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Date: July 24, 1996
Refer to: EM/ER:96-398

Mr. Ted Taylor
Los Alamos Area Office
US Department of Energy, MS A316
Los Alamos, NM 87544

**SUBJECT: INTERIM ACTION PLAN FOR ACTIVITIES AT TA-10, PRSs
10-003(a-o) AND 10-007**

Dear Ted:

Enclosed for your records please find a copy of the Interim Action Plan for activities in Technical Area 10, Potential Release Sites 10-003(a-o) and 10-007. This activity is planned for completion in Fiscal Year 1996. Informational copies of this plan are being distributed to the regulators.

If you have any questions, please call Garry Allen at (505) 667-3394 or Bonnie Koch at (505) 665-7202. Thank you for your cooperation in this matter.

Sincerely,

Jorg Jansen
Jorg Jansen
Program Manager

JJ/bp

Enclosure: Interim Action Plan for TA-10, PRSs 10-003(a-o) and 10-007

Cy (w/ enc.):
G. Allen, CST-18, MS E525
B. Garcia, NMED-HRMB (2 copies)
D. Griswold, AL-ERD, MS A906
J. Harry, EES-5, MS M992
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N. Naraine, DOE-HQ, EM-453
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Interim Action Plan for

TA-10, Central Area,
10-003(a-o), 10-007

Field Unit 1

Environmental
Restoration
Project

July 1996

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-96-2275

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1.0 RATIONALE AND OBJECTIVE OF INTERIM ACTION

During the Phase I investigation of Technical Area (TA) 10, strontium-90 contamination was detected in chamisa growing at the location of the former radiochemistry laboratory liquid waste disposal complex, known as the Central Area. It was determined that the chamisa were taking up strontium-90 from the subsurface through their roots, and bringing the contamination to the surface. A risk assessment was conducted to determine the dose associated with ingestion of the contaminated chamisa (see Attachment A). The results of the risk assessment indicate that a one-time ingestion of 30 grams (about one ounce) of the contaminated chamisa would be associated with a dose of 100 mrem. This dose is at the upper limit of the 15 to 100 mrem/yr dose range discussed in DOE Order 5400.5, Proposed Rule 10 C.F.R. Section 834, and EPA Proposed Rule 40 C.F.R. 196 (DOE 1993, 1315; DOE 1990, 0080; DOE 1991, 0779; EPA 1994, 1316). However, additional ingestion of contaminated chamisa would cause the dose to exceed the upper dose limit. Therefore, an interim action is necessary to remove the contaminated chamisa from the site.

The objective of the interim action will be to remove all of the chamisa associated with the Central Area. In addition, the interim action will include a radiological survey to determine whether other plants growing in the Central Area are providing a pathway for subsurface strontium-90 contamination to reach the surface. Any contaminated vegetation found during this survey will be removed from the Central Area. If any trees are found to be contaminated, they will be removed only if they are found to provide a pathway for exposure.

2.0 SITE DESCRIPTION AND CHARACTERIZATION DATA

The TA-10 Central Area consists of Potential Release Sites (PRSs) 10-003(a-o) and 10-007 (Fig. 1). PRSs 10-003(a-o) were part of the liquid waste disposal complex that served the former radiochemistry laboratory (TA-10-1). The radiochemistry laboratory was used to separate, precipitate, and encapsulate lanthanum-140 into sources (LANL 1992, 0783). The liquid waste disposal complex consisted of liquid disposal pits, industrial waste manholes and septic tanks, industrial waste lines, and a leach field that received the liquid radioactive and chemical wastes generated by radiochemistry laboratory operations (LANL 1992, 0783). PRS 10-007 is a building-debris landfill (PRS 10-007) created during the 1963 decontamination and decommissioning of this area. Items in the landfill include concrete from the two former firing site detonation control buildings (TA-10-13 and TA-10-15), as well as soil from the vicinity of the former inspection building (TA-10-8), one of the former battery buildings (TA-10-14), and the former control building (TA-10-13) (LANL 1992, 0783).

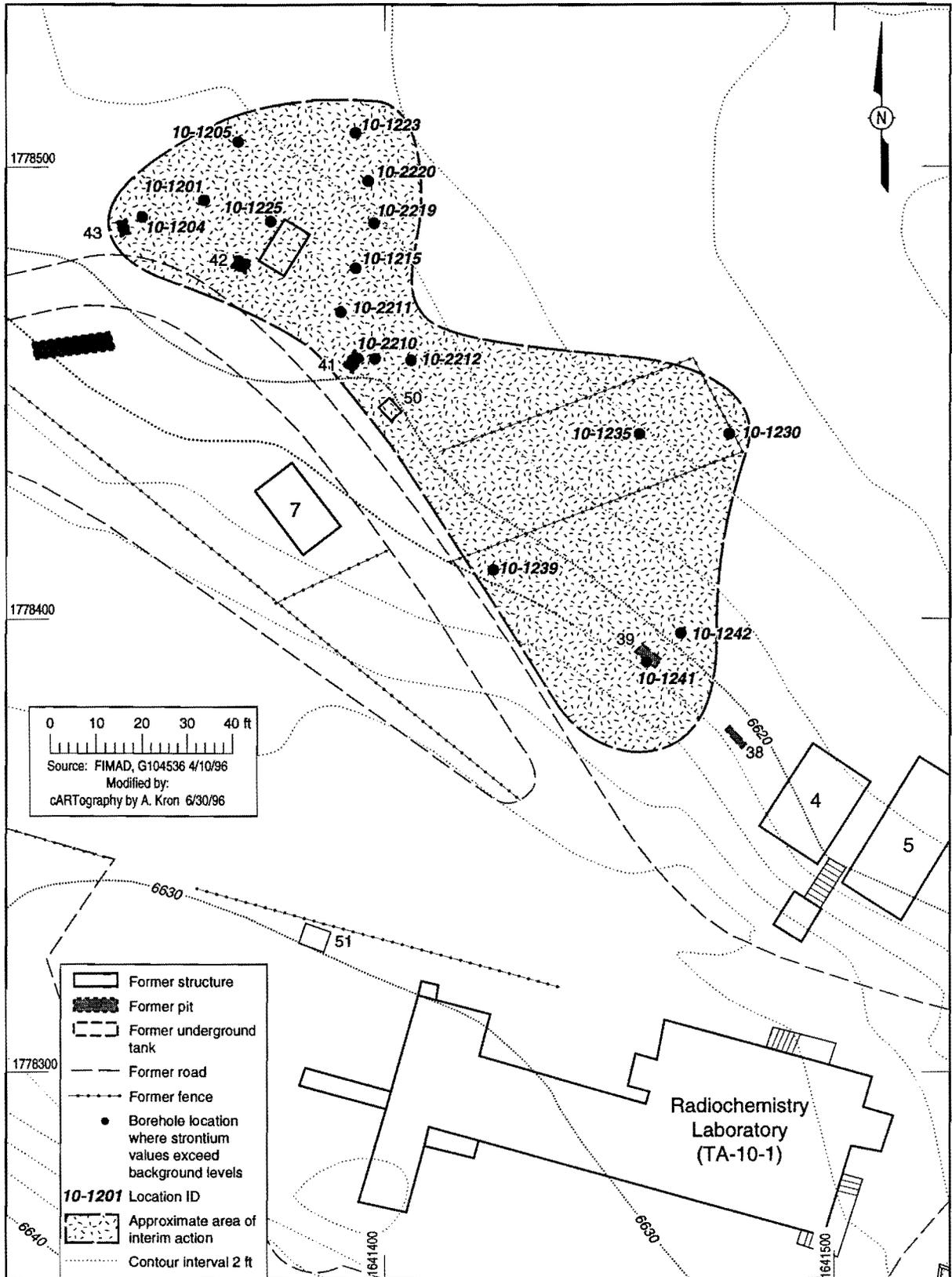


Fig. 1. Locations of Central Area samples containing strontium-90 above background levels and approximate area of the interim action.

The results from the 1994 Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) indicate that the only remaining chemical of potential concern (COPC) for the Central Area is strontium-90. The RFI data indicate a maximum strontium-90 soil concentration of 41 886 pCi/g at a depth of 17 to 17.5 ft below ground surface (LANL 1996, 06-0145). During a routine pre-drilling radiological survey of the site, elevated radioactivity was detected in surface soils and chamisa plants in the western portion of the Central Area. Several contaminated plants were collected for analysis, and one of the chamisa plants was found to contain 90 500 pCi/g of strontium-90 in dry ash (Fresquez et al. 1995, 06-0142).

A risk assessment was conducted to determine the dose associated with direct ingestion of the contaminated chamisa (see Attachment A). The results for this scenario indicate that a one-time ingestion of 30 grams (about one ounce) of the contaminated chamisa would be associated with a dose of 100 mrem. This dose is at the upper limit of the 15 to 100 mrem/yr dose range discussed in DOE Order 5400.5, Proposed Rule 10 C.F.R. Section 834, and EPA Proposed Rule 40 C.F.R. 196 (DOE 1993, 1315; DOE 1990, 0080; DOE 1991, 0779; EPA 1994, 1316). However, additional ingestion of contaminated chamisa would cause the dose to exceed the upper dose limit. Therefore, an interim action is necessary to remove the contaminated chamisa from the site.

3.0 INTERIM ACTION

The proposed interim action will consist of 1) a radiological survey and 2) removal of all chamisa and any additional contaminated vegetation. If any trees are found to be contaminated, they will be removed only if they are found to provide a pathway for exposure. The entire Central Area will be surveyed using a grid system and an ESP-1™ beta/gamma meter to determine whether chamisa is the only plant containing beta/gamma contamination. Once all contaminated vegetation is identified, all chamisa and any additional contaminated plants will be sawed off at the base with a hand saw and placed in 55 gallon drums. All stumps will then be treated with an herbicide such as Roundup™ to prevent regrowth. Whenever possible, smaller plants will be removed by simply pulling the plants and their roots from the ground. Erosion controls will be considered if found necessary.

4.0 MONITORING AND CONFIRMATORY ACTIVITIES

No confirmatory sampling will be necessary following the removal of all chamisa and any other contaminated vegetation from the Central Area. However, periodic visual inspection of the site will be conducted to verify that no regrowth is occurring in the remaining stumps. This periodic monitoring will continue until the final remedy is implemented to address the subsurface strontium-90 contamination remaining in the Central Area.

5.0 MAINTENANCE AND INSPECTION

If any new growth is noted during site monitoring, it will be surveyed for beta/gamma radiation. If radioactive contamination is detected, then the new growth will be removed using the same methods described above.

6.0 WASTE MANAGEMENT

Approximately five 55-gallon drums of plant material and personal protective equipment (PPE) will be generated during the interim action. The plant material and PPE will be disposed of as low-level radioactive waste.

7.0 SCHEDULE AND COST

The complete cost to implement this interim action is estimated at approximately \$25 000. This cost includes the readiness review, implementation plan, waste management, and the final interim action report. The interim action will require approximately five working days to complete. Site monitoring will continue until the final remedy is implemented to address the subsurface strontium-90 contamination remaining in the Central Area.

8.0 REFERENCES

DOE (US Department of Energy), June 5, 1990. "Radiation Protection of the Public and the Environment," DOE Order 5400.5 (Change 1), Washington, DC. **(DOE 1990, 0080)**

DOE (US Department of Energy), March 8, 1991. "DOE Guidance on the Procedures in Applying the ALARA Process for Compliance with DOE 5400.5, Interim Guidance," Office of Environmental Guidance, Washington, DC. **(DOE 1991, 0779)**

DOE (US Department of Energy), March 25, 1993. "Radiation Protection of the Public and the Environment, Proposed Rule," Title 10, Part 834, Federal Register, Vol. 58, No. 56. **(DOE 1993, 1315)**

EPA (US Environmental Protection Agency), May 11, 1994. "Environmental Protection Agency Radiation Site Cleanup Regulation," (preliminary working draft), Title 40, Part 196. **(EPA 1994, 1316)**

Fresquez, P. R., T. S. Foxx, and L. Naranjo, Jr., November 1995. "Strontium Concentrations in Chamisa (*Chrysothamnus nauseosus*) Shrub Plants Growing in a Former Liquid Waste Disposal Area in Bayo Canyon." Los Alamos National Laboratory Report LA-13050-MS, Los Alamos, New Mexico. **(Fresquez et al. 1995, 06-0142)**

LANL (Los Alamos National Laboratory), May 1992. "RFI Work Plan for Operable Unit 1079," Los Alamos National Laboratory Report LA-UR-92-850, Los Alamos, New Mexico. **(LANL 1992, 0783)**

LANL (Los Alamos National Laboratory), June 1996. "Radiological Addendum to the RFI Report for Potential Release Sites 10-002(a,b), 10-003(a-o), 10-004(a,b), 10-005, and 10-007, Field Unit 1," Los Alamos National Laboratory Report LA-UR-95-1748, Los Alamos, New Mexico. **(LANL 1996, 06-0145)**

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**ATTACHMENT A HUMAN HEALTH RISK ASSESSMENT FOR CONTAMINATED CHAMISA
IN THE TA-10 CENTRAL AREA**

Elevated levels of strontium-90 were detected in chamisa plants and surface soil at the location of the former radiochemistry laboratory liquid waste disposal complex, known as the Technical Area (TA)-10 Central Area. Ingestion of these materials would be associated with increased cancer risks. The dose associated with ingestion of these materials was calculated as described below.

The acute dose associated with a single ingestion of 30 g (about one ounce) of the plant material is estimated as follows.

$$\text{Dose (mrem)} = \text{Cp} \times \text{IR} \times \text{DCF}$$

where:

Cp = plant concentration in pCi/g wet weight;

IR = ingestion rate of 30 g; and

DCF = dose conversion factor for ingestion of 1.53×10^{-4} mrem/pCi for strontium-90 (RESRAD 1995, 06-0146).

The highest strontium-90 concentration detected in the chamisa plants was approximately 90 000 pCi/g in dry ash (Fresquez et al. 1995, 06-0142). Assuming a moisture content of 75%, the wet weight concentration would be approximately 22 000 pCi/g. Using the above equation, this concentration would lead to a dose of 100 mrem if 30 g of contaminated chamisa were ingested.

The increased cancer risk associated with a single ingestion incident is estimated as follows.

$$\text{Risk} = \text{Cp} \times \text{IR} \times \text{SF}$$

where:

SF = cancer slope factor of 5.6×10^{-11} increased cancer risk/pCi strontium-90 (EPA 1995, 1304).

Based on samples collected from boreholes and previous site remediation, strontium-90 contamination is present primarily at depths of 11 to 18 ft below ground surface. The

contaminated chamisa plants are believed to be taking up strontium-90 from this depth interval. Many other plants found in Bayo Canyon have root depths that exceed 10 ft, including plants with edible parts such as piñon nuts, prickly pear fruit, sage, and juniper. If these plants were to grow in the TA-10 Central Area, ingestion of greater than 30 g would be feasible.

Plant uptake also provides a route of exposure to foraging animals that may be hunted and consumed by humans. Deer are found in Bayo Canyon and are known to forage on chamisa and other deep-rooted plants such as perennial grasses.

Because strontium-90 is readily taken up by plants and plants in Bayo Canyon are known to have root depths that can reach the strontium-90 contaminated soil, interim action is necessary to minimize plant uptake and mitigate potential biota and food chain pathways for strontium-90. Even a single ingestion incident of plant material at this site could be associated with unacceptable doses of radionuclides and increased cancer risk.

REFERENCES

EPA (US Environmental Protection Agency), June 1995. "Exposure Factors Handbook," (preliminary draft), EPA/600/P-95/002A, Office of Research and Development, Washington, DC. **(EPA 1995, 1304)**

Fresquez, P. R., T. S. Foxx, and L. Naranjo, Jr., November 1995. "Strontium Concentrations in Chamisa (*Chrysothamnus nauseosus*) Shrub Plants Growing in a Former Liquid Waste Disposal Area in Bayo Canyon." Los Alamos National Laboratory Report LA-13050-MS, Los Alamos, New Mexico. **(Fresquez et al. 1995, 06-0142)**

RESRAD Version 5.61, Environmental Assessment Division, Argonne National Laboratory, Argonne, Illinois. **(RESRAD 1995, 06-0146)**

**INTERIM ACTION PLAN
APPROVAL/DISAPPROVAL FORM**

PRS(s) 10-003(a-o), 10-007

The undersigned have reviewed the Interim Action Plan and believe that an Interim Action is appropriate.

FPL Grallen

Date 23 July 96

FPC Everett A. Hollinger
for Donnie Koch

Date 7-23-96

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I, Theodore J. Taylor, DOE-LAO, **APPROVE** , **DISAPPROVE** the accompanying Interim Action Plan for PRS(s) 10-003(a-o), 10-007, TA-10.

The following reasons reflect the decision for disapproval:

Signed: Everett A. Hollinger
for Theodore J. Taylor

Date: 7-23-96