

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL RESTORATION PROJECT
VOLUNTARY CORRECTIVE ACTION PLAN

EMERGENCY
SEP 21 PM 0:55

0026
TA-10

for

AREA OF CONCERN

C-10-001, RADIOACTIVELY-CONTAMINATED SOIL

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2 August 1995
Rev.1



3391

TCTO

FIELD WORK APPROVAL FORM

This form must be completed prior to starting remediation field work in accordance with Voluntary Corrective Action Plans.

I, _____, DOE-LAAO, Approve the field work as proposed in the accompanying Voluntary Corrective Action Plan for Area of Concern C-10-001, TA-10.

I, _____, DOE-LAAO, DO NOT APPROVE the field work as proposed in the accompanying Voluntary Corrective Action Plan for Area of Concern C-10-001, TA-10.

The following reasons reflect the decision for disapproval:

Signed: _____

Date: _____

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Voluntary Corrective Action Plan for Area of Concern C-10-001

1.0 Introduction

This Voluntary Corrective Action (VCA) Plan addresses assessment of the extent of contamination and removal of contaminated soil at Area of Concern (AOC) C-10-001 on Los Alamos County property in Bayo Canyon (Figure 1). The site consists of two small areas of radioactively-contaminated soil and has been selected for voluntary corrective action because the remedy for the contamination is obvious and easily implemented.

2.0 Site Type and Description

This VCA addresses two small areas of radioactively-contaminated soil within a larger area of disturbed soil in Bayo Canyon (Figure 2). This area is near a location where materials and soil associated with the firing sites at TA-10, SWMUs 10-001(a-d), were apparently bulldozed and left remaining even after decontamination and decommissioning (D & D) activities were conducted in 1963. The site was discovered during routine shrapnel removal operations in the summer and fall of 1994. Since then, the site has been formally designated as AOC, C-10-001. For each of the contaminated areas, the area on the ground surface with elevated radioactivity, as determined with hand-held radiation screening instruments, comprises approximately 2 ft by 2 ft.

Existing field screening and laboratory analytical data indicate that only strontium-90 contamination is present. A sample was collected for the VCA at a point where the maximum field radiation-screening results (approximately 50,000 counts per minute of beta/gamma radiation) were found. Analytical results for this sample indicate strontium-90 concentration at 3518 pCi/g. Uranium and cesium were detected at levels at or slightly above background. The sample was not analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), or metals because there is no archival information that indicates that these constituents are present.

3.0 Proposed Remedy

The proposed VCA addresses only strontium-90 contamination. The assumption is that the postremediation concentration of strontium-90 will need to meet the standards for residential land use. Either a backhoe or hand tools will be used to remove the contaminated soil, depending on the volume of contaminated soil present. Several boreholes will be hand-augered around the area of surface contamination and the soils will be field screened for radiation to estimate the volume of soil to be removed. During the excavation, field screening results will guide the extent of excavation. Results from analyses conducted in the MRAL or from an offsite analytical laboratory will be used to confirm that the remediation goal has been met.

Soil cleanup guidelines for strontium-90 at the VCA site have been calculated using Version 5.60 of the RESRAD code. Soil cleanup guidelines calculated by RESRAD pertain only to areas of 100 m² or more and are not directly relevant to areas of contamination as small as the VCA site at TA-10. Soil cleanup guidelines for strontium-90 were, therefore, determined using "hot spot" criteria, as described below.

The Manual for Implementing Residual Radioactive Material Guidelines using RESRAD, Version 5.0 (DOE 1993) contains guidance for the evaluation of radionuclide hot spots within a larger area of contamination. RESRAD may be used to calculate soil cleanup guidelines for radionuclides in soil when the assumption that soil contamination is homogenous over an area of 100 m² or more

holds true. For smaller areas, such as the TA-10 VCA site. DOE (1993) provides multiplication factors for estimating hot spot criteria using the soil cleanup guidelines calculated by RESRAD. Hot spot criteria may be estimated for areas ranging from <1 m² to 25 m².

The soil cleanup guideline is calculated for a residential scenario in Bayo Canyon using Version 5.60 of the RESRAD code. Exposure pathways evaluated include soil ingestion, inhalation of fugitive dust, external gamma exposure, and ingestion of contaminated fruits and vegetables. Average values of fruit and vegetable consumption, and average values of home production of fruits and vegetables, are used in the calculations. These average values are obtained from EPA's Exposure Factors Handbook (EPA 1989, 0304). For the soil cleanup guideline, the contaminated zone is assumed to extend to a depth of 2 m and cover 2 acres. Ingestion of contaminated soil is assumed to occur at a rate of 100 mg/d (EPA 1989, 0304). An annual dose limit of 15 mrem/yr is used in the calculation, based on EPA's proposed rule in 40 CFR 196 (EPA Radiation Site Cleanup Regulation). A full listing of input parameters used in the RESRAD simulation is available in the RESRAD output file in Appendix A.

The soil cleanup guideline calculated for strontium-90, using the input parameters stated above, is 9.7 pCi/g. This value is the maximum dose at any time and is achieved at time zero (i.e., the soil guideline increases with time). Because of the relatively short half-life of strontium-90 (approximately 28 years), the soil cleanup guideline after 10 years will be 12 pCi/g and after 100 years, 108 pCi/g. Using the multiplication factors provided in DOE (1993), the following hot spot criteria is may be calculated for strontium-90 at time zero. For areas larger than 25 m², RESRAD soil guidelines may be applied directly.

<u>hot spot area (m²)</u>	<u>multiplication factor</u>	<u>hot spot criteria (mrem/yr)</u>
<1	10	97
1 - <3	6	58
3 - <10	3	29
10 - 25	2	19

The RESRAD soil cleanup guidelines and hot spot criteria were calculated assuming that no erosion or leaching phenomena contribute to either loss of strontium-90 over time or deposition of sediment over the hot spot. Although these phenomena would not affect the soil cleanup guideline at time zero, soil cleanup guidelines for future times are likely to be slightly overestimated. The soil cleanup guidelines do not consider exposure to radionuclides in groundwater due to leaching from contaminated soil. Any contribution from this pathway would be minimal due to the limited extent area of the contamination and depth to groundwater at the VCA site at TA-10.

With the current understanding of the extent of contamination at each of the sites, it is anticipated that the cleanup level will be between 58 and 97 pCi/g for the strontium-90.

4.0 Justification/Rationale for the Action

Area of Concern, C-10-001, meets key criteria for implementation of the VCA process. The strontium-90 contamination could potentially pose a health risk to present-day recreational users or future residents of Bayo Canyon. However, rather than conduct a detailed risk assessment for the contamination, removal of the contaminated soil is recommended. The site remediation technology for the contaminated area is straightforward. The waste generated as a result of the VCA is not expected to contain RCRA hazardous waste and therefore, no mixed waste is anticipated.

5.0 Estimated Waste Volumes by Type

Waste characterization samples will be collected and analyzed separately from the confirmation samples. Composite samples will be analyzed in the Mobile Radiochemistry Analytical Laboratory (MRAL) for gross beta activity as a proxy for the strontium-90. One composite soil sample per 4 cubic yards of excavated bulk soil will be analyzed for gross beta activity.

Table 5-1 describes each waste type, estimated volume, and anticipated mode of disposal. The volume estimate is based on the assumption that each excavation will be 6 ft in diameter and 4 ft deep. Some allowance is also made for swelling of the volume of removed soil.

Waste Type	Estimated Volume	Disposal Container	Anticipated Disposal
Radioactively-Contaminated Soil	9 yds ³	B-25 Box or 55 gal drums	TA-54, Area G
Decontamination Wastewater	<55 gal.	55-gal. drum	TA-50
PPE, misc Exclusion-Zone Trash	<55 gal.	55-gal. drum	TA-54, Area G

6.0 Description of Confirmatory Sampling

After excavation, confirmatory samples will be collected from the base of the excavation and analyzed either in the MRAL for gross beta radiation as a proxy for strontium-90 or sent to an offsite laboratory for strontium-90 analysis. Both facilities will utilize proportional counting as the analytical method. The number of confirmation samples will depend on the areal extent of the contamination as determined from field screening and on the size of the excavation. It is estimated that three confirmation samples will be taken per excavation. If samples are analyzed in the MRAL, extended count times will be implemented (as compared to the standard 5-minute count time) and possibly sample preparation, such as sample digestion, will be conducted to further reduce detection limits and analytical error. The sample results will be evaluated to confirm that the remediation goals were met.

7.0 Estimated Schedule and Cost to Complete the VCA

The cost to complete the VCA at C-10-001 is estimated to be \$60,420. This cost estimate includes contractor labor, equipment purchase and rental, and \$ 27,253 in excavation services. Costs for five days for the MRAL are not included. Waste disposal costs for the estimated 9 cubic yards of low level radioactive waste (LLW) are not included, because current guidance from the ER Project Office is that there will be no disposal charges for the first 600 cubic meters of LLW waste generated by the ER Project. If excavation services are not required because of limited extent of contamination, then the estimated cost to complete the VCA is \$33,167.

Site activities are estimated to require a maximum of seven days to implement. Final report preparation is estimated to require two days.

8.0 References

DOE (US Department of Energy), September 1993, Draft Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0, ANL/EAD/LD-2.

EPA (US Environmental Protection Agency), May 1989, Exposure factors Handbook, EPA/600/8-89/043, Office of Health and Environmental Assessment, Washington, DC. (EPA, 1989, 0304)

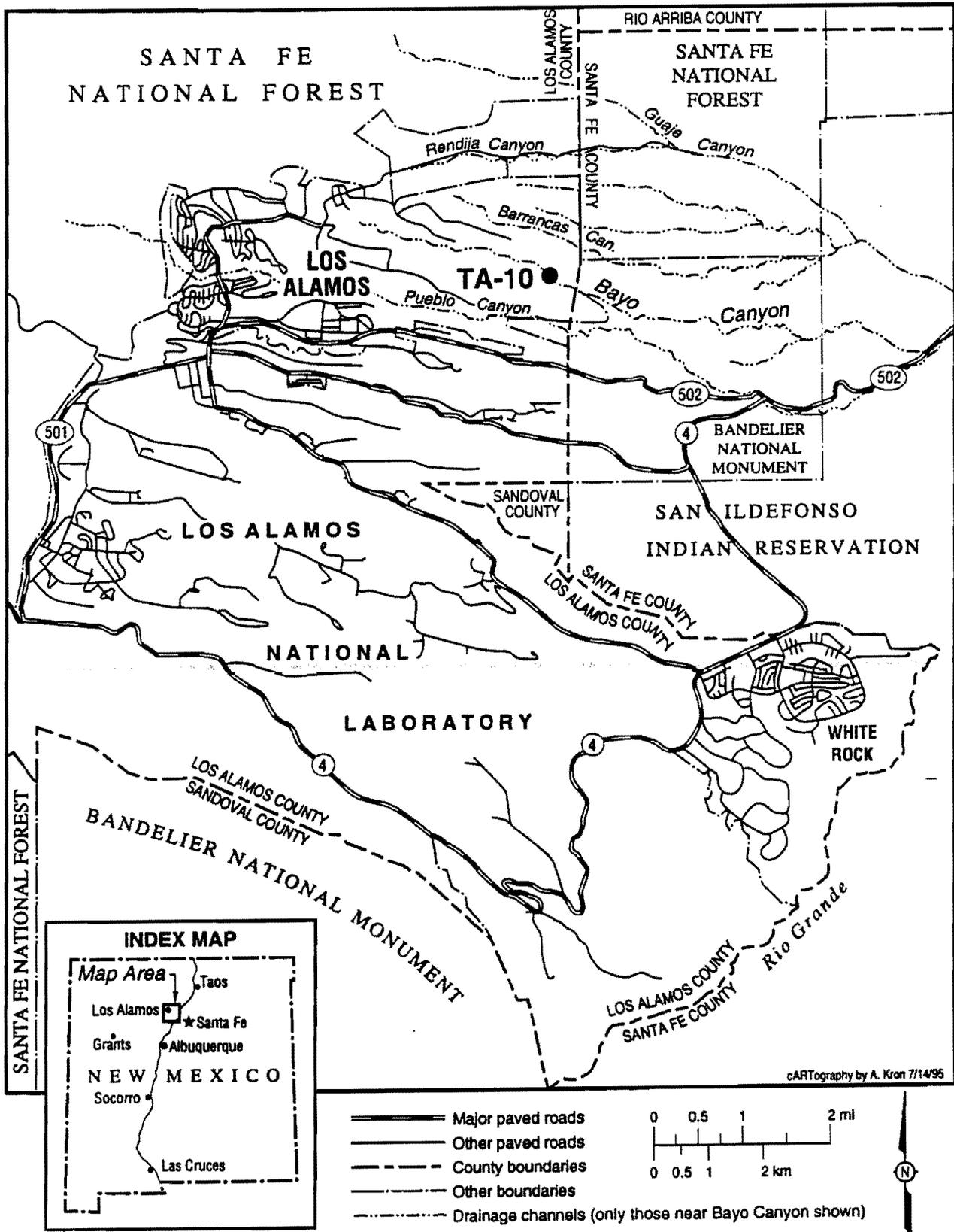


Figure 1. Regional site map.

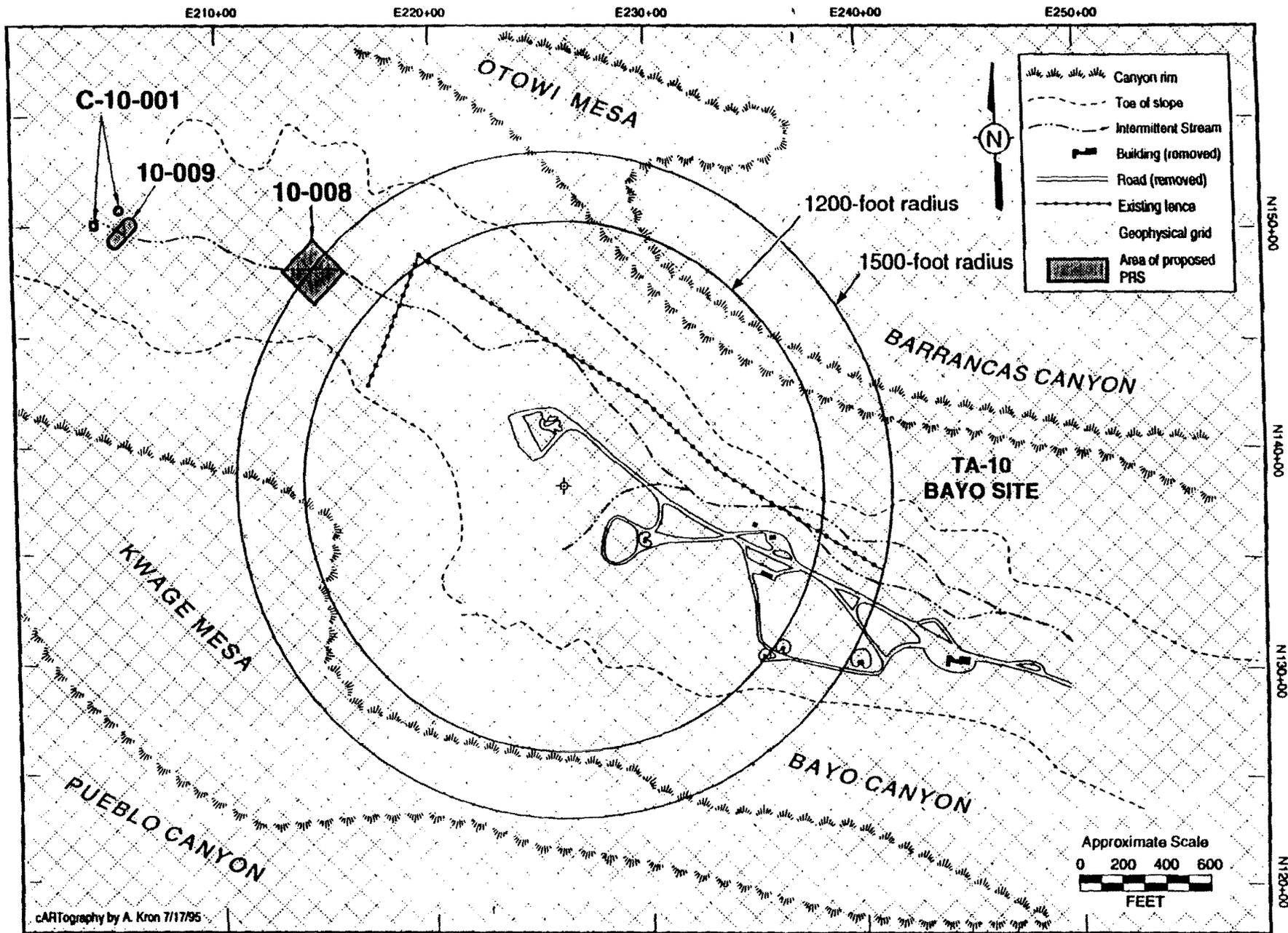


Fig. 2 Locations of proposed new TA-10 SWMUs and AOCs.

Appendix A