

SLAPS VICINITY PROPERTIES POST-REMEDIAL ACTION SURVEY PLAN

PURPOSE

The purpose of this plan is to describe the methodologies that the Formerly Utilized Sites Remedial Action Program (FUSRAP) will use for radiological surveys, sampling, and analysis to document the final condition of the SLAPS Vicinity Properties as free of radioactive contamination above the Department of Energy's health based criteria [DOE Order 5400.5 (Reference 1)]. Nothing herein is intended to compromise the Independent Verification Contractor's (IVC) independence; the purpose is to document the Project Management Contractor's (PMC) plans to conduct post-remedial action surveying/sampling and to coordinate their actions with the IVC. This plan implements the DOE protocol for verification and certification of sites under FUSRAP (Reference 2).

Bechtel National, Inc. (BNI) will be the FUSRAP PMC and, at this time, the Oak Ridge Institute for Science and Education (ORISE) will act as the IVC.

BACKGROUND

Manhattan Engineer District acquired the St. Louis Airport Site (SLAPS) in 1946 and used it from 1946 until 1966 to store residues from the St. Louis Downtown Site (SLDS). The residues included pitchblende raffinate residues, radium-bearing residues, barium sulfate cake, Colorado raffinate residues, and contaminated scrap. In 1966, these residues were purchased by Continental Mining and Milling Company of Chicago, removed from SLAPS, and placed in storage at 9200 Latty Avenue [currently the Hazelwood Interim Storage Site (HISS) and the adjacent Futura Coating site]. In the process of transporting the residues from SLAPS to Latty Avenue, some of the material was spilled from trucks onto the roadside. Characterization activities have established that radioactive contamination is present on many of the SLAPS vicinity properties (Figure 1). Redistribution of the contamination on the properties has occurred as a result of flooding, surface runoff, and road and utility construction activities (Reference 3).

RESIDUAL CONTAMINATION GUIDELINES

The source of contamination of the designated properties was residues from the processing of uranium bearing ores. The applicable residual contamination guidelines are as follows:

<u>radionuclide</u> ^a	<u>soil concentration above background</u> ^b
Radium-226	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over any 15-cm-thick soil layer below the surface layer.
Thorium-230	
Thorium-232	
Uranium-238	50 pCi/g averaged over any 15-cm-thick soil layer.

^a Radium and thorium guidelines from Reference 1. Uranium guideline was issued by DOE and is site specific.

^b These guidelines take into account ingrowth of radium-226 from thorium-230 and of radium-228 from thorium-232, and assume secular equilibrium. If either thorium-230 and radium-226 or thorium-232 and radium-228 are both present, and not in secular equilibrium, the guidelines apply to the higher concentration. If other mixtures of radionuclides occur, the sum of the ratios of the soil concentration of each radionuclide to the allowable limit for that radionuclide will not exceed 1.

The residual contamination guidelines for fixed and transferable radioactive contamination (DOE Order 5400.5 & 5480.11):

	(dpm/100 cm ²)		
	<u>average</u>	<u>maximum</u>	<u>removable</u>
Alpha	500	1,500	20
Beta-Gamma	5,000	15,000	1,000

Note: Alpha and Beta-Gamma limits are applied independently. The measured values may be averaged over 1 square meter to meet fixed and removable criteria provided the maximum values in any 100 cm² do not exceed three times the fixed and removable criteria.

DECONTAMINATION ACTIVITIES

All designated areas of contamination are exterior to any buildings. In general, remediation of the site will consist of excavation of soil exceeding the applicable residual contamination guidelines and decontamination of structures exceeding the fixed and transferable surface residual contamination guidelines. Contaminated structures such as culverts, utility poles, and pipelines may be encountered during excavation.

Consequently, post-remedial action surveys and sampling will focus on confirming that soil and structures remaining after remedial action do not contain radioactive contamination at concentrations exceeding the applicable guidelines. To the extent necessary, equipment used during the decontamination activities will be cleaned and surveyed for surface contamination prior to release.

Areas where remedial activities will be conducted will include, but will not be limited to, those identified on the design drawings as issued, indicating the general areas and depths of excavation.

POST-REMEDIATION SURVEYS AND SAMPLING

Following remediation, the FUSRAP Radiological Support Services Subcontractor (RSSS), ThermoNuclear Services (TNS), will perform post-remedial action surveys and sampling to determine the completeness of the removal action and prepare a verification report to document that the site complies with the applicable site-specific criteria.

Survey Equipment

The recommended equipment for use by FUSRAP for Post-RA surveys includes:

- Gamma scintillation detector (Eberline SPA-3 or equivalent)
- Reuter-Stokes Pressurized Ion Chamber (PIC)
- Fidler

The recommended equipment for use by FUSRAP for release of equipment and materials from the site includes:

- Alpha scintillation detector (Eberline AC-3 or equivalent)
- Alpha scintillation counter (Eberline SAC-4 or equivalent)
- Beta/Gamma Pancake GM detector (7 mg/cm² mylar shielded Eberline HP-210 or equivalent)

The types of calibration sources and methods for instrument calibration will be coordinated between Bechtel/TNS and the IVC to insure compatibility and reproducibility of results.

Background Measurements

For radiological surveys background measurements from three remote background locations in the general vicinity of the site (0.5 to 3 miles) have been taken in accordance with TNS procedure 3C.2 (Reference 4A). For soil samples TNS and the IVC will utilize background concentrations for radionuclides in soil that were established for the St. Louis area and reported in the *Radiological Characterization Report for FUSRAP Properties in the St. Louis, Missouri, Area*, August 1990.

Surveys & Soil Sampling

General

After completion of the excavation of contaminated soils, TNS shall conduct post-remedial action surveys to verify area has been decontaminated of the area. A survey grid shall be established at the site, conforming to the specifications in TNS procedure 3B.1 (Reference 4B) and 191-IG-032, "Instruction Guide for Post-Remediation Radiological Survey of Soil" (Reference 5), and surveys shall be conducted in each 100 m² grid. The grids shall be numbered in sequential order and recorded in the sample logbook with the coordinates for the center of each grid. To ensure comparability of post-remedial action results, the IVC will use the same grid number system.

Surveys

Any structures within the excavations, such as culverts, utility poles, or pipes, will be surveyed for release according to TNS procedures 3A.2 and 3A.3 (References 4D and 4E) after all surface dirt has been removed.

TNS will measure external gamma radiation exposure rates at a height of 1 meter as required by 191-IG-032 (Reference 5); at the number of locations necessary to be representative of the entire remediated area as required by FCR-116-17 (attached, applies to all St. Louis Sites); using methods in accordance with TNS procedure 3B.3 (Reference 4C). For the SLAPS vicinity properties, PIC readings are required for 10 to 20% of the grids. The results of all surveys will be submitted to the Bechtel ET team lead, including a sketch of grid locations and approximate excavation depths, before backfilling the excavation.

Soil Sampling

TNS shall also collect post-remedial action soil samples to verify satisfactory remediation of the properties. One post-remedial action composite sample shall be collected in each 100 m² grid as directed in 191-IG-032 and TNS procedure 4A.1 (References 4F and 5). One composite sample will be collected from each sample grid. Composite samples will be collected by taking individual samples (25 per 100 m²) from each sample grid and compositing these individual samples into the one composite for that grid (Figure 2). The IVC will be given the opportunity to take concurrent splits.

The averaging criteria contained in *A Manual for Implementing Residual Radioactive Material Guidelines* (Reference 11) and DOE Order 5400.5, Chapter IV, Section 4 will be used for point sources/hot spots.

Samples from each grid shall be collected using properly decontaminated sampling equipment (Reference 6).

Proper chain of custody of the TNS samples shall be maintained by using the sample custody and labeling methodology described for sediment samples in 191-IG-028, "Instruction Guide for Surface Water and Sediment Sampling Activities" (Reference 7) and the sample surveying, packaging, and shipping methodology in PI R4.7, "How to Ship Samples from a FUSRAP Site" (Reference 8).

All samples shall be analyzed by the mobile laboratory at HISS for uranium-238, isotopic thorium, and radium-226 in accordance with approved TNS sample analysis procedures and the Mobile Lab Management Plan (Reference 12). Alternatively, samples can be shipped to the TNS laboratory in Oak Ridge, TN, for analysis.

Hazard Assessment Sampling

Discrete samples, in support of a future hazard assessment, shall be collected as follows:

- In areas where the face of the excavation under the road is vertical, take one sample per grid, biased to areas associated with increased instrument countrates (if present) from the uppermost portion of the sub-base material immediately below the gravel base (Figure 3).
- In areas where the face of the excavation adjacent to the road is sloped, material should be removed with a hand shovel or equivalent in order to create a vertical face and then sampled in the same manner as described above (Figure 4). The material removed from the sloped facc should be treated as contaminated material and added to the soil wastestream.

- Samples collected for the purpose of performing hazard assessments should not be composites. All samples should be collected from the most probable contaminated areas. If survey instrument readings do not indicate concentrations above background, the samples should be collected from areas adjacent to excavated areas where activity significantly above background was known to exist prior to excavation.

Safety and Health

Safety and health risks associated with tasks described herein have been identified and addressed by the *Health and Safety Plan for the St. Louis Site* (Reference 9).

The work will be performed under a Hazardous Work Permit specific to the activities.

Quality Assurance/Quality Control

QA/QC field duplicate samples and measurements shall be collected at a frequency of one additional sample/measurement for each 20 collected.

Rinse blanks from decontaminated sampling equipment may be collected at the rate of one rinse per day of sampling. Rinse blanks shall be collected according to the recommendations in 191-IG-028 (Reference 7). If practical, a smear of the decontaminated sampling equipment may be collected and counted as determined by the Bechtel sampling coordinator.

Data Quality Objectives

The lower limit of detection for alpha spectroscopy shall be no greater than 0.1 pCi/g. Quality indicator goals shall be as follows: precision, ± 2 sigma; completeness, 100%; accuracy, $\pm 25\%$. QA/QC samples are discussed in the previous section.

BECHTEL/ORISE COORDINATION

Bechtel is the contractor responsible for completing the remedial action. To define the areas for remediation, Bechtel used data collected by ORNL during designation, as well as supplemental information obtained by Bechtel as part of the pre-RA planning and scoping activities and the remedial investigation.

Bechtel will have responsibility for excavation of contaminated soil. Upon completion of these activities, TNS will perform a post-RA survey. The IVC will then commence verification of the remediated properties. The IVC will perform a walkover survey on the surface of the ground. The result of this walkover survey shall be used to determine whether there are areas requiring additional remediation. This survey is expected to include all areas previously identified as being contaminated on the designated properties. Bechtel will assist ORISE in this survey by interfacing with the property owners in advance to secure their approval for property access.

Bechtel will provide the IVC access to post-remediation results as they become available. Bechtel will notify the IVC when remediation of an area is complete. The IVC will perform final independent verification surveys of the area following remediation, post-RA surveys, and receipt of post-RA data for the remediated area. The IVC may collect soil sample splits concurrent with Bechtel sampling efforts.

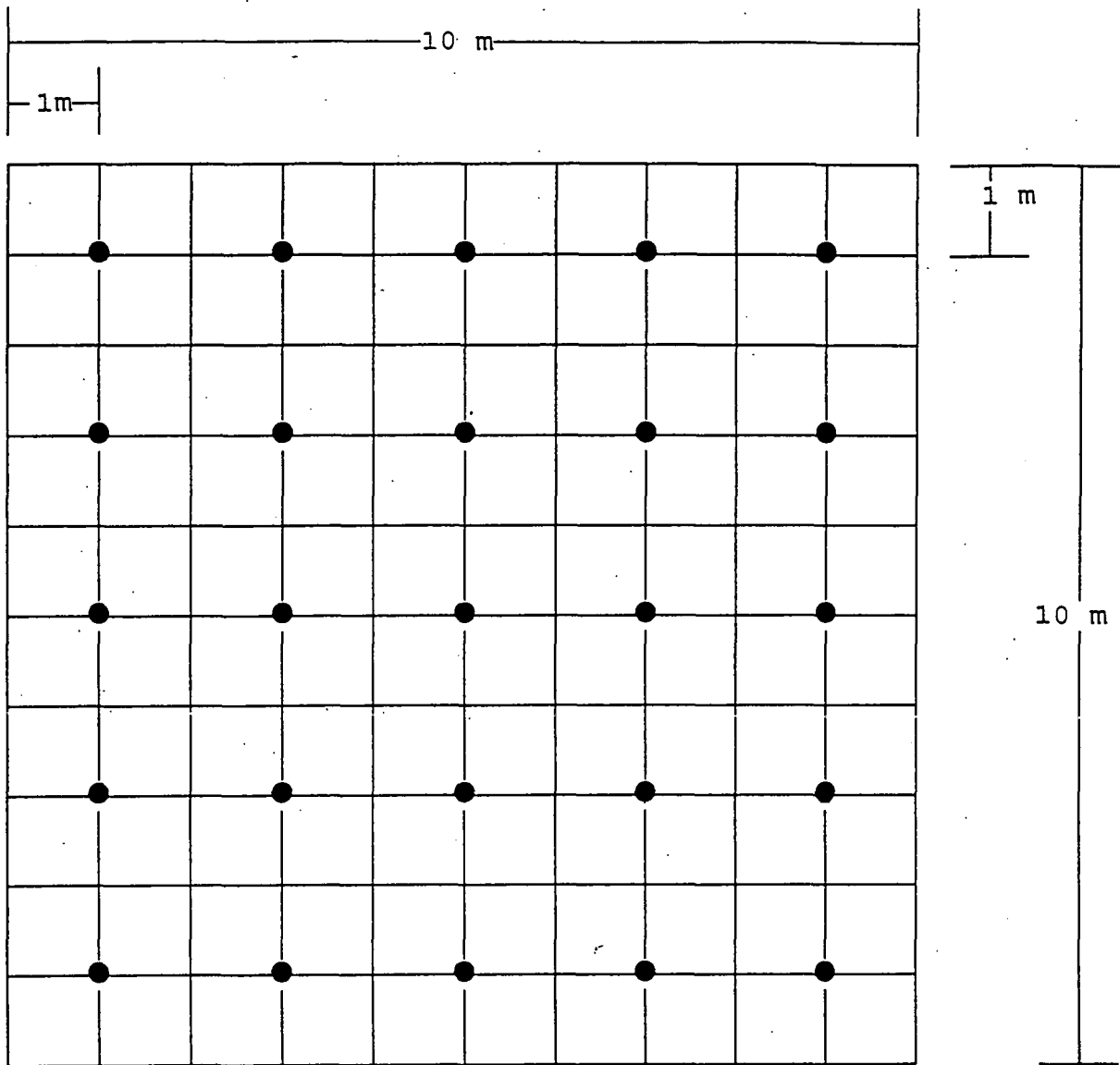
Measurements taken by Bechtel and the IVC at identical locations should agree within the 95 percent confidence interval for the analytical methods used (Reference 2). For consistency and ease of data comparison, Bechtel and the IVC shall utilize the same, or similar, type of calibration techniques, calibration sources, and survey techniques in conducting the surveys. Bechtel shall establish a survey grid across the decontaminated areas and the IVC shall conduct their surveys referring to that grid.

Upon agreement by both parties that the site meets the applicable residual contamination guidelines as determined by direct measurements and analytical results, the IVC will then demobilize, and Bechtel will remain to restore the site to the condition agreed upon by the property owners.

Bechtel will provide final validated sample results to the IVC as soon as they are available. A letter documenting the release of the properties for unrestricted use shall be prepared by Bechtel and sent to the property owners within 3 months following demobilization. Bechtel will also prepare one Post-Remedial Action Report (PRAR) per year for the St. Louis properties remediated during the year for DOE review and publish. A Certification Docket will be completed by Bechtel after the completion of all additional St. Louis vicinity properties. ORISE will issue a verification report to DOE with a copy to Bechtel (Reference 2).

REFERENCES

- (1) DOE Order 5400.5, *Radiation Protection of the Public and Environment*, Washington, D.C.
- (2) DOE, 1990, *Verification and Certification Protocol for the Office of Environmental Restoration FUSRAP and D&D Program*, Revision 3, November.
- (3) DOE/OR/20722-203, *Radiological Characterization Report for FUSRAP Properties in the St. Louis, Missouri, Area*, August 1990.
- (4) ThermoNuclear Services (TNS), *Health Physics Operational Procedures Manual*:
 - A) 3A.2 "Direct Surface Contamination Survey"
 - B) 3A.3 "Transferable Surface Contamination Survey"
 - C) 3B.1 "Delineation of Survey Areas in Open Land"
 - D) 3B.3 "Gamma Ray Exposure Rate Surveys at 1-Meter in Open and Enclosed Areas"
 - E) 3C.2 "Determination of Background"
 - F) 4A.1 "Systematic and Bias Surface Soil Sampling (Radiological)"
- (5) BNI, 1993, "Instruction Guide for Post-Remediation Radiological Survey of Soil," 191-IG-032, Revision 0; and FCR 116-17.
- (6) BNI, 1992, "Instruction Guide for Decontamination of Field Sampling Equipment at FUSRAP Sites," 191-IG-011, Revision 5.
- (7) BNI, 1993, "Instruction Guide for Surface Water and Sediment Sampling Activities," 191-IG-028, Revision 0.
- (8) BNI, 1994, "How to Ship Samples from a FUSRAP Site," PI R4.7, Revision 2.
- (9) BNI, 1993, *Health and Safety Plan for the St. Louis Site*, 116/134/140/153-HSP, Rev. 0.
- (10) Fiore to Price, "Uranium Cleanup Guidelines for St. Louis, MO, FUSRAP Sites," November 6, 1990, CCN 072892.
- (11) DOE/CH/8901, *A Manual for Implementing Residual Radioactive Material Guidelines*, June 1989.
- (12) BNI, 1995, *Mobile Lab Management Plan for St. Louis, Missouri*, Draft.



● Sample Locations

FIGURE 2: Survey Grid - 10 m x 10 m

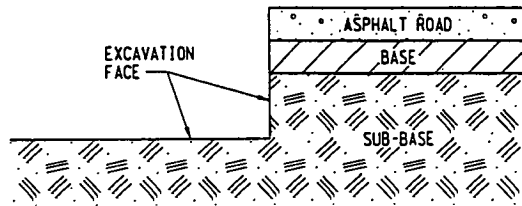


FIGURE 3

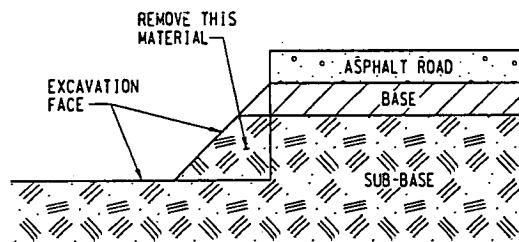


FIGURE 4

NTS

Site Specific Release Criteria

Date: November 14, 1995

SLAPS and HISS vicinity properties, St. Louis, MO

WBS: 134 and 140

Isotope(s): Th-230, Uranium and Uranium daughters

History: Vicinity properties have been contaminated through the migration of radioactive materials from transportation routes used to relocate radioactive materials from the Malinkrodt Chemical Plant in downtown St. Louis.

Survey Contamination Guidelines dpm/100 cm²

	Alpha	Beta-Gamma
Removable:	20	1,000
Total:	500	5,000
Maximum:	1,500	15,000

Chemical Considerations: No known chemical concerns.

Note: Alpha and Beta-Gamma limits are applied independently. The measured values may be averaged over 1 square meter to meet fixed and removable criteria provided the maximum values in any 100 cm² do not exceed three times the fixed and removable criteria.

Concurrences:

H&S Supervisor _____ Date _____ ET Team Lead _____ Date _____

(See FUSRAP PI 24.026 and DOE Orders 5480.11 & 5400.5)

FIELD CHANGE REQUEST/FIELD CHANGE NOTICE

Page 1 of 1

JOB NO. 14501

FCR NO.

116-17

FCN NO.

PREPARER AND DATE: M. M. 8/3/95CHECKER AND DATE: P. Shoffner 8/3/95

AFFECTED DOCUMENTS (WI, drawings, specifications, Scope of Work, SSRS Form, etc.) and Rev. No.

FUSRAP 191-IG-032, Post Remediation Radiological Survey of Soil, Section 2.2.2, Rev. 0

REASON FOR CHANGE

To collect post-remedial action (RA) coneshield gamma measurements, and gamma exposure rate measurements in a cost effective and timely manner. Further, to provide adequate and sufficient information used to determine the Department of Energy guidelines for residual radioactive contamination in soil.

EXISTING CONDITIONS

Section 2.2.2 states that coneshield gamma scan locations shall be positioned so that total coverage of the post remedial action grid is provided. Section 2.2.2 also states that gamma exposure rate survey measurements shall be taken in the middle of each post-remediation survey grid block.

These surveys, as stated, are currently being performed in post-RA areas at the St. Louis Site.

DESCRIPTION OF CHANGE

The intent of employing the cone shield when performing gamma scans is to eliminate the contribution of radioactivity from surfaces above and adjacent to the area actually being measured (i.e., the vertical faces of a trench excavation). In most of the excavations being performed in the St. Louis area, the soils being surveyed are in open areas. Therefore, this contribution or "shine" is not a factor. Walkover scans of these areas with a FIDLER before post RA soil sample collection is done when releasing excavated areas. Therefore, use of a coneshield shall be necessary only in excavations where "shine" will be a factor, or unless otherwise directed by the ET Team Lead or designee.

Additionally, under the above guidance, gamma exposure rate measurements using a pressurized ion chamber or PIC, is prescribed and performed on each of the 100 square meter grids of a remediated soil area. These areas are typically measured with the PIC subsequent to a walkover with a FIDLER, which in turn directs collection of a post-RA soil sample. It is the current practice to perform this measurement after the collection of a soil sample that is below the site specific guidelines, or after successful remediation has been performed.

Based on current methodology, it has been determined to be more cost effective and productive to perform enough of the above readings necessary, in order to be representative of the entire remediated area. Frequency of measurements will be determined by the ET Team Lead or designee on a case by case basis. Upon determination of this frequency, direction to field personnel will be documented in the applicable work guidance document for the specific remedial action.

S/C NO. <u>N/A</u>	DISPOSITION OF FCR REQUIRED	SITE SUPERINTENDENT SIGNATURE AND DATE		
FCO NO. <u>N/P</u>	BY DATE <u>8/9/95</u>	<u>C. E. Mattson</u> <u>8/8/95</u>		
FCR CHANGE APPROVED	FCR OR FCN TO BE INCORPORATED INTO AFFECTED DOCUMENTS	REVISION TO QAA OR QAP REQUIRED	TEAM LEADER CONCURRENCE INITIALS AND DATE	PROJECT ENGINEER DEPARTMENT MANAGER SIGNATURE AND DATE
YES () NO ()	YES (X) SEE REMARKS NO ()	YES () NO (X)	<u>JSK 8/4/95</u>	<u>JEM 8.8.95</u>

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Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the St. Louis Site, Missouri



U.S. Department of Energy