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Ralph Ford-Schmid
NMED, DOE Oversight Bureau
P.O. Box 26110
Santa Fe, NM 87502

ENTERED

January 19, 1996

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LANL (TA-36) (Potrillo Canyon)

Dear Ralph,

I am forwarding a copy of the Potrillo Canyon paper I told you about at the public meeting in Española last week. I would be interested in talking with you about it, especially the implications for more intensive monitoring and the potential for clean-up and restoration. My interest goes beyond the SWEIS; the last construction project I managed was at the Lower Slobovia firing site at TA-36. I spent six months working in that shit! At the preconstruction conference at LANL, we were told no TLD's would be necessary. I found out, through a friend who worked in EM, that the site had not even been surveyed prior to the project, as LANL protocol requires. Ultimately, TLD's were supplied, just as "a precaution", and LANL spent the next six months trying to cover their ass.

Again, thank you for your assistance and interest in the SWEIS. I hope it ends up being more than just "rubber stamp" blanket NEPA coverage for the next five to ten years. I apologize for taking so long to get this to you.

Best Regards,

John Hogan

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WASTE MANAGEMENT '92
"Working Towards a Cleaner Environment"

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Waste Processing, Transportation, Storage and Disposal, Technical Programs and Public Education

Volume 1

Technology and Programs for Radioactive Waste Management and Environmental Restoration

Proceedings of the
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at Tucson, Arizona
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QUANTIFICATION OF URANIUM TRANSPORT AWAY FROM FIRING SITES AT LOS ALAMOS NATIONAL LABORATORY-A MASS BALANCE APPROACH

Naomi M. Becker
Environmental Protection Group (EM-8)
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

ABSTRACT

Investigations were conducted at Los Alamos National Laboratory to quantify the extent of migration of depleted uranium away from firing sites. Extensive sampling of air particles, soil, sediment, and water was conducted to establish the magnitude of uranium contamination throughout one watershed. The uranium source term was estimated, and mass balance calculations were performed to compare the percentage of migrated uranium with original expenditures. Mass balance calculations can be powerful in identification of the extent of waste migration and used as an aid in planning future waste investigations.

DESCRIPTION OF THE PROBLEM

Los Alamos National Laboratory routinely collects and analyzes water, soil, sediment, particulate materials, vegetation, and biota for chemical and radiochemical constituents to assess the Laboratory's impact on the environment. During 1983, fish collected from a reservoir downstream from the Laboratory exhibited elevated levels of uranium that were statistically significant. Investigations were initiated to determine if this elevated uranium could be due to offsite transport of uranium which is used in dynamic weapons testing at Laboratory firing sites and to quantify the extent of migration within the watershed.

During a dynamic weapons test, depleted uranium is substituted for enriched uranium in a weapons component. The component is then explosively detonated, or is impacted against a target in the open air environment. This results in both the production of a wide range of depleted uranium particles as well as particle scattering over a large distance away from the firing pad. The explosive detonation process of aerial distribution over the watershed distinguishes this contaminant transport problems from others where the source term is spatially discrete (e.g., transport away from a waste pile or landfill.)

Mass balance calculations can aid waste management investigations which characterize the extent and magnitude of waste migration. At Los Alamos, applied mass balance to the determination of the extent of uranium transport away from firing sites will be described and will demonstrate how useful a tool this can be in decision-making for waste treatment and cleanup procedures.

SETTING AND SOURCE TERM DESCRIPTION

Although there are numerous watersheds at the Laboratory which contain firing sites where dynamic tests are conducted, investigations were confined to one watershed named Potrillo Canyon. Potrillo Canyon was selected because of its small size, it is contained entirely within the Laboratory boundaries, it is limited to public access, and contains five firing sites, four of which remain active today. Potrillo Canyon is about 7.8 km^2 in area, 8 km in length, and is relatively steep, with an average gradient of 3 percent. The watershed is characterized by flat mesa tops leading to nearly vertical canyon walls which terminate in large talus piles of boulders of Bandelier Tuff, a volcanic rock composed of ash flows and ash falls.

In terms of historical usage of uranium, it has been estimated that on the order of 100 metric tons of depleted and natural uranium has been expended by Los Alamos National Laboratory since the 1940's. Uranium usage was greatest during the early years of Laboratory operation. A conservative estimate of the total uranium source term in Potrillo Canyon is about 35,000 kg (1).

RESULTS OF DEPLETED URANIUM SAMPLING IN SOIL, SEDIMENT, AIR, AND WATER

More than 450 samples of fallout from air, soil, sediment and water and suspended sediment in spring/summer/autumn runoff were collected between 1983 and 1990 and analyzed for total uranium to evaluate the magnitude of transport of uranium away from firing sites by airborne and surface water runoff mechanisms. Results for the maximum, minimum and mean values are presented in Table I. Background levels of uranium in fallout range from 1-6 $\mu g/g$, in soil from 2-5 $\mu g/g$, and in water about 1 ppb (1). The greatest concentrations of uranium were found in transported suspended sediment carried in runoff waters where average concentrations were 51 $\mu g/g$, followed by sediment present in stream banks where average concentrations were 42.2 $\mu g/g$, Table I. Average concentrations of 17.5 $\mu g/g$ were observed in geomorphology deposits such as alluvial fans and point bars. Average uranium concentrations dissolved in runoff waters of 11.9 ppb were also found to be elevated above background concentrations. Uranium present in fallout and in surface soils were found to be at or slightly above background concentrations in most samples, which indicated that airborne transport and wind redistribution is not significant in mobilization of uranium away from firing sites. Uranium concentrations in runoff in the dissolved and suspended sediment phases were found to decline with downstream direction in the watershed, with the largest concentrations below two firing sites near the top of the watershed, implying both dilution and contaminant deposition in the distal direction.

MASS BALANCE CALCULATIONS

Calculations were made to determine the amount of uranium currently coexisting on or attached to fluvial sediment in the watershed today. Using average measured concentrations of uranium in fluvial sediment and subtracting off background

TABLE I

Uranium in Air, Water, Sediment, and Soil Units are μg/g (except where noted)

	Min	Max	Mean	Standard Deviation
Air (fallout)	0.8	7.5	3.5	2.1
Soil (top 5 cm)	1.2	66.	4.8	8.3
Runoff				
- dissolved (ppb)	BDL*	654	11.9+	53.4+
- suspended sediment	0.5	404.9	51.1	157.1
Sediment				
- Channel Deposits	1.0	158.1	8.6	23.0
- Bank Deposits	1.5	373.0	42.2	100.3
- Alluvial Fans and Point Bars	1.6	154.5	17.5	39.8

*Below Limits of Detection.
+ Derived using Maximum Likelihood Estimators (3).

levels of uranium, estimates were made of the uranium inventory in the channel, on banks, in point bars and alluvial fans, and in an area known as a discharge sink where sediment is preferentially accumulating in the watershed. Calculations were made considering uranium concentrations above background of: (1) 3 ppm (by weight) along the entire channel length and width to a depth of 0.1 m in the channel bed; (2) 3.5 ppm above background along the entire channel length on both banks extending 1 m from the bank edge and 0.1 m depth; (3) 7 ppm in an estimated 30 point bars deposits upstream from the discharge sink; (4) 9 ppm in 2 major alluvial fans; and (5) 1 ppm above background in a 0.2 m depth profile within the discharge sink. For each of these 5 regions, soil masses were multiplied by soil concentrations to obtain uranium volumes. For the channel and bank segments, point bar deposits and major alluvial fans upstream of the discharge sink, it was estimated that between 100 and 300 kg of uranium are present. Estimates of uranium associated with fluvial sediments accounted for about 5 percent or less of the estimated total uranium expenditure (35,000 kg).

From these data it may be concluded that most of the uranium mass 1) is not tied up in the fluvial sediments, 2) has already left the watershed, or 3) remains on the firing sites. Flow and uranium loss can occur by vertical flow (infiltration) in the discharge sink or through horizontal flow out the watershed. Infiltration and surface water losses are considered separately.

Examining the volume of uranium which enters the discharge sink, there are dissolved and suspended uranium components. Assuming an annual total inflow of 5200 m^3 (measured during 1990) and an average dissolved uranium concentration of 1.86 ppb (measured between 1984 and 1990), then 9.5 g of uranium annually are carried in the dissolved phase. Over 45 years of operation this would amount to an influx of about 0.5 kg of dissolved uranium transported into the discharge sink, or less than 1 percent of the estimated 35,000 kg source term.

The average annual suspended sediment load was calculated by assuming the suspended load to be 5 percent of the average discharge based upon visual observations of the volume of suspended sediment which was collected in cumulative samplers emplaced throughout the watershed. Using a range of 35,000 to 1,400,000 $kg/km^2 \cdot yr$ (3) and multiplying by an average suspended sediment uranium concentrations of 8.01 ppm by weight (measured), the average annual uranium influx into the discharge sink ranged from 1 to 36.5 kg/yr. The combined dissolved and suspended sediment influx to the discharge sink over the 45 years constituted between 0.1 and 4.7 percent of the 35,000 kg uranium source term.

If large volumes of depleted uranium had exited the watershed through surface water transport at the outlet, a depleted uranium signature observable through inspection of the ratio of uranium-235 to uranium-238 is expected to have remained in the sediments in the lower half of the watershed. Because little depleted uranium signature was observed in sediments in the channel, banks, and floodplain downstream of the discharge sink, and it was inferred through chemical and aerial photographic data that there has been little transport across the discharge sink during the last 23 years, it was assumed that most of the uranium must remain in the watershed.

A second calculation was made to determine what the concentrations of uranium in runoff water should be if all the uranium expended were uniformly dissolved in precipitation on an annual basis. Considering 0.5 m of precipitation annually and that 80 percent of the precipitation is lost to evaporation, transpiration and infiltration, then,

Dissolved Concentration

$$= 35{,}000 \text{ kg} / (0.2)(0.5 \text{ m})(7.8 \text{ km}^2)(45 \text{ yrs}) \qquad \text{(Eq. 1}$$

$$\cong 1 \text{ ppm.}$$

A dissolved concentration of one ppm is an underestimat because not all precipitation contacts the uranium; expecte concentrations would be even higher. The dissolved concen tration of 1 ppm exceeds observed dissolved uranium conce trations in runoff water by 2 to 3 orders of magnitude. Clearl high dissolved uranium concentrations in surface water a not observed and dissolved transport in surface water is not main uranium transport mechanism.

The argument that most of the uranium mass has left t watershed either by movement into the discharge sink (d solved phase) or by flowing past the watershed outlet is r jected. Calculations showed that the fluvial sediment conta less than 5 percent of the expended mass. The only plausib location for the remaining uranium is at or near the firing sit

Results from an aerial radiological flyover in 1982 estimated that between 4 and 23 Curies of Protactinium-23 (Pa-234m) remained near three firing sites in the watersh the variability dependent on the estimated vertical distrib tion. It is reasonable to assume equilibrium between Pa-23 and uranium-238 (U-238) because the half-life decay fr uranium-238 to Protactinium is short, on the order of abou half year, whereas the half-life of uranium-238 is long, on order of 4.5 x 10^9 years. Then assuming this equilibri

(equality between Pa-234m and U-238), an estimated 4-23 Curies of uranium remain at the three firing sites. Multiplying Curies by 3.003×10^6 to convert to kilograms, the amount of uranium still remaining at the firing sites is calculated to range from 12,000 to 69,000 kg, bracketing the estimated 35,000 kg uranium expended in Potrillo Canyon.

Consider this hypothesis from another viewpoint. If all the 35,000 kg of uranium were situated at the three firing sites, then what magnitude of soil concentration would be expected? Assuming the contaminated area is 26,000 m^3 from measurements with an assumed uniform concentration to 0.6 m depth,

Soil Concentration

$$= 35{,}000 \text{ kg} / (26{,}000 \text{ m}^3 \times 19 \text{ g/cm}^3) \qquad \text{(Eq. 2)}$$

$$\cong 72 \text{ ppm},$$

and 19 g/cm^3 is the approximate specific weight of uranium. Unpublished surface soil studies reported concentrations of uranium ranging from 408 to 3359 ppm by weight at one of these firing sites, and unpublished surface and depth data at another of the firing sites ranged from 560 to 4580 ppm uranium by weight. Concentrations in the vertical direction ranged from 2 to 75 ppm by weight to 3.7 m depth with the largest concentrations in the uppermost 0.6 m. Therefore, an average soil concentration of 72 ppm is consistent with measured concentrations at firing sites. This shows that the original estimated source term of 35,000 kg may even be slightly low.

APPLICATIONS TO WASTE MANAGEMENT

In investigations of former waste disposals sites, a frequent objective is to determine the extent of waste migration from its original location. Waste inventories or inventory estimates provide the initial source term. Sampling in the vicinity of the disposal unit can be designed to provide an estimate of the extent of the waste migration. Pathways which might be considered significant could include 1) air, in particulate, gaseous and vapor phases; 2) soil and sediment, with transport by hydrologic mechanisms in both the horizontal (surface water) and vertical (saturated and unsaturated, potentially multi-phase flow); 3) water transport, by runoff and snowmelt, through infiltration, in the dissolved and suspended sediment phases. Results from sampling are then integrated over the sampling area and compared to the original source term estimates. When the percent of waste which has migrated is small is compared to the original amount, then decisions can be made regarding the need and extent for future sampling, remediation, capping, or possibly exhumation. Risk assessment can be performed as an aid in the decision-making process. In some cases, the combination of inventory analyses and preliminary sampling investigations coupled with mass balance calculations and risk assessment may obviate extensive and costly waste site studies.

REFERENCES

1. N.M. BECKER, "Influence of Hydraulic and Geomorphologic Components of a Semi-Arid Watershed on Depleted Uranium Transport," Ph.D dissertation at University of Wisconsin - Madison (1991).
2. R.J. GILLIOM and D.R. HELSEL, "Estimation of Distributional Parameters for Censored Trace Level Water Quality Data 1. Estimation Techniques," Water Resources Research 22 (2) 135-146 (1986).
3. L.B. LEOPOLD, W.W. EMMETT, and R.M. MYRICK, "Channel and Hillslope Processes in a Semiarid Area New Mexico," United States Geological Survey Professional Paper 352-G (1966).
4. A.E. FRITZSCHE, "An Aerial Radiological Survey of Technical Area 15 and Surroundings Los Alamos National Laboratory," EGG-10282-1095, EG&G (1986).

Response
Refer to the response to General Comment 2, above. The tables are now presented according to sample location.

Comment
5. *A synopsis of the sampling proposed in the RFI work plan should be included in the report. This should include a review of the laboratory analysis conducted.*

Response

See text changes in Section 1.2.1, third paragraph:

Phase I of the RFI Work Plan required collection of fluid and sludge samples to determine if COPCs were present at levels above SALs at PRS 36-003(a). Because of the design of the septic system, samples were to be collected in the drainfield and in the septic tank, where most constituents would be likely to accumulate. See Appendix A for a listing of analytical results. Figure 1-7 shows a map of the PRS with sample locations and identifiers. **Table 1-1 indicates the sampling and analysis information for PRS 36-003(a).**

See text changes in Section 1.2.2, third paragraph:

Phase I of the RFI Work Plan required collection of fluid and sludge samples to determine if COPCs were present at levels above SALs at PRS 36-003(b). Because of the design of the septic system, samples were to be collected below the inlet pipe, where most constituents would be likely to settle. Additionally, the end of the outfall pipe was to be located. If the pipe was buried, the area 1 ft beyond and below the pipe was to be characterized. If the pipe discharged to the surface, the area of interest included the surface soil extending from the end of the pipe into the gully for a distance of approximately 10 ft. See Appendix A for a listing of analytical results. Figure 1-8 shows a map of the PRS with sample locations and identifiers. **Table 1-1 indicates the sampling and analysis information for PRS 36-003(b).**

See text changes in Section 1.2.3, third paragraph:

Phase I of the RFI Work Plan required mapping the site, conducting a geomorphical survey, land visually evaluating the site in order to recommend additional sampling for this PRS. Surface soils in the Boneyard, and soils and sediments in runoff channels leading to the main drainage from the Minie firing site, were used to determine whether constituents exceed established SALs. Disturbed areas, roadways, and current storage locations within the Boneyard were mapped in detail on a 2-ft. contour map. A geomorphical survey was performed to identify five potential sampling locations within runoff channels down to the main drainage from Minie firing site. Additionally, five sampling locations were identified from visual inspection of disturbance, whether from natural erosion or from use. During sampling an additional sample was added, again from a visual inspection. See Appendix A for a listing of analytical results. Figure 1-9 shows a map of the PRS with sample locations and identifiers. **Table 1-2 indicates the sampling and analysis information for PRS 36-005.**

See text changes in Section 1.2.4, third paragraph:

For Phase I work, the RFI Work Plan required land and geomorphic surveys in order to identify optional sampling locations downstream for the collection of soil, sediment, and liquid samples within 200 ft of the outfall. Five surface soil and two sediment samples were taken, and two water samples were also collected. See Appendix A for a listing of analytical results. Figure 1-10 shows a map of the PRS with sample locations and identifiers. **Table 1-3 indicates the sampling and analysis information for PRS C-36-003.**

Los Alamos National Laboratory Response to EPA NODs for RFI Report for PRSs 36-003(a), 36-003(b), 36-005, and C-36-003

General Comment:

Comment

1. *The format used for this report did not follow guidance from EPA. It is preferable to discuss the details for each solid waste management unit (SWMU) in full.*

Response

This RFI Report, submitted September 29, 1995, followed the format that was in place during its preparation. Reports submitted after October 1, 1995, followed the new guidance.

Comment

2. *The calculation of the upper tolerance limits and the approach to ecological risk screening should follow the guidance given the Los Alamos National Laboratory (LANL) by EPA in the September 1995, meeting.*

Response

For the recalculation of the upper tolerance limits and the effects on the tables and text, see Attachment A of this response. Attachment A includes revisions of Chapters 3 and 4 of the RFI Report. Use the following information as the guide to the revisions in Attachment A of this NOD response:

- Replace Sections 3.0 through 3.2.1.3 in the RFI Report with the revised text in Attachment A.
- Following Table 3.2 in revised text, return to original RFI Report at Section 3.2.2 for the remaining sections in Chapter 3.
- Replace Sections 4.1.2.3 and 4.1.3 in the RFI Report, including tables, with the revised text.
- Replace Sections 4.2.3, 4.2.3.1, 4.2.3.2, 4.2.3.3, and 4.2.4 in the RFI Report, including tables, with the revised text. The Ecotoxicological Screening Assessment 4.2.3.4 in the RFI Report is not revised.
- Replace Sections 4.3.2.3, 4.3.3, and 4.3.4 in the RFI Report, including tables, with the revised text.
- Replace Sections 4.4.2.3, 4.4.3, and 4.4.4 in the RFI Report, including tables, with the revised text.

For the approach to the ecological risk screening, see the following statement:
In accordance with conversations between Laboratory Environmental Restoration Project personnel and EPA Region 6 Officials, further ecological risk assessment at this site will be deferred until the site can be assessed as part of the new Ecological Exposure Unit (Ecozone) approach that is being developed by Laboratory in conjunction with EPA and the NMED.

Comment

3. *Figures should be presented which indicate all the sample location numbers so these may be correlated with sampling results.*

Response

Replacement figures are Attachment B of this NOD response.
Replace Figure 1-7 with 1-7 (Revised)
Replace Figure 1-8 with 1-8 (Revised)
Replace Figure 1-9 with 1-9 (Revised)
Replace Figure 1-10 with 1-10 (Revised)

Comment

4. *Data comparison tables represent information based on analyte. A much better and preferred presentation of data is by sampling location, so that all the potential contaminants for a location may be identified at one glance.*

Expedited Cleanup Completion Report for

Potential Release Site
36-003(a)
Septic Tank

Field Unit 2

Environmental
Restoration
Project

January 1996
Revision 2

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-96-374

Expedited Cleanup Plan Completion Report
Potential Release Site 36-003(a)
Septic Tank

1.0 SUMMARY OF EXPEDITED CLEANUP

1.1 Overview

Potential Release Site (PRS) 36-003(a) is a septic system that served Building 1 at Technical Area (TA) 36 (Figure 1). The site was included in the Hazardous and Solid Waste Amendments (HSWA) Module to the Los Alamos National Laboratory (Laboratory) Resource Conservation and Recovery Act (RCRA) Permit, EPA ID NM0890010515. A Department of Energy-approved expedited cleanup (EC) plan "EC Plan for Solid Waste Management Unit 36-003(a)" was prepared and submitted to EPA Region 6 as part of a Class III permit modification in June 1995. The septic tank portion of the septic system was determined to require corrective action because it contains a RCRA-hazardous D-listed waste, silver (D011). This expedited cleanup action only involved the septic tank because contaminants of concern were not found in other portions of the septic system.

The septic tank is a 1,160-gal. reinforced concrete tank approximately 7 ft deep by 6 ft wide by 10 ft long, which is buried 2 ft below ground surface. The septic tank was in use from 1949 (when it was built) until 1992, when the sanitary line from Building 1 was diverted to the Laboratory sanitary system. While active, the septic system received sanitary and photochemical wastes.

As part of the 1994 RFI Phase I investigation, six sludge and liquid samples were collected from within the septic tank. In the EC plan, barium, cadmium, lead, mercury, and silver were identified as chemicals of potential concern (COPCs) (i.e., chemicals with maximum concentrations greater than their screening action levels [SALs]). Subsequently, chromium, copper, manganese, vanadium, and zinc were also identified as COPCs. Lead, along with cyanide and selenium contribute to a normalized sum of greater than the target value of 1 in a multiple chemicals analysis for noncarcinogens. Because the cyanide and selenium have SAL comparison ratios (maximum concentration/SAL) greater than 0.1 they are also identified as COPCs. Silver concentrations in the liquid contents of the tank were found at 18.3 mg/L, exceeding the RCRA toxicity characteristic level of 5 mg/L.

The results of 1994 RFI Phase I investigation together with the results of confirmatory sampling conducted during the cleanup effort were to provide the basis for the final solution to the septic system, PRS 36-003(a). Sample results from the drainfield were assumed to be representative of any potential contamination that may have been discharged to the seepage pit. The drainfield had been in use for 25 years before the seepage pit was installed to accommodate larger volumes that the drainfield was not able to serve, and the line to the drainfield was disconnected, as indicated in the RFI Work Plan. The sample results in the drainfield were assumed to be indicative of the contents of the seepage pit, which to date has not been located.

As reported in the RFI Report, the contents of the septic tank contained silver that was above the RCRA regulatory level. The Phase I results showed the presence of cyanide, mercury, di-n-butyl phthalate, 2-ethylhexyl phthalate, and methylene chloride in the leachfield, but the levels were below cleanup levels, and total mercury was 0.23 mg/kg, which is below the RCRA level. See Appendix A for the Phase I sample results showing the detected analytes. Leachfield samples and duplicates are indicated by Matrix entry, subsurface soil.

1.2 Expedited Cleanup

Expedited cleanup activities began on August 31, 1995 (a photograph of the EC activity is presented in Appendix C). Overlying soil was removed to expose the top of the tank. The top was found to be an integral part of the tank with a 2 ft by 2 ft manway opening. The opening was used as access to pump the contents of the tank into a Department of Transportation (DOT)-certified vacuum tanker truck. The interior of the septic tank was then cleaned three times with a steam pressure washer. The rinsate was pumped into the tanker truck after each cleaning. No cracks in the tank were discovered during a visual

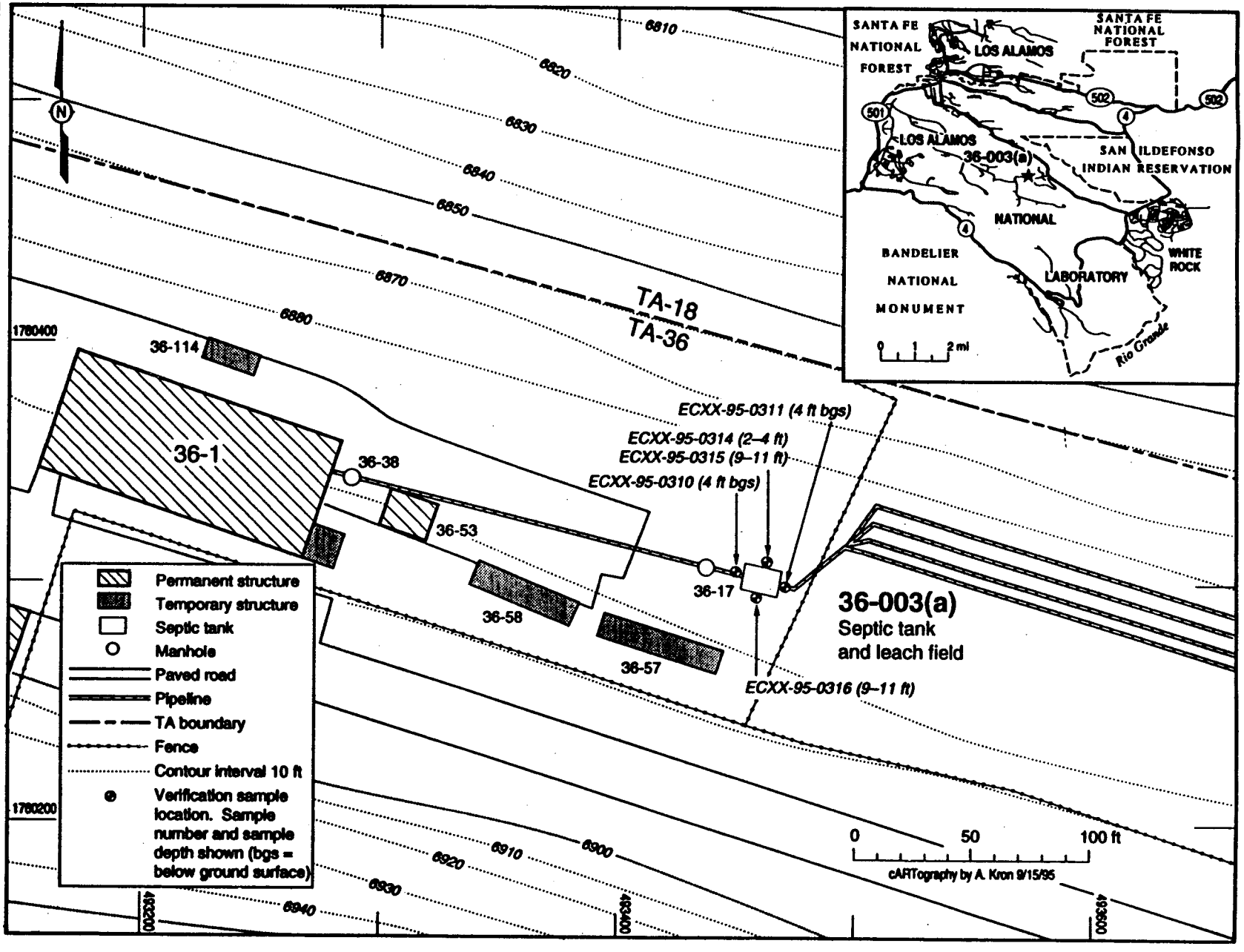

Figure 1. Location of septic tank and sample locations.

inspection of the interior of the tank. Verification photographs inside the tank were also taken to verify tank integrity.

To verify the integrity of the ports, soil samples (ECXX-95-0310 and ECXX-95-0311) were taken at a depth of 4 ft below ground surface (bgs) under the exterior junction of each port with the tank (locations of the confirmatory samples are indicated in Figure 1). The ports were sealed on September 5, 1995, by filling the tank with approximately 5 yd^3 flowable concrete to a level just above the open ports. On September 20, 1995 (after receipt of the confirmatory analyses), the remaining tank void was filled with approximately 5 yd^3 of flowable concrete.

Additional sub-surface soil samples (ECXX-95-0315 and ECXX-95-0316) were taken on the north and south sides of the tank at a depth of 9-11 ft bgs to verify tank integrity and confirm that surrounding materials are free of contamination. As requested by the EPA in written comments on the EC plan, sample analyses were limited to VOCs and TAL metals. VOC samples were analyzed by SW846 8260 or equivalent method, and TAL samples were analyzed by SW846 6010/7000 or equivalent methods. During the drilling on the north side of the tank, core material from a depth of 3 ft was found to exhibit a reading of 10 ppm on the HNu. A sample (ECXX-95-0314) was collected from this material and submitted for volatile organic compounds (VOC) analysis.

To evaluate the confirmatory analytical data, all detected COPC concentrations were compared to their respective background upper tolerance limit (UTL). Table 1 presents the background UTLs and the maximum detected COPC concentrations found in the confirmatory samples. Cadmium, cyanide, mercury, and silver were not detected and therefore are not included in this table. The maximum detected confirmatory sample values for all COPCs (contaminants found within the septic tank) were below the corresponding background UTLs. These results confirm that contaminants within the tank were contained by the septic tank.

TABLE 1

COMPARISON OF MAXIMUM COPC VALUES TO UTLS

Analyte	Sample Value (mg/kg)	Background UTL (mg/kg)
Barium	48	1,140
Chromium	5.4	34.2
Copper	14	15.7
Lead	11	39
Manganese	270	1,030
Vanadium	8.3	66.2
Zinc	47	101

Detected values for other analytes in the confirmatory samples that have established UTLs are also below UTL values. Acetone is not a COPC and is not background constituent but was detected in confirmatory samples at 0.015 mg/kg and 0.014 mg/kg (limit of detection was 0.010 mg/kg). The EPA CLP Functional Guidelines for Organic Data Review (EPA-540/R-94-012, 2/94) suggest that detections of chemicals which are common laboratory contaminants can be considered to be due to lab contamination if the sample concentration is less than ten times (10X) the EPA CLP Contract Required Quantitation Limit. Using the 10X criteria, acetone values up to 0.100 mg/kg should be considered lab contamination in the absence of higher blank values. The detected concentrations of acetone were orders of magnitude below the screening action level (SAL) of 8000 mg/kg in the confirmatory samples.

A summary of all the analytical results is presented in Appendix A. All sampling and screening data are available and will be provided upon request.

2.0 SITE RESTORATION

The site was restored by covering the tank and surrounding area with soil. The entire area, including the surrounding excavations, was backfilled using the soil that had been removed and stockpiled during the excavations. The surface was compacted and brought to the original ground level.

3.0 MODIFICATIONS TO THE EC PLAN

During the expedited cleanup, a number of deviations were made from the plan due to unforeseen problems or unforeseen opportunities to improve the process.

The EC plan assumed that access to the tank contents would be through a removable tank lid. As the tank did not have a removable lid, access was obtained through a manway opening.

Because of the restricted access through the manway opening, access to the inlet and outlet ports as described in the EC plan was not possible. Also, removal and capping of the inlet and outlet ports was not possible as described in the EC plan because the ports were constructed of steel and cast into the concrete tank. Therefore, the exterior connection of the ports to the tank were excavated and samples were collected directly below each connection (the most likely location of contamination if leakage of the tank contents at the inlet or outlet ports had occurred).

The EC plan stipulated pumping the contents of the tank into waste drums. Rather than pumping the contents into drums and managing the waste drums pending disposal, the contents of the tank were pumped directly into a vacuum tanker truck for transport to the disposal site. The vacuum tanker truck was DOT-certified and permitted for transportation of hazardous waste. This method required less man-hours and was safer than the method described in the EC plan.

The EC plan assumed that ceramic pipes were connected to the tank and that they could be cut and capped. When the connecting pipes were excavated, it was found that they were steel. Cutting and capping the steel pipes were beyond the capabilities of the EC team and would have involved a significant delay and additional cost. Therefore, the pipes were sealed by filling the tank with flowable concrete past the point of the inlet and outlet ports.

The EC plan called for continuous core samples on the north and south sides of the tank. Core recovery during drilling at these locations was poor because the site material contained unconsolidated tuff boulders. As continuous core was not produced, the team was unable to scan the core and study the lithology. The drill team stopped drilling about every foot to examine the recovered core material for staining and to screen for organic compounds (using the HNu) and for radiation. The plan intended that X-ray fluorescence (XRF) spectrometry be used as a screening technique for silver. This device was not used because the XRF was found not to be reliable for the detection of silver.

4.0 QUANTITIES AND TYPES OF WASTE GENERATED

Approximately 1500 gal. of RCRA-hazardous liquid waste was collected for disposal during this cleanup. Information on the contents of the septic tank is shown in Appendix A. The actual volume of liquid requiring disposal will be reported when Rollins Environmental Services, Inc. delivers the liquid to the Highway 36 Land Development Company waste disposal facility in Deer Trail, Colorado (EPA ID# COD 991 3004 84). The contents of the tanker were sampled by Rollins to meet the waste acceptance criteria of the disposal facility. Sample results taken by Rollins were not as specific as the results of samples taken during the ER Phase I investigation. The objectives of Rollins' sampling were for the purposes of determining that the waste was within their operating permit. Rollins results confirmed the ER Phase I investigation sample results. The Rollins' sample results are in Appendix A of this report.

5.0 OUTSTANDING ITEMS FROM THE ACCEPTANCE INSPECTION

The checklist was completed by an independent party and is presented in Appendix B. No outstanding items were identified from the Acceptance Inspection Checklist. Based on this inspection, this action is certified (Appendix D) by the independent party.

6.0 PROBLEMS ENCOUNTERED AND LESSONS LEARNED

Because an engineering drawing was not available for the 36-003(a) septic system, the field team had to base the EC plan on an engineering drawing for a septic system that was constructed at about the same time. Based on that drawing, the field team assumed that the lid to the tank was a removable concrete slab set in place. It was discovered during the EC that the design of the 36-003(a) septic tank was different than the engineering drawing used.

The field team was able to take advantage of a vacuum tanker truck to remove the contents of the tank. The contents of the septic tank were pumped directly in the truck tank during pumping and steam cleaning. This modification to the EC plan was faster, safer, and eliminated the need to establish a RCRA less-than-90 day waste storage area.

7.0 CONCLUSIONS

This report serves as the formal request for regulator concurrence to remove PRS 36-003(a) from the Hazardous and Solid Waste Amendment (HSWA) Module in the Resource Conservation and Recovery Act (RCRA) Permit because no further action is required.

APPENDIX A

ANALYTICAL DATA

PHASE I SAMPLE RESULTS AT PRS 36-003(a)
DATA COMPARISON OF MAXIMUM DETECTED ANALYTES

ANALYTE	LOCATION NUMBER	SAMPLE ID NUMBER	DEPTH (in.)	MATRIX	MAXIMUM SAMPLE VALUE	BACKGROUND UTL	SAL	UNITS	>SAL
INORGANICS									
Aluminum	36-3097	AAB1877	N/A*	Sludge/Liquid	42000	N/A	N/A	µg/L	
Arsenic	36-3097	AAB1878(D)	N/A	Sludge/Liquid	16.7	N/A	50	µg/L	
Barium	36-3097	AAB1877	N/A	Sludge/Liquid	3350	N/A	2000	µg/L	X
Cadmium	36-3097	AAB1877	N/A	Sludge/Liquid	30	N/A	5	µg/L	X
Chromium	36-3097	AAB1877	N/A	Sludge/Liquid	780	N/A	400	µg/L	X
Copper	36-3097	AAB1877	N/A	Sludge/Liquid	5070	N/A	3000	µg/L	X
Cyanide	36-3055	AAB1895	0-24	Subsurface Soil	1.6	N/A	1600	mg/kg	
Cyanide	36-3096	AAB1876	N/A	Sludge/Liquid	61.4	N/A	200	µg/L	
Lead	36-3096	AAB1876	N/A	Sludge/Liquid	290	N/A	400	µg/L	
Manganese	36-3096	AAB1876	N/A	Sludge/Liquid	1000	N/A	180	µg/L	X
Mercury	36-3052	AAB1892	0-24	Subsurface Soil	0.23	0.1	24	mg/kg	
Mercury	36-3097	AAB1877	N/A	Sludge/Liquid	11.5	N/A	2	µg/L	X
Nickel	36-3097	AAB1877	N/A	Sludge/Liquid	128	N/A	1600	µg/L	
Selenium	36-3096	AAB1876	N/A	Sludge/Liquid	24.2	N/A	50	µg/L	
Silver	36-3097	AAB1878(D)	N/A	Sludge/Liquid	18300	N/A	170	µg/L	X
Vanadium	36-3097	AAB1877	N/A	Sludge/Liquid	659	N/A	240	µg/L	X
Zinc	36-3097	AAB1877	N/A	Sludge/Liquid	12900	N/A	10000	µg/L	X

* N/A = not available

PHASE I SAMPLE RESULTS AT PRS 36-003(a)
DATA COMPARISON OF DETECTED MAXIMUM ANALYTES
(concluded)

ANALYTE	LOCATION NUMBER	SAMPLE ID NUMBER	DEPTH (in.)	MATRIX	MAXIMUM SAMPLE VALUE	BACKGROUND UTL	SAL	UNITS	>SAL
SEMI-VOLATILES									
Dichlorobenzene (1,4)-[p-]	36-3096	AAB1876	N/A	Water	44	75	N/A*	µg/L	
Di-n-butyl phthalate	36-3053	AAB1893	0-24	Subsurface Soil	0.61	N/A	8000	mg/kg	
Bis(2-ethylhexyl)-phthalate	36-3053	AAB1898	0-24	Subsurface Soil	2.1	N/A	50	mg/kg	
VOLATILE ORGANICS									
Butanone [2-]	36-3096	AAB1876	N/A	Water	49	N/A	1700	µg/L	
Carbon disulfide	36-3096	AAB1876	N/A	Water	210	N/A	3500	µg/L	
Chloromethane	36-3097	AAB1878	N/A	Water	13	N/A	27	µg/L	
Chlorobenzene	36-3097	AAB1878	N/A	Water	6	N/A	100	µg/L	
Methylene Chloride	36-3055	AAB1895	0 - 24	Subsurface Soil	0.015	N/A	5.6	mg/kg	

* N/A = not available

Summary of Analytical Results From Confirmatory Sampling

Analyte	Location ID	Sample ID	Matrix	Sample Value	SAL Level	BKGD UTL	Units	Depth (In.)	Analysis Qualifier	Suite
Aluminum	36-03123	ECXX-95-0310	SOIL	3500		123000	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	4000		123000	mg/kg	0-54		INORGANIC
Barium	36-03123	ECXX-95-0310	SOIL	48	5600	1140	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	48	5600	1140	mg/kg	0-54		INORGANIC
	36-03125	ECXX-95-0315	SOIL	5.42	5600	1140	mg/kg	114-132	V*	INORGANIC
	36-03126	ECXX-95-0316	SOIL	10.8	5600	1140	mg/kg	108-132	V	INORGANIC
Calcium	36-03123	ECXX-95-0310	SOIL	2600		54400	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	5500		54400	mg/kg	0-54		INORGANIC
	36-03125	ECXX-95-0315	SOIL	160		54400	mg/kg	114-132	V	INORGANIC
	36-03126	ECXX-95-0316	SOIL	238		54400	mg/kg	108-132	V	INORGANIC
Chromium	36-03123	ECXX-95-0310	SOIL	5.4	400	34.2	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	4.1	400	34.2	mg/kg	0-54		INORGANIC
	36-03125	ECXX-95-0315	SOIL	36.6	400	34.2	mg/kg	114-132	V	INORGANIC
	36-03126	ECXX-95-0316	SOIL	83.2	400	34.2	mg/kg	108-132	V	INORGANIC
Copper	36-03123	ECXX-95-0310	SOIL	14	3000	15.7	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	5.4	3000	15.7	mg/kg	0-54		INORGANIC
	36-03126	ECXX-95-0316	SOIL	1.22	3000	15.7	mg/kg	108-132		INORGANIC
Iron	36-03123	ECXX-95-0310	SOIL	14000		35600	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	8200		35600	mg/kg	0-54		INORGANIC
Lead	36-03123	ECXX-95-0310	SOIL	7.5	400	39	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	11	400	39	mg/kg	0-54		INORGANIC
	36-03125	ECXX-95-0315	SOIL	2.54	400	39	mg/kg	114-132	V	INORGANIC
	36-03126	ECXX-95-0316	SOIL	3.87	400	39	mg/kg	108-132	V	INORGANIC
Magnesium	36-03123	ECXX-95-0310	SOIL	810		16100	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	850		16100	mg/kg	0-54		INORGANIC
	36-03125	ECXX-95-0315	SOIL	61.5		16100	mg/kg	114-132	V	INORGANIC
	36-03126	ECXX-95-0316	SOIL	131		16100	mg/kg	108-132	V	INORGANIC
Manganese	36-03123	ECXX-95-0310	SOIL	260	11000	1030	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	270	11000	1030	mg/kg	0-54		INORGANIC
	36-03125	ECXX-95-0315	SOIL	178	11000	1030	mg/kg	114-132	V	INORGANIC
	36-03126	ECXX-95-0316	SOIL	268	11000	1030	mg/kg	108-132	V	INORGANIC
Nickel	36-03126	ECXX-95-0316	SOIL	1.5	1600	26.7	mg/kg	108-132		INORGANIC
Potassium	36-03123	ECXX-95-0310	SOIL	700		6180	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	770		6180	mg/kg	0-54		INORGANIC
	36-03125	ECXX-95-0315	SOIL	208		6180	mg/kg	114-132		INORGANIC
	36-03126	ECXX-95-0316	SOIL	271		6180	mg/kg	108-132		INORGANIC
Sodium	36-03123	ECXX-95-0310	SOIL	130		3320	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	120		3320	mg/kg	0-54		INORGANIC
	36-03125	ECXX-95-0315	SOIL	147		3320	mg/kg	114-132	V	INORGANIC
	36-03126	ECXX-95-0316	SOIL	188		3320	mg/kg	108-132	V	INORGANIC
Strontium	36-03123	ECXX-95-0310	SOIL	5.1	48000	151**	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	21	48000	151**	mg/kg	0-54		INORGANIC
Vanadium	36-03123	ECXX-95-0310	SOIL	8.3	560	66.2	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	7.9	560	66.2	mg/kg	0-54		INORGANIC
	36-03125	ECXX-95-0315	SOIL	1.04	560	66.2	mg/kg	114-132		INORGANIC
	36-03126	ECXX-95-0316	SOIL	1.34	560	66.2	mg/kg	108-132		INORGANIC
Zinc	36-03123	ECXX-95-0310	SOIL	39	24000	101	mg/kg	0-54		INORGANIC
	36-03124	ECXX-95-0311	SOIL	47	24000	101	mg/kg	0-54		INORGANIC
	36-03125	ECXX-95-0315	SOIL	18.4	24000	101	mg/kg	114-132	V	INORGANIC
	36-03126	ECXX-95-0316	SOIL	22.5	24000	101	mg/kg	108-132	V	INORGANIC
Acetone	36-03125	ECXX-95-0314	SOIL	0.0151	8000		mg/kg	24-48		ORGANIC
	36-03126	ECXX-95-0316	SOIL	0.0142	8000		mg/kg	108-132		ORGANIC

* Refers to analytes considered to be nondetects as a result of blank contamination (sample concentrations were within 5 times the method blank concentration).

** from the TA-21 Non-Process Area Baseline

36-203(a)

Hig[illegible]y 36 Land Development Com[illegible]y
Treatment, Storage and Disposal Facility
ANALYSIS REPORT

Generator: Los Alamos National Labs (Rollins Chempak)
EPA ID: NM0890010515 Waste Profile: R11966 Date: 8/23/95
Description: P: Hazardous Liquid Lab#: P-19124

ANALYSIS	Method	Units	MDL	Result
Radioactivity	Meter	microR/Hr	14	<14
Reactivity	WAP	Y/N	---	Air N Water N
Color	Visual	---	---	Clear
Free Liquids	9095	Y/N	---	N
% Solids	WAP	Solid	1%	0%
% Aqueous Liquids	WAP	Liquid	1%	100%
% Organics	WAP	Organic	1%	0%
pH	9045	pH	0.5	7.33
Density	ASTM	Lb/Yd3	25	1719.00
Load Bearing	WAP	Ton/Ft2	0.1	<.33
Flash Point	MOD 1010	degree C	21	>60C
Reactive Sulfide	WAP	ppm	5	<5
Reactive Cyanide	WAP	ppm	2	<2
Reactive Ammonia	WAP	ppm	10	<10
TOC (TCLP)	9060	mg/L	250	250
TOX (TCLP)	9020	mg/L	5.00	5.00
TOC (Liq)	9060	mg/L	-----	<250
TOX (Liq)	9020	mg/L	-----	<5.00
Screening	ASTM	Y/N	---	Oxid - Shock -

Fingerprint Analyst — Date 8-23-95 — TOC/TCX Analyst — Date 8/23/95

Lab#: P-19124
Run Date: 8/22/95
Mix #

TCLP METALS	Method	Units	MDL	As Recd	MDL	After Mix
Antimony	6010	mg/L	0.030	<0.030		
Arsenic	6010	mg/L	0.030	<0.030		
Barium	6010	mg/L	0.010	0.099		
Beryllium	6010	mg/L	0.005	<0.005		
Cadmium	6010	mg/L	0.005	<0.005		
Chromium	6010	mg/L	0.005	<0.005		
Lead	6010	mg/L	0.030	<0.030		
Nickel	6010	mg/L	0.010	<0.010		
Selenium	6010	mg/L	0.050	<0.050		
Silver	6010	mg/L	0.005	<0.005		
Thallium	6010	mg/L	0.070	<0.070		
Vanadium	6010	mg/L	0.005	<0.005		
Zinc	6010	mg/L	0.010	0.180		
Mercury	7470	mg/L	0.008	<0.008	0.008	------
Mercury (Total)	7471	mg/Kg	------	------	------	------

Metals Analyst — Date 8/23/95
QA/QC Reviewer — Date 8/23/95
Lab Manager — Date 8/24/95

36-003(a)

Highway 36 Land Development Company
Treatment, Storage and Disposal Facility
CYANIDE ANALYSIS

Generator:	Los Alamos National Labs (Rollins Chempak)		
EPA ID:	NM0890010515	Date:	8/22/95
Waste Profile:	R11966		
Description:	P: Hazardous Liquid	Lab#:	P-19124

		As Received		After Mix	
Analysis	Units	MDL	Result	MDL	Result
Total CN-	~~mg/Kg~~ mg/L HS	0.01	0.05	------	------
Amenable CN-	~~mg/Kg~~ mg/L HS	------	------	------	------

Helene Jekel
Analyst(s)

08/22/95
Date

QA/QC Reviewer

8/23/95
Date

W. Schneider
Laboratory Manager

8/24/95
Date

APPENDIX B

ACCEPTANCE INSPECTION CHECKLIST

APPENDIX B

ACCEPTANCE INSPECTION CHECKLIST

Unit Number and Description

36-003(a), Septic Tank

✓ EPA and DOE notified at least 10 days in advance of field work.

✓ Verification samples and confirm integrity of tank.

✓ Tank contents removed and containerized.

✓ Tank inlet and outlet plugged.

✓ Tank interior washed.

✓ Wash liquid collected and containerized.

✓ All waste generated is characterized and managed appropriately.

✓ Tank backfilled.

✓ Site restored.

Reviewer: David McIlroy

Signature _____

APPENDIX C

PHOTOGRAPH

PRS 36-003(a) - Unearthing top of septic tank

APPENDIX D

CERTIFICATION OF COMPLETION

CERTIFICATION OF COMPLETION

I certify that all work pertaining to the Expedited Cleanup (EC) for Potential Release Site (PRS) 36-003(a) has been completed in accordance with the Department of Energy-approved EC plan entitled **EC Plan for Solid Waste Management Unit 36-003(a)**. Based on my personal involvement or inquiry of the person or persons who managed this cleanup, a review of all data gathered, and a visit to the site, to the best of my knowledge and belief, all criteria of the plan have been met or exceeded. I believe that the completion of this EC is protective to both human health and the environment. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Gene Gould
Field Unit Two Project Leader
Environmental Restoration Project
Los Alamos National Laboratory

9/28/95
Date

Dave McInroy
Compliance Manager, Independent Review
Environmental Restoration Project
Los Alamos National Laboratory

9/28/95
Date

Environmental Restoration Project
PRS Completion Summary Sheet

Description: PRS 36-003(a), Septic System, is located east of Building 1 at Technical Area 36, an explosives-testing area. The area includes five firing sites that are used to conduct 1500 explosives tests annually.

Contaminants: The RCRA Facility Investigation at the site determined the presence of the following contaminants confined in the septic tank portion of the septic system: barium, cadmium, mercury, and silver, all above screening action levels (SAL); and lead, cyanide, selenium, 2-butanone, carbon disulfide, chlorobenzene, chloromethane, and p-dichlorobenzene below SALs. Contaminants in the leach field include cyanide and metals which were significantly below SALs.

Method of Cleanup: The site was remediated as an expedited cleanup. The contents of the septic tank were pumped into a vacuum tanker truck. The septic tank was subsequently cleaned three times using pressurized steam. Each time, the resulting cleaning waters were pumped into the vacuum tanker truck. Because the inlet and outlet ports were steel and could not be easily capped, the tank was filled with flowable concrete past the level of the ports pending results of confirmatory sampling. Samples were taken from below the ports, and samples were taken from boreholes drilled on the north and south sides of the tank. Analytical sample results confirmed that contaminants have not migrated from the septic tank. The tank was subsequently filled with flowable concrete and the site was restored.

Start Date: August 31, 1995

Completion Date: September 20, 1995

ATTACHMENT 2

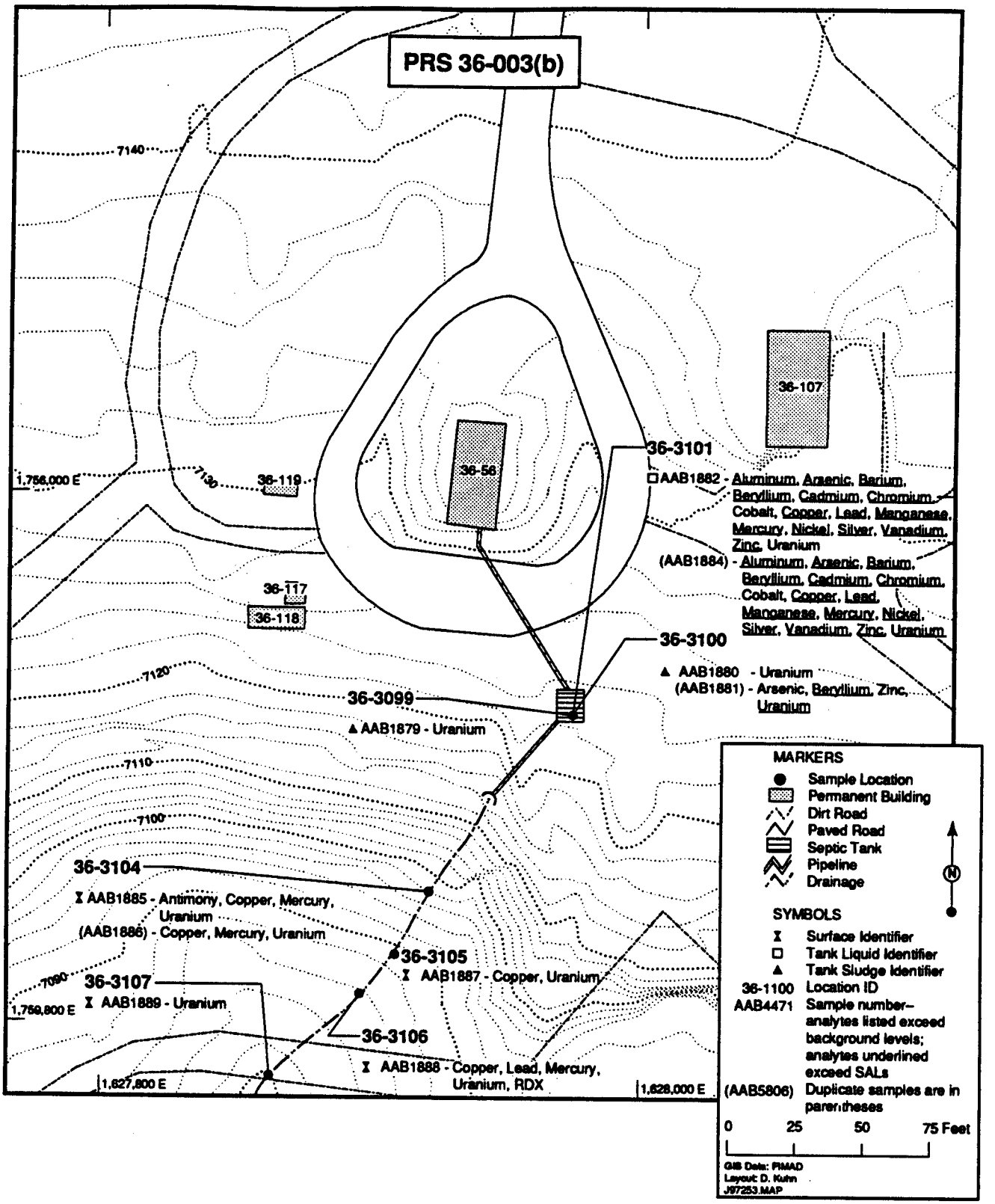

Figure 1-8 (Revised). PRS 36-003(b), Septic System, with sampling locations and results.

ATTACHMENT 3