ENVIRONMENTAL RESTORATION PROJECT

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TA-55

Date: May 17, 2002
Refer to: ER2002-0358

Mr. John Young, Corrective Action Project Leader
Permits Management Program
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building 1
Santa Fe, NM 87505-6303

SUBJECT: SUBMITTAL OF SUPPLEMENTAL INFORMATION IN SUPPORT OF NO FURTHER ACTION (NFA) FOR SOLID WASTE MANAGEMENT UNIT (SWMU) 55-009

Dear Mr. Young:

Enclosed please find three copies of the Risk Reduction and Environmental Stewardship Environmental Restoration (RRES-ER) report entitled "Supplemental Information in Support of NFA for SWMU 55-009" (LA-UR-01-6810). The material presented in the enclosed document supports the proposal for the removal of SWMU 55-009 from the Laboratory's Hazardous Waste Facility Permit as made by the Laboratory in its March 1995 Request for Permit Modification (LA-UR-95-767).

The supplemental information within the enclosed report documents

- the history of the request for permit modification for this SWMU;
- the additional information about this SWMU conveyed to your staff by Laboratory personnel during a 9/04/01 meeting;
- the site visit to this SWMU made by your staff on 9/18/01;
- the field screening and swipe sample collection conducted by Laboratory personnel as directed and witnessed by your staff on 9/18/01, and
- the results of the confirmatory sample counts conducted under fixed laboratory conditions.

SWMU 55-009 meets the requirements of no further action under NFA Criterion 2 [the site was never used for the management (that is, generation, treatment, storage, or disposal) of Resource Conservation and Recovery Act solid or hazardous wastes].

Please call Linda Nonno at (505) 665-0725 should you have any questions.

Sincerely,

Dave McInroy, Acting Program Manager
Environmental Restoration Project
Los Alamos National Laboratory

Sincerely,

Everett Trollinger, Project Manager
Department of Energy
Office of Los Alamos Site Operations

DM/ET/LN/vn

Enclosure: Supplemental Information in Support of NFA for SWMU 55-009

Cy (w/enc.):
M. Boettner, RRES-ER, MS M992
M. Kirsch, RRES-ER, MS M992
S. Martinez, RRES-ER, MS M707 (6 copies)
L. Nonno, RRES-ER, MS M992
D. Gregory, OLAS0, MS A316
E. Trollinger, OLASO, MS A316
T. Trujillo, DOE-AL, MS A906
T. Longo, DOE-HQ, EM 453
L. King, EPA, R.6, 6PD-N (2 copies)
J. Davis, NMED-SWQB, MS J993
RRES-ER File, MS M992
IM-5, MS A150
RPF, MS M707

Cy (w/o enc.):
S. Boliver, RRES-ER MS M992
A. Dorries, RRES-ER MS M992
D. Hickmott, EES-6 MS M992
J. Hopkins, RRES-ER MS M992
J. McCann, RRES-ER MS M992
D. McInroy, RRES-ER, MS M992
W. Neff, RRES-ER MS M992
A. Pratt, RRES-ER MS M992
B. Ramsey, RRES-DO, MS J591
K. West, PM-PPC MS M992
J. White, RRES-SWRC, MS K490
J. Parker, NMED-DOE OB
S. Yanicak, NMED-DOE OB, MS J993
J. Kieling, NMED-HRMB
J. Bearzi, NMED-HRMB

SUPPLEMENTAL INFORMATION IN SUPPORT OF NFA FOR SWMU 55-009

SWMU 55-009 BACKGROUND INFORMATION

In the March 1995 request for permit modification, the ER Project proposed SWMU 55-009 for removal from the Laboratory's Hazardous Waste Facility Permit. This SWMU is an inactive sanitary sewer monitoring station (structure number 55-263) consisting of a concrete-lined pit (9 ft wide x 9 ft long by 6 ft deep) located in the Laboratory's high-security, highly access-controlled TA-55 plutonium complex. The walls and floor of the monitoring station consist of 6-in.-thick reinforced concrete. The TA-55 sanitary waste line runs through this structure and carries sanitary wastewater from Buildings 55-3 and 55-4 to the Laboratory's sanitary wastewater treatment facility located at TA-46. Building 55-3, the TA-55 Operations Center, functions as a general support facility and contains a chemical laboratory. Building 55-4 is the main plutonium-processing facility at TA-55. The SWMU report (1990, 07514) identified SWMU 55-009 as an inactive monitoring "sump." The term sump denotes an engineered, below-ground-level containment reservoir that receives liquid before it is pumped (or drained) to another location. However, this unit not only has never contained a drain, it has never served as a reservoir to manage liquids of any type; therefore, the SWMU report's identification of this unit as a sump is incorrect. In actuality, this unit was designed and installed solely as a station to house radiological monitoring equipment and to shield the equipment from adverse weather conditions. The monitoring equipment and surrounding concrete structure were installed in approximately 1975 at the time when the TA-55 complex was originally constructed.

In 1993, EPA Region 6 approved SWMU 55-009 for inclusion into a Class III request for permit modification. On the basis of this approval, the Laboratory proposed this SWMU for removal from its permit in March of 1995. In 1997, NMED denied this request. Although NMED did not concur with NFA for this site in 1997, the AUA/Permit Modification High-Performing Team (comprised of NMED and ER personnel) has been working to arrive at concurrence. As part of this effort, ER personnel Linda Nonno (Regulatory Compliance Focus Area) and Gabriela Lopez-Escobedo (RCRA Corrective Actions Focus Area) met with Relf Price of the Laboratory's Nuclear Material Management and Accountability Group (NMT-4) in February 2001 to attain more detailed historic and operational information concerning the SWMU 55-009 monitoring equipment. Mr. Price brought Tim Hayes (NMT-4 Group Leader) into the meeting. Mr. Hayes offered his services in providing additional information to our NMED-HWB regulator, Neelam Dhawan. Due to various ER Project/NMED priorities, a meeting with the regulator was not possible until September 4, 2001. On that date, Linda Nonno arranged a meeting with Neelam Dhawan and Tim Hayes; Ms. Lopez-Escobedo was unable to attend. During that meeting, the following additional information concerning SWMU 55-009 was conveyed to Ms. Dhawan:

> The monitoring equipment was installed at this portion of the sanitary waste line solely as a security measure to prevent the theft of valuable radioactive materials (such as plutonium) from the TA-55 complex. The intent was that this equipment was to detect any stolen radioactive materials covertly targeted to leave the TA-55 complex by means of flushing down sanitary drains such as sinks or toilets. Should any stolen radiological materials be detected in the sewer pipe, the monitoring device was designed to activate a compressor (housed within the concrete structure) that controlled a cut-off valve within the pipe. The activation of the valve was intended to immediately block the passage of the stolen materials from moving further through the pipe, thus thwarting the attempted theft. However, the monitoring equipment never functioned as originally intended. It failed because of high humidity caused by moisture condensation in the concrete structure in which it was housed. After making several failed attempts at getting the detection equipment to perform properly, in May 1983, DOE and TA-55 personnel agreed to discontinue further attempts to monitor the waste line. The monitoring equipment was removed

later that year, but the concrete-lined pit was left in place. The structure was used solely for security monitoring purposes and it is not known or suspected of receiving contaminants or releasing contaminants to the environment.

Upon receipt of this information, Ms. Dhawan requested a site visit by NMED personnel and also asked if confirmatory swipes could be taken during the site visit should HWB determine that they were necessary once they had viewed the site. The site visit was arranged for 9:00 am on September 18, 2001. Mr. Hayes agreed to have a forklift operator on-site to remove the cover of the monitoring pit and to arrange to have a Laboratory radiological control technician (RCT) present in order to take radiological smears should HWB request them. The details of the site visit are documented in Attachment 1.

COLLECTION AND FIELD SCREENING OF CONFIRMATORY SAMPLES

As detailed in Attachment 1, NMED personnel attending the 9/18/01 site visit determined that radiological smears should be taken. The RCT selected 5 swipe locations and NMED selected 4 additional locations. The RCT indicated all 9 sample locations on a site map (see Attachment B of the attached 9/18/01 site visit report). Once the sample locations were selected, the RCT attached a smear pad to one end of a pole (approximately 8–9 ft in length) and swiped it over the first location. The RCT retrieved the smear pad and screened it using an Eberline Smart Heath Physics Alpha/Beta detector (model SHP-330). No activity above background was detected. Using the method just described, the RCT proceeded to collect and screen smears from the 8 remaining pre-selected locations; no activity above background was detected for any of the 8 smears.

Mr. Baggett (DOE Oversight Bureau) attempted to conduct an independent screening of the smears, but was unable to do so because his equipment failed to operate properly due to a light leak.

CONFIRMATORY SAMPLE RESULTS

Immediately after the site visit, according to standard Laboratory practice (following standard operating procedure ESH-1-02-02.3, part 4.5.7 to meet 10 CFR 835 limits for alpha and beta surface contamination; see Attachment 2), the RCT conveyed the nine smears to an ESH-1 laboratory to achieve a more precise reading (by means of a longer count time) than could be obtained through field screening. In the laboratory, each smear was counted on a Berthold Alpha/Beta Smear Counter. For this instrument, the minimum detectable activity for beta is 7 disintegrations per minute and the minimum detectable activity for alpha is 3 disintegrations per minute. No alpha or beta activity above instrument background was detected for any of the 9 smears.

The sample measurement results[1] for the 9 smears are included as Attachment 3.

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[1] On the original sample results received from Mike Dempsey (the ESH-1 RCT who collected the smears at structure no. 55-263) on 9/19/2001, samples 7, 8, and 9 are labeled "FLOOR (DIRT)," which is misleading. To clarify: the floor of the monitoring station is concrete, as stated throughout this document. However, over the past 26 yr a thin layer of dust/soil has deposited over the concrete. Ms. Nonno conveyed this fact to Mr. Dempsey in a phone conversation that took place on 11/19/01and explained that his labeling was inconsistent with the site descriptions of SWMU 55-009 that appear in several ER documents. She also stated that she had rechecked with Liz Ronquillo of NMT, who had confirmed that the floor of the structure was, indeed, concrete. Mr. Dempsey stated that he had known that the floor of the structure was concrete and that he had added "(DIRT)" to denote the dust/soil layer that had been deposited over the floor. He consented that his labeling might be confusing and agreed to strike out "(DIRT)" on the sample

ATTACHMENTS (3):

1) Documentation of 9/18/01 site visit to SWMU 55-009 by NMED
2) Standard operating procedure ESH-1-02-02.3 (9 pages) and relevant portions of 10 CFR 835 (2 pages).
3) Berthold sample measurements readings dated 9/18/01 and revised sample measurements readings with (DIRT) strikeout[1] for samples 7, 8, and 9 (2 pages).

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measurement results, initial the strike out, and provide a revised copy (received on 11/20/01), which is included as Attachment 3.

REPORT OF 9/18/01 SITE VISIT TO SWMU 55-009

At approximately 8:45 AM on the morning of September 18, 2001, Gabriela Lopez-Escobedo and I met Neelam Dhawan, John Young, and Dave Baggett in the parking lot of Pueblo Complex (1900 Diamond Drive, Los Alamos). Liz Ronquillo of NMT-7 escorted us through TA-55 security and had us view a safety tape before escorting us to the site location of SWMU 55-009 (Laboratory structure number 55-263). At SWMU 55-009, we were met by additional NMT personnel (Tim Hayes and Jeff Carmichael) and an ESH-1 RCT. Ms. Lopez-Escobedo recorded the events with a digital camera (see Attachment 1-A photographs).

Upon inspection of the site, John Young determined that radiological smears should be taken. He felt that smears confirming no radiological contamination would ultimately assist in supporting the NFA for SWMU 55-009 through its public comment period.

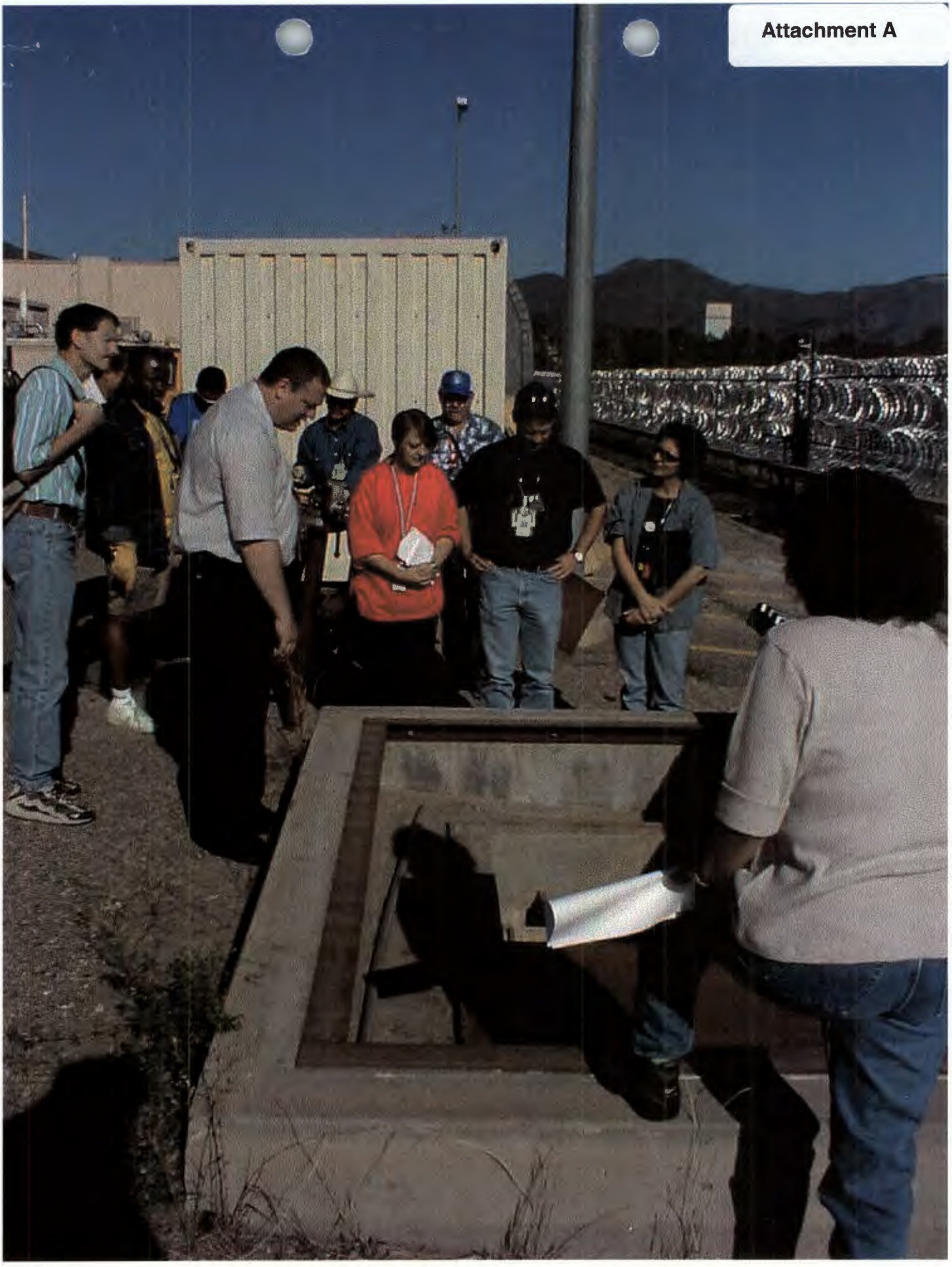
The RCT selected 5 swipe locations (1 at the flange of the sanitary sewer pipe, 2 at various locations along the pipe, 1 at the plate covering the former location of the monitoring equipment, and 1 on a table beneath the pipe). The RCT marked these locations as 1 thru 5 on a site map (see Attachment 1-B, ESH-1 Smear Survey Form) and asked NMED personnel if the locations were adequate. NMED selected 4 additional locations (3 on the concrete floor beneath the sanitary sewer pipe and 1 at the compressor that activated the cut-off valve). The RCT marked these locations as 6 thru 9 on the map. Once NMED, NMT-4, and ER personnel had agreed to all nine of the smear locations, the RCT attached the first smear pad to one end of a pole (approximately 8–9 ft in length) and swiped it over the first location. The RCT retrieved the smear pad and screened it using an Eberline Smart Heath Physics Alpha/Beta detector (model SHP-330). No activity above background was detected. Mr. Baggett attempted to conduct an independent screening of the smear, but was unable to do so because his equipment failed to operate properly due to a light leak. Using the method just described, the RCT proceeded to collect and screen smears from the 8 remaining pre-selected locations; no activity above background was detected for any of the 8 smears.

Linda Nonno
Regulatory Compliance
Environmental Restoration Project

ATTACHMENTS (2):

A) 4 photographs taken on 9/18/01documenting site visit.
B) ESH-1 Smear Survey Form w/smear location map dated 9/18/01 (2 pages).

Attachment A



9-18-01 site visit to SWMU 55-009: Determining whether to take confirmatory samples.

9-18-01 site visit to SWMU 55-009: RCT field screening a smear.

9-18-01 site visit to SWMU 55-009: Interior of monitoring structure prior to collecting smears.

9-18-01 site visit to SWMU 55-009: RCT swiping a segment of the sanitary sewer pipe (smear #5).

ESH-1 SMEAR SURVEY FORM

SAMPLE DESCRIPTION

Sample Date/Time: 9/18/01 0900 No. Of Samples: 9

TA: 55 Bldg: PF-263

RCT: M. Dempsey Z Number: 116396

RCT Signature: M. Dempsey MS: E503

Phone/Fax: 5-4998 / 7-1009

SAMPLE TRACKING NUMBER

$2.71 + 4.65\sqrt{R_b} + R_b$

PURPOSE OF SURVEY

☐ Routine ☐ Pre-Job ☐ Post-Job ☐ Hot-Job

☐ Item Release ☐ Offsite Shipment ☐ Onsite Shipment

☒ Non-Routine / Other: Smear survey of TA-55 sewer line as it leaves TA-55

INSTRUMENTATION

TYPE	HSE No.	CAL Due	% EFF	BKG
Alpha + Beta SHP380	13331	1/18/02	100	BK / 172B
Beta Berthold	844242	4/27/02	various	various

ADDITIONAL INFORMATION

Occurrence No.: N/A

Incident No.:

RWP No.:

ESH-1 REVIEW BY

Smear No.	Location	ALPHA*	BETA*	Smear No.	Location	ALPHA*	BETA*
1	PF-263 Access Flange	< MDA	< MDA	16	N/A		
2	Pipe			17			
3	Detector plate			18			
4	Table			19			
5	Pipe			20			
6	Compressor			21			
7	Floor (Dirt)			22			
8				23			
9				24			
10	No further Entries			25			
11				26			
12				27			
13				28			
14				29			
15				30			

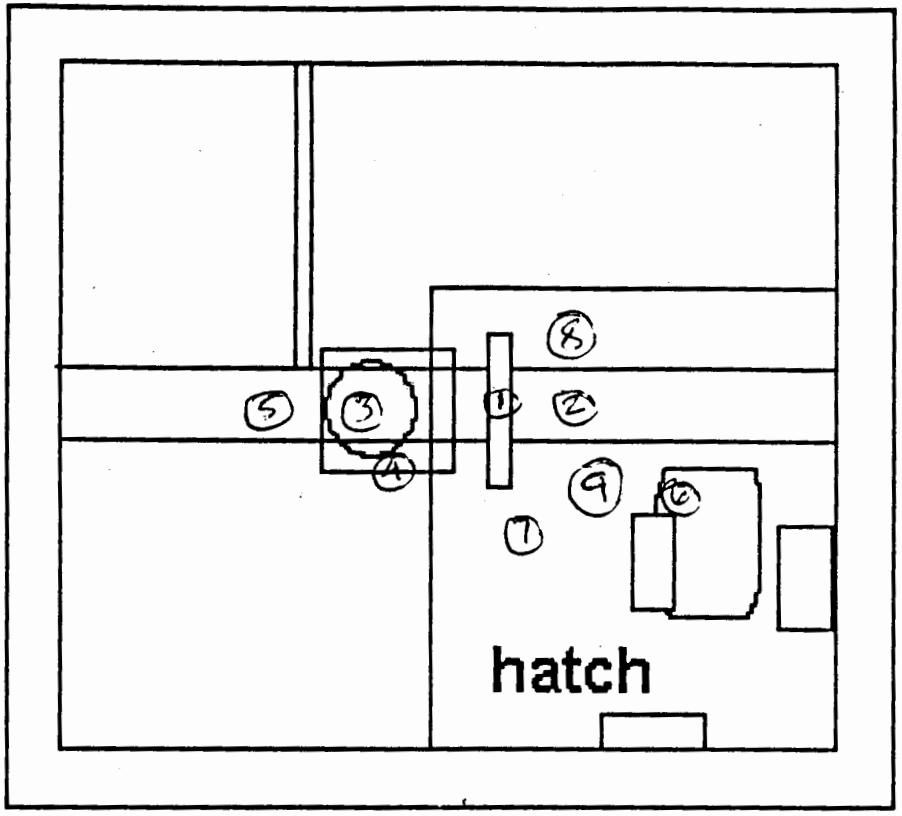
*dpm/100 cm²

	SIGNATURE	PRINTED NAME	DATE	HSE NUMBER	CAL. DUE	MDCR
RCT	Mike Dempsey Dempsey	Michael A. Dempsey	9/18/01	SHP330 13331	1/18/02	23 & 236
RCT SUPERVISOR	Robert C Stoker	Robert C Stoker	9/18/01	Berthold 844242	4/27/02	various
LINE ORGANIZATION	Ronald Wells	Ronald Wells	9/18/01			
OTHER						

REASON FOR SURVEY

- ☐ ROUTINE: NA
- ☐ RWP:
- ☐ RIR:
- ☑ OTHER: NMED survey of sewer pipe

North
no scale



PF-263 Access hatch

○ Contamination Survey (dpm/100 cm2)
- ○ Gloves
- ○ Floor
- ● Area
- ○ Direct
- ● Smear
- ♀ LAS (Large Area Swipe)
- ○ Other:

○ Radiation Survey
- ○ Neutron
- ○ Beta/gamma
- ○ Area
- ○ Middle Window
- ○ Glove Palm
- ○ Other

KEY

(X) Smear, with number inside circle (Results may be circled adjacent to smear #)

xx k Direct reading, (dpm/100cm2)

OTHER:

COMMENTS: Smear survey of TA-55 sewer pipe as it leaves TA-55

NOT UCNI

~~Classification: UCNI~~ ~~Date: September 26, 1997~~ ~~Joel Williams, NMT-2~~

Map Revision Date 12/12/97

BY: br/ak

NA

~~Unclassified Controlled Nuclear Information~~
~~Not for Public Dissemination~~
~~Unauthorized dissemination subject to civil and criminal sanctions under section 148 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2168).~~

NOT UCNI

ESH-1 controlled document

Surveying for Fixed and Removable Contamination

ESH-1-02-02

Revision 3

Approvals

Approved by: Regina R. Fuchs **Date:** 2/20/01
Regina R. Fuchs
ESH-1 Procedure Coordinator

Approved by: Gerry Schlapper **Date:** 2/20/01
Gerry Schlapper
ESH-1 Group Leader

1.0 INTRODUCTION

Contamination surveys are the primary method of monitoring the effectiveness of contamination control programs. Contamination surveys include direct, smear, and large area swipe (LAS) surveys for alpha, beta, tritium, and gamma contamination.

1.1 Purpose

Contamination surveys are used to

- Assess workplace radiological conditions and analyze hazards;
- Identify areas requiring radiological posting;
- Provide the basis for establishing radiological controls such as protective clothing;
- Verify the effectiveness of physical designs and administrative controls;
- Identify and control the spread of contamination using routine surveys in areas such as laboratories, process areas, and step-off pads;
- Verify the absence of contamination in areas such as change rooms and lunchrooms; and
- Control the release of material from radiological controlled areas.

1.2 Scope

This procedure applies to all ESH-1 personnel and other appropriately trained and authorized personnel who perform contamination surveys.

2.0 DOCUMENT SPECIFIC DEFINITIONS

See ESH-1-01-05, "Master Glossary," for standardized definitions.

Fixed contamination - is radioactive material that cannot be readily removed from surfaces by nondestructive means, such as casual contact, wiping, brushing, or washing.

Masslinn - In the context of this procedure, the brand name Masslinn is used as a generic term for a cloth-like material that is impregnated with mineral oil and is used to conduct large-area-swipe surveys.

NuCon/DEFENSAP Smears - Typical smear media. NuCon is a trade name for a 1 3/4" diameter, cloth smear. DEFENSAP is a trademark of Defense Apparel Corporation. In the context of this procedure, NuCon Smears refers to a 1 ¾" diameter cloth smear with an adhesive backing in a folder.

Pylox gloves - Pylox gloves are used as protective equipment while taking tritium smears. Pylox has better resistance to tritium permeation than other materials

Qualitative – as used in this procedure, refers to measuring contamination without reliably measuring the amount of contamination present. Qualitative survey results are NOT used to establish posting requirements or to release materials and areas.

Large-area swipes and direct floor monitor surveys are qualitative surveys used mostly:

- As a means of promptly assessing whether low-level fixed or removable contamination exists in an area
- To quickly delineate a contamination boundary
- For surveying when hot particles are a potential problem
- For routine surveys of uncontrolled areas, controlled, or radiological buffer areas

Quantitative – as used in this procedure, refers to measuring both the presence and amount of contamination present. Quantitative surveys are used to establish posting requirements, and to release materials or areas. Smear surveys and direct surveys, using hand-held instruments, are quantitative surveys used to reliably measure contamination levels.

Removable contamination - is radioactive material that can be readily removed from surfaces by nondestructive means.

Total contamination - is the sum of fixed plus removable contamination.

Whatman 40 Circles - Typical smear media for tritium. Whatman 40, 2.54-cm diameter circles are used to perform surface contamination surveys for tritium.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Failing to perform contamination surveys according to this procedure could result in:

- Improper posting of contaminated areas
- Improper labeling of radioactive material
- Unauthorized exposure to personnel
- Inadequate characterization of work place conditions

3.2 If quantitative results are needed, such as for decontrol or release surveys, large-area swipes or floor monitor surveys must be supplemented with direct and smear surveys. Proper planning should allow for a reduced number of direct surveys and smears when concurrent floor and LAS surveys are conducted.

3.3 Correction factors must be applied for surveying removable contamination on rough, wet, or oily surfaces. Rough surfaces may damage the survey media and may not come into contact completely with the media. Extra care is required.

3.4 Correction factors for alpha and beta energy versus efficiency must be applied when the isotopes being surveyed for have different energies than the energies the instruments were calibrated to. Refer to the instrument-specific procedures for those correction factors.

3.5 Personnel who perform contamination surveys must be aware of sources and pathways for internal and external exposure and shall take appropriate precautions to minimize such exposure (such as wearing appropriate personal protective equipment {PPE} and dosimetry).

3.6 Personnel who perform contamination surveys should be aware of other physical, biological, and electrical hazards they may encounter and take appropriate measures to control such hazards.

4.0 PROCEDURE

These procedural steps are divided into seven sections covering survey methods:

1) General Requirements
2) Preparing for the survey
3) Surveying for Fixed Contamination with Hand-Held Instruments
4) Surveying with Floor Monitors
5) Performing Quantitative Smear Surveys for alpha, beta, and gamma
6) Performing Quantitative Tritium Smear Surveys
7) Performing Qualitative Large-Area-Swipe Surveys

4.1 General Requirements

Surveys for fixed and removable contamination are often performed together. It is good practice to perform the direct survey before the removable.

4.1.1 Use hand held instruments to perform quantitative surveys for total contamination.

4.1.2 Use smears to perform quantitative surveys for removable contamination.

4.1.3 Use large-area-swipes or floor monitors to perform qualitative surveys.

4.1.4 For decontrol surveys, augment large-area swipe and floor monitor surveys with smear and direct surveys.

4.2 Preparing for the survey

4.2.1 Based on guidelines from ESH-1-02-01, "Contamination Monitoring Standard," determine the area to be surveyed.

4.2.2 Review the latest available, area survey data.

4.2.3 Prepare a survey map or form with sufficient detail to indicate areas surveyed and any contamination discovered during the survey.

4.2.4 Select instruments for the type of radionudide present. Refer to instrument-specific procedures for guidance.

4.2.5 As appropriate, use instrument-specific procedures to determine the area background and MDA.

4.2.6 If surveying for alpha or beta isotopes with different energies than the instruments were calibrated for, apply required correction factors. Refer to instrument-specific procedures.

Caution: It is critical to document results, even if no contamination is detected. It is acceptable in some cases (e.g. LAS surveys or direct surveys over large areas) to indicate in general terms what has been surveyed if results are negative; positive results must be clearly indicated. These documents become part of the Laboratory's permanent record of radiological conditions.

4.2.7 Record:

- Names of the people conducting the survey
- Date, time, and purpose of the survey
- Location of survey
- Appropriate reference to a specific RWP, document, release tag, etc.
- Model, PN number, and cal due date of the instruments
- Type of survey
- Instruments' efficiency and area background as appropriate
- Correction factors as appropriate

4.3 Surveying for Total Contamination With Hand-Held Instruments (Direct Surveys)

4.3.1 Hold the detector within ~1/2 cm (1/4 inch) of the surface being monitored.

4.3.2 To ensure that low-level fixed contamination will be detected, move the detector less than 5 cm (2 inches) per second.

4.3.3 If there is a positive meter response, hold the detector over the spot for a few seconds to verify if there is a positive response.

4.3.4 If using a detector with a surface area <100 cm^2 and if the area of contamination is >100 cm^2, adjust the reading to correct for the actual probe surface when determining the dpm/100 cm^2.

Example 1:

A direct reading of 1000 cpm on a Ludlum 139/air proportional probe would have an adjusted reading of ~2,600 dpm/100 cm^2.

1000 cpm/0.5 cpm/dpm x 100/76 cm^2 = 2,632 dpm/100 cm^2

Example 2:

A direct reading of 1000 cpm on an ESP/HP260 would have an adjusted reading of ~13,000 dpm/100 cm^2:

1000 cpm/0.5 cpm/dpm x 100/15.5 cm^2 = 12,903 dpm/100 cm^2

Example 3:

A direct reading of 1000 dpm on an E-600/SHP360 would have an adjusted reading of ~6,500 dpm/100 cm^2:

1000 dpm x 100/15.5 cm^2 = 6,452 dpm/100 cm^2

These equations apply to contamination uniformly distributed over an area >100 cm^2.

4.3.5 If the contamination is not uniformly distributed or if an object has a surface area <100 cm^2, correct the measured value to dpm per the unit area surveyed

Example:

1000-dpm total contamination on an object of 25 cm2 surface area should be reported as 1000 dpm over 25 cm2.

4.4 Surveying with Floor Monitors

Note: Alpha only, beta/gamma only and alpha/beta floor monitors are available.

4.4.1 Move the floor monitoring cart over the floor less than 5 cm (2 inches) per second.

4.4.2 If there is a positive meter response, stop the cart over the spot for a few seconds to verify there is a positive meter response.

4.4.3 If you verify a positive response, go to section 4.3, "Surveying for Fixed Contamination With Hand-Held Instruments."

4.5 Performing Quantitative Smear Surveys for alpha, beta, and gamma

4.5.1 Determine the number of smears to be taken.

4.5.2 Specify the number and location of the smears on the form or map.

4.5.3 Collect the supplies you will need to conduct the survey.

- Plastic bag to hold the used smears
- Gloves
- NuCon smears
- Survey map or form
- Protective clothing for the area or RWP
- Any other necessary items

4.5.4 Number the NuCon smear folders.

4.5.5 Proceed to the area or facility where you will conduct the survey and put on the protective clothing required for the area.

4.5.6 Perform the smear survey.

CAUTION: Be aware that the smear disk will disintegrate if a large area is smeared.

1) With moderate pressure, rub the smear on an area ~100 cm^2. This is about the same area as a dollar bill.

2) Screen the samples. If the smear has activity greater than 20,000 dpm alpha or greater than 200,000 dpm beta/gamma, notify HPAL before sending the smears to them.

NOTE: This may be done at the end of the survey, before counting smears locally, or before sending the them to HPAL.

NOTE: If the smears show significant activity on a hand held instrument, you may use the direct instrument reading instead of counting the smear in a sample counter. This will help prevent contaminating the smear counter. Record the necessary instrument information on the survey form or map.

CAUTION: Placing used smears in the same bag as unused smears may lead to accidental use of a smear in two locations or in cross-contamination.

3) To prevent accidental re use and cross contamination, close the smear folder and place it in a plastic bag separate from the unused smears.

Note: Closing the smear folder usually prevents cross-contamination.

4) If you suspect that the area is highly contaminated in some places or the contamination is very loose or fine, use an individual plastic bag for each smear folder. Do not allow the smears to become cross-contaminated.

4.5.7 Send the samples to HPAL for analysis in accordance with ESH-1-01-04, "Submitting Samples to HPAL," and ESH-1-14-01, "Packaging, Transporting, Receipt and Storage of Radioactive Material," or count them locally according to instrument-specific and facility-specific procedures.

4.5.8 Either attach the HPAL results to the form or map, or record the results for each smear in dpm per 100 cm^2 on the form or map.

4.6 Performing Tritium Smear Surveys

4.6.1 Determine the number of smears to be taken.

4.6.2 Specify the number and location of the smears on the form or map.

4.6.3 Collect the supplies you will need to conduct the survey.

- Several pairs of pylox gloves
- Tritium smear vials (each smear vial should contain 1 ml of demineralized water or the required volume of "fluor")
- Tritium smear disks (Whatman 40 Circles of 2.54-cm diameter or equivalent)
- Protective clothing
- Any other necessary items.

4.6.4 Place an unused tritium smear in sample vial number 1 and mark the vial as "Control" or "Bkg" sample in space number 1 of the survey form.

4.6.5 With moderate pressure, rub the smear on an area ~100 cm^2. Keep in mind that the diameter of the Whatman 40 is about half the diameter of a NuCon smear.

4.6.6 Place the tritium smear immediately in a prepared vial marked with the correct number.

4.6.7 Place an unused tritium smear in every tenth vial. Mark the vial as a "control" or "Bkg."

4.6.8 To reduce chances of cross-contamination and to minimize your exposure due to tritium permeation through the glove, frequently change the pylox glove on the hand you are using to take smears.

4.6.9 If the area of the surfaced smeared is <100 cm^2, estimate the actual size of the area smeared.

Example: A 10-cm^2 smear reading 1000 dpm on a counting instrument would have an activity of 1,000 dpm over 10 cm^2:

4.6.10 Send the samples to HPAL for analysis in accordance with ESH-1-01-04, "Submitting Samples to HPAL," and ESH-1-14-01, "Packaging, Transporting, Receipt and Storage of Radioactive Material", or count them locally according to instrument-specific and facility-specific procedures.

4.6.11 Attach the HPAL results to the form or map.

4.7 Performing Qualitative Large Area Swipe Surveys

Note: These instructions are for LAS surveys using a Masslinn mop. Alternatively, large area swipes may be done by hand with Masslinn-type material or cheesecloth provided you wear gloves and survey your hands frequently.

4.7.1 In general:

- Large-area swipes are used to supplement comprehensive contamination control programs which include direct monitoring and smear surveys.
- A smear survey is required to assure that an area is clean or to release an area as an uncontaminated area.
- Large-area-swipe surveys are used before re-entry after evacuation, as an aid in the response to contamination incidents, or in other emergencies.
- Large-area swipes can be performed on facility floors, walls, equipment, or any other large items with smooth surfaces which require contamination monitoring or decontamination.

4.7.2 Check the Masslinn mop handle and head for damage, defects, or contamination. If it is contaminated, then dispose of it according to facility-specific procedures.

4.7.3 Split each Masslinn sheet into two 12-inch sections and load the mop head with several of these.

CAUTION: Be aware of the potential to spread small areas of high contamination into larger areas.

4.7.4 Swipe the area or item being surveyed with a "mopping" or "mowing" action in a forward direction. Slightly overlap each stroke to ensure full coverage. Walk on areas already swiped.

CAUTION: Be aware of the potential for the Masslinn swipe to pick up "hot particles" or to become highly contaminated. Take precautions to minimize personnel contamination.

4.7.5 Periodically monitor the Masslinn to determine if any contamination exists.

4.7.6 Consider the contamination history and area designation, and the following guidelines to determine the frequency for monitoring the Masslinn.

Area	Unit
Corridors	Every 15 feet
Open areas	10- by 10-foot sections
Laboratory aisles	Every 10 feet
Laboratory floors	Under individual glove boxes
Laboratory walls	10- by 10-foot sections

4.7.7 Periodically check the Masslinn for dust loading. If the Masslinn is dirty, monitor the swipe and remove that section of Masslinn. Re-swipe the same area if loose dust is obvious and falling off the Masslinn. Monitor the underlying section of Masslinn each time a section of used Masslinn is removed from the mop.

4.7.8 Record the highest reading for each swipe in dpm on an ESH-1 LAS survey form or on a survey map.

4.8 Post Survey Requirements

Caution: It is critical to document results, even if no contamination is detected. It is acceptable in some cases (e.g. LAS surveys or direct surveys over large areas) to indicate in general terms what has been surveyed if results are negative; positive results must be clearly indicated. These documents become part of the Laboratory's permanent record of radiological conditions.

4.8.1 Record on the survey map or form:

- Survey locations and results
- Any pertinent notes that would aid the reader to interpret the results or to plan future actions
- Corrective actions that were taken in response to the survey

4.8.2 Evaluate the survey results, and control and post the area as appropriate.

4.8.3 Sign the survey documentation, and have a supervisor or peer review and sign the documentation.

4.8.4 If the area is contaminated, make appropriate notifications, and help determine whether the area needs to be decontaminated.

4.8.5 After the area is decontaminated, re-survey the area to verify successful decontamination.

4.8.6 Route completed survey documentation according to established team records protocols, including posting them or otherwise making them available to appropriate facility / operating group personnel.

5.0 REQUIRED RECORDS

Required records include ESH-1 survey forms or maps:
Direct Survey Form
Smear Survey Form
LAS Survey Form
Sample Analysis Form

6.0 REFERENCES

10CFR835, "Occupational Radiation Protection"
LIR402-700-01, "Occupational Radiation Protection Requirements"
ESH-1-01-05, "Master Glossary"
ESH-1-02-01, "Contamination Monitoring Standard

7.0 ATTACHMENTS

Appendix A of the LANL RPP

Nuclide[a]	Removable[b,c]	Total (fixed + removable)
Natural U, ^{235}U, ^{238}U, and associated decay products*	1,000 alpha dpm/100 cm^2 [d]	5,000 alpha dpm/100 cm^2 [d]
Transuranics, ^{226}Ra, ^{228}Ra, ^{230}Th, ^{228}Th, ^{231}Pa, ^{227}Ac, ^{125}I, ^{129}I	20 dpm/100 cm^2 [d]	500 dpm/100 cm^2 [d]
Natural Th, ^{232}Th, ^{90}Sr, ^{223}Ra, ^{224}Ra, ^{232}U, ^{126}I, ^{131}I, ^{133}I	200 dpm/100 cm^2 [d]	1,000 dpm/100 cm^2 [d]
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ^{90}Sr and others noted above. [f]	1,000 beta-gamma dpm/100 cm^2 [d]	5,000 beta-gamma dpm/100 cm^2 [d]
Tritium organic compounds, surfaces contaminated by HT, HTO, and metal tritide aerosols	10,000 dpm/100 cm^2 [d]	10,000 dpm/100 cm^2 [d]

[a]The values in this table apply to radioactive contamination deposited on, but not incorporated into, the interior of the contaminated item. For purposes of this table only, it is assumed that tritium contamination deposits onto the surface but is not incorporated into the interior of the contaminated item. This table does not apply to personnel contamination. Where contamination by both alpha- and beta-gamma-emitting nuclides is present, the limits established for the alpha- and beta-gamma-emitting nuclides apply independently. 10 CFR 835, Appendix D

[b]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by first swiping the area with dry filter paper or soft absorbent paper while applying moderate pressure and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note: the use of dry material may not be appropriate for tritium.) 10 CFR 835, Appendix D For objects with a surface area less than 100 cm^2, the entire surface should be swiped, and the activity per unit area should be based on the actual surface area. 10 CFR 835, Appendix D Except for transuranics, ^{228}Ra, ^{227}Ac, ^{228}Th, ^{230}Th, ^{231}Pa, and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual contamination levels are below the values for removable contamination. 10 CFR 835, Appendix D

[c]The "removable" and "total" levels may be averaged over 1 m^2 provided the maximum activity in any area of 100 cm^2 is less than three times the values specified. For purposes of averaging, any square meter of surface shall be considered to be above the activity guide G if (1) from measurements of a representative number n of sections it is determined that $1/n\ \Sigma_n S_i \geq G$, where S_i is the dpm/100 cm^2 determined from measurement of section i; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100-cm^2 area exceeds 3 G. 10 CFR 835, Appendix D

[d]As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute (cpm) observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation. At LANL, the instrument is calibrated so that the meter reading will directly correspond to the alpha or beta surface emission rate. A nominal conversion to activity in dpm is possible by multiplying the instrument contact reading in cpm by a factor of 2.

[e]When measuring fixed contamination during a survey, the active area of the probe used must be taken into account. For example, if the active area is 100 cm^2 and the nuclide is natural uranium, then the 5000-dpm α/100-cm^2 limit will apply. For a 40-cm^2 probe, 2000 dpm α would be the limit because of the reduced active area of the probe.

[f]This category of radionuclides includes mixed fission products, including the Sr-90 that is present in them. It does not apply to Sr-90 that has been separated from the other fission products or mixtures in which the Sr-90 has been enriched. 10 CFR 835, Appendix D

*Because of the physical properties of depleted uranium shrapnel (DU), the contamination values of this appendix do not apply, and traditional methods/values for specifying levels of contamination are generally inappropriate to the situations in which such shrapnel is created. For DU shrapnel, area designations and contamination control are addressed in LPR402-703.0 and LPR402-704.0.

Page 441

Subpart L—Radioactive Contamination Control

SOURCE: 63 FR 59686, Nov. 4, 1998, unless otherwise noted.

§ 835.1101 Control of material and equipment.

(a) Except as provided in paragraphs (b) and (c) of this section, material and equipment in contamination areas, high contamination areas, and airborne radioactivity areas shall not be re-leased to a controlled area if:

(1) Removable surface contamination levels on accessible surfaces exceed the

page 442

removable surface contamination val-ues specified in appendix D of this part; or

(2) Prior use suggests that the remov-able surface contamination levels on inaccessible surfaces are likely to ex-ceed the removable surface contamina-tion values specified in appendix D of this part.

(b) Material and equipment exceeding the removable surface contamination values specified in appendix D of this part may be conditionally released for movement on-site from one radiologi-cal area for immediate placement in another radiological area only if appro-priate monitoring is performed and ap-propriate controls for the movement are established and exercised.

(c) Material and equipment with fixed contamination levels that exceed the total contamination values speci-fied in appendix D of this part may be released for use in controlled areas out-side of radiological areas only under the following conditions:

(1) Removable surface contamination levels are below the removable surface contamination values specified in ap-pendix D of this part; and

(2) The material or equipment is rou-tinely monitored and clearly marked or labeled to alert personnel of the con-taminated status.

This Area would have to be posted if levels > Appendix D ~~the~~ were found

By using a "scaler" ie. The Berthold, The Minimum Detectable Activity is much lower. (MDA)

AT This facility
↓
I Always use
Pu + Sr/Y 90

Pu = 20/500 Rem. Fixed + Remov
Sr/Y 90 = 200/1000
The most Restrictive

Radionuclide	Half-Life	Air Immersion DAC (mCi/ml)	(Bq/m 3)
Pr–144m 2	7.2 min	9.E–04	3.E+07
Nd–149 1	1.73 h	1.E–05	4.E+05
Gd–162 2	9.7 min	1.E–05	4.E+05
Td–162 2	7.76 min	4.E–06	1.E+05
Dy–157 1	8.06 h	1.E–05	4.E+05
Re–182m 1	12.7 h	4.E–06	1.E+05
Os–190m 2	9.9 min	3.E–06	1.E+05
Ir–190m 1	3.2 h	8.E–05 6	3.E+06 6
Au–195m 2	30.6 s	2.E–05	7.E+05
Tl–200 1	26.1 h	3.E–06	1.E+05
Tl–207 2	4.77 min	4.E–05 3	1.E+06 3
Tl–208 2	3.053 min	1.E–06	4.E+04
Tl–209 2	2.20 min	2.E–06	7.E+04
Tl–210 2	1.30 min	1.E–06	4.E+04
Pb–204m 2	66.9 min	2.E–06	7.E+04
Bi–211 2	2.13 min	1.E–04	4.E+06
Po–211 2	0.516 s	5.E–04	2.E+07
Th–233 2	22.3 min	1.E–04	4.E+06
Pa–234 1	6.70 h	2.E–06	7.E+04
Pa–234m 2	1.17 min	4.E–05 3	1.E+06 3
U–239 1	23.40 min	8.E–05 6	3.E+06 6
Np–240 1	65 min	4.E–06	1.E+05
Np–240m 2	7.4 min	1.E–05	4.E+05
Am–246 1	25.0 min	4.E–06	1.E+05

1 Committed effective dose equivalent from inhalation is calculated in ICRP Publication 30, but the DAC value for external ex-posure to a contaminated atmospheric cloud is more restrictive than the DAC value for inhalation.
2 Committed effective dose equivalent from inhalation is not calculated in ICRP Publication 30, but DAC value for external ex-posure to contaminated cloud should be more restrictive than DAC value for inhalation due to relatively short half-life of radio-nuclide.
3 DAC value is determined by limit on annual shallow dose equivalent to skin, rather than yearly limit on effective dose equiva-lent.
4 DAC value applies to radionuclide in vapor form only; DAC value for inhalation is more restrictive for radionuclide in inorganic form.
5 DAC value applies to radionuclide in inorganic or vapor form.
6 DAC value for exposure to contaminated atmospheric cloud is the same as DAC value for inhalation.

[58 FR 65485, Dec. 14, 1993, as amended at 63 FR 59687, Nov. 4, 1998]

APPENDIX D TO PART 835—SURFACE CONTAMINATION VALUES

The data presented in appendix D are to be used in identifying the need for posting of contamination and high contamination areas in accordance with § 835.603(e) and (f) and identifying the need for surface contamina-tion monitoring and control in accordance with §§ 835.1101 and 835.1102.

SURFACE CONTAMINATION VALUES 1 IN DPM/100 CM 2

α Removable / α Total

← 20 / 500 Fixed + Removable

Radionuclide	Removable 2 4	Total (Fixed + Removable) 2, 3
U-nat, U-235, U-238, and associated decay products	7 1,000	7 5,000
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	500
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above 5	1,000	5,000
Tritium and tritiated compounds 6	10,000	N/A

1 The values in this appendix, with the exception noted in footnote 5, apply to radioactive contamination deposited on, but not incorporated into the interior or matrix of, the contaminated item. Where surface contamination by both alpha-and beta-gamma-emitting nuclides exists, the limits established for alpha-and beta-gamma-emitting nuclides apply independently.
2 As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associ-ated with the instrumentation.
3 The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm 2 is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the surface contamination value if: (1) From measurements of a representative number of sections it is determined that the aver-age contamination level exceeds the applicable value; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm 2 area exceeds three times the applicable value.

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see actual Reference for a
better copy.

Sample Measurement
C:\UMS\LB770\1\MD18901.SDT

Sample Measurement Parameters:
Comment: PF-263 SMEAR SURVEY
User: 116396
Preset Time: 3:00
Alpha Preset Error: 2%
User Protocol: ALPHA/BETA

Instrument Name: TA55ESH1BERT
Cycles: 1
Beta Preset Error: 2%

Cycle 1 of 1
Start Time: 9/18/2001 12:01:56

Elapsed Time: 3:00
Guard: 18.63 cps

	Spl #	Sample Name	Alpha (DPM)	MDA	MRA	Beta (DPM)	MDA	MRA
1	1	PIPE FLANGE	0.000	5.4807	0.9613	4.012 (±72.0%)	9.6923	3.7612
2	2	PIPE	0.000	5.7079	1.0544	0.000	9.8056	3.8294
3	3	DETECTOR PLATI	0.000	5.1452	0.6948	0.40 (>100%)	9.0595	3.4337
4	4	TABLE	0.000	5.3130	0.9042	7.500 (±41.2%)	8.6122	3.2903
5	5	PIPE	1.251 (>100%)	4.6271	0.5216	1.951 (>100%)	9.8506	3.8432
6	6	COMPRESSOR	0.000	5.2294	0.8604	1.965 (>100%)	9.4467	3.6881
7	7	FLOOR (DIRT)	1.015 (>100%)	5.7940	1.0947	2.428 (>100%)	9.5598	3.6433
8	8	FLOOR (DIRT)	0.000	5.1875	0.8222	1.317 (>100%)	8.7055	3.2881
9	9	FLOOR (DIRT)	0.000	5.6440	0.9606	0.16 (>100%)	8.9259	3.4013
10	10	BLANK	0.000	5.3061	0.8730	0.000	9.7608	3.7815

Sample Measurement
C:\UMS\LB770\1\MD18901.SDT

Sample Measurement Parameters:
Comment: PF-263 SMEAR SURVEY
User: 116396
Preset Time: 3:00
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