

**PROPOSED
CONFIRMATORY SURVEY PLAN
FOR SURVEY UNITS 1 AND 2
INTERIOR OF BUILDING 2
ENGELHARD PLANT
PLAINVILLE, MASSACHUSETTS**

INTRODUCTION AND SITE HISTORY

D.E. Makepeace, predecessor of the current Engelhard Corporation, manufactured nuclear fuel elements at its plant on Route 152 in Plainville, Massachusetts from 1957 until cessation of operations in 1962. Manufacturing operations were performed under the Atomic Energy Commission (AEC), predecessor agency to U.S. Nuclear Regulatory Commission (NRC), Docket No. 070-139. The Building 2 interior and equipment used in the fuel fabrication operations were decontaminated and a final radiological survey was performed by Engelhard Corporation in 1963. Based on the results of this survey, and the AEC's confirmatory survey of the Building 2 interior and equipment, the facility licenses were terminated (Engelhard 1996). The decontaminated equipment was removed from the plant and sold to the Italian government. Subsequently, the area used for nuclear fabrication was converted to other non-nuclear metal fabrication operations.

A radiological scoping survey was conducted of the plant in July 1988 as a part of a multi-phase site assessment initiated by Engelhard Corporation to identify potential areas of environmental concern. This survey identified residual contamination consisting of U-238, U-235, and U-234, with low enrichments of U-235.

A more detailed characterization survey of Buildings 1 and 2 was conducted in March 1994, which resulted in delineating affected and unaffected areas based on current NRC regulatory guidelines.

Prepared by the Environmental Survey and Site Assessment Program, Environmental and Health Sciences Division, Oak Ridge Institute for Science and Education, under interagency agreement (NRC FIN No. A-9093) between the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy.

An NRC-approved Decontamination Plan for releasing the Building 2 affected areas in accordance with current criteria was then implemented. These areas were decontaminated from June through October 1996 (Engelhard 1996).

The building decommissioning activities consisted of removing remaining equipment from the affected area, collecting and removing loose material, scabbling contaminated surfaces (mainly floors and some walls) and collecting the removed material, and sawing and breaking concrete floors to remove piping and floor joints. The piping was generally found to be physically intact and without perforation, with a few small pockets of contaminated soil under locations where the pipe had been cut—contaminated soil was removed. In addition, expansion joints were cut out of the floor to remove any contamination that had collected in these locations and localized areas of contaminated material were removed from overhead piping, structural members, and electrical buss ducts. Remediation control surveys performed by the licensee showed that all surfaces were within NRC residual surface contamination criteria.

Engelhard conducted a final radiological status survey of each of the two survey units in Building 2 as the decontamination effort was completed. The results of the survey demonstrated that the radiation levels in the building satisfied NRC residual contamination guidelines, established for release of formerly licensed sites to unrestricted use. The final status survey report covers only Buildings 1 and 2; the decommissioning project for the exterior regions of the facility is scheduled to be undertaken later upon NRC approval of Engelhard Corporation's proposed approach to exterior decontamination.

The U.S. Nuclear Regulatory Commission, Division of Waste Management, has requested that the Environmental Survey and Site Assessment Program (ESSAP) of Oak Ridge Institute for Science and Education (ORISE) perform a confirmatory survey of Building 2 at the Engelhard Corporation plant in Plainville, Massachusetts.

SITE DESCRIPTION

The Engelhard facility is located at 30 Taunton Street (also known as Massachusetts Highway Route 152) in Plainville, Norfolk County, Massachusetts. The facility housed areas both used for nuclear fuel fabrication and non-nuclear operations—fuel element fabrication operations were totally segregated from the non-nuclear manufacturing and other operations.

Buildings 1 and 2 were the only buildings existing at the time of nuclear fuel fabrication. Neither Building 1 or 2 is currently being used for any Engelhard operations, and there is no Engelhard worker population in these buildings. The affected areas in Building 2 were well delineated, based on the results of the characterization survey and knowledge of the plant operating history. The affected areas were entirely within Building 2 and consisted of:

- Rooms where localized average surface contamination levels on the floor and in cracks and crevices exceeded applicable residual surface contamination criteria. These rooms included the tunnel ramp, the former precious metal storage room (2L), the former scrap melt room (2M), the corridor and part of the floor in the room north of the scrap melt room (2N), part of the floor in the former melt room (2H), and the room on the left of the entrance corridor in Building 2 (2B).
- Rooms where localized average floor surface contamination levels were less than the residual surface contamination release criteria, but were elevated above background levels (greater than 2 to 3 times background). These rooms were decontaminated based on ALARA considerations. The rooms were designated as 2A, 2C, 2D, 2F, room to the north of 2I (subsequently designated 2P), and 2K.
- Subfloor piping originating in the affected area where elevated radiation levels were measured in the drain inlet openings and outlets.

The remainder of Building 2, and all of Building 1, was classified as unaffected. During decontamination activities, rooms 2E and 2G were added to the affected area.

OBJECTIVE

The objective of the survey is to obtain sufficient radiological data for use by the NRC in evaluating the radiological condition, relative to current guidelines, of interior areas of Building 2 of the Engelhard facility.

RESPONSIBILITY

Work described in this survey plan will be performed under the direction of William L. (Jack) Beck, Program Director, and Eric W. Abelquist, Assistant Program Director of ESSAP. The cognizant site supervisor has the authority to make appropriate changes to the survey procedures as deemed necessary. After consultation with the NRC site representative, the scope of the survey may be altered based on findings as the survey progresses.

DOCUMENT REVIEW

ESSAP has reviewed the licensee's final survey report for the Engelhard facility (Engelhard 1996) and correspondence between the NRC and licensee concerning NRC's comments on the final report. The information was used in the development of this survey plan.

SURVEY PROCEDURES

A survey team from ESSAP will visit the Engelhard facility and perform a visual inspection and independent measurements and sampling. ESSAP survey activities will be conducted in accordance with the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 1995a and b). Specific survey procedures applicable to this survey are listed on pages 8 and 9 of this survey plan. Deviations to the survey plan or procedures will be documented in the site logbook. The survey will consist of a review of the final status survey data; alpha, beta, and gamma scans; surface activity measurements; exposure rate measurements; soil sampling; and, miscellaneous sampling.

The licensee divided the Building 2 interior areas into two affected survey units. Survey Unit 1 includes 2L, 2M, and the tunnel. Survey Unit 2 includes 2A, entry, 2B, 2C, 2D, 2E, 2F, 2G, 2H, 2K, 2N, and 2P.

REFERENCE GRID

Measurement and sampling locations will be referenced to either the licensee's grid system where possible or to prominent building features and recorded on appropriate field drawings.

SURFACE SCANS

Surface scans for alpha, beta, and gamma radiation will be performed on 50 to 100% of the affected areas, and 10 to 25% of the unaffected areas in Building 2. Scans will be performed using gas proportional, GM, and/or NaI scintillation detectors coupled to ratemeters or ratemeter-scalers with audible indicators. Locations of elevated direct radiation identified by surface scans will be marked for further investigation.

SURFACE ACTIVITY MEASUREMENTS

Construction material specific backgrounds will be determined in areas of similar construction but without a history of radioactive material use.

Surface activity measurements for determining total residual alpha and beta surface activity levels will be performed at a minimum of 10 locations in each room in Building 2. Surface activity measurements will also be performed on the building roof. Additional measurements will be performed at locations of elevated direct radiation detected by surface scans. Direct measurements will be performed using gas proportional detectors coupled to ratemeter-scalers. A smear sample for determining removable gross alpha and gross beta activity will be collected at all direct measurement locations.

Areas of residual activity, in excess of the guidelines, will be brought to the immediate attention of the licensee and the NRC. If additional remediation is performed during the ESSAP survey, follow-up measurements will be performed.

EXPOSURE RATE MEASUREMENTS

Background exposure rate measurements will be performed at five to ten locations of similar construction, but without a history of radioactive material use. Exposure rates also will be measured at a minimum of five locations within both survey units in Building 2. Exposure rates will be measured at 1 meter above the surface using a pressurized ionization chamber (PIC) or a microrem meter.

SOIL SAMPLING

Background soil concentrations determined from a previous ESSAP survey site in the vicinity will be used as background soil concentration data for this site (ORISE 1985).

Soil samples will be collected from trenches and subfloor areas at a minimum of 10 locations within the Building 2 areas. Additional soil samples will also be collected from any locations of elevated direct radiation identified by surface scans.

MISCELLANEOUS SAMPLING

Samples of miscellaneous material such as paint, drain residues, and roof sediments may be collected from locations where material may have accumulated, or from locations of elevated direct radiation detected by surface scans.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and data will be returned to ORISE's ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses will be performed in accordance with the ORISE/ESSAP

Laboratory Procedures Manual (ORISE 1995c). Soil samples will be initially analyzed by solid-state gamma spectrometry. The radionuclides of interest are U-235 and U-238; however, spectra will be reviewed for other identifiable photopeaks. A limited number of samples may also be analyzed by alpha spectrometry to determine isotopic uranium abundances. Soil and sediment sample results will be reported in units of picocuries per gram (pCi/g). Smears will be analyzed for gross alpha and gross beta activity using a low-background proportional counter. Direct measurement data and smear data will be converted to units of disintegrations per minute per 100 square centimeters (dpm/100 cm²). Exposure rates will be reported in microroentgens per hour (μR/h). The data generated will be compared with the NRC guidelines established for release for unrestricted use. Results will be presented in a draft report and provided to the NRC for review and comment.

GUIDELINES

The primary contaminant of concern for this site is uranium. The applicable NRC guidelines for residual uranium surface activity levels are (NRC 1987):

Uranium

- 5,000 dpm α/100 cm², total, averaged over a 1 m² area
- 15,000 dpm α/100 cm², total, maximum in a 100 cm² area
- 1,000 dpm α/100 cm², removable activity

The exposure rate guideline is 5 μR/h above background at one meter above building surfaces (NRC 1991).

The generic NRC guidelines for residual concentrations of uranium in soil are provided in the NRC Branch Technical Position on "Disposal or Onsite Storage of Thorium and Uranium Wastes from Past Operations" (NRC 1981). Specifically, the Option 1 average soil guideline for enriched uranium is 30 pCi/g.

TENTATIVE SCHEDULE

Measurement and Sampling	January 8 and 9, 1997
Sample Analysis	January 1997
Draft Letter Report	January 24, 1997

LIST OF CURRENT PROCEDURES

Applicable procedures from the ORISE ESSAP Survey Procedures Manual (Revision 9; April 30, 1995) include:

- Section 5.0 Instrument Calibration and Operational Check-Out
 - 5.1 General Information
 - 5.2 Electronic Calibration of Ratemeters
 - 5.3 Gamma Scintillation Detector Check-Out and Cross-Calibration
 - 5.5 GM Detector Calibration and Check-Out
 - 5.6 Proportional Detector Calibration and Check-Out
 - 5.8 Pressurized Ionization Chamber Calibration and Check-Out
 - 5.10 Floor Monitor Check-Out
 - 5.13 Field Measuring Tape Calibration

- Section 6.0 Site Preparation
 - 6.2 Reference Grid System

- Section 7.0 Scanning and Measurement Techniques
 - 7.1 Surface Scanning
 - 7.3 Alpha Radiation Measurement
 - 7.4 Beta Radiation Measurement
 - 7.5 Gamma Radiation (Exposure Rate) Measurement

- Section 8.0 Sampling Procedure
 - 8.1 Surface Soil Sampling
 - 8.2 Subsurface Soil Sampling
 - 8.7 Determination of Removable Activity
 - 8.8 Miscellaneous Sampling
 - 8.9 Sample Identification and Labeling

- Section 9.0 Integrated Survey Procedures
 - 9.2 General Survey Approaches and Strategies

Section 10.0 Health and Safety and Control of Cross Contamination

Section 11.0 Quality Assurance and Quality Control

Applicable procedures from the ORISE/ESSAP Quality Assurance Manual (Revision 7; January 31, 1995) include:

- Section 5 Training and Certification
- Section 6 Equipment and Instrumentation
- Section 7 Quality Control
- Section 8 Sample Chain-of-Custody
- Section 9 Data Management
- Section 10 Data Review and Validation
- Section 11 Records Handling and Storage

REFERENCES

Engelhard Corporation. Final Status Survey Report, Survey Units 1 and 2 in Interior of Plainville, Massachusetts Plant of Engelhard Corporation. Plainville, Massachusetts; November 1996.

Oak Ridge Institute for Science and Education (ORISE). Radiological Survey of the Texas Instruments Site, Attleboro, Massachusetts. Oak Ridge, Tennessee; January 1985.

Oak Ridge Institute for Science and Education. Survey Procedures Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 9. Oak Ridge, Tennessee; April 30, 1995a.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 9. Oak Ridge, Tennessee; January 31, 1995b.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 9. Oak Ridge, Tennessee; January 31, 1995c.

U.S. Nuclear Regulatory Commission (NRC). Disposal or Onsite Storage of Thorium and Uranium Wastes from Past Operations. Washington, DC: Federal Register 46 (205): 52061-52063; October 23, 1981.

U.S. Nuclear Regulatory Commission. Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source, or Special Nuclear Material. Washington, DC; August 1987.

U.S. Nuclear Regulatory Commission. Office of Nuclear Safety and Safeguards, Review Plan: Evaluating Decommissioning Plans for Licensees Under 10 CFR Parts 30, 40, and 70, Washington, DC; 1991.

ATTACHMENT A

FY 97 SPENDING PLAN		PERFORMANCE PERIOD	
		From	To
Name of Laboratory:		Dec-96	Mar-97
Oak Ridge Institute for Science and Education			
		RFTA	Est. Project Cost
Title of Project: #678		97-7	\$30,500.00
Engelhard, Plainville, MA			
Fee or Non-Fee Recoverable: Non-Fee		NRC Fin Number	ORISE Number
TAC Number:		A9093	1285.51

COST ELEMENTS	Oct-96	Nov-96	Dec-96	Jan-97
Direct Costs	\$0.00	\$0.00	\$6,932.00	\$11,553.00
Indirect Costs- (G&A, DOE Factor)	\$0.00	\$0.00	\$2,218.00	\$3,697.00
Total Estimate Costs	\$0.00	\$0.00	\$9,150.00	\$15,250.00
Project Completion	0.00%	0.00%	30.00%	80.00%

COST ELEMENTS	Feb-97	Mar-97	Apr-97	May-97
Direct Costs	\$2,311.00	\$2,311.00	\$0.00	\$0.00
Indirect Costs- (G&A, DOE Factor)	\$739.00	\$739.00	\$0.00	\$0.00
Total Estimate Costs	\$3,050.00	\$3,050.00	\$0.00	\$0.00
Project Completion	90.00%	100.00%	100.00%	100.00%

COST ELEMENTS	Jun-97	Jul-97	Aug-97	Sep-97
Direct Costs	\$0.00	\$0.00	\$0.00	\$0.00
Indirect Costs- (G&A, DOE Factor)	\$0.00	\$0.00	\$0.00	\$0.00
Total Estimate Costs	\$0.00	\$0.00	\$0.00	\$0.00
Project Completion	100.00%	100.00%	100.00%	100.00%

ACTIVITY INFORMATION	Hours	Estimated Cost
Site Visit	0.0	\$0.00
Document Review	10.0	\$1,400.00
Presurvey	24.0	\$2,500.00
Travel- Labor	54.0	\$5,500.00
Travel- Other Expenses		\$6,200.00
Survey Activities	54.0	\$5,500.00
Report Preparation	57.0	\$6,000.00
Sample Analysis	30.4	\$3,400.00
Other	0.0	\$0.00
Total	229.4	\$30,500.00