etching operations began in TA-22-52. This was a photosensitive, resistant coating operation that used ferric chloride and caustic chemicals. The spent ferric chloride solution, containing traces of copper, was reportedly disposed through the outfall from 1974 to 1977. From 1977 to 1985, the ferric chloride waste solution was drummed and sent to the Laboratory's liquid waste treatment plant for disposal. The outfall has been inactive since 1977.

2.1.2 Physical Setting

The former TA-22 plating shop is located on Two Mile Mesa on the northern flank of Pajarito Canyon in Los Alamos County. Los Alamos County has a semi-arid, temperate mountain climate. Rainfall at this site averages approximately 22 inches per year. High extremes in precipitation include 2.51 inches per day of precipitation and 153 inches per year of snowfall. Average snowfall is about 55 inches per year.

SWMU 22-015(c) lies within US Department of Energy (DOE)-owned land, and the area is removed from public access roads. Access to the site is via State Road 501 and then Two Mile Mesa Road. Elevation contours, shown on a Facility for Information Management, Analysis, and Display (FIMAD) map of SWMU 22-015(c) (FIMAD Plot G103324), indicate that the lower portion of this SWMU potentially receives stormwater runoff from a 5-acre catchment area in TA-22.

A soil map presented in the RFI Work Plan for OU 1111 defines the soil types present within the SWMU drainage, as Carjo and Tocal loam soil types. The upper part of the drainage from the outfall to the former pond overflow area contains the deepest soil profile, with an approximate depth of 30 inches. Downstream of the former pond area, soils are 6 inches deep or less and have outcrops of the Tshirege Member of the Bandelier Tuff exposed at eroded areas in the channel. Several surface stormwater drainage channels converge downstream of the pond area. The drainage flows along the tuff surface and is poorly defined where all soil has been eroded. At the wagon road, the drainage appears to split into two paths: both branches of the drainage cascade over a steep rock embankment to flow to Pajarito Canyon. There is no continuous soil cover within the drainage downstream of the wagon road.

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1.0 INTRODUCTION

This Expedited Cleanup (EC) Plan addresses Solid Waste Management Unit (SWMU) 22-015(c), a former plating and etching facility outfall and related runoff area. The site is located on Two Mile Mesa adjacent to Building TA-22-52 in the western portion of Los Alamos National Laboratory (the Laboratory), in Los Alamos, New Mexico (Figure 1-1). This EC Plan is being proposed as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process described in the Operable Unit (OU) 1111 RFI Work Plan (LANL 1993, 1091).

SWMU 22-015(c) is included in Table A of the Hazardous and Solid Waste Amendments (HSWA) of the Laboratory's RCRA permit.

SWMU 22-015(c) consists of a former outfall from a plating and etching facility, and a related runoff area. Preliminary results from the Phase I RFI sampling indicate that sediments and soils within the drainage channel contain concentrations of metals that are elevated with respect to Laboratory screening action levels (SALs) and background concentrations.

Activities comprising this EC Plan include excavation of metals-contaminated soils where above cleanup levels and collection of verification samples. The excavation will be backfilled with clean fill, recontoured, and revegetated to prevent future erosion. The excavated soil will be disposed of at a permitted industrial waste landfill.

This EC Plan identifies the level of effort required from the initial transmittal of the plan to the U.S. Environmental Protection Agency (EPA) Region 6 for review and implementation of the plan, through completion of the final project report. In the development of this EC Plan, the following assumptions were made:

- The levels of contaminants of concern (COCs) and volumes of anticipated waste are consistent with preliminary RFI data.
- Future land use at the location of this SWMU will continue to be for industrial purposes.
- Minimal delays in EC operations will be experienced as a result of inclement weather, site access problems, or other delays. Delays that may result from the acquisition and scheduling of heavy equipment, subcontractors, and from the acceptance of waste at a permitted disposal facility cannot be anticipated and therefore are not considered in this plan.
- A Site-Specific Health and Safety Plan (SSHASP) and Waste Management Checklist will be developed specifically to address COCs identified in this EC Plan. Deviations from the anticipated concentrations and locations of COCs may necessitate adjustments to both plans.
- Any comments generated by agencies for public review may necessitate adjustments to the scope of this EC Plan.

ACRONYMS

AP	Administrative Procedure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code Of Federal Regulations
COPC	chemicals of potential concern
COC	contaminant of concern
DOE	U.S. Department of Energy
EC	expedited cleanup
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FIMAD	Facility for Information Management, Analysis, and Display
FPL	Field Project Leader
FTL	Field Team Leader
HSWA	Hazardous and Solid Waste Amendments
LANL, the Laboratory	Los Alamos National Laboratory
OU	Operable Unit
PPE	personal protective equipment
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAL	screening action level
SOP	Standard Operating Procedure
SSHASP	Site-Specific Health and Safety Plan
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	Technical Area
TCLP	Toxicity Characteristic Leaching Procedure
TSD	treatment, storage, and disposal
UCL	upper confidence limit
UTL	upper tolerance limit
WAC	waste acceptance criteria
VOC	volatile organic compound
XRF	x-ray fluorescence

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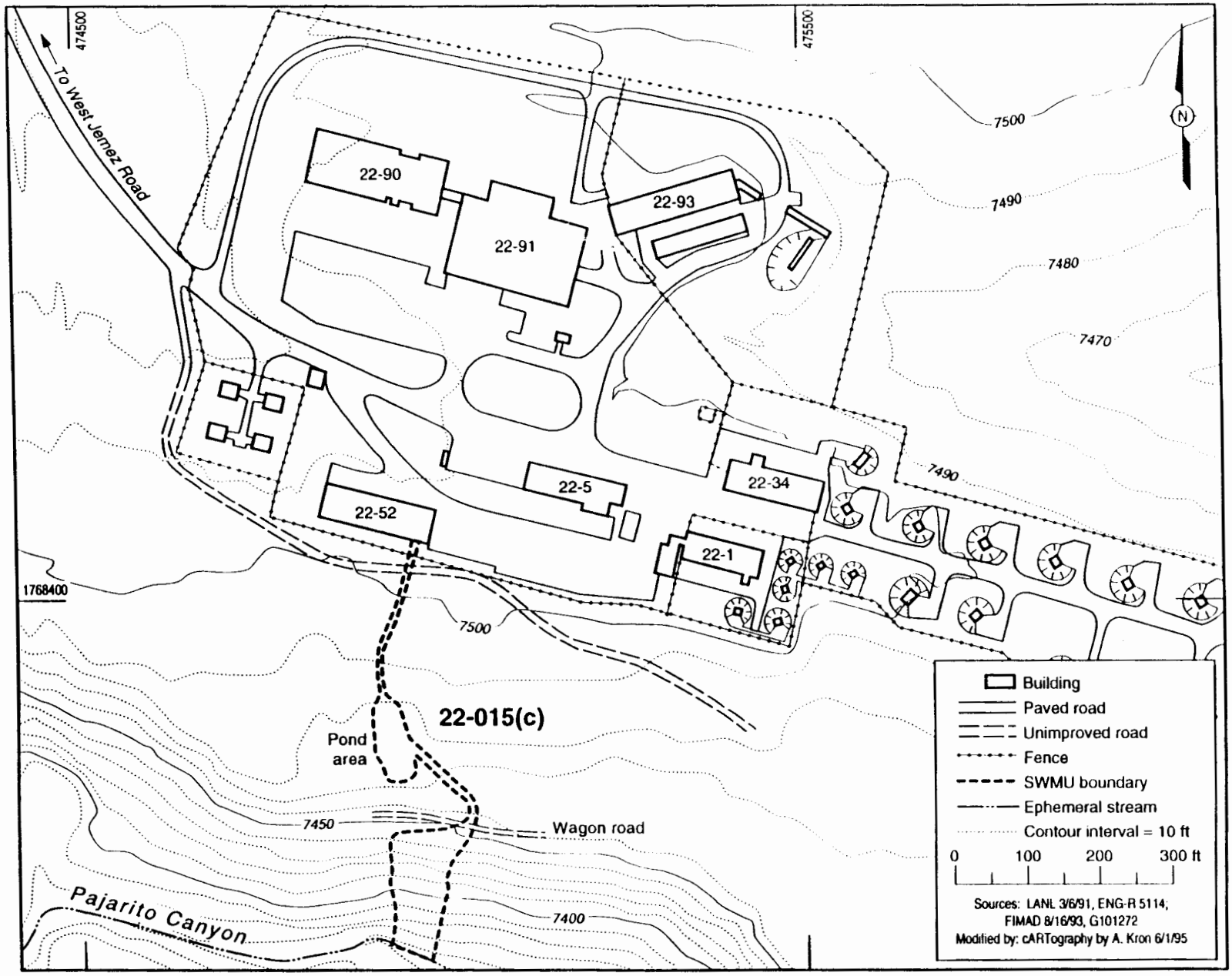


Figure 2-1. SWMU 22-015(c) site location map.

2.2 Summary of Investigations

2.2.1 Investigations Prior to the RFI

There were no investigations of SWMU 22-015(c) prior to the RFI Phase I investigation completed in June 1994.

2.2.2 RCRA Facility Investigation

2.2.2.1 Method of Investigation

During June 1994, sediment and soil samples were collected from stained and unstained areas within the drainage and from the pond area. RFI sample locations and site topography are shown on Figure 2-2. The area was divided into seven reaches to designate sampling locations based on SWMU characteristics and topography. These reaches are shown on Figure 2-3 and are described below:

- S1 extends from the TA-22-52 drain pipe and includes the pond area;
- S2 extends from the pond area to the wagon road and includes the wagon road;
- S3 consists of the drainage area below the wagon road;
- U1 consists of unstained soil within the east and west banks of the upper outfall drainage channel to the upper edge of the pond;
- U2 designates unstained soils surrounding the pond area;
- U3 consists of the unstained channel banks from the lower edge of the pond area to just below the wagon road; and
- U4 consists of the unstained channel banks along the drainage channel from below the wagon road to the canyon bottom.

Soil samples from S3 were located between rocks in the drainage where soils and sediments have accumulated. These soil samples were collected from two depths (0-6 inches and from tuff) in the drainage area below the wagon road.

A composite sampling method was implemented for areas S1, S2, U1, U2, U3, and U4 based on the assumption that the contaminants of concern were distributed homogeneously along the channel due to infiltration over long time periods. Six grab samples were collected from within the pond area (area S2) to compare to the composite samples collected from the same area to verify this assumption. Downstream of the pond area, grab samples were collected from the channel and banks of the drainage (the S3 reach). No composites were prepared from these grab samples since the sediment cover was discontinuous and the concentration of contaminants was likely to be widely variable. Composite and grab sample locations are summarized in Tables presented in Annex 6.10.

Two composite samples were gathered from each depth at each sample composite sample location: one composite from grab samples collected from a shallow depth and one composite from samples collected from the tuff to characterize the stained channel and the adjacent unstained embankment within the pond area and within the channels leading to and from the pond area. The embankment samples were collected approximately 5 feet out from the channel bank. Separate composite samples were collected to represent the east bank and the west bank of the drainage.

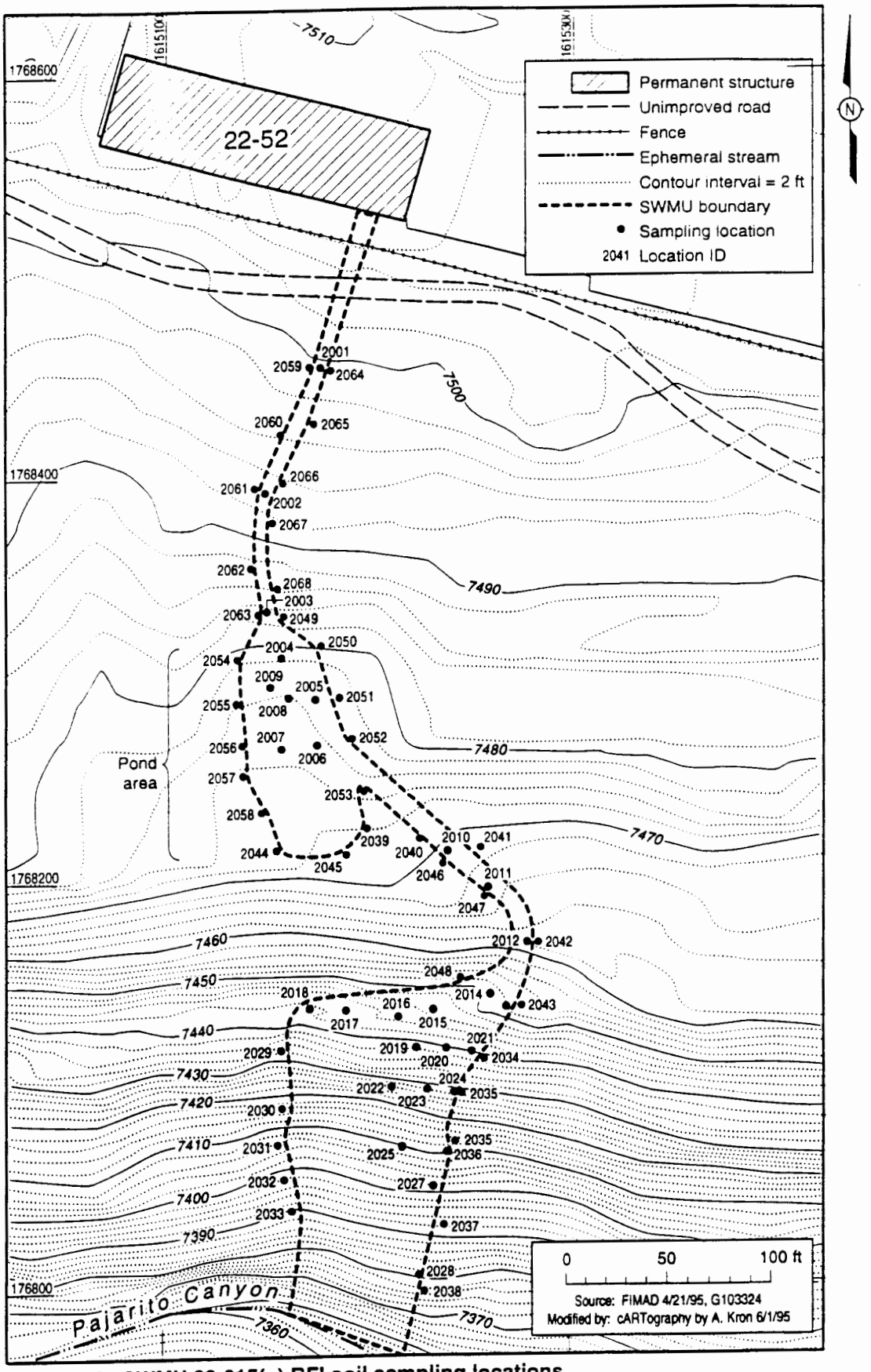


Figure 2-2. SWMU 22-015(c) RFI soil sampling locations.

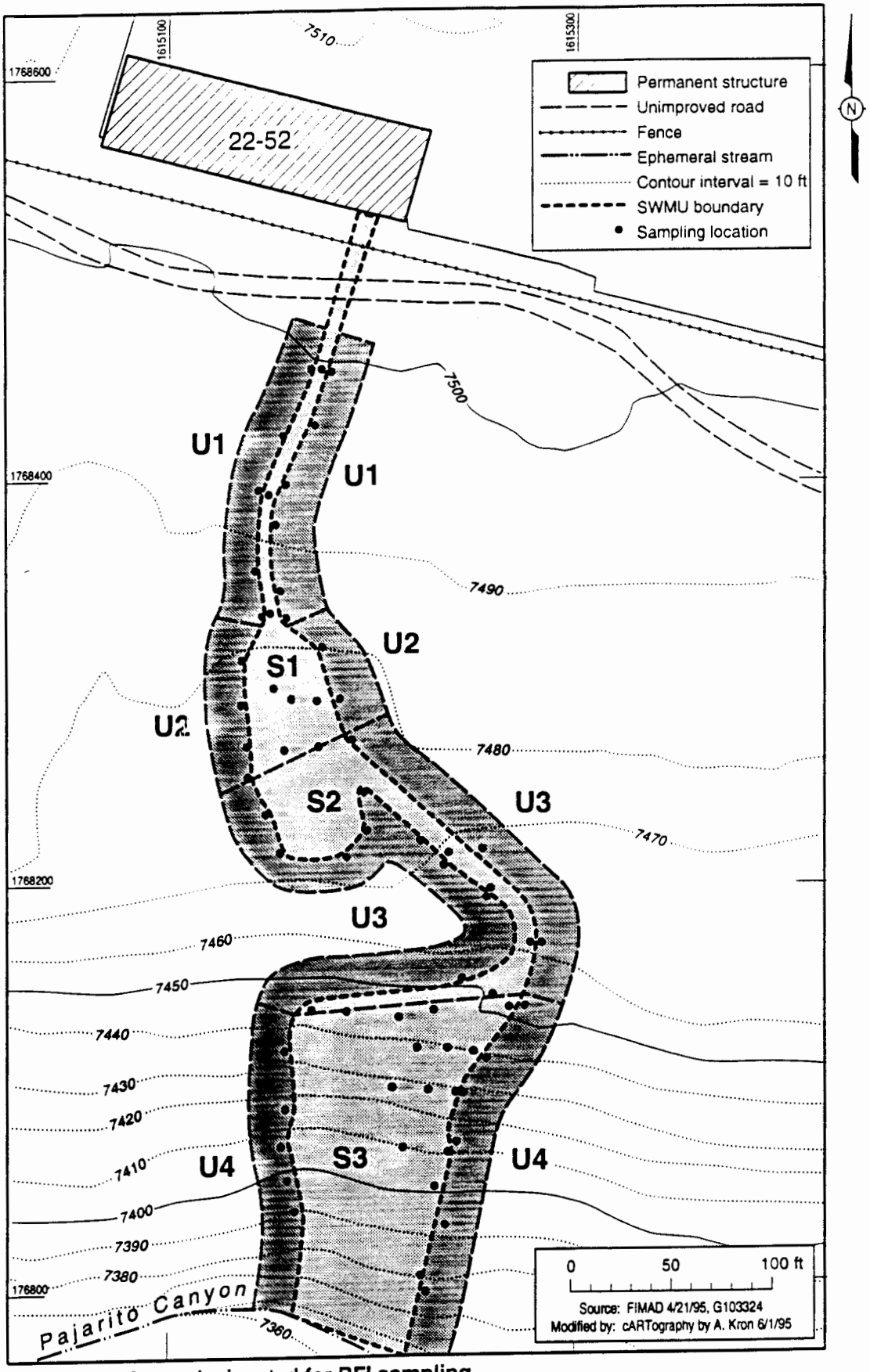


Figure 2-3. Areas designated for RFI sampling.

Shallow soil samples were collected from the surface to a depth 6 inches using stainless steel scoops. Stainless steel hand augers were used to collect deeper samples, which extended to variable depths between 4 and 37 inches. Sampling protocols are described in the standard operating procedures (SOPs) ER-SOP-06.09 (scoop sampling) and ER-SOP-06.10 (hand auger sampling) (LANL 1993, 0875). Forest detritus was removed from the samples, the samples were packaged in a locked cooler, and submitted under chain-of-custody to an approved off-site laboratory.

All samples were analyzed by gamma spectroscopy for cesium-137 and strontium-90, metals, semivolatile organic compounds (SVOCs), and cyanide. Three additional samples were collected from the pond area and analyzed for volatile organic compounds (VOCs), nitrites, and fluoride, as well as the above analytes.

2.2.2.2 Results of the Investigation

Annex 6.9 presents a summary of the RFI analytical sampling results reported above detection limits for all RFI samples collected at the site. The detected concentrations, screening action levels (SALs), and upper tolerance limits (UTLs) for background concentrations in soil are also presented for comparison. The sample locations where data exceeded the SALs are summarized in Annex 6.10. Based on preliminary review of the RFI sampling data, the results are summarized below:

S1 Sample Data - Concentrations of metals (arsenic, chromium, copper, lead, nickel, and silver) exceeded SALs (UTL for chromium) in soil samples from the channel (S1 samples), the former pond area, and the unstained soil within the east and west banks of the channel (U1 samples). Concentrations decreased rapidly below a depth of 6 inches and did not exceed the SALs in unstained soil surrounding the pond area (U2 samples). A comparison of composite sample data and grab sample data from the pond area indicates that the composite samples tend to be half the maximum concentrations in the grab samples for most metals, except lead and mercury. Therefore, a factor of two was applied to the composite data to assess whether or not values exceeded SALs.

S2 Sample Data - Concentrations of arsenic, chromium, copper, and lead exceeded SALs in samples from a 6-inch depth in the channel. The chromium UTL was exceeded for samples collected from the unstained west embankment (U3 samples).

S3 Sample Data - Concentrations for chromium exceeded the UTL in soil and tuff samples collected from the unstained embankment (U4 samples).

Radioisotope Data - Soil samples collected from the center of the pond area and the channel leading to the pond area detected trace concentrations of strontium-90 that were slightly elevated with respect to background and the SAL. This radionuclide detection is most probably the result of deposition and subsequent transport of TA-22 air emissions concentrated in the pond area from sediment erosion and deposition.

Background Data - Three site-specific background surface soil samples were collected from an area west of TA-22-52, and upgradient from the SWMU. Chromium, lead and zinc were detected in these samples; however, the elements silver, cadmium, copper, mercury, and nickel were not detected. Cesium-137 and strontium-90 were detected at an average level of 1.2 pCi/g. Analytical results from the TA-22 background samples are also provided in Annex 6.9.

2.2.3 Summary and Evaluation of Results

Annex 6.9 presents a summary of Phase I RFI analytical results reported above detection or method-specific quantitation limits for all samples collected at this site. The detected concentrations, SALs, and UTLs for Laboratory background concentrations in soil are also presented for comparison. An extensive review of preliminary Phase I RFI analytical data confirms that historical releases to the soil-lined channels on the south side of TA-22-52 have left elevated levels of heavy metals. The deepest penetration of the metals into the soil was detected in samples from the former pond area and in the channel leading to the pond area. Downstream of the pond area, the channel is narrow

and close to the tuff surface. In these areas, metals concentrations that exceeded SALs were limited to a depth of 6 inches or less. The results are summarized as follows:

- Arsenic and lead were detected above SALs, and chromium above the UTL in soil samples from the S1, U1, Pond, and S3 areas. Concentrations for all metals detected decrease in concentration with depth. For example, the maximum concentration of arsenic (227 ppm) was detected at a depth of 6 inches in the pond area (sample location 2007). However, a concentration of 3.2 ppm arsenic was detected at a depth of 37 inches at the same sample location. The maximum chromium concentration (952 ppm) was detected at a depth of 6 inches in the pond area (sample location 2008), but was detected at 9.4 ppm at a depth of 29 inches at the same sample location. The maximum lead concentration (557 ppm) was also detected at a depth of 6 inches at sample location 2024 near the cliff edge. This sample also had the second highest observed chromium concentration (931 ppm) and appears to represent soil and sediment eroded from the pond area. Additional heavy metals were detected; however, arsenic, chromium and lead are the primary COCs for this SWMU (see Annex 6.9).

- Analytical results from soil samples collected from the S3 reach showed relatively homogeneous metals concentrations throughout each soil depth (i.e., 0 to 6-inches, 6- to 18-inches, etc.). The grab or discrete sample data indicate that metals concentrations decrease with distance downstream within the S3 reach.

- A single SVOC (bis(2-ethylhexyl)phthalate) was detected only in samples collected from the pond area with a maximum concentration of 69 ppm (sample locations 2007 and 2008). Phthalates are common components of plasticizers and are often seen in samples contaminated by laboratory gloves (EPA Method SW 846, Volume IB, Section 4.1.2). Additionally, this compound was not used in any operations conducted in TA-22-52.

- Two VOCs (methylene chloride and tri-chloro-1,2,2-triflouroethane) were also detected at trace concentrations (0.032 and 0.054 ppm, respectively) only in samples collected from locations 2007 and 2008 in the pond area. These results are attributed to laboratory contamination since neither compound was used in TA-22-52 operations and these samples are from the same analytical run as those with the SVOC detects.

- Strontium-90 was detected above the Laboratory SAL (5.9 pCi/g) in sediments within the pond area at a depth of 6 inches at a maximum concentration 7.2 pCi/g (at sample location 2007).

Subsequent to the RFI sampling, four additional soil and sediment samples were collected from RFI sample locations that represent the "worst-case" metals concentrations, and were analyzed by the Toxicity Characteristic Leaching Procedure (TCLP) to determine if the leachate exceeded RCRA standards for hazardous waste. These samples were collected from the following locations:

- One grab sample from the drainage channel above the pond area (RFI sample location 2001);

- One grab sample from sediments in the pond area (RFI sample location 2008);

- One composite sample from sediments in the pond area (from the vicinity and RFI sample location 2008); and

- One grab sample below the pond area past the wagon trail and near the canyon edge (RFI sample 2024).

Analytical results from the samples indicate that the soil and sediments from these "worst-case" locations do not approach TCLP limits (see Annex 6.11). The composite sample was also analyzed using a hydrochloric acid (HCl) extraction according the procedure described in Annex 6.11. This procedure is intended to simulate the bio-availability of the heavy metals upon ingestion. The HCl extraction yielded trace concentrations of lead and barium and indicated that the metals present in soils at this site are not readily available if the soil were to be ingested (see Annex 6.11).

2.3 Types and Volumes of Waste

The nature of the wastes expected to be generated by the proposed cleanup is presented in Table 2-3. Surface and near-surface soil samples revealed elevated levels of a variety of heavy metals. Strontium-90 was also detected at slightly elevated levels in the pond area. The soils contaminated with heavy metals are considered special or industrial solid waste and the soils with elevated levels of strontium-90 may be considered low-level solid waste. As described in Section 3.3, soils contaminated above proposed cleanup levels will be excavated and placed directly into bulk storage containers or dump trucks on site for transportation to and disposal at an approved waste facility. The soils will be segregated to ensure that all soil with elevated levels of strontium-90 are disposed at the Laboratory's Area G, and the remaining soils are disposed at an approved industrial waste landfill.

Verification sampling will be performed as described in Section 3.5. A small volume of solid and/or liquid wastes may be generated by this activity. Waste associated with this effort may include disposable sampling equipment, personal protective equipment, and decontamination water. These materials will be handled in accordance with the site-specific Waste Management Checklist.

TABLE 2-1
ANTICIPATED WASTE VOLUMES

Item	Type	Anticipated Volume
Sampling Waste/Personal Protective Equipment (PPE)	Solid Waste - Non-hazardous	8 cu. ft.
Decontamination Wastewater	Water - Non-hazardous	1,000 gal.
Soils with Heavy Metals	Industrial Waste - Non-hazardous	350 cu. yds.
Soils with Heavy Metals and Radionuclides	Low-Level - Non-hazardous	60 cu. yds.

2.4 Potential Impacts on Public Health and the Environment

Receptors of possible contaminants include animals and humans. Potential exposure routes of receptors include the following:

- Inhalation of dust from dried sediments from the stained channel or the pond area;
- Ingestion of sediment or possibly contaminated drainage water; and
- Skin contact with contaminated sediments, water, or soil.

2.4.1 Potential Pathways

2.4.1.1 SWMU - In Place

The SWMU is partially located within a drainage channel that continues to receive stormwater runoff which discharges to Pajarito Canyon. Chemical data indicate that the pond area and shallow sediments contain elevated concentrations of heavy metals and radioisotopes. Therefore, a source area continues to be present for releases to the environment via erosion of contaminated soil and sediment.

The primary mode for transport of contaminated soil and sediment is believed to be via the established drainage system. In this scenario, flow in the drainage channel would remove material from the SWMU and transport it to Pajarito Canyon.

2.4.1.2 SWMU - Remediation

Expedited cleanup activities at SWMU 22-015(c) include excavation of soils and regrading of the site to minimize future erosion. Primary pathways associated with these activities are airborne dispersion during the excavation and surface water runoff of contaminated sediments prior site restoration activities. These possible scenarios will be minimized through dust control and by the use of erosion control during construction. Disturbed soil will be compacted, contoured, and revegetated as needed to minimize erosion. Little or no potential exists for aqueous transport during remediation because excavated soils will be placed directly into bulk containers or dump trucks. Furthermore, the excavated area will be covered with plastic sheeting to prohibit water from entering the excavation.

2.4.2 Future Land Use

SWMU 22-015(c) lies within DOE-owned land on a mesa top. The area is removed from public access roads. In the foreseeable future, the land is anticipated to be used exclusively for Laboratory (industrial) operations (LANL 1994, 1171).

2.4.3 Cleanup Levels

Identification of the chemicals of potential concern (COPCs) considered for this EC was based on simple comparisons of SWMU 22-015(c) Phase RFI analytical results to background and SAL concentrations. As presented in Annex 6.9, analytical results from the Phase I RFI sampling indicate that a background UTL or SALs were exceeded for arsenic, chromium, copper, nickel, lead, and silver. SAL comparisons for chromium (Cr) are not as straight forward due to the range of SALs for Cr VI at 400 ppm to Cr III at 80,000 ppm. Concentrations of total chromium in the RFI analytical results exceed the Cr VI SAL but not the Cr III SAL.

The derivation of human health risk-based cleanup levels for this EC is based on an occupational exposure scenario (continued Laboratory operations) using the standard EPA default exposure parameters for the generic worker as presented in *RAGS Part B, Development of Risk-Based Preliminary Remediation Goals (US EPA, 1991)*. These default exposure parameters assume an exposure frequency and duration of 250 days per year for 25 years. Exposure pathways considered include ingestion and inhalation of contaminated soil. This approach is considered very conservative in that few to no workers are expected to come into contact with remediated soils in this outfall area.

Cleanup levels calculated for this EC effort are presented in Table 2-2 below. Typically, the Laboratory derives cleanup levels assuming an acceptable level of risk of 1E-06 for carcinogens, and a hazard index of 0.1 for noncarcinogens. This conservative approach is adopted to account for the presence of multiple constituents. With this approach, the residual risk remaining at the site following remediation will be within the EPA acceptable risk range of 1E-04 to 1E-06 for carcinogens, and less than a hazard index of 1 for noncarcinogens. Table 2-2 indicates that the cleanup effort at this SWMU will be driven by the 25 mg/kg cleanup level for arsenic and cadmium (due to its toxicity). It should be noted that the arsenic cleanup level is based on an acceptable risk level of 1E-05 due to the fact that a risk level of 1E-06 results in a cleanup level for this contaminant lower than background (the background UTL for arsenic is 12 mg/kg). The equations and assumptions used for the calculation of cleanup levels in this plan are provided in Annex 6.12.

TABLE 2-2
CLEANUP LEVELS FOR SWMU 22-015(c)

Chemical	Cleanup Level (mg/kg)	Rationale
Arsenic	25	Carcinogen. Based on a risk level of 10^{-5}, a risk level of 10^{-6} creates a cleanup level lower than background.
Cadmium	25	Carcinogen - 10^{-6} risk level.
Chromium III	204,400	Noncarcinogenic. Based on a hazard index of 0.1.
Chromium VI	38	Carcinogenic Chromium VI. Based on a risk level of 10^{-5}, a risk level of 10^{-6} creates a cleanup level lower than background.
Lead	3,000	California Department of Toxic Substances Control (DTSC 19920 algorithm for adults.
Copper	7,500	Noncarcinogenic. Based on a hazard index of 0.1.
Nickel	4,100	Noncarcinogenic. Based on a hazard index of 0.1.
Silver	1,000	Noncarcinogenic. Based on a hazard index of 0.1.

2.4.3.1 Sampling and Risk Assessment Plan for Residual Downstream Soils

Results from the RFI and additional biased samples submitted for TCLP analysis indicate that leaching of metals from soils and sediments at this SWMU did not contribute concentrations of metals on the hillside below the outfall that would pose an unacceptable human health or ecological risk. In addition, the possibility that the total chromium present is in the form of Cr VI (the most toxic and mobile state of CR) is also highly unlikely for several reasons: (1) chromium was barely detectable following the TCLP procedure for soil containing the highest concentrations observed at this site; and (2) the presence of high levels of iron in the soils may have caused any Cr VI to be reduced to Cr III.

Therefore, to ensure that contaminated soils left in place on the hillside do not pose an unacceptable health and/or ecological risk, a minimum of five additional biased samples will be collected from sediment traps located in the two main drainages flowing down the hillside. These samples will be collected and analyzed for the metals of concern (including Cr VI) prior to initiation of this EC. Results from this additional sampling will be compared to SALs and ecological screening thresholds (currently under development) to determine if further action is required. If assessment results indicate that leaving these soils in place may pose an unacceptable human health or ecological risk, they will be excavated and disposed during the EC. Results of this assessment will be provided in the final report for this EC. It should be noted that human health and ecological risk assessment of the canyon bottom will be addressed in future Canyons Phase I RFIs.

3.0 EXPEDITED CLEANUP

3.1 Overview and Rationale

Phase I RFI analytical results indicate that soil and sediment in the drainage downstream of the TA-22-52 outfall contains metals concentrations that exceed LANL SALs, but are not hazardous according to TCLP. These sediments are potentially part of the larger drainage system of the Pajarito Canyon. The proposed EC (described in Section 3.3) will be implemented to remove the soil and physically stabilize the remediated site using erosion controls.

During the planning of this EC, three different treatment technologies were reviewed for potential applicability to this site. The three treatment technologies include: electro kinetic remediation, soil washing, and soil stabilization. All three technologies offer viable options for treating metals-contaminated soil in-situ; however, the electro kinetic remediation and soil washing options require a large site with between 2,000 and 3,000 cubic yards of contaminated soil. As such, these two technologies involve significant mobilization and treatment costs which are prohibitive for such a small site.

Subsequent sampling and analysis of soils from the most contaminated portions of this SWMU confirmed that the soils do not come close to failing RCRA TCLP limits, making the third treatment option of soil stabilization unnecessary. All three technologies are currently being evaluated by the ER Project for application at more suitable sites.

3.2 Permitting, Approval, and Notification Requirements

An excavation permit will be prepared and submitted for approval before execution of this plan.

Documentation will be prepared in accordance with Laboratory Environmental Restoration (ER) Administrative Procedure (AP) LANL-ER-AP-05.1, Rev. 0, "Readiness Review for Environmental Restoration Program Field Activities" (LANL 1993, 0951). Key documents to be prepared include a SSHASP and a site-specific Waste Management Checklist. Personnel training requirements will be specified and will require completion prior to implementation of the EC Plan. Site workers must have received all training for this project as specified in the SSHASP.

3.2.1 Regulatory Notification/Permit Modifications

SWMU 22-015(c) is included in Table A of the Hazardous and Solid Waste Amendments permit. Implementation of this EC will require a Class III modification to the Laboratory's RCRA Permit. EPA and the New Mexico Environment Department have been notified of this project, and a request for a permit modification has been submitted. Implementation of this EC Plan will proceed upon receipt of EPA approval.

3.2.2 DOE Approval

If the Laboratory intends to implement this EC prior to receiving EPA approval, DOE approval must be documented through receipt of the signed Field Work Approval Form (Annex 6.7).

3.3 Cleanup Activities

SWMU 22-015(c) is located outside of the secured and fenced area that comprises TA-22. Access to the site is already restricted along the Two Mile Mesa Road. The first activity will be to secure site access and establish staging areas and exclusion zones. Soil requiring removal to a low-level radioactivity disposal site will be taken to Area G. Other soil will be excavated as needed and staged for transport as a non-hazardous solid waste to Cerro Colorado landfill near Albuquerque, New Mexico (see Figure 3-1).

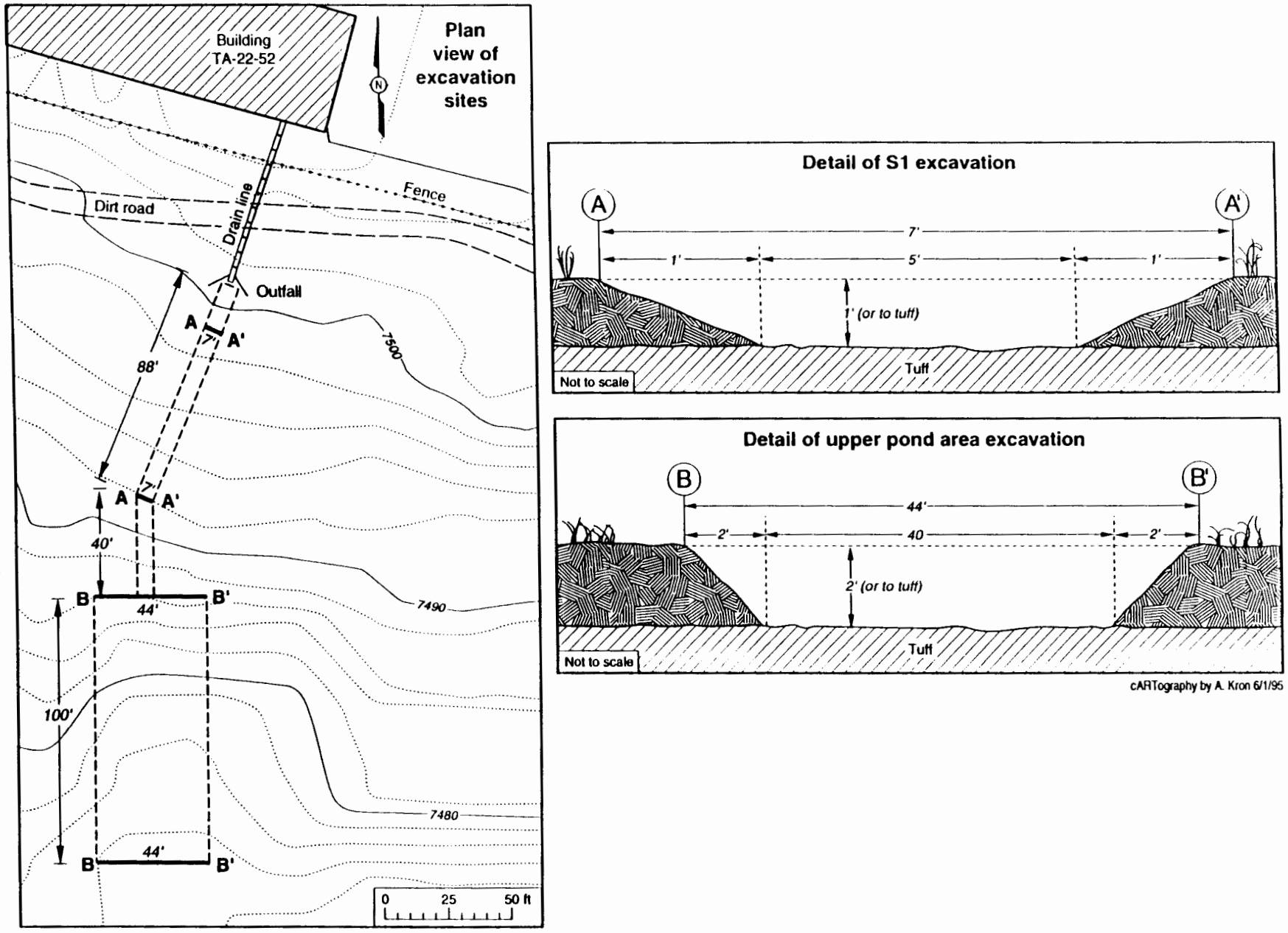


Figure 3-1. Schematic showing areas to be excavated.

As contaminated soil is excavated from each portion of the SWMU, confirmation samples will be collected from the excavation and analyzed for total metals and radionuclides in a mobile field laboratory to confirm that cleanup levels have been met. Four samples will be collected in the drainage between the outfall and the pond area. Six samples will be collected from the pond area. This number of samples is believed to be sufficient because the RFI data indicate that there is consistent metals concentrations with depth and location along the drainage channel. Areas with metals concentrations still above cleanup levels will be excavated and resampled.

As described in Section 3.5, verification samples will be collected from the excavations prior to backfilling with clean soil. Clean soil will be brought to the site and used as fill for the excavations. The fill will be placed in lifts as needed, compacted by rolling with the excavator, and contoured.

Soils located along the wagon road and down the canyon wall are not proposed for excavation. This is because of the small quantity of soils involved and because disturbance of the soil will contribute to significant future erosion in these areas. However, prior to the initiation of this EC, a maximum of five additional samples will be collected and analyzed from these areas, and a risk assessment conducted (with these new data and RFI data) to ensure levels of materials left in the soils and sediment do not pose an unacceptable health and/or ecological risk. If the assessment indicates the residual soils pose an unacceptable risk, then the soil will be excavated and disposed of as a solid waste.

Excavating equipment will be decontaminated with pressure-washing equipment on-site. Wash water will be contained, tested, and disposed of in accordance with the Waste Management Checklist.

3.4 Waste Management Issues

As indicated in Section 2.3, wastes to be generated during the EC include non-hazardous solid waste (soils), used PPE, and decontamination rinse water. Solid and liquid wastes will be disposed of in accordance with the Waste Management Checklist.

3.4.1 Characterization of Materials for Disposal

Field screening of samples for radioactivity will be conducted on all solid and liquid wastes generated during the EC. Excavated will be characterized in accordance with the approved disposal facility's waste acceptance criteria. One sample of the liquid waste (decon water) will be collected for characterization prior to disposal.

3.4.2 Treatment, Storage, and Disposal Plans for Waste

The excavated soil is not a hazardous waste and no treatment of soil has been proposed. Excavated soils will be placed directly into bulk containers or dump trucks for transport to the permitted disposal facility. Any liquid waste will be staged on-site until the final waste characterization data are available. Any other solid waste will be disposed of in accordance with the Waste Management Checklist.

3.5 Verification Plan

As mentioned in Section 2.4.3, the cleanup effort at this SWMU will be driven by the 25 ppm (or 25 mg/kg) cleanup level for arsenic. Therefore, this verification sampling plan design is based on the arsenic cleanup level. Because RFI data indicate that the other metal contaminants are collocated with the arsenic contamination, attainment of all cleanup levels will be achieved once the arsenic cleanup level is achieved. This will be confirmed during the collection and analyses of verification samples.

The number of samples to be taken to determine whether a confirmation unit has achieved the cleanup standard due to excavation is dictated by the sampling frequency needed to achieve statistically defensible data. In this case, the area to be excavated corresponds to the default industrial occupational scenario exposure unit of 500 cubic meters. Therefore, the entire excavated area will be sampled to determine if cleanup levels have been met. *Methods for Evaluating the Attainment of Cleanup Standards, Volume 1, Solid Media (EPA 1988)*, provides the formulae for calculating the number of random samples needed to determine if the mean concentration remaining in the area after excavation is less than the cleanup goal at a specified level of confidence. The required number of samples is computed using the equation presented in Annex 6.13.

Application of this approach with assumptions as outlined, results in a verification sample size of 4 random soil samples to be collected for off-site certified laboratory analysis, (see Table 3-1). Results from the 4 laboratory verification samples will be used to calculate the 95% upper confidence limit (UCL) to compare to the cleanup level established for each contaminant of concern. The site cleanup objectives will be obtained when the calculated UCL is less than the established cleanup levels.

3.6 Site Restoration Plan

When verification sample results confirm that the site has been remediated in accordance with this plan, the excavated area will be filled with clean dirt, compacted, and contoured to minimize erosion. The pond area will have clean fill added to elevate the final grade approximately 1 to 2 feet above the pre-existing grade. Erosion protection such as flow diversions, berms, gravel and stone protection, and revegetation will be used to minimize future erosion of the impacted area. Areas downstream of the pond area that require excavation will have clean gravel backfill applied to minimize erosion. Two drainage culverts are proposed to divert stormwater away from the east and west sides of the remediated area. The surface will be graded as needed to direct surface flow to the culverts.

3.7 Acceptance Inspection

The Laboratory proposes an Acceptance Inspection as the mechanism for DOE and EPA to assess the implementation and effectiveness of the EC. A minimum of 10 days' notification will be provided to the agencies before the start of field activities. At that time, a tentative date for the inspection will be agreed upon.

An inspection checklist will be used to document the scope of the inspection and will become part of the EC Final Report. The checklist and the timing of the inspection will be developed by the Laboratory and agreed to by the other agencies. This inspection checklist will contain specific items, criteria, and requirements to be inspected that will constitute acceptance of remediation activities.

The Acceptance Inspection will be conducted by an independent professional skilled in the appropriate technical discipline. During the Acceptance Inspection, written resolution and an anticipated schedule for completion will be identified for any outstanding items and documented on the inspection checklist. The Laboratory Field Project Leader (FPL) or designee will be responsible for completing outstanding inspection items and documenting their resolution in the EC report.

Upon completion of the remediation activities, the Laboratory will submit a written report to EPA Region 6, certifying that the remedy has been completed in accordance with the EC Plan and Acceptance Inspection Checklist. The certification will be signed by the permittees (the Laboratory and DOE) and by the independent professional conducting the inspection. The certification will accompany the EC Final Report.

TABLE 3-1
SUMMARY OF VERIFICATION SAMPLES AND ANALYSES FOR SWMU 22-015(c)

Sample Description	Field Screening					Field Laboratory Analysis					Fixed Laboratory Analysis					
	Beta-Gamma	Alpha	Organic Vapor	Radiological Smear & Swipe Techniques	XRF	PCBs	VOCs (SW 8260)*	SVOCs (SW 8270)*	Metals (ICPES)	Gross Gamma, Alpha, Beta	PCBs	VOCs (SW 8260)*	Metals (SW 6010/7000)*	SVOCs (SW8270)*	Total Uranium	Gamma Spectrometry
Surface Soil Samples	14	14							10	10			4			
Duplicate	3	3							1	1			1			
Decontamination Water	2	2							1	1						
Excavation Equipment	1	1							1	1						

Note: Additional samples may be taken based on field surveys and observations.
*: Applicable EPA SW 846 methods.

3.8 Final Report

After field activities are completed and all analytical results from the verification samples are obtained, a final report on the EC will be prepared. This report will outline the EC process and the "as-left" condition of the site. A proposed outline for this report is presented as Annex 6.8.

4.0 PROJECT MANAGEMENT

Overall implementation of this expedited cleanup will be managed by Cheryl Rofer, the FPL. Danny Martinez will serve as Field Team Leader (FTL) for the EC activities.

4.1 Staff and Resource Requirements

Total anticipated cost for the EC is **$93,300** as detailed in the following breakdown.

Pre-Field Activities	
Preparation of Waste Management Checklist	$1,000
Preparation of Site Health and Safety Plan	2,500
Field Work Plan preparation	2,000
Contracting of subcontractors/plan prep.	3,500
Subtotal	*$9,000*
Field Activities	
Excavation of 350 cu. yds.	$7,000
Transportation of soil to Cerro Colorado	9,500
Site restoration	3,500
Disposal of low-level radioactive waste	5,000
Disposal of solid waste	14,000
Subtotal	*$39,000*
Personnel Costs	
Field Team verification sampling	$2,050
Coordination/supervision	24,250
Subtotal	*$26,300*
Analytical Costs	
Verification Samples	$ 4,800
Chem Van @ $2,000/day	4,000
Rad Van @ $2,000/day	4,000
Waste Disposal Characterization	200
Subtotal	*$13,000*
Post Field Activities	
Acceptance Inspection	$4,000
Final Report	2,000
Subtotal	*$6,000*
TOTAL ESTIMATED COST	**$93,300**

It is important to note that the total estimated cost of this EC may increase by $30,000 if the eco-risk assessment indicates that additional soils from the hillside must also be removed. The maximum estimated volume of this soil is approximately 75 cu. yds.; however, the labor involved in removing soil from the hillside will be significant.

4.2 Schedule

The proposed EC schedule is shown in Table 4-1. The submittal of this EC Plan to the EPA in June 1995 will initiate the 60-day public review/comment period. No sooner than 15 days after the start of this period, a public meeting will be held. Preparation for field work will be conducted concurrent to the public review period. Field work will be initiated within 10 days of agency and public approval or receipt of EPA temporary authorization to proceed. The final report will be submitted to EPA within 14 days of receipt of verification sample results.

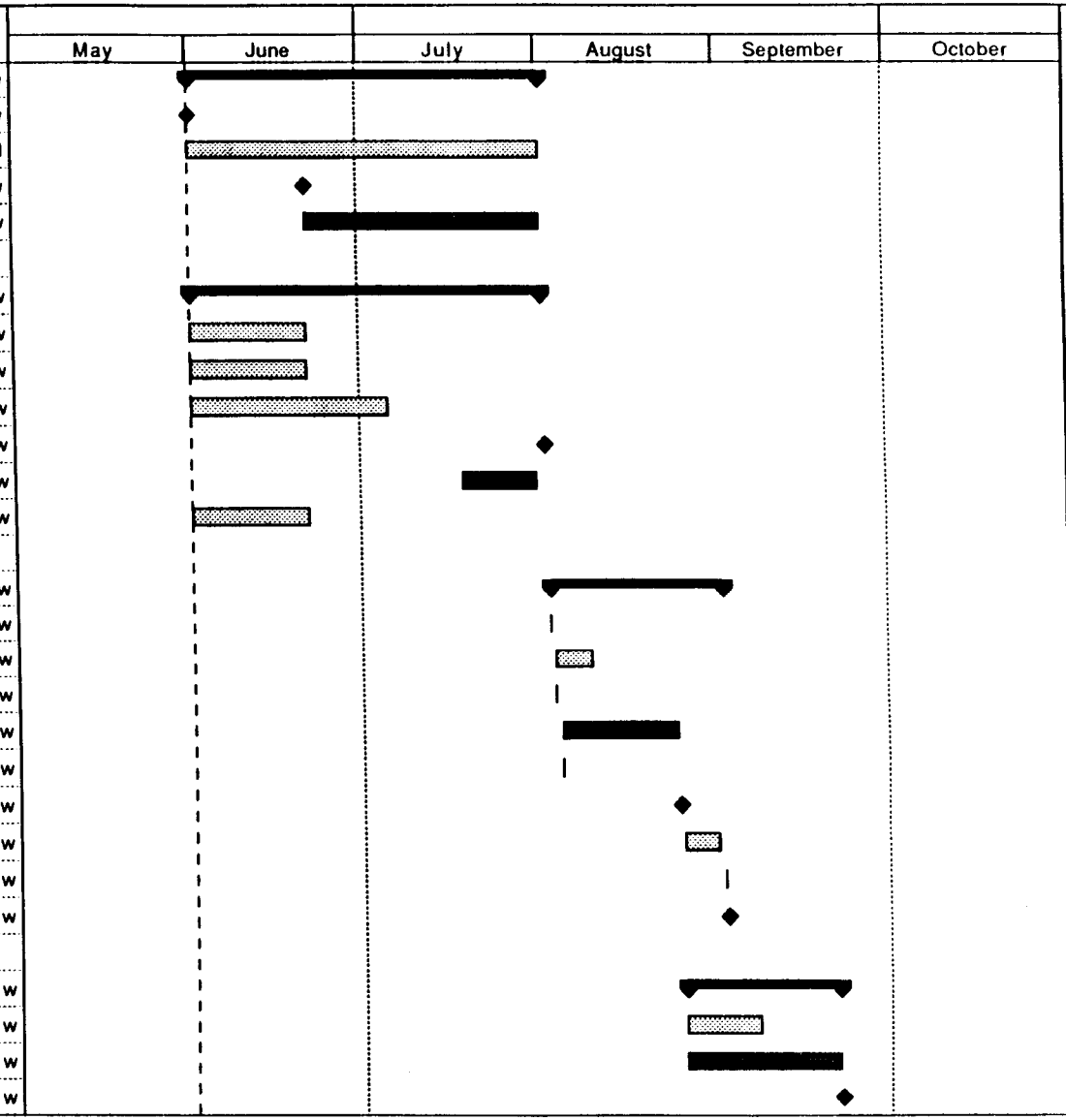
4.3 Stakeholder Notifications

Stakeholder notifications are an integral part of the procedure for conducting ECs. ER Project personnel will notify state and local governments, external and internal stakeholders, and individuals on the ER Project mailing list of the availability of the EC Plan. The EC Plan will be available to the stakeholders at the Laboratory Community Reading Room in Los Alamos; the document repositories at the public libraries in Los Alamos, Espanola, and Santa Fe; and the San Ildefonso Pueblo Governor's office.

The submission to EPA of this EC plan will trigger publication of a public notice starting a 60-day public comment period.

TABLE 4-1 PROPOSED SCHEDULE - SWMU 22-015(C)

ID	Name	Duration
1	1.0 PUBLIC ACCEPTANCE	8.77ew
2	1.1 SUBMIT EC PLAN TO EPA	0 w
3	1.2 PUBLIC COMMENTS	44d
4	1.3 PUBLIC MEETING	0ew
5	1.4 RESPOND TO PUBLIC COMMENT	6 w
6		
7	2.0 PLANNING	8.77ew
8	2.1 PREPARE/REVISE HEALTH AND SAFETY PLAN	3 w
9	2.2 PREPARE/REVISE WASTE MANAGEMENT PLAN	3 w
10	2.3 FIELD WORK PLANNING	5 w
11	2.4 FIELD WORK APPROVAL FORM SIGNED	0 w
12	2.5 10-DAY NOTIFICATION OF FIELD WORK	2 w
13	2.6 SAMPLE COLLECTION/ECO-RISK	3 w
14		
15	3.0 IMPLEMENT EXPEDITED CLEANUP	4.34ew
16	3.1 MOBILIZATION	0.2w
17	3.2 PERFORM EXCAVATION	1 w
18	3.3 VERIFICATION SAMPLING	0.2w
19	3.4 VERFICATION ANALYSIS	3 w
20	3.5 ACCEPTANCE INSPECTION	0.2w
21	3.6 ANALYSIS COMPLETE	0 w
22	3.7 SITE RESTORATION	1 w
23	3.8 DEMOBILIZATION	0.2w
24	3.9 COMPLETE EC	0 w
25		
26	4.0 REPORT PREPARATION	3.91ew
27	4.1 VALIDATE SAMPLE DATA	2 w
28	4.2 PREPARE FINAL REPORT	4 w
29	4.3 SUBMIT REPORT	0 w



Project:
Date: 6/1/95

Critical Noncritical Progress Milestone Summary

Los Alamos National Laboratory

6.0 ANNEXES

6.1 Implementation SOPs

See Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

6.2 Quality Assurance Plan

See Quality Program Plan And Quality Assurance Project Plan For Environmental Restoration, February 1995, Los Alamos National Laboratory, Los Alamos, New Mexico.

6.3 Health and Safety Plan

See Los Alamos National Laboratory (LANL) ER Project Health and Safety Plan (HASP), (LANL, February 11, 1995).

6.4 Records Management Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter IV, Records Management Program Plan.

6.5 Public Involvement Plan

See Installation Work Plan for Environmental Restoration, Revision 4, Chapter V, Public Involvement Program Plan.

6.6 Waste Management Checklist

6.7 Field Work Approval Form

6.8 Proposed Outline for Expedited Cleanup Report

6.9 RFI Analytical Results

6.10 Summary of Composite and Grab Sample Location

6.11 TCLP and HCl Extraction Results

6.12 Cleanup Level Calculations

6.13 Verification Sample Locations

ANNEX 6.7

FIELD WORK APPROVAL FORM

ANNEX 6.7

FIELD WORK APPROVAL FORM

This form must be completed prior to starting site remediation field work for Expedited Cleanups that do not have an EPA-approved plan.

I, _____, DOE-LAAO, APPROVE the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU 22-015(c), TA-22-52, for the excavation and restoration of the surface disposal site.

I, _____, DOE-LAAO, DO NOT APPROVE the field work as proposed for SWMU 22-015(c), TA-22-52, as described in the accompanying Expedited Cleanup Plan for the excavation and restoration of the surface disposal site.

The following reasons reflect the decision for disapproval:

Signed: _____ Date:_____

ANNEX 6.8

PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORT

ANNEX 6.8

PROPOSED OUTLINE FOR EXPEDITED CLEANUP REPORT

1.0 SUMMARY OF EXPEDITED CLEANUP

- 1.1 Overview
- 1.2 Expedited Cleanup

2.0 DISCUSSION OF SAMPLING AND ANALYSIS

- 2.1 Verification Sampling and Analysis
  - 2.1.1 Sampling Objectives
  - 2.1.2 QA/QC
  - 2.1.3 Sampling Activities
- 2.2 Site Restoration

3.0 MODIFICATIONS TO THE EC PLAN

4.0 QUANTITIES AND TYPES OF WASTE GENERATED

5.0 OUTSTANDING PROBLEMS FROM THE ACCEPTANCE INSPECTION

6.0 PROBLEMS ENCOUNTERED AND LESSONS LEARNED

APPENDICES

A ANALYTICAL DATA
B ACCEPTANCE INSPECTION CHECKLIST
C WASTE STREAM INVENTORY
D PHOTOGRAPHS
E CERTIFICATION OF COMPLETION

ANNEX 6.9

RFI ANALYTICAL RESULTS

22-015(c)
Locations and Depths
Single Grabs

Sample ID	Location ID	Depth (in)
AAA8588	2004	2 - 6
AAA8589	2004	37
AAA8590	2007	2 - 6
AAA8591	2007	28
AAA8592	2008	2 - 6
AAA8593	2008	29
AAA8600	2019	0 - 6
AAA8601	2019	6
AAA8602	2020	0 - 6
AAA8603	2020	12
AAA8604	2021	0 - 6
AAA8605	2021	12
AAA8606	2022	0 - 6
AAA8607	2022	8
AAA8608	2023	0 - 6
AAA8609	2023	6
AAA8610	2024	0 - 6
AAA8611	2024	10
AAA8612	2025	0 - 6
AAA8613	2025	6
AAA8614	2026	0 - 6
AAA8615	2026	30
AAA8616	2027	0 - 6
AAA8617	2027	24
AAA8619	2028	0 - 6
AAA8620	2028	16

22-015(c)
Locations and Depths
Multiple Grabs

Sample ID		Grab 1	Grab 2	Grab 3	Grab 4	Grab 5	Grab 6
AAA8581	Location ID	2001	2002	2003			
	Depth (in)	0 - 6	0 - 6	0 - 6			
AAA8582	Location ID	2001	2002	2003			
	Depth (in)	12	4	4			
AAA8583	Location ID	2004	2005	2006	2007	2008	2009
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
AAA8584	Location ID	2004	2005	2006	2007	2008	2009
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
AAA8585	Location ID	2004	2005	2006	2007	2008	2009
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
AAA8586	Location ID	2004	2005	2006	2007	2008	2009
	Depth (in)	32	32	32	32	32	19
AAA8587	Location ID	2004	2005	2006	2007	2008	2009
	Depth (in)	32	32	32	32	32	19
AAA8594	Location ID	2010	2011	2012			
	Depth (in)	6	6	6			
AAA8595	Location ID	2010	2011	2012			
	Depth (in)	3	10	10			
AAA8596	Location ID	2013	2014	2015	2016	2017	2018
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
AAA8597	Location ID	2013	2014	2015	2016	2017	2018
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
AAA8598	Location ID	2013	2014	2015	2016	2017	2018
	Depth (in)	10	10	10	10	10	6
AAA8599	Location ID	2013	2014	2015	2016	2017	2018
	Depth (in)	10	10	10	10	10	6
AAA8621	Location ID	2029	2030	2031	2032	2033	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8622	Location ID	2029	2030	2031	2032	2033	
	Depth (in)	7	12	16	8	4	
AAA8623	Location ID	2034	2035	2036	2037	2038	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8624	Location ID	2034	2035	2036	2037	2038	
	Depth (in)	10	7	36	8	19	
AAA8625	Location ID	2039	2040	2041	2042	2043	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8626	Location ID	2039	2040	2041	2042	2043	
	Depth (in)	8	5	3	3	14	
AAA8627	Location ID	2044	2045	2046	2047	2048	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8628	Location ID	2044	2045	2046	2047	2048	
	Depth (in)	12	18	2	12	6	
AAA8629	Location ID	2049	2050	2051	2052	2053	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8630	Location ID	2049	2050	2051	2052	2053	
	Depth (in)	24	36	36	24	24	
AAA8631	Location ID	2054	2055	2056	2057	2058	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8632	Location ID	2054	2055	2056	2057	2058	
	Depth (in)	4	3	13	10	6	
AAA8633	Location ID	2059	2060	2061	2062	2063	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8634	Location ID	2059	2060	2061	2062	2063	
	Depth (in)	6	6	3	10	10	
AAA8635	Location ID	2064	2065	2066	2067	2068	
	Depth (in)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	
AAA8636	Location ID	2064	2065	2066	2067	2068	
	Depth (in)	11	13	11	13	11	
AAA8637	Location ID	2064	2065	2066	2067	2068	
	Depth (in)	11	13	11	13	11	

Samples were not taken at additional locations.

22-015(c)
Organic and Radionuclide Detects
Single Grab

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8588	1	Bis(2-ethylhexyl)phthalate	7	MG/KG	50	NA
AAA8588	1	Methylene chloride	0.01	MG/KG	5.6	NA
AAA8588	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.016	MG/KG	NA	NA
AAA8589	1	Methylene chloride	0.009	MG/KG	5.6	NA
AAA8589	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.01	MG/KG	NA	NA
AAA8590	1	Bis(2-ethylhexyl)phthalate	6.6	MG/KG	50	NA
AAA8590	1	Methylene chloride	0.032	MG/KG	5.6	NA
AAA8590	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.054	MG/KG	NA	NA
AAA8591	1	Methylene chloride	0.013	MG/KG	5.6	NA
AAA8591	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.009	MG/KG	NA	NA
AAA8592	1	Bis(2-ethylhexyl)phthalate	69	MG/KG	50	NA
AAA8592	1	Methylene chloride	0.009	MG/KG	5.6	NA
AAA8592	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.012	MG/KG	NA	NA
AAA8593	1	Methylene chloride	0.01	MG/KG	5.6	NA
AAA8593	1	Trichloro-1,2,2-trifluoroethane [1,1,2]	0.007	MG/KG	NA	NA
AAA8603	1	Bis(2-ethylhexyl)phthalate	2.6	MG/KG	50	NA
AAA8588	1	Cesium-137	0.537	PCI/G	4	1.4
AAA8589	1	Cesium-137	0.001	PCI/G	4	1.4
AAA8590	1	Cesium-137	0.658	PCI/G	4	1.4
AAA8591	1	Cesium-137	0.001	PCI/G	4	1.4
AAA8592	1	Cesium-137	0.404	PCI/G	4	1.4
AAA8593	1	Cesium-137	0.025	PCI/G	4	1.4
AAA8600	1	Cesium-137	0.682	PCI/G	4	1.4
AAA8601	1	Cesium-137	0.393	PCI/G	4	1.4
AAA8602	1	Cesium-137	1.761	PCI/G	4	1.4
AAA8603	1	Cesium-137	0.152	PCI/G	4	1.4
AAA8604	1	Cesium-137	1.460	PCI/G	4	1.4
AAA8605	1	Cesium-137	0.150	PCI/G	4	1.4
AAA8606	1	Cesium-137	1.085	PCI/G	4	1.4
AAA8607	1	Cesium-137	0.199	PCI/G	4	1.4
AAA8608	1	Cesium-137	1.259	PCI/G	4	1.4
AAA8609	1	Cesium-137	0.114	PCI/G	4	1.4
AAA8610	1	Cesium-137	1.762	PCI/G	4	1.4
AAA8611	1	Cesium-137	0.183	PCI/G	4	1.4
AAA8611R	1	Cesium-137	0.271	PCI/G	4	1.4
AAA8612	1	Cesium-137	0.155	PCI/G	4	1.4
AAA8613	1	Cesium-137	0.001	PCI/G	4	1.4
AAA8614	1	Cesium-137	0.221	PCI/G	4	1.4
AAA8614R	1	Cesium-137	0.203	PCI/G	4	1.4
AAA8615	1	Cesium-137	0.001	PCI/G	4	1.4
AAA8616	1	Cesium-137	0.375	PCI/G	4	1.4
AAA8617	1	Cesium-137	0.101	PCI/G	4	1.4
AAA8617R	1	Cesium-137	0.062	PCI/G	4	1.4

22-015(c)
Organic and Radionuclide Detects
Single Grab

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8618	1	Cesium-137	0.396	PCI/G	4	1.4
AAA8619	1	Cesium-137	0.494	PCI/G	4	1.4
AAA8620	1	Cesium-137	0.345	PCI/G	4	1.4
AAA8588	1	Strontium-90	5.75	PCI/G	5.9	1
AAA8589	1	Strontium-90	0.59	PCI/G	5.9	1
AAA8590	1	Strontium-90	7.22	PCI/G	5.9	1
AAA8591	1	Strontium-90	0.00	PCI/G	5.9	1
AAA8592	1	Strontium-90	6.24	PCI/G	5.9	1
AAA8593	1	Strontium-90	0.90	PCI/G	5.9	1
AAA8600	1	Strontium-90	0.18	PCI/G	5.9	1
AAA8600R	1	Strontium-90	0.08	PCI/G	5.9	1
AAA8601	1	Strontium-90	0.64	PCI/G	5.9	1
AAA8602	1	Strontium-90	0.51	PCI/G	5.9	1
AAA8603	1	Strontium-90	0.36	PCI/G	5.9	1
AAA8603R	1	Strontium-90	0.03	PCI/G	5.9	1
AAA8604	1	Strontium-90	0.02	PCI/G	5.9	1
AAA8605	1	Strontium-90	0.15	PCI/G	5.9	1
AAA8606	1	Strontium-90	0.83	PCI/G	5.9	1
AAA8607	1	Strontium-90	0.29	PCI/G	5.9	1
AAA8608	1	Strontium-90	0.30	PCI/G	5.9	1
AAA8609	1	Strontium-90	0.08	PCI/G	5.9	1
AAA8609R	1	Strontium-90	0.05	PCI/G	5.9	1
AAA8610	1	Strontium-90	0.45	PCI/G	5.9	1
AAA8611	1	Strontium-90	0.57	PCI/G	5.9	1
AAA8612	1	Strontium-90	0.90	PCI/G	5.9	1
AAA8613	1	Strontium-90	1.47	PCI/G	5.9	1
AAA8614	1	Strontium-90	0.15	PCI/G	5.9	1
AAA8615	1	Strontium-90	0.37	PCI/G	5.9	1
AAA8616	1	Strontium-90	0.15	PCI/G	5.9	1
AAA8617	1	Strontium-90	1.15	PCI/G	5.9	1
AAA8618	1	Strontium-90	0.83	PCI/G	5.9	1
AAA8619	1	Strontium-90	0.79	PCI/G	5.9	1
AAA8620	1	Strontium-90	0.28	PCI/G	5.9	1
NA Not applicable.						

22-015(c)
Organic and Radionuclide Detects above UTL and/or SAL
Single Grab

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8592	1	Bis(2-ethylhexyl)phthalate	**69**	MG/KG	50	NA
AAA8602	1	Cesium-137	1.761	PCI/G	4	1.4
AAA8604	1	Cesium-137	1.460	PCI/G	4	1.4
AAA8610	1	Cesium-137	1.762	PCI/G	4	1.4
AAA8588	1	Strontium-90	5.75	PCI/G	5.9	1
AAA8590	1	Strontium-90	**7.22**	PCI/G	5.9	1
AAA8592	1	Strontium-90	**6.24**	PCI/G	5.9	1
AAA8613	1	Strontium-90	1.47	PCI/G	5.9	1
AAA8617	1	Strontium-90	1.15	PCI/G	5.9	1
NA Not applicable.						

22-015(c)
Metal Detects, Single Grab

	Number of Grabs	silver	aluminum	arsenic	barium	beryllium	calcium	cadmium	cyanide
UTL---->		1.61	123000	11.6	1143	3.31	54362	2.7	n/a
SAL---->		400	n/a	n/a	5600	n/a	n/a	80	1600
AAA8588	1		3690	55.7				1.8	1.3
AAA8588R	1	2.1	3679	45.3	26.5	0.35	565	1.7	
AAA8589	1	7.6	5440	5.5		1.6		6.1	
AAA8590	1	5.5	2710	227			3860	5.9	11.5
AAA8591	1	4.2	3710	3.2				5.8	
AAA8592	1	20.7	5680	198				4.1	1.1
AAA8593	1		11300	3			1400	1.5	
AAA8600	1		5690	6.9	46.3		1070	1.4	
AAA8601	1		4940	3.6				1.3	
AAA8602	1	4.8	5520		121		7200	3.9	
AAA8603	1	4.1	4230	2.5	47.1		2430	8.5	
AAA8604	1	15.9	7730	20.5	120		4560	42.6	0.84
AAA8605	1	13	5580	9.2	46.6		1590	22.6	2.7
AAA8606	1	31.3	9600	36.7	97.2		3770	22	1.7
AAA8607	1	34.7	6230	3.9	52		1390	7.3	
AAA8608	1	9.1	6960	15.7	75		1430	12.8	1.3
AAA8609	1	3.6	4350	5.5				9.1	1.2
AAA8610	1	30	12700	66.9	151		4580	79.6	3.7
AAA8611	1	27.4	6200	5.3	58.9		1870	55.2	2
AAA8612	1	18.3	4640	6.7			1190	9.1	
AAA8613	1	2.8	6050	2.6				2.1	
AAA8614	1	5.7	5670	6.8				9.3	1
AAA8615	1	4.5	4020	2.9				5.5	
AAA8616	1	18.2	4710	7.5				16.8	
AAA8617	1	23	4[illegible]80	6.2				37	3.4
AAA8618	1	10.5	[illegible]10	7.3				16	1.1
AAA8619	1	8.8	5270	15.3	50.7		1700	28.2	1.1
AAA8620	1	11.7	5900	4				15.6	4.1

n/a Not applicable.

22-015(c)
Metal Detects, Single Grab

	Number of Grabs	cobalt	chromium	copper	fluorine	iron	mercury	potassium	magnesium	manganese
UTL---->		51.1	34.2	15.7	n/a	35586	0.1	6179	16147	1030
SAL---->		n/a	n/a	3000	n/a	n/a	24	n/a	n/a	11000
AAA8588	1		449	3990	5	85100	0.06			120
AAA8588R	1	2.4	430	3998		92237	0.06	676	616	94
AAA8589	1		43.1	176	7	9280				174
AAA8590	1		566	13600	4	276000	0.21			127
AAA8591	1		48	59.8	4	8310				178
AAA8592	1		952	2540	4	42300	0.16			59.3
AAA8593	1		9.4	28.1	6	13500			1390	306
AAA8600	1		29.6	2400		17700		1100		150
AAA8601	1		30.3	1860		8720				145
AAA8602	1		20	33.4		5810		1430	1490	499
AAA8603	1		23.6	15.9		4190		1320		202
AAA8604	1	21	581	12500		37900	0.39		1340	363
AAA8605	1		318	3320		17800	0.08			191
AAA8606	1	16.4	637	6610		35300	0.28		1470	319
AAA8607	1		176	1440		6790				231
AAA8608	1		352	4080		17300	0.09			266
AAA8609	1		99.1	645		8220				381
AAA8610	1	21.1	931	15100		77900	0.2		1840	309
AAA8611	1		523	1750		10100	0.35			138
AAA8612	1		146	2400		13500				144
AAA8613	1		15.8	118		7880				215
AAA8614	1		118	1800		12800	0.04			268
AAA8615	1		24.5	243		6350				285
AAA8616	1		330	2350		13000	0.19			82.4
AAA8617	1		146	722		8650				226
AAA8618	1		347	2520		10900	0.25			159
AAA8619	1		303	4670		18000	0.06			163
AAA8620	1		166	1780		9340				289

n/a Not applicable.

22-015(c)
Metal Detects, Single Grab

	Number of Grabs	sodium	nickel	nitrite	nitrate	lead	platinum	selenium	vanadium	zinc
UTL---->		1884	26.7	n/a	n/a	39	n/a	1.7	66	101
SAL---->		n/a	1600	8000	130000	400	n/a	400	560	24000
AAA8588	1		526	7	7	127	81.9		95.7	99.1
AAA8588R	1	141	467			121	84.9	0.85	106	93.8
AAA8589	1		120	0.7	0.7	6.1	13.8			48
AAA8590	1		219	9.7	9.7	179	254		298	108
AAA8591	1		58.7	1.2	1.2	3.9	16.2			44.6
AAA8592	1		1200	8.1	8.1	271	51.1		59.4	111
AAA8593	1		68.7	1.1	1.1	8.3	19.9			44.5
AAA8600	1		36.3			22.3	15.9		18.3	30
AAA8601	1		53			46.1	16.4			32.4
AAA8602	1		48.2			19	14.2			28.1
AAA8603	1		38.7			13.1				24
AAA8604	1		1400			364	41.4		49.3	238
AAA8605	1		454			89.6	21.7		20	93.2
AAA8606	1		1330			518	37.6		48.4	191
AAA8607	1		269			35.9				57.7
AAA8608	1		920			413	26.6		33	139
AAA8609	1		380			74			14	68.2
AAA8610	1		1630			557	85.1		90.7	296
AAA8611	1		658			69.4	16.1		14.6	122
AAA8612	1		316			63.5	21.9		18.1	72.3
AAA8613	1		61.2			6.1				37.7
AAA8614	1		388			165	21		13.2	76.8
AAA8615	1		71.8			13.7	14.2			30.5
AAA8616	1		877			215	19.1		15.2	117
AAA8617	1		375			54.6	14.1			66.9
AAA8618	1		1160			196	16.7		16.4	151
AAA8619	1		1240			191	19.1		24.3	170
AAA8620	1		748			188	15.8		12.4	120

n/a Not applicable.

22-015(c)
Metal Detects above UTL and/or SAL
Single Grab

	Number of Grabs	silver	arsenic	cadmium	chromium	copper	iron	mercury	nickel	lead	vanadium	zinc
UTL---->		1.61	11.6	2.7	34.2	15.7	35586	0.1	26.7	39	66	101
SAL---->		400	n/a	80	n/a	3000	n/a	24	1600	400	560	24000
AAA8588	1		55.7		449	**3990**	85100		526	127	95.7	
AAA8588R	1	2.1	45.3		430	**3998**	92237		467	121	106	
AAA8589	1	7.6		6.1	43.1	176			120			
AAA8590	1	5.5	227	5.9	566	**13600**	276000	0.21	219	179	298	108
AAA8591	1	4.2		5.8	48	59.8			58.7			
AAA8592	1	20.7	198	4.1	952	2540	42300	0.16	1200	271		111
AAA8593	1					28.1			68.7			
AAA8600	1					2400			36.3			
AAA8601	1					1860			53	46.1		
AAA8602	1	4.8		3.9		33.4			48.2			
AAA8603	1	4.1		8.5		15.9			38.7			
AAA8604	1	15.9	20.5	42.6	581	**12500**	37900	0.39	1400	364		238
AAA8605	1	13		22.6	318	**3320**			454	89.6		
AAA8606	1	31.3	36.7	22	637	**6610**		0.28	1330	518		191
AAA8607	1	34.7		7.3	176	1440			269			
AAA8608	1	9.1	15.7	12.8	352	**4080**			920	413		139
AAA8609	1	3.6		9.1	99.1	645			380	74		
AAA8610	1	30	66.9	79.6	931	**15100**	77900	0.2	1630	557	90.7	296
AAA8611	1	27.4		55.2	523	1750		0.35	658	69.4		122
AAA8612	1	18.3		9.1	146	2400			316	63.5		
AAA8613	1	2.8				118			61.2			
AAA8614	1	5.7		9.3	118	1800			388	165		
AAA8615	1	4.5		5.5		243			71.8			
AAA8616	1	18.2		16.8	330	2350		0.19	877	215		117
AAA8617	1	23		37	146	722			375	54.6		
AAA8618	1	10.5		16	347	2520		0.25	1160	196		151
AAA8619	1	8.8	15.3	28.2	303	**4670**			1240	191		170
AAA8620	1	11.7		15.6	166	1780			748	188		120

n/a Not applicable.

22-015(c)
Organic and Radionuclide Detects
Multiple Grabs

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8581	3	Bis(2-ethylhexyl)phthalate	51	MG/KG	50	n/a
AAA8581	3	Di-n-octyl phthalate	2	MG/KG	1600	n/a
AAA8582	3	Bis(2-ethylhexyl)phthalate	3.4	MG/KG	50	n/a
AAA8583	6	Bis(2-ethylhexyl)phthalate	2.3	MG/KG	50	n/a
AAA8587	6	Bis(2-ethylhexyl)phthalate	2.5	MG/KG	50	n/a
AAA8633	5	Bis(2-ethylhexyl)phthalate	14	MG/KG	50	n/a
AAA8581	3	Cesium-137	0.150	PCI/G	4	1.4
AAA8582	3	Cesium-137	0.001	PCI/G	4	1.4
AAA8583	6	Cesium-137	0.425	PCI/G	4	1.4
AAA8584	6	Cesium-137	0.802	PCI/G	4	1.4
AAA8585	6	Cesium-137	0.982	PCI/G	4	1.4
AAA8586	6	Cesium-137	0.001	PCI/G	4	1.4
AAA8587	6	Cesium-137	0.001	PCI/G	4	1.4
AAA8594	3	Cesium-137	0.436	PCI/G	4	1.4
AAA8595	3	Cesium-137	0.069	PCI/G	4	1.4
AAA8596	6	Cesium-137	0.695	PCI/G	4	1.4
AAA8596R	6	Cesium-137	0.635	PCI/G	4	1.4
AAA8597	6	Cesium-137	0.730	PCI/G	4	1.4
AAA8598	6	Cesium-137	0.255	PCI/G	4	1.4
AAA8599	6	Cesium-137	0.355	PCI/G	4	1.4
AAA8621	5	Cesium-137	1.231	PCI/G	4	1.4
AAA8622	5	Cesium-137	0.124	PCI/G	4	1.4
AAA8623	5	Cesium-137	1.058	PCI/G	4	1.4
AAA8624	5	Cesium-137	0.166	PCI/G	4	1.4
AAA8625	5	Cesium-137	1.604	PCI/G	4	1.4
AAA8626	5	Cesium-137	0.123	PCI/G	4	1.4
AAA8626R	5	Cesium-137	0.105	PCI/G	4	1.4
AAA8627	5	Cesium-137	1.537	PCI/G	4	1.4
AAA8628	5	Cesium-137	0.001	PCI/G	4	1.4
AAA8629	5	Cesium-137	1.271	PCI/G	4	1.4
AAA8630	5	Cesium-137	0.001	PCI/G	4	1.4
AAA8631	5	Cesium-137	0.792	PCI/G	4	1.4
AAA8632	5	Cesium-137	0.001	PCI/G	4	1.4
AAA8633	5	Cesium-137	1.256	PCI/G	4	1.4
AAA8634	5	Cesium-137	0.001	PCI/G	4	1.4
AAA8635	5	Cesium-137	1.464	PCI/G	4	1.4
AAA8636	5	Cesium-137	1.373	PCI/G	4	1.4
AAA8637	5	Cesium-137	0.001	PCI/G	4	1.4
AAA8581	3	Strontium-90	4.12	PCI/G	5.9	1
AAA8582	3	Strontium-90	0.32	PCI/G	5.9	1
AAA8583	6	Strontium-90	0.29	PCI/G	5.9	1
AAA8584	6	Strontium-90	0.48	PCI/G	5.9	1

22-015(c)
Organic and Radionuclide Detects
Multiple Grabs

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8585	6	Strontium-90	0.09	PCI/G	5.9	1
AAA8586	6	Strontium-90	0.64	PCI/G	5.9	1
AAA8587	6	Strontium-90	0.44	PCI/G	5.9	1
AAA8594	3	Strontium-90	0.20	PCI/G	5.9	1
AAA8595	3	Strontium-90	0.40	PCI/G	5.9	1
AAA8596	6	Strontium-90	0.07	PCI/G	5.9	1
AAA8597	6	Strontium-90	0.29	PCI/G	5.9	1
AAA8598	6	Strontium-90	0.13	PCI/G	5.9	1
AAA8599	6	Strontium-90	0.11	PCI/G	5.9	1
AAA8599R	6	Strontium-90	0.81	PCI/G	5.9	1
AAA8621	5	Strontium-90	0.34	PCI/G	5.9	1
AAA8621R	5	Strontium-90	0.32	PCI/G	5.9	1
AAA8622	5	Strontium-90	0.28	PCI/G	5.9	1
AAA8623	5	Strontium-90	0.50	PCI/G	5.9	1
AAA8624	5	Strontium-90	1.12	PCI/G	5.9	1
AAA8625	5	Strontium-90	0.11	PCI/G	5.9	1
AAA8626	5	Strontium-90	0.37	PCI/G	5.9	1
AAA8626R	5	Strontium-90	0.28	PCI/G	5.9	1
AAA8627	5	Strontium-90	0.47	PCI/G	5.9	1
AAA8628	5	Strontium-90	0.12	PCI/G	5.9	1
AAA8629	5	Strontium-90	0.63	PCI/G	5.9	1
AAA8630	5	Strontium-90	0.29	PCI/G	5.9	1
AAA8631	5	Strontium-90	0.43	PCI/G	5.9	1
AAA8632	5	Strontium-90	0.19	PCI/G	5.9	1
AAA8633	5	Strontium-90	0.26	PCI/G	5.9	1
AAA8634	5	Strontium-90	0.23	PCI/G	5.9	1
AAA8635	5	Strontium-90	0.12	PCI/G	5.9	1
AAA8636	5	Strontium-90	0.19	PCI/G	5.9	1
AAA8637	5	Strontium-90	0.18	PCI/G	5.9	1

n/a Not applicable.

22-015(c)
Organic and Radionuclide Detects above UTL and/or SAL
Multiple Grabs

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	SAL	UTL
AAA8581	3	Bis(2-ethylhexyl)phthalate	51	MG/KG	50	n/a
AAA8625	5	Cesium-137	1.604	PCI/G	4	1.4
AAA8627	5	Cesium-137	1.537	PCI/G	4	1.4
AAA8635	5	Cesium-137	1.464	PCI/G	4	1.4
AAA8581	3	Strontium-90	4.12	PCI/G	5.9	1
AAA8624	5	Strontium-90	1.12	PCI/G	5.9	1
n/a Not applicable.						

22-015(c)
Additional Organics and Radionuclides which may be of concern
Multiple Grabs

Sample ID	Number of Grabs	Analyte Name	Sample Value	Sample Units	Sample value times # of grabs*	SAL	UTL
AAA8633	5	Bis(2-ethylhexyl)phthalate	14	MG/KG	70	50	n/a
AAA8584	6	Cesium-137	0.802	PCI/G	4.812	4	1.4
AAA8585	6	Cesium-137	0.982	PCI/G	5.892	4	1.4
AAA8596	6	Cesium-137	0.695	PCI/G	4.17	4	1.4
AAA8597	6	Cesium-137	0.730	PCI/G	4.38	4	1.4
AAA8621	5	Cesium-137	1.231	PCI/G	6.155	4	1.4
AAA8623	5	Cesium-137	1.058	PCI/G	5.29	4	1.4
AAA8629	5	Cesium-137	1.271	PCI/G	6.355	4	1.4
AAA8633	5	Cesium-137	1.256	PCI/G	6.28	4	1.4
AAA8636	5	Cesium-137	1.373	PCI/G	6.865	4	1.4

* This column shows the worst case scenario for grab samples. Even though the reported value did not exceed the UTL or SAL, these samples may still be of concern.

22-015(c)
Metal Detects, Multiple Grabs

	Number of Grabs	silver	aluminum	arsenic	gold	barium	beryllium	calcium	cadmium
UTL---->		1.61	n/a	n/a	n/a	1143	3.31	54362	2.7
SAL---->		400	123000	11.6	n/a	5600	n/a	n/a	80
AAA8581	3	71.2	5800	168	214	60.9		1450	26.4
AAA8582	3	14.9	4930	8.3	155				4.3
AAA8594	3	36.7	8660	15.6		70.9		1630	7.3
AAA8595	3	10.7	5430	4.5					8.9
AAA8621	5		5000			52.1		1800	
AAA8622	5		4250			43.6			
AAA8623	5	4.1	4600	2.9		49.6		1160	18.9
AAA8623R	5								
AAA8624	5	11.2	5010	2.8				1390	25.3
AAA8625	5	4.9	5260	2.8		52.7		2280	6.5
AAA8626	5		4350	2.3				1280	2.8
AAA8627	5	3.1	7540	3		84.1		2880	9.3
AAA8628	5	4.1	4800	3.3				1340	4.4
AAA8629	5	2.5	5900	2.8		69.2		2630	1.4
AAA8630	5		9080	4.5		84.4		1280	3.4
AAA8630R	5	6.4	5757	2.8		42.6	0.97	1442	3.3
AAA8631	5	2.2	5880	2.6		59.3		2300	4
AAA8632	5	6.1	3910	3.2				1140	7.1
AAA8633	5	266	5080	7.2	3080	56.5		1910	45.4
AAA8634	5	5.7	3730	4					9.3
AAA8635	5	65.9	6100	17.9	27.2	65.4		2200	68.2
AAA8636	5	35.1	6120	13.3	7.1	54.2		1410	41.9
AAA8637	5	3.7	3530	3.7					7.1
AAA8583	6	11.9	5240	45.1					3.5
AAA8584	6	13.1	5660	44.4					2.8
AAA8584R	6								
AAA8585	6	12.7	5660	47.6					4.7
AAA8586	6	3	8370	3.1		66.1	1.3	1780	3.6
AAA8587	6	3.6	6300	2.6					4.3
AAA8596	6	6.6	6210	12.3					5.2
AAA8597	6	8	6320	11.5					5.8
AAA8598	6	7.4	5510	6.8					8.4
AAA8598R	6	5.4	4675	6.8		36.4	0.29	815	6.62
AAA8599	6	8.1	7130	11.4					8.7
AAA8599R	6								
n/a Not applicable.									

22-015(c)
Metal Detects, Multiple Grabs

	Number of Grabs	cyanide	cobalt	chromium	copper	iron	mercury	potassium	magnesium
UTL---->		n/a	51.1	34.2	15.7	35586	0.1	6179	16147
SAL---->		1600	n/a	n/a	3000	n/a	24	n/a	n/a
AAA8581	3	3.8		996	1800	215000	1.5		
AAA8582	3			95.8	204	17800	4.3		
AAA8594	3	1.3		624	2080	25900	0.28		1430
AAA8595	3			121	401	6860		1290	
AAA8621	5			13.1	16.6	7270			
AAA8622	5			13.4	30.1	5540			
AAA8623	5			60.7	124	8560			
AAA8623R	5								
AAA8624	5			80.6	324	6750			
AAA8625	5			29.6	203	7220			
AAA8626	5			21.5	40.2	7050			
AAA8627	5			35.9	72.8	7660		1380	1450
AAA8628	5			31	32.6	6380			
AAA8629	5			15.4	11.8	6730		1110	1060
AAA8630	5			27.7	28.6	9600		1620	2320
AAA8630R	5		3.3	28.2	34.8	10306		771	1017
AAA8631	5			11.2	8.8	6970		1070	1100
AAA8632	5			23.2	11.6	6040			
AAA8633	5	4.2		1340	389	30600	2.6		
AAA8634	5			73.4	83.9	6180	0.28		
AAA8635	5	6.6		1700	1390	10100	0.81		
AAA8636	5	4.3		897	1350	10200	0.58		
AAA8637	5			78.9	149	7100			
AAA8583	6	1.8		583	3840	69800	0.17		
AAA8584	6	1.9		579	3730	67100	0.76		
AAA8584R	6	1.5							
AAA8585	6	2.2		569	4790	81500	0.68		
AAA8586	6			54.1	150	13600			1520
AAA8587	6			53.5	202	8850			
AAA8596	6			314	1800	20800	0.22		
AAA8597	6			355	2000	22300	0.28		
AAA8598	6	2.7		275	1520	12800	0.06		
AAA8598R	6		3	218	1135	10128	0.04	836	748
AAA8599	6	1.5		298	1350	16300	0.07		1450
AAA8599R	6	1.7							

n/a Not applicable.

22-015(c)
Metal Detects, Multiple Grabs

	Number of Grabs	manganese	sodium	nickel	lead	platinum	selenium	vanadium	zinc
UTL---->		1030	1884	26.7	39	n/a	1.7	66	101
SAL---->		11000	n/a	1600	400	n/a	400	560	24000
AAA8581	3	77.9		1080	453	193	5.7	231	222
AAA8582	3	59.6		69.2	155	22.9			46.5
AAA8594	3	124		584	242	36		37.3	103
AAA8595	3	149		144	38.4	13.5			41.2
AAA8621	5	321		26.3	10.1				33.3
AAA8622	5	368		38.7	12.8				26.5
AAA8623	5	405		222	88.6				57.4
AAA8623R	5								
AAA8624	5	348		381	20.3				78.6
AAA8625	5	308		73.8	16.7				38.3
AAA8626	5	174		40.2	8.7				38.7
AAA8627	5	246		62.6	43.9			11.5	32.7
AAA8628	5	199		51.1	11				25.3
AAA8629	5	237		21.1	27.2				40.5
AAA8630	5	206		48.5	8.1			12.2	38.2
AAA8630R	5	434	222	48.4	7.3		0.83	10.6	36.4
AAA8631	5	228		12.3	9.9				23.6
AAA8632	5	236		81.2	4.6				28.5
AAA8633	5	165		1480	672	32		43.6	126
AAA8634	5	109		91.8	53.2				26.3
AAA8635	5	132		1080	382	16.7		34.9	139
AAA8636	5	107		677	228			27.1	101
AAA8637	5	163		68.9	15.1				31.4
AAA8583	6	72.4		511	206	66.8		81.1	88.7
AAA8584	6	89		544	172	62.3		77.9	89.7
AAA8584R	6								
AAA8585	6	79.6		692	241	71.9		95.9	109
AAA8586	6	528		64.8	10.5	16.6			42.5
AAA8587	6	276		72.6	8.3				37.5
AAA8596	6	133		582	163	21.1		24.5	84.2
AAA8597	6	163		566	170	27.7		27	81.3
AAA8598	6	194		443	122	13.6		17.9	67.4
AAA8598R	6	203	185	320	123	19.4	0.94	14.4	56.6
AAA8599	6	211		616	117	18.7		20.9	90.3
AAA8599R	6								

n/a Not applicable.

22-015(c)
Metal Detects above UTL and/or SAL
Multiple Grabs

	Number of Grabs	silver	arsenic	cadmium	chromium	copper	iron	mercury	nickel	lead	selenium	vanadium	zinc
UTL---->		1.61	n/a	2.7	34.2	15.7	35586	0.1	26.7	39	1.7	66	101
SAL---->		400	11.6	80	n/a	3000	n/a	24	1600	400	400	560	24000
AAA8581	3	71.2	168	26.4	996	1800	215000	1.5	1080	453	5.7	231	222
AAA8582	3	14.9		4.3	95.8	204		4.3	69.2	155			
AAA8594	3	36.7	15.6	7.3	624	2080		0.28	584	242			103
AAA8595	3	10.7		8.9	121	401			144				
AAA8621	5					16.6							
AAA8622	5					30.1			38.7				
AAA8623	5	4.1		18.9	60.7	124			222	88.6			
AAA8624	5	11.2		25.3	80.6	324			381				
AAA8625	5	4.9		6.5		203			73.8				
AAA8626	5			2.8		40.2			40.2				
AAA8627	5	3.1		9.3	35.9	72.8			62.6	43.9			
AAA8628	5	4.1		4.4		32.6			51.1				
AAA8629	5	2.5											
AAA8630	5			3.4		28.6			48.5				
AAA8630R	5	6.4		3.3		34.8			48.4				
AAA8631	5	2.2		4									
AAA8632	5	6.1		7.1					81.2				
AAA8633	5	266		45.4	1340	389		2.6	1480	672			126
AAA8634	5	5.7		9.3	73.4	83.9		0.28	91.8	53.2			
AAA8635	5	65.9	17.9	68.2	1700	1390		0.81	1080	382			139
AAA8636	5	35.1	13.3	41.9	897	1350		0.58	677	228			101
AAA8637	5	3.7		7.1	78.9	149			68.9				
AAA8583	6	11.9	45.1	3.5	583	3840	69800	0.17	511	206		81.1	
AAA8584	6	13.1	44.4	2.8	579	3730	67100	0.76	544	172		77.9	
AAA8585	6	12.7	47.6	4.7	569	4790	81500	0.68	692	241		95.9	109
AAA8586	6	3		3.6	54.1	150			64.8				
AAA8587	6	3.6		4.3	53.5	202			72.6				
AAA8596	6	6.6	12.3	5.2	314	1800		0.22	582	163			
AAA8597	6	8		5.8	355	2000		0.28	566	170			
AAA8598	6	7.4		8.4	275	1520			443	122			
AAA8598R	6	5.4		6.62	218	1135			320	123			
AAA8599	6	8.1		8.7	298	1350			616	117			

n/a Not applicable.

22-015(c)

Additional Metal Detects which may be of concern

Multiple Grabs

	Number of Grabs	silver	silver times # of grabs*	cadmium	cadmium times # of grabs*	copper	copper times # of grabs*	nickel	nickel times # of grabs*	lead	lead times # of grabs*	vanadium	vanadium times # of grabs*
UTL---->		1.61		2.7		15.7		26.7		39		66	
SAL---->		400		80		3000		1600		400		560	
AAA8581	3					1800	5400	1080	3240			231	693
AAA8582	3									155	465		
AAA8594	3					2080	6240	584	1752	242	1210		
AAA8623	5			18.9	94.5					88.6	443		
AAA8624	5			25.3	126.5			381	1905				
AAA8633	5	266	1330	45.4	227			1480	7400				
AAA8635	5			68.2	341	1390	6950	1080	5400	382	1910		
AAA8636	5			41.9	209.5	1350	6750	677	3385	228	1368		
AAA8583	6							511	3066	206	1236		
AAA8584	6							544	3264	172	1032		
AAA8585	6							692	4152	241	1446	95.9	575.4
AAA8596	6					1800	10800	582	3492	163	978		
AAA8597	6					2000	12000	566	3396	170	1020		
AAA8598	6					1520	9120	443	2658	122	732		
AAA8598R	6					1135	6810	320	1920	123	738		
AAA8599	6					1350	8100	616	3696	117	0		

* This column shows the worst case scenario for grab samples. Even though the reported value did not exceed the UTL or SAL, these samples may still be of concern.

22-015(c) Background samples
Radionuclide results

		SAL	4	5.9	86	18	59
		UTL	1.4	1	2.03	0.088	1.9
Location ID	Depth (ft.)	Sample ID	Cesium-137	Strontium-90	Uranium-234	Uranium-235	Uranium-238
06-9901	0 - 0.5	AAB7971	0.325	1.92	0.754	0.032	0.836
	0 - 0.5	AAB7971D	n/a	0.7	0.743	0.029	0.827
	2 - 3	AAB7972	0.044	-0.45	0.68	0.027	0.691
	2 - 3	AAB7972D	n/a	n/a	0.678	0.034	0.775
06-9902	0 - 0.5	AAB7973	0.344	0.68	0.655	0.038	0.734
	0 - 1	AAB7974	-0.01	-0.07	0.493	0.023	0.502
06-9903	0 - 0.5	AAB7975	0.947	1.21	0.687	0.027	0.831
	0 - 0.5	AAB7976	0.415	0.34	0.658	0.02	0.754
	0 - 1	AAB7977	0.022	-0.08	0.372	0.025	0.363
22-9904	0 - 0.5	AAB7978	0.446	0.09	0.601	0.029	0.635
	0 - 0.5	AAB7978D	n/a	0.38	n/a	n/a	n/a
	2 - 3	AAB7979	-0.009	0.03	0.527	0.032	0.527
22-9905	0 - 0.5	AAB7980	1.151	1.4	0.732	0.034	0.923
	0 - 1	AAB7981	0.019	0.21	0.5	0.023	0.464
22-9906	0 - 0.5	AAB7982	1.303	1	0.775	0.036	0.82
	0 - 0.5	AAB7983	1.052	0.3	0.736	0.034	0.791
	0.17 - 1.17	AAB7984	0.021	-0.08	0.561	0.038	0.489
	0.17 - 1.17	AAB7984D	0.027	n/a	n/a	n/a	n/a
n/a Not applicable.							
D= Duplicate.							

22-015(c) Background samples
Inorganic results

		SAL	#N/A	32	n/a	5600	n/a	80	n/a	400	n/a	3000	1600	n/a	400	n/a	11000	24	1600	n/a	400	400	n/a	6.4	560	24000
		UTL	#N/A	2.5	11.6	1143	3.31	2.7	54362	34.2	51.1	15.7	n/a	35586	39	16147	1030	0.1	26.7	6179	1.7	1.61	1884	0.9	66	101
Location ID	Depth (ft)	Sample ID	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
06-9901	0 - 0.5	AAB7971	4340	4.5	1.4	42.2	0.64	0.46	916	3.5	3	2.6	0.4	5210	9.9	735	182	0.02	1.5	1040	0.54	0.79	91.7	0.28	9.9	14.2
	0 - 0.5	AAB7971D	4467	4.5	2.7	42.9	0.44	0.36	923	3	3	2.3	0	5247	13.2	753	197	0.02	2.1	1039	0.54	0.79	81.8	0.28	9.8	13.4
	2 - 3	AAB7972	11400	4.7	1.3	37.3	1.2	0.38	4930	7.2	1.7	4.1	0.42	7980	11	2350	114	0.02	5.8	1850	0.56	0.83	338	0.29	9.5	21.7
06-9902	0 - 0.5	AAB7973	5980	4.6	1.6	77.7	0.57	0.39	1540	3.9	3.1	2	0.41	7000	11.6	823	269	0.02	1.7	1260	0.55	0.82	201	0.29	13.3	15.3
	0 - 1	AAB7974	4250	4.6	2.5	76.2	0.58	0.37	490	3.1	0.76	1.2	0.41	1380	3	349	23.2	0.02	1.3	920	0.54	0.81	383	0.28	2.6	3.7
	0 - 1	AAB7974D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n.a	0.01	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
06-9903	0 - 0.5	AAB7975	7660	4.7	2.8	78.5	0.61	0.38	2760	4.8	3	2.9	4.2	6260	12.8	1180	272	0.02	2.3	1490	0.56	0.83	177	0.29	9.6	17.1
	0 - 0.5	AAB7976	7180	4.8	2.7	115	0.49	0.39	3030	4.4	2.3	3.1	8.5	5410	9.5	1280	186	0.02	2.2	1430	0.57	0.84	197	0.3	9.1	18
	0 - 1	AAB7977	4070	4.4	2.1	51.3	0.52	0.36	617	3.6	0.74	1.2	0.39	1680	2.3	475	17	0.02	1.2	874	0.53	0.78	277	0.27	3.6	4.9
22-9904	0 - 0.5	AAB7978	6540	5	2.1	69.5	0.53	0.41	1720	3.9	5.3	3.3	0.45	6660	10.6	900	471	0.02	2.2	1430	0.6	0.89	210	0.31	9.7	19.4
	2 - 3	AAB7979	6580	4.9	1.1	47	0.84	0.4	1510	4.6	1.6	2.4	0.44	6870	3.5	1140	280	0.02	5.4	1090	0.59	0.87	352	0.31	6.6	20.3
22-9905	0 - 0.5	AAB7980	5740	4.7	1.5	50.7	0.45	0.38	1050	2.9	1.7	2.7	0.42	5700	7	808	216	0.02	2.2	1210	0.55	0.82	183	0.29	7.8	14.6
	0 - 1	AAB7981	6420	4.4	1.3	30.8	0.45	0.36	843	4.3	1.5	2.2	7.9	7160	4.5	731	170	0.02	2	918	0.53	0.78	328	0.27	7.1	16.1
22-9906	0 - 0.5	AAB7982	6890	4.6	0	91.8	0.68	0.86	2840	4.1	2.4	5.3	0.41	7830	20.8	1310	355	0.03	3.3	1350	0.55	0.81	149	0.28	9.5	30.2
	0 - 0.5	AAB7983	6230	4.5	2.2	89.5	0.6	1.1	3340	4.4	2.4	5.9	0.4	7130	19.5	1340	376	0.03	3.2	1330	0.54	0.8	140	0.28	8.5	30.1
	0.17 - 1.17	AAB7984	3550	4.4	0.56	24.4	0.92	0.35	800	1.8	0.73	1.8	0.39	4960	1.5	588	226	0.02	1.6	425	0.52	0.77	104	0.27	3	21.2

n.a. Not applicable
D Duplicate

22-015(c) Background samples
Organic results

		SAL	4800	n/a	120	24000	1	0.1	1
		UTL	3.4	1.1	n/a	4.29	12.4	12.1	12.2
Location ID	Depth (ft.)	Sample ID	Acenaphthene	Acenaphthylene	Aniline	Anthracene	Benzo[a]anthracene	Benzo[a]pyrene	Benzo[b]fluoranthene
06-9901	0 - 0.5	AAB7971	<350	<350	<350	<350	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<350	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<370	<370	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<360	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<340	<340	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<370	<370	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<350	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<390	<390	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<380	<380	<380	<380	<380
22 9905	0 - 0.5	AAB7980	<400	<400	<400	<400	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<340	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<360	<360	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<350	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<340	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	n/a	1	320000	24000	n/a
		UTL	5.9	19.4	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Benzo[g,h,i]perylene	Benzo[k]fluoranthene	Benzoic acid	Benzyl alcohol	Bis(2-chloroethoxy)methane
06-9901	0 - 0.5	AAB7971	<350	<350	<3500	<1700	<350
	2 - 3	AAB7972	<350	<350	<3500	<1700	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<3700	<1800	<370
	0 - 1	AAB7974	<360	<360	<3600	<1800	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<3400	<1700	<340
	0 - 0.5	AAB7976	<370	<370	<3700	<1800	<370
	0 - 1	AAB7977	<350	<350	<3500	<1700	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<3900	<1900	<390
	2 - 3	AAB7979	<380	<380	<3800	<1900	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<4000	<1900	<400
	0 - 1	AAB7981	<340	<340	<3400	<1700	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<3600	<1800	<360
	0 - 0.5	AAB7983	<350	<350	<3500	<1700	<350
	0.17 - 1.17	AAB7984	<340	<340	<3400	<1700	<340
n/a Not applicable.							

22-015(c) Background samples
Organic results

		SAL	16000	n/a	320	6400	400
		UTL	n/a	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Butyl benzyl phthalate	Chloro-3-methylphenol [4-]	Chloroaniline [4-]	Chloronaphthalene [2-]	Chlorophenol [o-]
06-9901	0 - 0.5	AAB7971	<350	<710	<1700	<350	<350
	2 - 3	AAB7972	<350	<710	<1700	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<730	<1800	<370	<370
	0 - 1	AAB7974	<360	<730	<1800	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<690	<1700	<340	<340
	0 - 0.5	AAB7976	<370	<740	<1800	<370	<370
	0 - 1	AAB7977	<350	<690	<1700	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<780	<1900	<390	<390
	2 - 3	AAB7979	<380	<770	<1900	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<800	<1900	<400	<400
	0 - 1	AAB7981	<340	<690	<1700	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<720	<1800	<360	<360
	0 - 0.5	AAB7983	<350	<710	<1700	<350	<350
	0.17 - 1.17	AAB7984	<340	<690	<1700	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	0.12	100	50	n/a
		UTL	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Bis(2-chloroethyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-ethylhexyl)phthalate	Bromophenylphenyl ether [4-]
06-9901	0 - 0.5	AAB7971	<350	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	160	1	1	3200	3200	0.44
		UTL	n/a	n/a	n/a	32.5	3.3	n/a
Location ID	Depth (ft.)	Sample ID	Dinitrophenol [2,4-]	Dinitrotoluene [2,4-]	Dinitrotoluene [2,6-]	Fluoranthene	Fluorene	Hexachlorobenzene
06-9901	0 - 0.5	AAB7971	<1700	<350	<350	<350	<350	<350
	2 - 3	AAB7972	<1700	<350	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<1800	<370	<370	<370	<370	<370
	0 - 1	AAB7974	<1800	<360	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<1700	<340	<340	<340	<340	<340
	0 - 0.5	AAB7976	<1800	<370	<370	<370	<370	<370
	0 - 1	AAB7977	<1700	<350	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<1900	<390	<390	<390	<390	<390
	2 - 3	AAB7979	<1900	<380	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<1900	<400	<400	<400	<400	<400
	0 - 1	AAB7981	<1700	<340	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<1800	<360	<360	<360	<360	<360
	0 - 0.5	AAB7983	<1700	<350	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<1700	<340	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	1.6	240	64000	800000	1600
		UTL	n/a	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Dichlorobenzidine [3,3'-]	Dichlorophenol [2,4-]	Diethyl phthalate	Dimethyl phthalate	Dimethylphenol [2,4-]
06-9901	0 - 0.5	AAB7971	<710	<350	<350	<350	<350
	2 - 3	AAB7972	<710	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<730	<370	<370	<370	<370
	0 - 1	AAB7974	<730	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<690	<340	<340	<340	<340
	0 - 0.5	AAB7976	<740	<370	<370	<370	<370
	0 - 1	AAB7977	<690	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<780	<390	<390	<390	<390
	2 - 3	AAB7979	<770	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<800	<400	<400	<400	<400
	0 - 1	AAB7981	<690	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<720	<360	<360	<360	<360
	0 - 0.5	AAB7983	<710	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<690	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	n/a	96	8000	1600	0.1
		UTL	n/a	19.5	n/a	n/a	2.9
Location ID	Depth (ft.)	Sample ID	Chlorophenylphenyl ether [4-]	Chrysene	Di-n-butyl phthalate	Di-n-octyl phthalate	Dibenzo[a,h]anthracene
06-9901	0 - 0.5	AAB7971	<350	<350	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	n/a	1600	7200	29
		UTL	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Dibenzofuran	Dichlorobenzene (1,2) [o-]	Dichlorobenzene (1,3) [m-]	Dichlorobenzene (1,4) [p-]
06-9901	0 - 0.5	AAB7971	<350	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	n/a	n/a	n/a	400	3200	n/a
		UTL	n/a	0.64	n/a	n/a	0.66	n/a
Location ID	Depth (ft.)	Sample ID	Methyl-4,6-dinitrophenol [2-]	Methylnaphthalene [2-]	Methylphenol [2-]	Methylphenol [4-]	Naphthalene	Nitroaniline [2-]
06-9901	0 - 0.5	AAB7971	<1700	<350	<350	<350	<350	<1700
	2 - 3	AAB7972	<1700	<350	<350	<350	<350	<1700
06-9902	0 - 0.5	AAB7973	<1800	<370	<370	<370	<370	<1800
	0 - 1	AAB7974	<1800	<360	<360	<360	<360	<1800
06-9903	0 - 0.5	AAB7975	<1700	<340	<340	<340	<340	<1700
	0 - 0.5	AAB7976	<1800	<370	<370	<370	<370	<1800
	0 - 1	AAB7977	<1700	<350	<350	<350	<350	<1700
22-9904	0 - 0.5	AAB7978	<1900	<390	<390	<390	<390	<1900
	2 - 3	AAB7979	<1900	<380	<380	<380	<380	<1900
22-9905	0 - 0.5	AAB7980	<1900	<400	<400	<400	<400	<1900
	0 - 1	AAB7981	<1700	<340	<340	<340	<340	<1700
22-9906	0 - 0.5	AAB7982	<1800	<360	<360	<360	<360	<1800
	0 - 0.5	AAB7983	<1700	<350	<350	<350	<350	<1700
	0.17 - 1.17	AAB7984	<1700	<340	<340	<340	<340	<1700

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	90	560	80	1	7400
		UTL	n/a	n/a	n/a	6	n/a
Location ID	Depth (ft.)	Sample ID	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Indeno[1,2,3-cd]pyrene	Isophorone
06-9901	0 - 0.5	AAB7971	<350	<350	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	240	240	5.3	n/a	5000	0.1
		UTL	n/a	n/a	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Nitroaniline [3-]	Nitroaniline [4-]	Nitrobenzene	Nitrophenol [2-]	Nitrophenol [4-]	Nitrosodi-n-propylamine [N-]
06-9901	0 - 0.5	AAB7971	<1700	<710	<350	<350	<1700	<350
	2 - 3	AAB7972	<1700	<710	<350	<350	<1700	<350
06-9902	0 - 0.5	AAB7973	<1800	<730	<370	<370	<1800	<370
	0 - 1	AAB7974	<1800	<730	<360	<360	<1800	<360
06-9903	0 - 0.5	AAB7975	<1700	<690	<340	<340	<1700	<340
	0 - 0.5	AAB7976	<1800	<740	<370	<370	<1800	<370
	0 - 1	AAB7977	<1700	<690	<350	<350	<1700	<350
22-9904	0 - 0.5	AAB7978	<1900	<780	<390	<390	<1900	<390
	2 - 3	AAB7979	<1900	<770	<380	<380	<1900	<380
22-9905	0 - 0.5	AAB7980	<1900	<800	<400	<400	<1900	<400
	0 - 1	AAB7981	<1700	<690	<340	<340	<1700	<340
22-9906	0 - 0.5	AAB7982	<1800	<720	<360	<360	<1800	<360
	0 - 0.5	AAB7983	<1700	<710	<350	<350	<1700	<350
	0.17 - 1.17	AAB7984	<1700	<690	<340	<340	<1700	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	0.014	140	5.8	n/a	48000	2400
		UTL	n/a	n/a	n/a	24.2	n/a	12.8
Location ID	Depth (ft.)	Sample ID	Nitrosodimethylamine [N-]	Nitrosodiphenylamine [N-]	Pentachlorophenol	Phenanthrene	Phenol	Pyrene
06-9901	0 - 0.5	AAB7971	<350	<350	<1700	<350	<350	<350
	2 - 3	AAB7972	<350	<350	<1700	<350	<350	<350
06-9902	0 - 0.5	AAB7973	<370	<370	<1800	<370	<370	<370
	0 - 1	AAB7974	<360	<360	<1800	<360	<360	<360
06-9903	0 - 0.5	AAB7975	<340	<340	<1700	<340	<340	<340
	0 - 0.5	AAB7976	<370	<370	<1800	<370	<370	<370
	0 - 1	AAB7977	<350	<350	<1700	<350	<350	<350
22-9904	0 - 0.5	AAB7978	<390	<390	<1900	<390	<390	<390
	2 - 3	AAB7979	<380	<380	<1900	<380	<380	<380
22-9905	0 - 0.5	AAB7980	<400	<400	<1900	<400	<400	<400
	0 - 1	AAB7981	<340	<340	<1700	<340	<340	<340
22-9906	0 - 0.5	AAB7982	<360	<360	<1800	<360	<360	<360
	0 - 0.5	AAB7983	<350	<350	<1700	<350	<350	<350
	0.17 - 1.17	AAB7984	<340	<340	<1700	<340	<340	<340

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	160	8000	64	n/a
		UTL	n/a	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Trichlorobenzene [1,2,4-]	Trichlorophenol [2,4,5-]	Trichlorophenol [2,4,6-]	Stigmast-5-en-3-ol [3,beta,] (TI)
06-9901	0 - 0.5	AAB7971	<350	<1700	<350	n/a
	2 - 3	AAB7972	<350	<1700	<350	n/a
06-9902	0 - 0.5	AAB7973	<370	<1800	<370	2200
	0 - 1	AAB7974	<360	<1800	<360	n/a
06-9903	0 - 0.5	AAB7975	<340	<1700	<340	n/a
	0 - 0.5	AAB7976	<370	<1800	<370	n/a
	0 - 1	AAB7977	<350	<1700	<350	n/a
22-9904	0 - 0.5	AAB7978	<390	<1900	<390	n/a
	2 - 3	AAB7979	<380	<1900	<380	n/a
22-9905	0 - 0.5	AAB7980	<400	<1900	<400	n/a
	0 - 1	AAB7981	<340	<1700	<340	n/a
22-9906	0 - 0.5	AAB7982	<360	<1800	<360	6500
	0 - 0.5	AAB7983	<350	<1700	<350	n/a
	0.17 - 1.17	AAB7984	<340	<1700	<340	n/a

n/a Not applicable.

22-015(c) Background samples
Organic results

		SAL	n/a	n/a	n/a
		UTL	n/a	n/a	n/a
Location ID	Depth (ft.)	Sample ID	Unknown Alcohol (TI)	Unknown organic acid (TI)	Unknown Polynuclear Aromatic Hydrocarbon (TI)
06-9901	0 - 0.5	AAB7971	n/a	n/a	n/a
	2 - 3	AAB7972	n/a	n/a	n/a
06-9902	0 - 0.5	AAB7973	n/a	3900	420
	0 - 1	AAB7974	n/a	n/a	n/a
06-9903	0 - 0.5	AAB7975	n/a	n/a	910
	0 - 0.5	AAB7976	500	n/a	920
	0 - 1	AAB7977	n/a	n/a	n/a
22-9904	0 - 0.5	AAB7978	n/a	n/a	n/a
	2 - 3	AAB7979	n/a	n/a	n/a
22-9905	0 - 0.5	AAB7980	n/a	n/a	n/a
	0 - 1	AAB7981	n/a	n/a	1100
22-9906	0 - 0.5	AAB7982	n/a	690	2500
	0 - 0.5	AAB7983	n/a	n/a	980
	0.17 - 1.17	AAB7984	n/a	n/a	n/a
n/a Not applicable.					

ANNEX 6.10

SUMMARY OF COMPOSITE AND GRAB SAMPLE LOCATIONS

SUMMARY OF COMPOSITE AND GRAB SAMPLE LOCATIONS
FOR SWMU 22-015(c)

Outfall Reach	Location ID	Sample ID	Grab Sample	Composite Sample (# of Grabs)	Sample Depth
S1	2001 - 2003	AAA8581		3	0-6"
S1	2001 - 2003	AAA8582		3	Tuff
S1	2004 - 2009	AAA8583		6	0-6"
S1	2004 - 2009	AAA8584		6	0-6"
S1	2004 - 2009	AAA8585		6 (FD)*	0-6"
S1	2004 - 2009	AAA8586		6	Tuff
S1	2004 - 2009	AAA8587		6	Tuff
Pond	2004	AAA8588	1		2-6"
Pond	2004	AAA8589	1		8"/Tuff
Pond	2007	AAA8590	1		2-6"
Pond	2007	AAA8591	1		8"/Tuff
Pond	2008	AAA8592	1		2-6""
Pond	2008	AAA8593	1		8"/Tuff
S2	2010 - 2012	AAA8594		3	0-6"
S2	2010 - 2012	AAA8595		3	Tuff
S2	2013 - 2018	AAA8596		6	0-6"
S2	2013 - 2018	AAA8597		6	0-6"
S2	2013 - 2018	AAA8598		6	Tuff
S2	2013 - 2018	AAA8599		6	Tuff
S3	2019	AAA8600	1		0-6"
S3	2019	AAA8601	1		Tuff
S3	2020	AAA8602	1		0-6"
S3	2020	AAA8603	1		Tuff
S3	2021	AAA8604	1		0-6"
S3	2021	AAA8605	1		Tuff
S3	2022	AAA8606	1		0-6"
S3	2022	AAA8607	1		Tuff
S3	2023	AAA8608	1		0-6"
S3	2023	AAA8609	1		Tuff
S3	2024	AAA8610	1		0-6"
S3	2024	AAA8611	1		Tuff
S3	2025	AAA8612	1		0-6"
S3	2025	AAA8613	1		Tuff
S3	2026	AAA8614	1		0-6"
S3	2026	AAA8615	1		Tuff
S3	2027	AAA8616	1		0-6"
S3	2027	AAA8617	1		Tuff
S3	2028	AAA8618	1		0-6"
S3	2028	AAA8619	1 (FD)*		0-6"
S3	2028	AAA8620	1		Tuff

SUMMARY OF COMPOSITE AND GRAB SAMPLE LOCATIONS FOR SWMU 22-015(c)

U4	2029 - 2033	AAA8621		5	0-6"
U4	2029 - 2033	AAA8622		5	Tuff
U4	2034 - 2038	AAA8623		5	9-6"
U4	2034 - 2038	AAA8624		5	Tuff
U3	2039 - 2043	AAA8625		5	0-6"
U3	2039 - 2043	AAA8626		5	Tuff
U3	2044 - 2048	AAA8627		5	0-6"
U3	2044 - 2048	AAA8628		5	Tuff
U2	2049 - 2053	AAA8629		5	0-6"
U2	2049 - 2053	AAA8630		5	Tuff
U2	2054 - 2058	AAA8631		5	0-6"
U2	2054 - 2058	AAA8632		5	Tuff
U1	2059 - 2063	AAA8633		5	0-6"
U1	2059 - 2063	AAA8634		5	Tuff
U1	2064 - 2068	AAA8635		5	0-6"
U1	2064 - 2068	AAA8636		5 (FD)*	0-6"
U1	2064 - 2068	AAA8637		5	Tuff

*(FD) - Field Duplicate

SUMMARY OF COMPOSITE AND GRAB SAMPLES COLLECTED FROM SWMU 22-015(c)

Outfall Reach	Description	Composite Samples	Grab Samples
S1	Stained area within the channel	2	0
S1	Within the pond area	4	6
U1	Unstained areas on channel banks	4	0
	Unstained areas on channel banks	4	0
S2	Stained areas within the channel	6	0
U3	Unstained areas on channel bank	4	0
S3	Stained areas within the channel down the hillside	0	19
U4	Unstained areas on channel bank	4	0

Note - This table does not include duplicate QA/QC samples.

SUMMARY OF AREAS WHERE METALS IN SOIL EXCEEDED SALs (cont.)

Element	SAL	S1 Channel						S2 Channel				S3 Channel			
		Stained Channel		Pond Area		Unstained Bank		Stained Channel		Unstained Bank		Stained Channel		Unstained Bank	
		Soil	Tuff	Soil	Tuff	Soil	Tuff	Soil	Tuff	Soil	Tuff	Soil	Tuff	Soil	Tuff
Ag	400					X									
As	11.6	X		X		X		X							
Cd	80														
Cr (Note 1)	34	X	X	X	X	X	X	X	X	X				X	X
Cu	3000	X		X		X									
Fe	N/A														
Ni	1600	X				X									
Pb	400	X				X		X							
Se	400														
V	560														
Zn	24000														
Cs-137	4														
Sr-90	5.9	X													
Cn	1600														

Notes: 1) The chromium value shown is the LANL background value.

ANNEX 6.11

TCLP AND HCL EXTRACTION RESULTS

REPORT NUMBER: 34579

********** CST ANALYTICAL REPORT **********

Prepared by: M. KOZUBAL on 15-May-1995

REQUEST NUMBER: 21925 MATRIX: SE ANALYST: OES PROGRAM CODE: MA51

OWNER: Richard Romero GROUP: ESH-19 MAIL-STOP: K490 PHONE: 5-4116

NOTEBOOK: EM90126 PAGE: 20

CUSTOMER SAMPLES:

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
22-2001	95.08661	AG	ICPES	< 0.01		MG/L	5/15/95	
22-2001	95.08661	BA	ICPES	0.89	0.09	MG/L	5/15/95	
22-2001	95.08661	CD	ICPES	0.4	0.04	MG/L	5/15/95	
22-2001	95.08661	CR	ICPES	0.038	0.018	MG/L	5/15/95	
22-2001	95.08661	PB	ICPES	< 0.03		MG/L	5/15/95	
22-2008	95.08662	AG	ICPES	< 0.01		MG/L	5/15/95	
22-2008	95.08662	BA	ICPES	0.84	0.08	MG/L	5/15/95	
22-2008	95.08662	CD	ICPES	0.039	0.005	MG/L	5/15/95	
22-2008	95.08662	CR	ICPES	0.041	0.004	MG/L	5/15/95	
22-2008	95.08662	PB	ICPES	< 0.03		MG/L	5/15/95	
22-2024	95.08663	AG	ICPES	< 0.01		MG/L	5/15/95	
22-2024	95.08663	BA	ICPES	1.4	0.1	MG/L	5/15/95	
22-2024	95.08663	CD	ICPES	0.81	0.08	MG/L	5/15/95	
22-2024	95.08663	CR	ICPES	0.047	0.031	MG/L	5/15/95	
22-2024	95.08663	PB	ICPES	< 0.03		MG/L	5/15/95	

CUSTOMER SAMPLE DUPLICATES:

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
22-2024	95.08663	AG	ICPES	< 0.01		MG/L	5/15/95	
22-2024	95.08663	BA	ICPES	1.4	0.1	MG/L	5/15/95	
22-2024	95.08663	CD	ICPES	0.8	0.08	MG/L	5/15/95	
22-2024	95.08663	CR	ICPES	0.049	0.005	MG/L	5/15/95	
22-2024	95.08663	PB	ICPES	< 0.03		MG/L	5/15/95	

****

REPORT NUMBER: 34579 (continued)

********** CST QUALITY ASSURANCE REPORT *********

Prepared by: M. KOZUBAL on 15-May-1995

REQUEST NUMBER: 21925 MATRIX: SE ANALYST: OES PROGRAM CODE: MA51

OWNER: Richard Romero GROUP: ESH-19 MAIL-STOP: K490 PHONE: 5-4116

NOTEBOOK: EM90126 PAGE: 20

SUMMARY OF CONTROL STATUS OF OPEN (NON-BLIND) QC SAMPLES RUN WITH THIS BATCH

SAMPLE NUM	ANALYSIS	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	QC VALUE	QC UNCERTAINTY	COMPLETION DATE	COMMENT
00.29417	BA	440.	44.	UG/L	500.	22.	5/15/95	UNDER CONTROL
00.29417	CD	430.	43.	UG/L	498.	21.	5/15/95	UNDER CONTROL
00.29417	CR	450.	45.	UG/L	499.	21.	5/15/95	UNDER CONTROL

SUMMARY OF CONTROL STATUS OF BLIND QC SAMPLES RUN WITH THIS BATCH

There were no blind Quality Control materials run with the samples reported above for one of the following reasons:

___ Only qualitative data requested

X Only Open (non-blind) QC samples run with this sample batch.

___ No QC samples run with this sample batch.

___ No QC samples for this constituent and matrix type available within CST

REPORT NUMBER: 34579

Analyst	Reviewer	Team Leader	QA Officer
			mag
5-15-95	5-15-95	5/17/95	5/17/95
Date	Date	Date	Date

No Sample Discrepancies Noted by Sample Management Section

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in 'Quality Assurance for Health and Environmental Chemistry: 1992,' LA-12790-MS, Vol. I, pp. 19-20.

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REPORT NUMBER: 34680

********** CST ANALYTICAL REPORT **********

Prepared by: BRL on 17-May-1995

REQUEST NUMBER: 21925 MATRIX: SE ANALYST: AAS PROGRAM CODE: MA51

OWNER: Richard Romero GROUP: ESH-19 MAIL-STOP: K490 PHONE: 5-4116

NOTEBOOK: PAGE:

CUSTOMER SAMPLES:

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
22-2001	95.08661	AS	ETVAA	< 3.		UG/L	5/15/95	
22-2001	95.08661	HG	CVAA	2.	0.2	UG/L	5/17/95	
22-2001	95.08661	SE	ETVAA	< 2.		UG/L	5/15/95	
22-2008	95.08662	AS	ETVAA	< 3.		UG/L	5/15/95	
22-2008	95.08662	HG	CVAA	< 0.2		UG/L	5/17/95	
22-2008	95.08662	SE	ETVAA	< 2.		UG/L	5/15/95	
22-2024	95.08663	AS	ETVAA	< 3.		UG/L	5/15/95	
22-2024	95.08663	HG	CVAA	< 0.2		UG/L	5/17/95	
22-2024	95.08663	SE	ETVAA	< 2.		UG/L	5/15/95	

CUSTOMER SAMPLE DUPLICATES:

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	COMPLETION DATE	COMMENT
22-2024	95.08663	AS	ETVAA	< 3.		UG/L	5/15/95	
22-2024	95.08663	SE	ETVAA	< 2.		UG/L	5/15/95	

MATRIX SPIKES:

CUSTOMER NUM	SAMPLE NUM	ANALYSIS	ANALYTICAL TECHNIQUE	AMOUNT SPIKED	AMOUNT RECOVERED	UNITS	COMPLETION DATE	COMMENT
22-2024	95.08663	AS	ETVAA	10.	13.	UG/L	5/15/95	
22-2024	95.08663	SE	ETVAA	10.	9.	UG/L	5/15/95	

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REPORT NUMBER: 34680 (continued)

********** CST QUALITY ASSURANCE REPORT *********

Prepared by: BRL on 17-May-1995

REQUEST NUMBER: 21925 MATRIX: SE ANALYST: AAS PROGRAM CODE: MA51

OWNER: Richard Romero GROUP: ESH-19 MAIL-STOP: K490 PHONE: 5-4116

NOTEBOOK: PAGE:

SUMMARY OF CONTROL STATUS OF OPEN (NON-BLIND) QC SAMPLES RUN WITH THIS BATCH

SAMPLE NUM	ANALYSIS	ANALYTICAL RESULT	ANALYTICAL UNCERTAINTY	UNITS	QC VALUE	QC UNCERTAINTY	COMPLETION DATE	COMMENT
00.29417	AS	24.	5.	UG/L	25.	1.	5/15/95	UNDER CONTROL
00.29417	SE	26.	5.	UG/L	25.	1.	5/15/95	UNDER CONTROL
00.30468	HG	4.	0.4	UG/L	5.04	1.05	5/17/95	UNDER CONTROL

SUMMARY OF CONTROL STATUS OF BLIND QC SAMPLES RUN WITH THIS BATCH

There were no blind Quality Control materials run with the samples reported above for one of the following reasons:

____ Only qualitative data requested

____ Only Open (non-blind) QC samples run with this sample batch.

____ No QC samples run with this sample batch.

____ No QC samples for this constituent and matrix type available within CST

REPORT NUMBER: 34680

Analyst	Reviewer	Team Leader	QA Officer
5/17/95	5/17/95	5/17/95	5/17/95
Date	Date	Date	Date

No Sample Discrepancies Noted by Sample Management Section

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in 'Quality Assurance for Health and Environmental Chemistry: 1992,' LA-12790-MS, Vol. I, pp. 19-20.

****

Sevenson Environmental Services, Inc.

May 25, 1995

Mr. Seth Gifford
ERM
3250 Trinity Dr.
Los Alamos, NM 87544

RE: Analytical/Treatability Work for ERM/Golder Project No.: TA-22-015(c)

Dear Mr. Gifford:

Sevenson Environmental Services, Inc. is in the process of completing various analytical test methods on the sample received by our treatability and analytical testing laboratory, Waste Stream Technology, Inc. Per your requests, the following work was implemented:

1) characterize soil sample for total and TCLP (Method 1311) RCRA metals;

2) conduct a shortened bioavailability extraction method on the soil sample for the RCRA metals;

3) evaluate data for purposes of performing MAECTITE® treatability study to reduce leachability and bioavailability of RCRA metals; and

4) analyze the sample and its TCLP extract fluid for total hexavalent chromium.

The analytical data for RCRA metals as both totals in soil and for RCRA toxicity in TCLP extract suggest that the sample of material received at WST was not hazardous under the characteristic rule of the RCRA regulations. Therefore, Sevenson did not perform any MAECTITE® chemical treatment studies on the material.

Sevenson discussed the results with ERM on May 16, 1995 over the telephone. It was determined that examination of the bioavailability of the metals may have significant impact to potential risk assessment activities applicable to a possible course of remedial action. Sevenson indicated that a shortened version of an in vitro screening test to evaluate heavy metal

bioavailability (Ruby, et. al., 1993 - attached) could be performed. The test basically replicated the TCLP extraction analysis (Method 1311), however, the extraction fluid utilized was a hydrochloric acid (HCl) solution at a pH of 2.0 S.U. similar to gastric fluids in the stomach. Agitation time was set for 2 hours, with the pH of the extraction fluid maintained at a pH of 2.0 with periodic additions of concentrated HCl. The neutralization step replicative of the human digestive system (i.e., carbonate buffering pre-small intestine bolus entrance) was not attempted.

If it were, reduced bioavailabilty of the metals would have resulted due to the relative insolubility of metal:carbonate complexes at a neutral pH. The first step as executed, therefore, should have resulted in a "worst-case" representation.

Based upon the RCRA-list heavy metal concentrations in the HCl extract, the data suggests that less than one-half of one percent (<0.5%) of the total lead and even less for total chromium (<0.03 %) present in the soil is susceptible to disassociation in simulated conditions of the stomach.

On May 24, 1995 Sevenson was notified by ERM/Golder that the state of New Mexico had stipulated that the site's remedial action level for chromium was based upon a total hexavalent chromium in soil, and not total chromium (trivalent + hexavalent valence forms). Sevenson informed ERM/Golder that we did have a recently developed draft analytical method (attached) for Cr (VI) in soil that eliminated the potential of chromium oxidation/reduction [Cr (III) to and from Cr (VI)] during sample handling and preparation. Sevenson also informed ERM/Golder that the TCLP extraction fluid (from Method 1311) was not an appropriate matrix to examine the concentration of Cr (VI). During the method's sample preparation, air could be introduced, or reducing conditions created that would affect the oxidation state of chromium. On May 25, 1995 the attached Cr (VI) method was initiated. Those results will be forwarded upon their receipt.

Finally, all analytical data attached to this letter are in preliminary form and have not been QA/QC validated. However, based upon the available data, the soil, if it were to become a waste at the time of excavation, would not be RCRA hazardous (assuming the sample was representative of worst-case contamination levels). Although heavy metals are present, primarily chromium and lead, no RCRA list metal species appear to be overly bioaccessible as screened when compared to the total metal concentrations in the sample.

I have enclosed copies of two (2) papers relative to bioavailability of lead in soil. They seem to have sparked an interest in the arena of Risk Assessment of heavy metals. The science and precepts presented in the literature closely support MAECTITE® chemical treatment process end-

products as developed in the mid-1980's and patented more recently.

Should you have any questions, please do not hesitate to call. I trust this information will be useful for your site.

Sincerely,
Sevenson Environmental Services, Inc.

Karl W. Yost
Director of Treatment Services

enclosures

cc: B. Russell
J. Williams
File

SAMPLE PROGRESS REPORT

Wastestream Technology
Date: 05-15-1995 Time: 16:51:28

Sample I.D. WS18031
Status: Analyses incomplete
Expiration Date: 05/26/95
Group Number: 9505-087
Client code: LOSALAMO
Updated:
SamplDes: INITIAL

Date collected: 05/12/95
Date submitted: 05/12/95
Due date: 05/26/95
Specification checking: off
Site Des:

Size: 1*300G

Analysis	Result	Unit	Finished	Anl
Lead in Solids by ICP	237.045	mg/Kg	05/15/95	AM
Cadmium in solids by ICP	14.651	mg/Kg	05/15/95	AM
Barium in Solids by ICP	30.382	mg/Kg	05/15/95	AM
Chromium in Solids by ICP	1076.342	mg/Kg	05/15/95	AM
Silver in Solids by ICP	16.965	mg/Kg	05/15/95	AM
Arsenic in Solids by GFAA	33.780	mg/Kg	05/15/95	AM
Selenium in Solids by GFAA	0.226	mg/Kg	05/15/95	AM
Mercury in Solids by Cold Vapor	---			
Lead in TCLP by ICP	Not detected	mg/L	05/15/95	AM
Cadmium in TCLP by ICP	0.043	mg/L	05/15/95	AM
Barium in TCLP by ICP	0.802	mg/L	05/15/95	AM
Chromium in TCLP by ICP	Not detected	mg/L	05/15/95	AM
Silver in TCLP by ICP	Not detected	mg/L	05/15/95	AM
Arsenic in TCLP by GFAA	Not detected	mg/L	05/15/95	AM
Selenium in TCLP by GFAA	Not detected	mg/L	05/15/95	AM
Mercury TCLP by Cold Vapor	Below det lim	mg/L	05/15/95	KP
Percent Moisture	35.16	%		

End of progress report on sample: WS18031

TA-22-015(c)

SAMPLE PROGRESS REPORT

Wastestream Technology
Date: 05-19-1995 Time: 09:40:57

Sample I.D. WS18106
Status: Analyses incomplete
Expiration Date: 05/24/95
Group Number: 9505-089
Client code: LOSALAMO
Updated:
SamplDes: HCL EXTRACT

Date collected: 05/17/95
Date submitted: 05/18/95
Due date: 05/31/95
Specification checking: off
Site Des:

Size: 1*500ML

Analysis	Result	Unit	Finished	Anl
Lead in Water by ICP	1.001	mg/L	05/18/95	AM
Cadmium in Water by ICP	0.097	mg/L	05/18/95	AM
Barium in Water by ICP	0.859	mg/L	05/18/95	AM
Chromium in Water by ICP	0.256	mg/L	05/18/95	AM
Silver in Water by ICP	Not detected	mg/L	05/18/95	AM
Arsenic in Water by GFAA	Not detected	mg/L	05/18/95	AM
Selenium in Water by GFAA	---			
Mercury in Water by Cold Vapor	---			
Hg water Method Blank Result	---			
Hg water Ref Sample % Recovery	---			
Hg water MS % Recovery	---			
Hg Duplicate Sample Result	---			
Hg duplicate sample RPD	---			

End of progress report on sample: WS18106

To: Karl
From: Donna

5/19/95

1 page

HCl Extract: 100g soil + 2L H_2O @ pH=2

ANNEX 6.12

CLEANUP LEVEL CALCULATIONS

The following equation was used to derive cleanup levels for carcinogenic compounds in commercial/industrial soil:

$$C\ (mg/kg) = \frac{TR \times BW \times AT \times 365\ d/yr}{EF \times ED \times \left[\left(SF_o \times 10^{-6}\ kg/mg \times IR_{soil}\right) + \left(SF_i \times IR_{air} \times (1/Y)\right)\right]}$$

Where:

Parameter	Definition	Units	Default
C	cleanup level - chemical concentration in soil	mg/kg	---
TR	target excess individual lifetime cancer risk	unitless	10^{-6} or 10^{-5}
BW	adult body weight	kg	70
AT	carcinogenic averaging time	yr	70
EF	exposure frequency	days/yr	250
ED	exposure duration	yr	25
SF_o	oral cancer slope factor	$(mg/kg\text{-}day)^{-1}$	chemical-specific
IR_{soil}	soil ingestion rate	mg/day	50
SF_i	inhalation cancer slope factor	$(mg/kg\text{-}day)^{-1}$	chemical-specific
IR_{air}	workday inhalation rate	m^3/day	20
Y	volatilization factor (VF) for volatiles particulate emission factor (PEF) for non-volatiles	m^3/kg m^3/kg	chemical-specific 1.11×10^7

The following equation was used to derive cleanup levels for noncarcinogenic contaminants in commercial/industrial soil:

$$Action\,Level\,(mg/kg) = \frac{THI \times BW \times AT \times 365\,d/yr}{EF \times ED \times \left[\left((1/RfD_o) \times 10^{-6}\,kg/mg \times IR_{soil}\right) + \left((1/RfD_i) \times IR_{air} \times 1/Y\right)\right]}$$

Where:

Parameter	Definition	Units	Default
THI	target hazard index	unitless	0.1
BW	adult body weight	kg	70
AT	noncarcinogenic averaging time	yr	25 (always equal to ED)
EF	exposure frequency	days/yr	250
ED	exposure duration	yr	25
RfD_o	oral chronic reference dose	mg/kg-day	chemical-specific
IR_{soil}	soil ingestion rate	mg/day	50
SF_i	inhalation chronic reference dose	mg/kg-day	chemical-specific
IR_{air}	workday inhalation rate	m^3/day	20
Y	volatilization factor (VF) for volatiles	m^3/kg	chemical-specific
	particulate emission factor (PEF) for non-volatiles	m^3/kg	1.11×10^7 (LANL)

Methodology for Establishing Cleanup Levels for Lead in Soil

LEAD EXPOSURES

EPA has not derived CSFs or RfDs for evaluating the toxicity of lead or lead compounds. Previously, EPA had considered the concentration range of 500 to 1,000 mg/kg lead in soil to be acceptable as an interim cleanup level for residential Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites (EPA 1992). This interim cleanup level was proposed in a Centers for Disease Control document (CDC 1985) on lead poisoning in children, as children and fetuses are considered the most sensitive receptors for lead's toxic end points. Even more current EPA (1994) guidance has suggested a lead concentration in soil of 400 mg/kg as the threshold level. However, more recently for residential CERCLA and RCRA sites, EPA has recommended replacing the 500 to 1,000 mg/kg cleanup range and the 400 mg/kg threshold level with levels derived by its Integrated Exposure Uptake Biokinetic (IEUBK) Model (Version 0.99d).

Because of the anticipated future use of the Laboratory site for industrial/commercial purposes, the residential exposures are not considered relevant for the site. The California Environmental Protection Agency (Cal/EPA) has developed its own model (1993) to predict blood lead (PbB) levels in adults as well as children. The Cal/EPA model was employed in this assessment to evaluate potential adverse health effects to adults from lead in soil at the Laboratory site (see attached table).

Cal/EPA Lead Model

Similar to the EPA IEUBK model, the Cal/EPA model is used to estimate blood lead concentrations resulting from exposures via several pathways (inhalation of particulates, ingestion of food, dust, soil, water, and plant uptake). The contribution from the pathways are added to derive an estimate median PbB concentration resulting from multipathway exposure. In addition, the model calculates the 90th, 95th, 98th and 99th percentile concentrations by assuming a lognormal distribution with a standard deviation of 1.42 mg/dl.

A PbB concentration of 10 mg/dl is the target PbB level for exposure to lead in the environment, regardless of the source. Sources include drinking water, grocery story food products, soil (incidental soil ingestion and dermal contact), and the air. Therefore, the calculation of a soil lead cleanup level for an industrial exposure scenario includes the contribution to blood lead levels from non-site sources.

The soil lead cleanup level includes the contribution to PbB levels from non-site sources as well as on-site soil contact, soil ingestion, and inhalation pathways and was calculated not to exceed the target level of 10 mg/dl at the 95 percentile concentration. The contact rate for soil ingestion was changed from 0.03 g soil/day to 0.05 g soil/day to reflect the on-site industrial exposure pathway. The lead concentrations used in the water and food ingestion pathways are default values and represent background lead levels that may be encountered in tap water and grocery store food products. All other exposure input parameters are default values based on a residential exposure scenario.

REFERENCES

Cal/EPA (California Environmental Protection Agency, Department of Toxic Substance Control), 1993. Cal-Tox, a Multimedia Total Exposure Model for Hazardous Waste Sites. Office of Science Affairs, Department of Toxic Substances Control. June.

EPA (U.S. Environmental Protection Agency). 1992. Revised Guidance on Establishing Soil Lead Cleanup Levels at CERCLA/RCRA Sites. OSWER Directive 9355, 4-08.

EPA (U.S. Environmental Protection Agency). 1994. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive No. 9355.4-12. July 14, 1994.

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

INPUT		OUTPUT					
MEDIUM	LEVEL		------ percentiles ------				
LEAD IN AIR (ug/m^3)	0.01		50th	90th	95th	98th	99th
LEAD IN SOIL (ug/g)	3385	BLOOD Pb, ADULT (ug/dl)	5.7	8.9	10.0	11.6	12.8
LEAD IN WATER (ug/l)	15						
PLANT UPTAKE? 1=YES 0=NO	0						
AIRBORNE DUST (ug/m^3)	50						

EQUATIONS, ADULTS

Pathway	Blood Pb ug/dl		Route-specific constant		concentration in medium		contact rate		percent of total
SOIL CONTACT:	0.66	=	1E-04 (ug/dl)/(ug/day)	*	3385 ug/g	*	1.85 g soil/day (5 g/m^2 * 0.37 m^2)		12%
SOIL INGESTION:	2.98	=	0.018 (ug/dl)/(ug/day)	*	3385 ug/g	*	0.05 g soil/day		53%
INHALATION:	0.29	=	1.64 (ug/dl)/(ug/m^3)	*	0.18 ug/m^3				5%
WATER INGESTION:	0.84	=	0.04 (ug/dl)/(ug/day)	*	15 ug/l	*	1.4 l water/day		15%
FOOD INGESTION:	0.88	=	0.04 (ug/dl)/(ug/day)	*	10.0 ug Pb/kg diet	*	2.2 kg diet/day		16%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (ug/kg) = 10.0 ug/kg

LEAD IN PRODUCE = 10 ug/kg or 0.00045 * soil lead = 10.0 ug/kg

ANNEX 6.13

VERIFICATION SAMPLE CALCULATIONS

SWMU 2-015(c)
Verification Sample Calculations

The required number of samples is computed using the following equation:

$$n_d = \frac{\left(z_{1-\beta} + z_{1-\alpha}\right)^2}{\tau^2} \quad where \quad \tau = \frac{(C_s - \mu_1)}{\sigma}$$

The required number of samples is computed using the following parameters and assumptions:

Parameter	Assumption	Value
α	alpha - the desired false positive rate	0.05
β	beta - the desired false negative rate	0.2
$z_{1-\alpha}$	critical value for the normal distribution with a probability of 1 - α	1.645
$z_{1-\beta}$	critical value for the normal distribution with a probability of 1 - β	0.842
τ	tau - an expression of relative difference	calculated
C_s	cleanup standard for the sample area	25 mg/kg for arsenic
μ_1	the mean concentration where the site should be declared clean with a high probability	assume 50% of C_s
σ	the estimate of the standard deviation of the individual contaminant concentrations within the CU	assume a coefficient of variation of 0.568 from arsenic background data (Longmire, et. al.), therefore, σ = 56.8% of μ_1.