

**FINAL DEMOBILIZATION PLAN
FOR
REMEDIAL INVESTIGATION
AT THE
NIAGARA FALLS STORAGE SITE
LEWISTON, NY**

**Prepared:
Under Contract to SAIC
for the
USACE-Buffalo District
Buffalo, NY.**

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1.0 INTRODUCTION

This demobilization plan details activities that will be completed in order to remove equipment and wastes generated used during the field effort at the Niagara Falls Storage Site (NFSS) in Lewiston, New York. The NFSS is being investigated under the Formerly Utilized Site Remedial Action Program (FUSRAP). Investigatory actions at the NFSS were carried out under the direction of the U.S. Army Corps of Engineers-Buffalo District (USACE-Buffalo District). This plan is organized by the types of equipment still present at the site and major tasks that will be completed during demobilization activities. This plan also details termination of existing leases, rentals and services currently in place as well as office area site restoration activities. Site work during demobilization will be performed under the current versions of the Site Safety and Health Plan (SSHP) and Radiation Protection Plan (RPP).

2.0 RADIOLOGICAL SCANNING ACTIVITIES/RELEASE OF EQUIPMENT

The final disposition of equipment will ultimately be based on the results of radiological survey activities conducted by Health Physics (HP) personnel and the planned or anticipated future use of the equipment. Release limits for equipment and materials are presented in Appendix A. Equipment which has contacted sampled site media (sediment, soil, groundwater or surface water, concrete, road materials, etc) or used for the storage of IDW must be surveyed for radiological contamination prior to unconditional release from the site or disposed of as IDW.

All equipment, tools, supplies, etc. shall be surveyed for surface contamination (fixed and removable). Surface limits will be applied in accordance with the U.S. NRC Regulatory Guide 1.86 (NUREG 1.86), *"Termination of Operating Licenses for Nuclear Reactors"* (Appendix B) and SAIC HP-03. (Appendix C) Army Regulation 11-9 of the Army Radiation Safety Program (also included in Appendix B) is considered to be an alternative to NUREG 1.86; however, NUREG 1.86 surface radioactivity values are more conservative and therefore will be utilized.

Unconditional site release of equipment will require 100% survey of all accessible surface areas that had the potential to contact radioactive materials. Process knowledge and survey results will be used to determine if an item needs additional monitoring (i.e., volumetric, non-accessible areas, etc.) to meet conditional or unconditional release as determined by the site RPM.

In the event that elevated activity in excess of the instrument MDA is identified, a reasonable precaution will be taken to reduce or remove the contaminant in accordance with HP-10 "Personnel and Equipment Decontamination" and HP-02 "ALARA Program" presented in Appendix C.

All personnel that handle or have the potential to come into contact with equipment or supplies that requires radiological survey for release will be required to complete a personal survey, performed by an HPT, prior to entering designated clean areas or site exit. All site personnel will be surveyed to non-detectable limits (less than instrument MDA) to ensure contamination control. Personnel decontamination events will be performed and documented in accordance with HP-10.

Unused items of PPE, equipment and supplies which have not been in contact with sampled site media will not be surveyed.

3.0 EQUIPMENT

Three categories of equipment are present at the site; Contract purchased equipment (Government-owned), Maxim-owned equipment, and vendor-supplied leased equipment. All equipment is currently stored in two leased 40-foot shipping containers located east of the office trailer or the leased office trailer itself. The location of the northern shipping container, designated SC-1 and the southern shipping container, designated SC-2 is shown on Figure 1. These containers are located east of the office trailer. SC-1 was used for "dirty" storage (i.e., pumps, hoses, generators, and fuel) and as an accumulation point for IDW such as PPE, used Whale pump strings, expendable sampling equipment (bailers, tubing, filters, etc) prior to transport to the IDW storage pad for containerization in 55-gallon drums. SC-2 was used for "clean" storage (i.e., sampling equipment, sample containers, tubing, new Whale pumps, coolers, and PPE).

Maxim will submit an electronic daily field report to Dennis Rimer for submission to the project team. Additionally, if an item cannot be released for unrestricted use, the Site Superintendent (Dennis Rimer) will be notified and the item will be reported in the daily report along with the ultimate disposition of the item (conditional release or disposed of as IDW). At the completion of the demobilization activities, Maxim will submit a summary of equipment in each category and the final disposition of the items to the USACE-Buffalo District.

3.1 Equipment Disposition Options

An inventory of equipment and the proposed final disposition of these items are presented in Table 1. Several equipment disposition options are possible. These options are dependent upon the results of the radiological survey activities and anticipated future use of the equipment:

- 1) Unconditional release of leased and rented equipment will require a 100% survey of accessible areas. These items will be decontaminated if necessary to meet unconditional release limits or ALARA, unconditionally released from the site and returned to the respective owners of the equipment. Any leased equipment or rented equipment which can not be released for unrestricted use would have to be purchased from the equipment supplier and retained at the NFSS or disposed of as IDW.
- 2) Contract-procured equipment or materials (Government-owned) will be surveyed and either unconditionally or conditionally released based on the radiological survey results. Government-owned equipment or materials which are determined to be unconditionally releasable will be available for future use by the USACE at the NFSS or other USACE sites. Government-owned unconditionally released equipment will remain at the NFSS facility unless an alternative storage location is identified by the USACE-Buffalo District. Government-owned equipment which cannot be unconditionally released must be left at the NFSS or disposed of as IDW. Maxim does not anticipate that a significant portion of the equipment currently stored in the shipping containers will require disposal as IDW.

3) Equipment or materials which are determined to be unconditionally releasable based on the results of radiological survey activities and have no anticipated future use by the USACE-Buffalo District at other sites may be disposed of as solid waste.

4) Maxim-owned equipment which is unconditionally released will be transported back to Maxim's St. Louis, Missouri facility. Non-releasable Maxim-owned equipment will either be disposed of as solid IDW, or at the discretion of the USACE-Buffalo District, left on-site for use during future on-site activities.

5) Any radiologically impacted equipment or materials that cannot be feasibly or practically decontaminated (i.e. fixed, non-removable contamination in excess of release limits, or decontamination costs exceed the cost of the equipment purchase price) will remain at the NFSS for future site-related use. As an alternative, these items may be disposed of as solid IDW.

3.2 Government-owned Equipment

Equipment which was purchased under contract DACW 49-97-D-001, Delivery Order 12 is the property of the United States Government. The following sections describe the types of government-owned equipment present at the NFSS and the recommended disposition of these materials.

Refrigerators and Freezer

Two refrigerators and one chest freezer are present in the Office trailer located at the NFSS. One refrigerator was used for the storage of employee food items and beverages. The second refrigerator was used for to hold soil and water samples prior to shipment. The freezer was used to store ice for use in sample shipment to the analytical laboratory. Maxim entered into a rental agreement with Rent-A-Center to procure these items for use at the site. Under the terms of this agreement, these items become the property of the renter after the term of the rental exceeded a set period.

The interior of will be surveyed for radiological contamination. It is intended that the sample refrigerator be surveyed for unconditionally release from the NFSS. Based on process knowledge, the food storage refrigerator and freezer need not be surveyed prior to release from the site. This equipment is the property of the USACE-Buffalo District and will be left on-site.

Miscellaneous Surplus Sample Containers

Over the course of the NFSS sampling effort, numerous extra sample containers have accumulated. These containers are currently stored in SC-2. These sample containers, supplied by the analytical services subcontractor General Engineering Laboratories (GEL), are the property of the U.S. Government. Containers which contain a small quantity of acid preservative will be rinsed and neutralized with water to a pH in the 6-9 range and discharged to the sink in Building 429. The empty sample containers will be disposed as a solid waste at the Modern Landfill.

PPE: Tyvek Coveralls, Nitrile and Neoprene Gloves, Over Boots (various sizes)

Unused expendable PPE items which were acquired during the course of the project i.e., Tyvek coveralls, overboots, gloves, earplugs, face shields, cotton gloves, safety glasses, face shields and hard hats are currently stored in SC-2 and the office trailer. These materials are the property of the U.S. Government and will be left on-site for use by USACE personnel during future on-site activities.

Decontamination Equipment

Approximately 400 feet of garden hose, procured to supply tap water to the decon pad during decontamination activities is currently stored in SC-1. Additionally, pressure treated 4"X4" posts were installed along the north and south perimeter of the decon pad (Figure 1) for use as supports for polyethylene tarp spray shields. The garden hose and posts will be left at the site for future use by the USACE-Buffalo District.

Surplus Miscellaneous Equipment

Surplus equipment related to sample collection such as spoons, bowls, hose clamps; plastic sheeting wire nuts, wire ties and pump tubing used for the preparation of disposable Whale Pump strings are currently stored in SC-2. Fifteen-gallon polyethylene carboys were used for the shipment of de-ionized water and containerization of monitoring well purge water. Approximately fifty-seven of these carboys are currently stored in SC-1. Four plastic modular shelving units used for the storage of clean equipment are present in SC-2. Submersible electric tank heaters were purchased to prevent stored IDW liquids from freezing and rupturing the polyethylene IDW storage tanks. These units are currently in use in the Liquid IDW storage tanks located in the IDW containment cell. Approximately 500 feet of electrical extension cords used to supply power to the shipping containers, tank heaters, and other electrically-powered equipment used during site activities are present on the facility.

Four 15-gallon carboys which were previously used for storage of de-ionized water will be retained by the USACE-Buffalo District for future use. The remainder of the carboys will be cut with an electric reciprocating saw to reduce the volume of the carboys and facilitate containerization in polyethylene soil tote bags. These carboys will be disposed of as IDW at the WCS, Texas facility. It is anticipated that all other items identified above will be left on-site for use by the USACE-Buffalo District. If the USACE-Buffalo District does not wish to retain these materials for future on-site site, they will be disposed of as solid waste or retained by Maxim following radiological release by HP support personnel.

Telephones and Fax machine and Miscellaneous Office Supplies

Two telephones and one fax machine which were purchased with contract funds are present in the office trailer. Other miscellaneous office supplies such as copy paper, file folders, dry erase board, ink pens, paper clips, pencils and electrical multi-strip extension cords are also present in the office trailer. These items have never entered a controlled or contaminated area; therefore do not require survey prior to release from the site. These items are the property of the U.S. Government and will be left at the site.

Small Sample Refrigerator

During the trenching activities at Vicinity Property G (VPG), a decision was made to retain several samples of soil and laboratory debris until a decision on sample analysis requirements was made. In order to reduce potential radiation exposures to site workers and visitors, a small apartment-sized refrigerator was purchased and placed in SC-1. This refrigerator is currently stored in SC-1 and is the property of the U. S. Government. It is anticipated that this refrigerator will be left on-site for use by USACE personnel during future on-site activities.

3.3 Maxim-owned Equipment

This equipment was supplied by Maxim and not purchased through contract DACW 49-97-D-001, Delivery Order 12. The following Maxim-owned equipment currently remains on the site: portable light stand, power inverter, microwave oven, desktop printer, Weber grill and two polyethylene truck tanks. The desk top printer and Weber grill have never entered a controlled or contaminated area; therefore do not require survey prior to release from the site. The Weber grill and microwave oven will be disposed of as a solid waste at the Modern Landfill.

The portable light stand, power inverter and portable truck tanks will be scanned for radiological contamination during the demobilization activities. If the portable light stand and power inverter are determined to be unconditionally releasable from the site they will, these items will be removed from the facility and transported to Maxim's St. Louis facility. If these items are determined to be radiologically contaminated and decontamination is not deemed to be feasible, these materials will be disposed as IDW. The polyethylene truck tanks will be left at the NFSS for future site use.

3.4 Leased/Rented Equipment

The following sections describe the Leased/Rented Equipment and proposed disposition of the equipment following completion of the demobilization activities at the site. A list of vendors is provided in Table 2.

Office Trailer

To provide a base of operations, Maxim leased an office trailer from GE Capital-Modular Space. The trailer served as a communication center (with telephone, fax, and computer); shelter during foul weather; and meeting and lunch area. This trailer is 12' X 64' in size and is blocked and anchored in place. The office trailer is located south of Building 429 immediately north of the inside security fence. Also included in the lease agreement with GE-Capital-Modular Space are 14 stackable chairs and one folding table and two stair sets.

Storage Containers

Two 40' shipping containers were leased from A-Verdi and delivered to the site. These containers, labeled SC-1 and SC-2, are located east of the office trailer as shown on Figure 1. SC-1 was used for "dirty" storage (i.e., pumps, hoses, generators, and fuel) and as an accumulation point for IDW such as PPE, used Whale pump strings, expendable sampling equipment (bailers, tubing, filters, etc) prior to transport to the IDW storage pad for containerization in 55-gallon drums. SC-2 was used for "clean" storage (i.e., sampling equipment, sample containers, tubing, new Whale pumps, coolers, and PPE). These units will be

scanned for radiological contamination and decontaminated as appropriate prior to release from the site.

Photocopy Machine

A photocopy machine which is leased from Nate's Typewriter and Computer is currently located in the NFSS office trailer. Use of the copy machine will be required during the liquid and solid IDW removal tasks. During or immediately following completion of the demobilization task, the photocopy machine rental agreement will be terminated and the equipment will be removed from the site.

4.0 UTILITIES

The following sections describe the utilities that are currently provided to the office trailer and the liquid IDW storage area.

Electricity

Electrical service can not be terminated until the completion of the IDW water disposal due to use of the ground-fault circuit interrupter (GFCI) outlets for operation of the IDW water tank heaters. Following disposal of the IDW water, service to the trailer and will be disconnected by an electrical contractor (Ferguson Electric). Ferguson Electric estimated that approximately two hours will be required to complete disconnection activities. Electrical equipment associated the extension of service from Building 429 to the wooden utility pole located near the west end of the office trailer and the GFCI outlets located on the same wooden utility pole, will remain the property of the U. S. Government and will be left in place.

Telephone

Telephone, and fax service to the office trailer is currently provided by the local phone company, Verizon. Local phone service will be terminated following completion of the demobilization activities.

5.0 VENDOR SUPPLIED SERVICES

Support services at the NFSS such as solid waste disposal, drinking water, security services phone and portable toilets were procured from various vendors in the Lewiston/Niagara Falls Area. Contact number and account information for these vendors is provided in Table 2. Currently the following vendors are supplying services:

- 1) Modern Disposal Service - dumpster
- 2) Mountain Valley Water - drinking water and drinking water dispenser
- 3) EZ Portable Toilets - portable toilet rental and servicing.

Security services were discontinued on January 22, 2005.

During or immediately following completion of the demobilization task, the services provided by these vendors will be terminated and any equipment associated with services provided will be removed from the site.

6.0 IDW STORAGE

6.1 Liquid IDW Storage

Storage Tanks

In order to accommodate the storage of large quantities of liquid investigation derived wastes (IDW) such as well development water and decon fluids, two 1,000 and six 1,500 gallon polyethylene storage tanks were purchased and delivered to the site. These tanks are currently being used for the storage of various liquid IDW awaiting acceptance and disposal at a Publicly Owned Treatment Plant (POTW). The tanks will be cleaned following removal, filtration and disposal of the liquid IDW during the liquid IDW Disposal Task. The interior of the IDW storage tanks will be cleaned of all solids with a high pressure wash, subject to three tap water rinses. The tanks will be then be inverted and free water allowed drained. When dry, the interior of the tanks will be surveyed for unconditional release from the NFSS. The tanks will be righted and the hatchways will be sealed with polyethylene to prevent water from entering the tanks. The exterior of the tanks will be surveyed for radiological contamination and decontaminated as required based on the survey results. These tanks are the property of the U.S. Government and will be surveyed for unconditional release and future use by the USACE-Buffalo District.

Tank heaters are currently in use in the liquid IDW tanks to prevent freezing of the IDW liquids. The tank heaters are the property of the U.S. Government. Following disposal of the IDW liquids, the tank heaters will be removed from the tanks and surveyed for radiological contamination. If survey results indicate that the tank heaters can be unconditionally released from the NFSS, these heater may be used by the USACE-Buffalo District at the NFSS or other sites. If survey results indicate that unconditional site release is not possible, the heaters will be left at the NFSS for future site use. If future use of these heaters is not desired, they will be disposed of as solid IDW.

Liquid IDW Containment Cell

Liquid IDW (consisting of monitoring well development water, purge water, and decontamination water), is currently stored in 1,000 and 1,500 gallon polyethylene tanks at a location south of the office trailer as shown on Figure 1. The tanks were placed in a secondary containment cell constructed of dimensional lumber (2" X 4"), particle board, and plywood and lined with a minimum of 12 mils of polyethylene plastic sheeting or poly-tarps. A layer of ¼ inch Styrofoam insulation was placed beneath the polyethylene lining to cushion the bottom of the tanks from the asphalt pavement and prevent perforation of the polyethylene lining beneath the tanks.

Following the removal of the liquid IDW and cleaning and removal of the tanks from the liquid IDW containment cell, the cell will be dismantled and scanned for radiological contamination. Lumber will be retained on-site. Styrofoam and plastic sheeting or polytarps will be placed in large polypropylene fabric bags or similar containers and shipped as IDW to Waste Control Specialists, Andrews TX.

6.2 Solid IDW

Solid IDW (consisting of drums of soil, PPE, and temporary well construction materials) are stored on the former foundation pad of Building 430 as shown on Figure 1. The drums are palletized (generally four drums to a pallet) and covered with polyethylene tarps to prevent corrosion and water accumulation on the drum lids. Nylon rope was used to secure the tarps to the pallets and drums.

The drums will not be removed from the pallets during loading for shipment. During drum staging activities conducted prior to loading for shipment, tarps will be removed from the drums containerized in disposable woven polyethylene soil tote bags and disposed of as IDW. Maxim recommends that serviceable tarps be retained for use on-site. Rope used to secure tarps around the drums will be disposed of as IDW.

During the investigation of Building 401, Maxim collected concrete cores to assess radiological and chemical impacts to the Building 401 floors and the subsurface beneath the building. These cores were transported to the Maxim St. Louis, Missouri facility for crushing and sample preparation prior to sample shipment to GEL. These cores are currently being stored at Maxim's St. Louis facilities. Maxim intends to transport these concrete cores to the NFSS for disposal as IDW.

7.0 FENCES

The north-south trending fence line which bisects the NFSS was cut across each roadway and left open for the duration of the remedial investigation. The fence was cut at the nearest post on one side of the roadway and rolled to the other side of the roadway. Any fence posts located in the roadway were removed or cut flush with the ground. The opening of this internal fence line (not the site boundary fence) did not compromise security of the site. Maxim recommends that these fence openings be left open to allow for access to the entire site.

8.0 MANPOWER REQUIREMENTS/PERSONNEL RESPONSIBILITIES

For the demobilization task, Maxim will mobilize two people to the site. These will include the Site Manager (for demobilization) and an Environmental Scientist who will also act as the Site Safety and Health Manager. Additional manpower will be mobilized for liquid IDW filtration/disposal and solid IDW disposal.

9.0 EQUIPMENT NEEDS

Based on the results of radiological scanning, decontamination of equipment may be required prior to release from the site. On an as-needed basis, decontamination equipment such as oven cleaner, garden-type sprayers, paper towels, scrub brushes and a rented steam cleaner or pressure washer will be used to decontaminate equipment or materials. Based on the large volume of building materials from the liquid IDW containment cell which will likely be disposed of as solid waste, a 20 cubic yard dumpster will be obtained from Modern Landfill to facilitate consolidation of these materials for disposal.

10.0 PROPOSED SCHEDULE OF DEMOBILIZATION ACTIVITIES

The proposed schedule for demobilization provides for an overlap of demobilization activities with the Liquid IDW Disposal Task and the Drum Removal Task. This will allow for disposal of any equipment or materials which are non-releasable for unrestricted use to be disposed of as IDW and also allows any decontamination fluids generated during demobilization activities to be disposed of concurrently with the liquid IDW present at the site. The generation of liquid IDW will be minimized to the extent practicable during demobilization activities. Maxim has anticipated that the demobilization activities will be performed concurrently with the IDW disposal tasks. The proposed schedule is presented in Table 3.

TABLES

Table 1
Inventory and Proposed Disposition of Equipment

Property of the U.S. Government (1)

Miscellaneous Surplus Sample Containers[□]
 PPE: Tyvek Coveralls, Nitrile and Neoprene Gloves, Over Boots (various sizes)[□]
 Approximately 400' of garden hose⁺
 6 Polyethylene 1500-gallon IDW tanks⁺
 2 Polyethylene 1000-gallon IDW tanks⁺
 8 submersible tank heaters⁺
 Approximately 2 boxes of new, unused Teflon bailers[□]
 4 Modular shelf units[□]
 Hose clamps, wire nuts, wire ties[□]
 1 Fax machine[□]
 2 Telephones (one cordless)[□]
 1 small sample refrigerator⁺
 5 folding tables⁺
 Dry Erase Board[□]
 Approximately 500 feet of electrical extension cords⁺
 6-8 Multi-strip extension cords⁺
 Miscellaneous Office Supplies (copy paper, file folders, paper clips, ink pens and pencils)[□]
 Approximately 57 15-gallon Carboys - 4 carboys to be retained by USACE-Buffalo District, remainder will be disposed of as IDW.
 Drum storage area tarps⁺
 Containment cell building materials - Lumber to be retained on-site, Styrofoam and polyethylene tarps will be disposed of as IDW.

Maxim-Owned Equipment (2)

1 Portable Light Stand[#]
 1 Power Inverter[#]
 2 polyethylene truck tanks⁺
 Desktop printer[□]
 Microwave oven[□]
 Weber Grill[□]

Vendor Supplied Rental (3)

1 Office trailer w/two step units[▼]
 2 Forty-foot Shipping Containers[▼]
 1 folding table[▼]
 14 stackable chairs[▼]
 Photo copy machine[▼]
 Portable Toilets (2)[▼]

(1) Contract-procured equipment or materials (Government-owned) will be surveyed and either unconditionally or conditionally released based on the radiological survey results. Government-owned equipment or materials which are determined to be unconditionally releasable will be available for future use by the USACE at the NFSS or other USACE sites. Government-owned unconditionally released equipment will remain at the NFSS facility unless an alternative storage location is identified by the USACE-Buffalo District. Equipment or materials which are determined to be unconditionally releasable based on the results of

radiological survey and have no anticipated future use by the USACE-Buffalo District at the NFSS or other sites may be disposed of as solid waste.

Government-owned equipment which cannot be unconditionally released must be left at the NFSS or disposed of as IDW. Maxim does not anticipate that a significant portion of the equipment currently stored in the shipping containers will require disposal as IDW.

(2) Maxim-owned equipment which is unconditionally released will be transported back to Maxim's St. Louis, Missouri facility. Non-releasable Maxim-owned equipment will either be disposed of as solid IDW, or at the discretion of the USACE-Buffalo District, left on-site for use during future on-site activities.

(3) Unconditional release of leased and rented equipment will require a 100% survey of accessible areas. These items will be decontaminated if necessary to meet unconditional release limits or ALARA, unconditionally released from the site and returned to the respective owners of the equipment. Any leased equipment or rented equipment which can not be released for unrestricted use would have to be purchased from the equipment supplier and retained at the NFSS or disposed of as IDW.

■ Items(s) will not be surveyed. Based on process knowledge items will be unconditionally released to the USACE. If equipment is Maxim owned, equipment will be removed from the site or disposed of as solid waste.

† Item will not be surveyed, based on process knowledge these items will be disposed of as IDW.

+ Item(s) will be surveyed and depending on survey results, items will either be released for unconditional or conditional use by USACE, or disposed of as IDW. Disposal of some items as IDW will require saw-cutting in order to containerize the materials.

◆ Item(s) will be surveyed, decontaminated as required based on scanning results, released for unrestricted use by USACE.

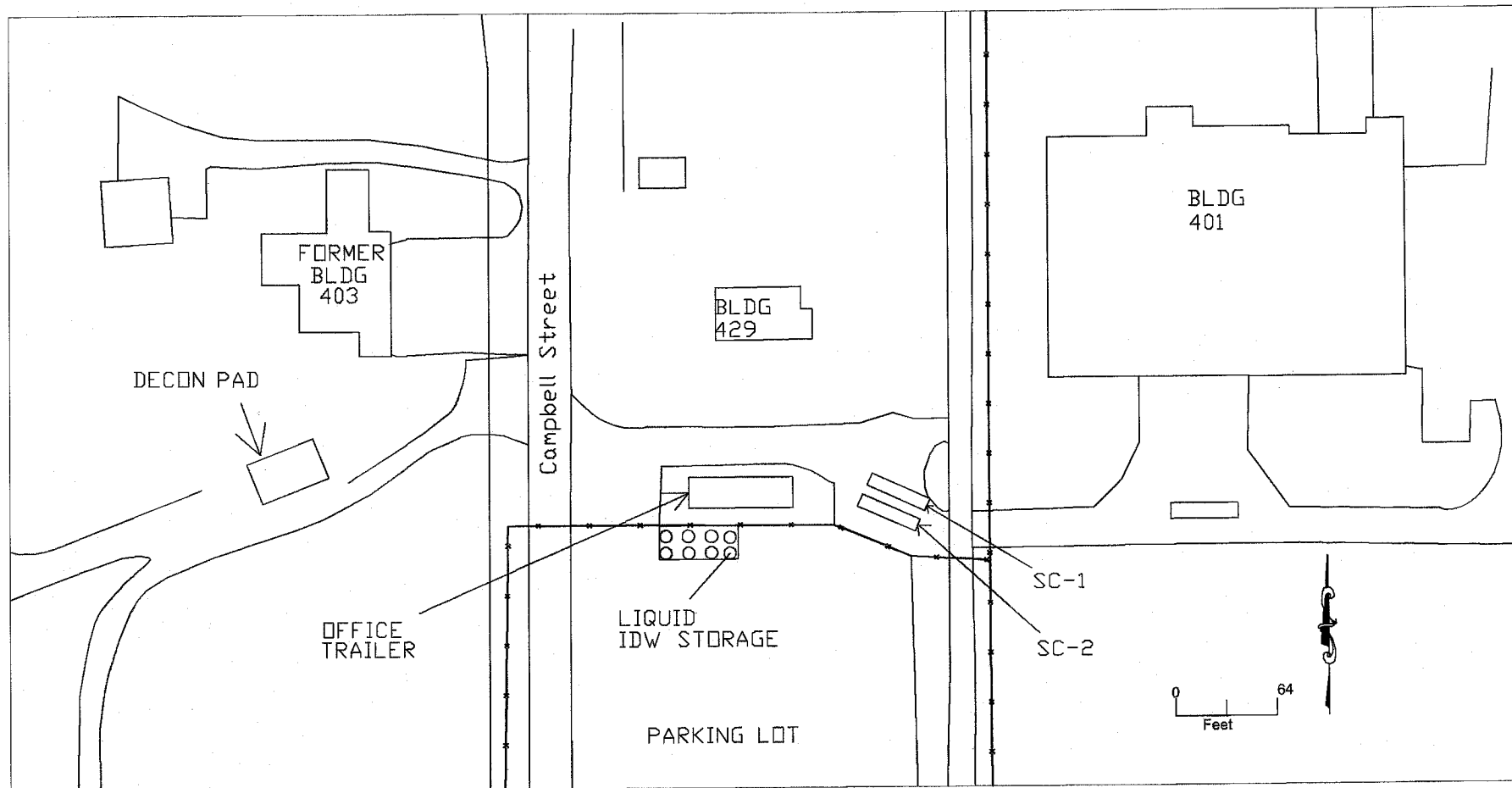
Item(s) will be surveyed, decontaminated as required based on survey results, released for unconditional use and removed from the site by Maxim. If unconditional release of the item(s) is/are not possible, the item(s) will be left at the NFSS for future use at the NFSS or disposed of as IDW.

▼ Item(s) will be surveyed and released for unrestricted use and returned to vendors. If radiologically impacted and decontamination to below unconditional release limits is not possible, item will be disposed as IDW or retained for use at the NFSS after purchase by the USACE.

| Table 2 | | | |
|--|--------------------------|------------------------------|--|
| Vendor-Supplied Service Providers | | | |
| Vendor Name | Service Provided | Phone Number | Account Number |
| A-Verdi | Shipping Container Lease | 800-248-3734 | Container # 3030* Lewiston and 4037*Lewiston |
| EZ Portable Toilets | Portable Toilet Service | 585-247-7440 | Location# 2574 |
| GE Capital | furniture lease | 800-523-7918 | 209338631640 |
| Modern Disposal Service | Dumpster | 800-662-0012 | 17076-001 |
| Mountain Valley Water | Bottled Water Supplier | 716-695-6884 | 4778 |
| Nates Typewriter and Computer | Copy Machine | 716-282-0088 | 3144260880 |
| Verizon | Phone Service | 800-345-6563 or 800-890-6886 | 7167549141-532-26-7 |

| Table 3 IDW and Demobilization Schedule | | | | | | | | | | | | |
|--|--------|--------------------------------|--------------------|---|--|----------------------------|--|---|----------------------|---------------|---------------|--------|
| Task | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 | Day 9 | Day 10 | Day 11 | Day 12 |
| IDW Filtration - 3 people, 7days | Travel | Vac Truck tanks 2, 3, 6, and 7 | Filter/Clean Tanks | | | Vac truck remaining liquid | Travel | | | | | |
| Task 6 Solid IDW Disposal - 3 People, 4 days | | | Travel | | Remove tarp covers/ Soil drum free water solidification, Scan and label drums. | Scan and label drums. | Scan label and Stage Drums for shipping. | Stage drums Prepare documentation of drums for shipping | Load and ship | Load and ship | | Travel |
| Task 3 Demob - 4 People, 10 days | | | Travel | Move Clean Equipment to designated Storage location | Scan/Decon SC-2 | Scan/Decon SC-1 | Move USACE retained equipment to onsite storage/ Decon | Dismantle Liquid IDW containment | Disconnect utilities | Load and ship | Load and Ship | Travel |

FIGURE



NFSS Site Office Facility Plan

MAXIM Technologies
A DIVISION OF TERRA TECHNOLOGY

| | |
|---------------------|------------------|
| PROJECT NO. 5450057 | FIGURE NO. 1 |
| SCALE: AS SHOWN | DATE: 02-18-2005 |
| DRAWN BY: DWC | CHECKED BY: GD |

APPENDIX A
EQUIPMENT AND MATERIAL RELEASE LIMITS

Appendix A
Health Physics Technical Work Record (TWR)

Location: Niagara Falls Storage Site, Lewiston N.Y.
Number/Rev: NF-00-01/01
Name: Determination of Weighted Release Limits

PURPOSE

The purpose of this TWR is to establish equipment/material radiological release limits that will be used during the demobilization efforts at the NFSS.

SOURCE TERM

The source term information used is based on site analytical results. Table 1 isotopic fractional isotopic abundance was calculated from the mean values of the data, and will be used to determine the weighted surficial release limit for the demobilization activities.

Because the MED/AEC waste is commingled with the soil, background values are not subtracted in Table 1. Release limits are based on NRC Regulatory Guide 1.86.

Table 1, Niagara Falls Storage Site Regulatory Guide 1.86 Alpha Release Limits

| Radionuclide | Activity Percentage | Total Limit | Removable Limit |
|--------------|---------------------|-------------|-----------------|
| U-238 | 14% | 5000 | 1000 |
| U-234 | 14% | 5000 | 1000 |
| U-235 | <1% | 5000 | 1000 |
| Th-230 | 13% | 100 | 20 |
| Ra-226 | 59% | 100 | 20 |

Limits taken from U.S. NRC Regulatory Guide 1.86, *Termination of Operating Licenses for Nuclear Reactors* (U.S. NRC, June 1974).

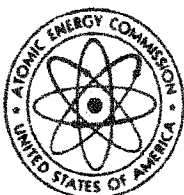
CONCLUSION

A weighted release limit of 100 dpm/100 cm² fixed/removable alpha and 30 dpm/100 cm² removable alpha was derived from the limits contained in Table 1 in accordance with the following calculation:

Weighted Release Limit =

$$\frac{1}{f_{238} / \text{limit}_{238} + f_{234} / \text{limit}_{234} + \text{etc...}}$$

APPENDIX
NUCLEAR REGULATORY COMMISSION
REGULATORY GUID 1.86



June 1974

U.S. ATOMIC ENERGY COMMISSION

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

REGULATORY GUIDE 1.86

TERMINATION OF OPERATING LICENSES FOR NUCLEAR REACTORS

A. INTRODUCTION

Section 50.51, "Duration of license, renewal," of 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that each license to operate a production and utilization facility be issued for a specified duration. Upon expiration of the specified period, the license may be either renewed or terminated by the Commission. Section 50.82, "Applications for termination of licenses," specifies the requirements that must be satisfied to terminate an operating license, including the requirement that the dismantlement of the facility and disposal of the component parts not be inimical to the common defense and security or to the health and safety of the public. This guide describes methods and procedures considered acceptable by the Regulatory staff for the termination of operating licenses for nuclear reactors. The Advisory Committee on Reactor Safeguards has been consulted concerning this guide and has concurred in the regulatory position.

B. DISCUSSION

When a licensee decides to terminate his nuclear reactor operating license, he may, as a first step in the process, request that his operating license be amended to restrict him to possess but not operate the facility. The advantage to the licensee of converting to such a possession-only license is reduced surveillance requirements in that periodic surveillance of equipment important to the safety of reactor operation is no longer required. Once this possession-only license is issued, reactor operation is not permitted. Other activities related to cessation of operations such as unloading fuel from the reactor and placing it in storage (either onsite or offsite) may be continued.

A licensee having a possession-only license must retain, with the Part 50 license, authorization for special nuclear material (10 CFR Part 70, "Special Nuclear Material"), byproduct material (10 CFR Part 30, "Rules of General Applicability to Licensing of Byproduct Material"), and source material (10 CFR Part 40, "Licensing of Source Material"), until the fuel, radioactive components, and sources are removed from the facility. Appropriate administrative controls and facility requirements are imposed by the Part 50 license and the technical specifications to assure that proper surveillance is performed and that the reactor facility is maintained in a safe condition and not operated.

A possession-only license permits various options and procedures for decommissioning, such as mothballing, entombment, or dismantling. The requirements imposed depend on the option selected.

Section 50.82 provides that the licensee may dismantle and dispose of the component parts of a nuclear reactor in accordance with existing regulations. For research reactors and critical facilities, this has usually meant the disassembly of a reactor and its shipment offsite, sometimes to another appropriately licensed organization for further use. The site from which a reactor has been removed must be decontaminated, as necessary, and inspected by the Commission to determine whether unrestricted access can be approved. In the case of nuclear power reactors, dismantling has usually been accomplished by shipping fuel offsite, making the reactor inoperable, and disposing of some of the radioactive components.

Radioactive components may be either shipped offsite for burial at an authorized burial ground or secured

USAEC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the AEC Regulatory staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

Published guides will be revised periodically, as appropriate, to accommodate comments and to reflect new information or experience.

Copies of published guides may be obtained by request indicating the divisions desired to the U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Director of Regulatory Standards. Comments and suggestions for improvements in these guides are encouraged and should be sent to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Chief, Public Proceedings Staff.

The guides are issued in the following ten broad divisions:

- | | |
|-----------------------------------|------------------------|
| 1. Power Reactors | 6. Products |
| 2. Research and Test Reactors | 7. Transportation |
| 3. Fuels and Materials Facilities | 8. Occupational Health |
| 4. Environmental and Siting | 9. Antitrust Review |
| 5. Materials and Plant Protection | 10. General |

on the site. Those radioactive materials remaining on the site must be isolated from the public by physical barriers or other means to prevent public access to hazardous levels of radiation. Surveillance is necessary to assure the long term integrity of the barriers. The amount of surveillance required depends upon (1) the potential hazard to the health and safety of the public from radioactive material remaining on the site and (2) the integrity of the physical barriers. Before areas may be released for unrestricted use, they must have been decontaminated or the radioactivity must have decayed to less than prescribed limits (Table I).

The hazard associated with the retired facility is evaluated by considering the amount and type of remaining contamination, the degree of confinement of the remaining radioactive materials, the physical security provided by the confinement, the susceptibility to release of radiation as a result of natural phenomena, and the duration of required surveillance.

C. REGULATORY POSITION

1. APPLICATION FOR A LICENSE TO POSSESS BUT NOT OPERATE (POSSESSION-ONLY LICENSE)

A request to amend an operating license to a possession-only license should be made to the Director of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545. The request should include the following information:

- a. A description of the current status of the facility.
- b. A description of measures that will be taken to prevent criticality or reactivity changes and to minimize releases of radioactivity from the facility.
- c. Any proposed changes to the technical specifications that reflect the possession-only facility status and the necessary disassembly/retirement activities to be performed.
- d. A safety analysis of both the activities to be accomplished and the proposed changes to the technical specifications.
- e. An inventory of activated materials and their location in the facility.

2. ALTERNATIVES FOR REACTOR RETIREMENT

Four alternatives for retirement of nuclear reactor facilities are considered acceptable by the Regulatory staff. These are:

- a. **Mothballing.** Mothballing of a nuclear reactor facility consists of putting the facility in a state of protective storage. In general, the facility may be left intact except that all fuel assemblies and the radioactive

fluids and waste should be removed from the site. Adequate radiation monitoring, environmental surveillance, and appropriate security procedures should be established under a possession-only license to ensure that the health and safety of the public is not endangered.

- b. **In-Place Entombment.** In-place entombment consists of sealing all the remaining highly radioactive or contaminated components (e.g., the pressure vessel and reactor internals) within a structure integral with the biological shield after having all fuel assemblies, radioactive fluids and wastes, and certain selected components shipped offsite. The structure should provide integrity over the period of time in which significant quantities (greater than Table I levels) of radioactivity remain with the material in the entombment. An appropriate and continuing surveillance program should be established under a possession-only license.

- c. **Removal of Radioactive Components and Dismantling.** All fuel assemblies, radioactive fluids and waste, and other materials having activities above accepted unrestricted activity levels (Table I) should be removed from the site. The facility owner may then have unrestricted use of the site with no requirement for a license. If the facility owner so desires, the remainder of the reactor facility may be dismantled and all vestiges removed and disposed of.

- d. **Conversion to a New Nuclear System or a Fossil Fuel System.** This alternative, which applies only to nuclear power plants, utilizes the existing turbine system with a new steam supply system. The original nuclear steam supply system should be separated from the electric generating system and disposed of in accordance with one of the previous three retirement alternatives.

3. SURVEILLANCE AND SECURITY FOR THE RETIREMENT ALTERNATIVES WHOSE FINAL STATUS REQUIRES A POSSESSION-ONLY LICENSE

A facility which has been licensed under a possession-only license may contain a significant amount of radioactivity in the form of activated and contaminated hardware and structural materials. Surveillance and commensurate security should be provided to assure that the public health and safety are not endangered.

- a. Physical security to prevent inadvertent exposure of personnel should be provided by multiple locked barriers. The presence of these barriers should make it extremely difficult for an unauthorized person to gain access to areas where radiation or contamination levels exceed those specified in Regulatory Position C.4. To prevent inadvertent exposure, radiation areas above 5 mR/hr, such as near the activated primary system of a power plant, should be appropriately marked and should not be accessible except by cutting of welded closures or the disassembly and removal of substantial structures

and/or shielding material. Means such as a remote-readout intrusion alarm system should be provided to indicate to designated personnel when a physical barrier is penetrated. Security personnel that provide access control to the facility may be used instead of the physical barriers and the intrusion alarm systems.

b. The physical barriers to unauthorized entrance into the facility, e.g., fences, buildings, welded doors, and access openings, should be inspected at least quarterly to assure that these barriers have not deteriorated and that locks and locking apparatus are intact.

c. A facility radiation survey should be performed at least quarterly to verify that no radioactive material is escaping or being transported through the containment barriers in the facility. Sampling should be done along the most probable path by which radioactive material such as that stored in the inner containment regions could be transported to the outer regions of the facility and ultimately to the environs.

d. An environmental radiation survey should be performed at least semiannually to verify that no significant amounts of radiation have been released to the environment from the facility. Samples such as soil, vegetation, and water should be taken at locations for which statistical data has been established during reactor operations.

e. A site representative should be designated to be responsible for controlling authorized access into and movement within the facility.

f. Administrative procedures should be established for the notification and reporting of abnormal occurrences such as (1) the entrance of an unauthorized person or persons into the facility and (2) a significant change in the radiation or contamination levels in the facility or the offsite environment.

g. The following reports should be made:

(1) An annual report to the Director of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545, describing the results of the environmental and facility radiation surveys, the status of the facility, and an evaluation of the performance of security and surveillance measures.

(2) An abnormal occurrence report to the Regulatory Operations Regional Office by telephone within 24 hours of discovery of an abnormal occurrence. The abnormal occurrence will also be reported in the annual report described in the preceding item.

h. Records or logs relative to the following items should be kept and retained until the license is terminated, after which they may be stored with other plant records:

- (1) Environmental surveys;
- (2) Facility radiation surveys,
- (3) Inspections of the physical barriers, and
- (4) Abnormal occurrences.

4. DECONTAMINATION FOR RELEASE FOR UNRESTRICTED USE

If it is desired to terminate a license and to eliminate any further surveillance requirements, the facility should be sufficiently decontaminated to prevent risk to the public health and safety. After the decontamination is satisfactorily accomplished and the site inspected by the Commission, the Commission may authorize the license to be terminated and the facility abandoned or released for unrestricted use. The licensee should perform the decontamination using the following guidelines:

a. The licensee should make a reasonable effort to eliminate residual contamination.

b. No covering should be applied to radioactive surfaces of equipment or structures by paint, plating, or other covering material until it is known that contamination levels (determined by a survey and documented) are below the limits specified in Table I. In addition, a reasonable effort should be made (and documented) to further minimize contamination prior to any such covering.

c. The radioactivity of the interior surfaces of pipes, drain lines, or ductwork should be determined by making measurements at all traps and other appropriate access points, provided contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement should be assumed to be contaminated in excess of the permissible radiation limits.

d. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated in excess of the limits specified. This may include, but is not limited to, special circumstances such as the transfer of premises to another licensed organization that will continue to work with radioactive materials. Requests for such authorization should provide:

(1) Detailed, specific information describing the premises, equipment, scrap, and radioactive contaminants and the nature, extent, and degree of residual surface contamination.

(2) A detailed health and safety analysis indicating that the residual amounts of materials on surface areas, together with other considerations such as the prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

e. Prior to release of the premises for unrestricted use, the licensee should make a comprehensive radiation survey establishing that contamination is within the limits specified in Table I. A survey report should be filed with the Director of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545, with a copy to the Director of the Regulatory Operations Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report should:

- (1) Identify the premises;
- (2) Show that reasonable effort has been made to reduce residual contamination to as low as practicable levels;
- (3) Describe the scope of the survey and the general procedures followed; and
- (4) State the finding of the survey in units specified in Table I.

After review of the report, the Commission may inspect the facilities to confirm the survey prior to granting approval for abandonment.

5. REACTOR RETIREMENT PROCEDURES

As indicated in Regulatory Position C.2, several alternatives are acceptable for reactor facility retirement. If minor disassembly or "mothballing" is planned, this could be done by the existing operating and maintenance procedures under the license in effect. Any planned actions involving an unreviewed safety question

or a change in the technical specifications should be reviewed and approved in accordance with the requirements of 10 CFR §50.59.

If major structural changes to radioactive components of the facility are planned, such as removal of the pressure vessel or major components of the primary system, a dismantlement plan including the information required by §50.82 should be submitted to the Commission. A dismantlement plan should be submitted for all the alternatives of Regulatory Position C.2 except mothballing. However, minor disassembly activities may still be performed in the absence of such a plan, provided they are permitted by existing operating and maintenance procedures. A dismantlement plan should include the following:

- a. A description of the ultimate status of the facility
- b. A description of the dismantling activities and the precautions to be taken.
- c. A safety analysis of the dismantling activities including any effluents which may be released.
- d. A safety analysis of the facility in its ultimate status.

Upon satisfactory review and approval of the dismantling plan, a dismantling order is issued by the Commission in accordance with §50.82. When dismantling is completed and the Commission has been notified by letter, the appropriate Regulatory Operations Regional Office inspects the facility and verifies completion in accordance with the dismantlement plan. If residual radiation levels do not exceed the values in Table I, the Commission may terminate the license. If these levels are exceeded, the licensee retains the possession-only license under which the dismantling activities have been conducted or, as an alternative, may make application to the State (if an Agreement State) for a byproduct materials license.

TABLE I
ACCEPTABLE SURFACE CONTAMINATION LEVELS

| NUCLIDE ^a | AVERAGE ^{b c} | MAXIMUM ^{b d} | REMOVABLE ^{b e} |
|---|--|--|--|
| U-nat, U-235, U-238, and associated decay products | 5,000 dpm α /100 cm ² | 15,000 dpm α /100 cm ² | 1,000 dpm α /100 cm ² |
| Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129 | 100 dpm/100 cm ² | 300 dpm/100 cm ² | 20 dpm/100 cm ² |
| Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133 | 1000 dpm/100 cm ² | 3000 dpm/100 cm ² | 200 dpm/100 cm ² |
| Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. | 5000 dpm β - γ /100 cm ² | 15,000 dpm β - γ /100 cm ² | 1000 dpm β - γ /100 cm ² |

^aWhere surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

^bAs 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 associated with the instrumentation.

^cMeasurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

^dThe maximum contamination level applies to an area of not more than 100 cm².

^eThe amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

Army Regulation 11-9

Army Programs

The Army Radiation Safety Program

Headquarters
Department of the Army
Washington, DC
28 May 1999

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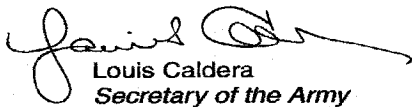
Headquarters
Department of the Army
Washington, DC
28 May 1999

*Army Regulation 11-9

Effective 29 June 1999

Army Programs

The Army Radiation Safety Program



Louis Caldera
Secretary of the Army

History. This is a new regulation.

Summary. This regulation prescribes Army radiation safety policy. It is a consolidation of several regulations that partially covered this policy. It implements DODI 6055.8 and DODI 6055.11. It includes Army policy for the use, licensing, disposal, transportation, dosimetry, accident reporting, safety design, and inventory control of and radiation exposure standards for ionizing and nonionizing radiation sources. This regulation updates policy to be consistent with current Federal radiation safety regulations; simplifies Army radiation authorization, Army radiation permit, and Nuclear Regulatory Commission license application procedures; requires Army radiation authorizations for the use of machine-produced ionizing radiation; and strengthens MACOM and installation radiation safety authority.

Applicability. This regulation applies to the Active Army, the Army National Guard of the

United States, the Army Reserve, and Army contractors. This regulation does not apply to nuclear weapons (AR 50-5).

Proponent and exception authority. The proponent of this Army regulation is the Director of the Army Staff (DAS). The DAS has the authority to approve exceptions to this regulation that are consistent with controlling law and regulation. The DAS may delegate this authority, in writing, to a division chief within the proponent agency in the grade of colonel or civilian equivalent.

Army management control process. This regulation contains management control provisions and identifies key management controls that must be evaluated.

Supplementation. Supplementation of this regulation is prohibited without prior approval from HQDA (DACS-SF), WASH DC 20310-0200.

Suggested improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to HQDA (DACS-SF), WASH DC 20310-0200.

Distribution. This publication is available in electronic media only and is intended for command level C for Active Army and D for Army National Guard of the United States.

*This regulation supersedes AR 40-14, 30 June 1995; AR 40-46, 15 November 1974; AR 385-9, 1 April 1982; and AR 385-11, dated 1 May 1980
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Summary of Change

AR 11-9

Army Programs

The Army Radiation Safety Program

This publication—

- Establishes radiation safety policies and procedures for all ionizing and nonionizing radiation sources used by Army personnel or on Army installations (located throughout).
- Establishes the position of Army Radiation Safety Officer (para 1-4).
- Establishes the Army Radiation Safety Council (para 1-5).
- Provides personnel radiation exposure standards (table 5-1).
- Provides radioactive contamination guidelines and radioactive waste disposal instructions (para 5-3).
- Provides radiation accident and incident reporting policies (chap 6).
- Provides instructions for applying for Nuclear Regulatory Commission licenses, Army radiation authorizations, and Army radiation permits (chap 2).
- Integrates risk management into the Army radiation safety program (chap 1).

Chapter 1

Introduction

1-1. Purpose

This regulation establishes policies and procedures for the use of, licensing, disposal, transportation, safety design, and inventory control of ionizing and nonionizing radiation sources. It also provides radiation exposure standards and dosimetry and accident reporting instructions. Its objective is to assure safe use of radiation sources and compliance with all applicable Federal and DOD rules and regulations.

1-2. References

Required and related publications are listed in appendix A.

1-3. Explanation of terms

Abbreviations and special terms used in this regulation are explained in the glossary.

1-4. Responsibilities

- a. The Assistant Secretary of the Army (Installations and Environment) (ASA(I&E)) establishes overall Army environment, safety, and occupational health policy and maintains general oversight of and serves as advocate for the Army Radiation Safety Program.
- b. The Assistant Secretary of the Army (Manpower and Reserve Affairs) establishes overall Army health and preventive medicine policy and maintains oversight of medical and health aspects of the Army Radiation Safety Program.
- c. The Director of Army Safety (DASAF), Office of the Chief of Staff, Army, will—
 - (1) Provide Army Staff oversight of the Army Radiation Safety Program.
 - (2) Administer, direct, and integrate Army Force Protection risk management (AR 385-10).
 - (3) Chair the Army Radiation Safety Council (ARSC).
 - (4) In coordination with the ASA (I&E), designate, in writing, a qualified nuclear medical science officer (SSI 72A67C) colonel to serve as Army Radiation Safety Officer (Army RSO).
- d. The Commanding General, Army Materiel Command (AMC) will—
 - (1) Control NRC (Nuclear Regulatory Commission) licenses and Army radiation authorizations for Army radioactive commodities.
 - (2) Provide ionizing radiation dosimetry services (at the Army Ionizing Radiation Dosimetry Center (AIRDC)) that meet the requirements of 10 CFR 20.1501(c). The Chief, AIRDC, will—
 - (a) Publish instructions for starting, maintaining, and ending personnel dosimetry services (SB 11-206).
 - (b) Maintain the Army's Central Dosimetry Records Repository (CDRR). The CDRR will archive comprehensive dosimetry records for all Army personnel and for other personnel who use Army dosimetry services. Records will meet the requirements of 10 CFR 20.2106 and 20.2110. Records will include results of bioassays, administrative dose assignments (including copies of documents that make the assignments), and supplementary occupational dose equivalent information (for example, dosimetry information resulting from off-duty employment, "moonlighting") that any radiation safety officer (RSO) reports. In particular, the AIRDC will meet the requirements of 10 CFR 20.2106(f) for long-term retention of these records.
 - (c) Provide quarterly personnel dosimetry reports (automated dosimetry record (ADR)) to RSOs for all personnel who received dosimetry services during the previous calendar quarter. These reports will enable supported RSOs to meet all recordkeeping requirements in 10 CFR 20.2106.

- (d) Provide reporting services that enable RSOs to meet all requirements of 10 CFR 19.13, 29 CFR 1910.1096(n) and (o), and 29 CFR 1926.53(p) and (q).
 - (e) Provide reporting services that meet the requirements of 10 CFR 20.2206.
 - (f) Notify immediately (by telephone or message) the RSO, The Surgeon General (TSG), the major Army command (MACOM) radiation safety staff officer (RSSO), and the Army RSO when AIRDC records indicate that any Army personnel ionizing radiation exposure standard (table 5-1) may have been exceeded.
 - (3) Provide Army low-level radioactive waste disposal services (TM 3-261) (at the Army Low-Level Radioactive Waste Disposal Division, U.S. Army Industrial Operations Command, ATTN: AMSIO-DMW, Rock Island, IL 61299-6000). In addition:
 - (a) Establish procedures for implementing the Army's responsibility as DOD Executive Agent for Low-Level Radioactive Waste Disposal.
 - (b) Maintain records of all Army radioactive waste disposal by burial.
 - (4) Provide the Army radiation test, measurement, and diagnostic equipment (TMDE) program and accredited radiation instrument calibration services (AR 750-43 and TB 750-25).
 - (5) In coordination with CG, U.S. Army Medical Command (MEDCOM), maintain capability to provide on-site radiation safety support following radioactive material contamination accidents and incidents.
 - (6) Assure that foreign military sales of radioactive material (RAM) and items that contain RAM comply with applicable United States regulations and DOD directives.
- e. The Surgeon General will—
- (1) Establish Army radiation safety personnel exposure standards as necessary and provide them to the Army RSO for promulgation (para 1-4I(3)).
 - (2) Approve all radiation dose limits in excess of limits promulgated in this regulation (chap 5) and provide these limits to the Army RSO for promulgation as necessary (para 1-4I(3)).
 - (3) Establish and promulgate Army radiological health guidelines for deployment operations as necessary.
 - (4) Provide Army Staff supervision on the medical and health aspects of exposure to ionizing radiation associated with doses that AIRDC documents.
- f. The Commanding General, Training and Doctrine Command (CG, TRADOC), will—
- (1) Include appropriate radiation safety training in MOS/SSI-producing courses and in unit mission-essential task list (METL) profiles for personnel in MOS/SSIs (military occupational specialty/specialty skill identifier) and TOE units that use radiation and radioactive commodities.
 - (2) Prepare training modules [in coordination with CG, AMC and CG, Army Medical Department Center and School (CG, AMEDDC&S), about protection from U.S. and foreign ionizing and nonionizing radiation sources that may expose Army personnel to radiation during deployment. These modules will be available for radiation safety training of deploying and deployed personnel as necessary.
- g. The Commanding General, U.S. Army Medical Command will—
- (1) Prepare training modules (at AMEDDC&S), in coordination with CG, TRADOC and CG, AMC about health hazards of, protection from, and medical treatment of injuries caused by U.S. and foreign radiation sources that may expose Army personnel during deployment. These modules will be available for radiation safety training of deploying and deployed personnel as necessary.
 - (2) In coordination with CG, AMC, maintain capability to provide on-site medical advice and support following radioactive contamination accidents or incidents (AR 40-13).

- (3) Survey each installation and each NRC license, Army reactor permit, or Army radiation authorization (ARA) holder at least once every three years for compliance with applicable radiation safety and health regulations and guidance (AR 40-5).
 - (4) Establish appropriate occupational health surveillance for personnel occupationally exposed to radiation (AR 40-5).
 - (5) Perform health hazards assessments (HHAs) of commodities and systems that emit radiation or contain RAM as early as practical in development and before fielding (AR 40-10).
 - (6) Provide radiation bioassay services (AR 40-5) that comply with criteria of the American National Standards Institute (ANSI) (see ANSI N13.30). Such services are available from the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) on a cost-reimbursable basis.
 - (7) Provide medical support for investigations of alleged excessive radiation exposures (DODI 6055.11 and DA PAM 40-18).
- h. The Assistant Chief of Staff for Installation Management (ACSIM) will provide oversight for all radioactive contamination surveys conducted in support of base closure or installation restoration activities.
- i. Each MACOM commanding general will—
- (1) Assure installation and subordinate command compliance with conditions of AMC-held radioactive commodity NRC licenses and ARAs. (See para 2-1b.)
 - (2) Designate, in writing, a person to be the MACOM RSSO.
 - (3) Issue ARAs as necessary (para 2-3).
 - (4) As necessary, establish and employ procedures to assure that captured, purchased, borrowed, or otherwise obtained foreign equipment and materiel are surveyed for RAM and that appropriate actions are taken following discovery of any RAM in those items.
 - (5) Concerning the MACOM radiation safety program:
 - (a) Establish review and approval procedures for conducting risk management in accordance with established doctrine (DODI 6055.1).
 - (b) Maintain a central register of risk decisions regarding deviations from the Army standards of this regulation and DA PAM 40-18 within the command.
 - (c) Assure that the complete risk management process is executed before the conduct of all operations.
 - (6) Report excess military-exempt lasers to the Defense Reutilization and Marketing Service for utilization screening within DOD (DOD 4160.21-M-1). (See para 3-2c.)
 - (a) Maintain accountability during the screening period.
 - (b) Losing and gaining organizations will transfer excess directly between themselves.
 - (c) After utilization screening is completed, identify supply system requirements for usable parts. Return required parts to the supply system.
- j. Each installation commander—
- (1) Will designate, in writing, a qualified individual to be Installation RSO.
 - (2) May establish an Installation Radiation Safety Committee (RSC). (See para 1-6.)
 - (3) Will prepare and maintain historical records of location of use or storage of RAM on the installation and the responsible activity for that use or storage (para 2-5).
 - (4) Will maintain documentation listing locations categorized as "RF controlled" and "RF uncontrolled" environments as necessary (DODI 6055.11).
 - (5) Issue Army radiation permits as necessary (para 2-4).
- k. Each commander will—
- (1) Designate, in writing, a person to be the RSO when any of the following is true.

- (a) When a NRC license, Army reactor permit, ARA, or applicable technical publication requires it.
- (b) When para 5-2b requires any personnel in the command to wear AIRDC-issued dosimetry.
- (c) When para 5-2c requires any personnel in the command to participate in a bioassay program.
- (d) When the activity operates, maintains, or services a class IIIb or class IV laser system (section 1.3, ANSI Z136.1) that is not type-classified. The title of the person so designated may be "laser safety officer" (LSO).
- (2) When paragraph (1) above requires the designation of an RSO (or LSO)—
 - (a) Establish written policies and procedures to assure compliance with applicable Federal, DOD, and Army radiation safety regulations and directives. These documents will include emergency reaction plans as necessary and procedures for investigating and reporting radiation accidents, incidents, and overexposures (chap 6).
 - (b) Assure that an internal (for example, the RSO or local acting IG (Inspector General)) or external (for example, the TSG (para 1-4g(3)) or an RSO from another command) agent or agency audits the radiation safety program annually.
- (3) Assure that all personnel occupationally exposed to radiation receive appropriate radiation safety training commensurate with potential hazards from radiation sources they may encounter.
- (4) Maintain an inventory of radiation sources as higher headquarters directs and in accordance with requirements of NRC licenses, Army reactor permits, ARAs, and technical publications.
- (5) For radioactive commodities in the command, establish written policies and procedures as necessary to assure compliance with radiation safety requirements in applicable technical publications. (See para 2-1b(1).)
- I. The Army Radiation Safety Officer will—
 - (1) On behalf of the DASAF, direct the Army Radiation Safety Program.
 - (2) On behalf of the DASAF, develop, manage, and promulgate Army radiation safety policy and guidance.
 - (3) On behalf of TSG, promulgate Federal and Army radiation safety personnel exposure standards within the Army.
 - (4) On behalf of the ASA (I&E), provide HQDA oversight of the DOD Executive Agency for Low-Level Radioactive Waste, to include matters concerning depleted uranium.
 - (5) Resolve radiation safety issues between MACOMs as necessary.
 - (6) Promote good radiation safety practices throughout the Army.
 - (7) Provide radiation safety consultation to the DA staff and MACOM commanders and staffs.
 - (8) Serve as HQDA radiation safety point-of-contact with other DOD and Federal agencies.
 - (9) Represent HQDA on DOD radiation safety committees, working groups, and panels.
 - (10) Coordinate HQDA-level radiation safety plans and responses to radiation emergencies, accidents, and incidents.
 - (11) Integrate risk management into the Army Radiation Safety Program.
- m. Major Army command RSSOs will—
 - (1) Assure MACOM implementation of Army radiation safety policy.
 - (2) Direct the MACOM radiation safety program.
 - (3) Establish MACOM radiation safety policy.

- (4) Provide radiation safety consultation to the MACOM commanding general and staff and to subordinate commanders and staffs.
- (5) Serve as MACOM radiation safety point-of-contact.
- n. Each Installation RSO will—
 - (1) Direct the installation radiation safety program.
 - (2) Assist TOE (Table of Organization and Equipment) units on the installation to meet requirements of NRC licenses and ARAs for radioactive commodities. In particular, the installation RSO will—
 - (a) Assure that TOE unit personnel receive appropriate radiation safety training as necessary.
 - (b) Meet all reporting requirements for accidents or incidents (para 6-2).
 - (c) Assure appropriate inventory control per applicable technical publications and logistics regulations.
 - (3) Notify the AMC RSSO when a building or area that currently or formerly contained radioactive commodities is scheduled for demolition or will no longer contain radioactive commodities. This is to provide AMC radioactive commodity license holders appropriate notice so that they can take decommissioning actions as necessary.
- o. Each RSO (or LSO), including the installation RSO, will—
 - (1) Perform or be responsible for the performance of all radiation safety functions that applicable Federal, DOD, and Army regulations and NRC license, Army reactor permit, and ARA conditions require.
 - (2) Establish plans and procedures for handling credible emergencies involving radiation and radioactive materials. This includes coordination with civilian and military emergency response organizations as necessary.
 - (3) Coordinate with supporting medical personnel to help assure that personnel receive appropriate occupational health surveillance (AR 40-5).
 - (4) For an RSO with laser safety responsibilities, assume the responsibilities of an LSO as listed in section 1.3.2, ANSI Z136.1, except for occupational health responsibilities. (The RSO or LSO will assist the occupational health physician as necessary in meeting laser occupational health responsibilities.)

1-5. Army Radiation Safety Council

- a. The ARSC is the Chief of Staff, Army's advisory body to provide recommendations for Army radiation safety directives and to gather and disseminate information about the status of the Army radiation safety program.
- b. Membership includes the DASAF as chair (para 1-4c(3)), the Army RSO as recorder, the Radiological Hygiene Consultant to TSG, a representative of the ACSIM (Assistant Chief of Staff for Installation Management), a representative of the Army Reactor Office (AR 50-7), and the RSSO from each MACOM, the National Guard Bureau, and the Office, Chief Army Reserve.
- c. The ARSC will meet at least once each 6 month period and at the call of the chair.

1-6. Installation Radiation Safety Committee

- a. The installation RSC is the installation commander's advisory body to gather and disseminate information about the status of the installation radiation safety program.
- b. Membership includes a chair that the commander designates, the installation RSO (recorder), and all tenant RSOs. Installations with large numbers of TOE unit personnel that use radioactive commodities will include military representatives knowledgeable about the TOE units' radiation safety programs.
- c. Each installation RSC will meet at least once each calendar year and at the call of the chair.

1-7. Radiation Safety Committee

When a technical publication or conditions of a NRC license, Army reactor permit, or ARA require an RSC, it will meet the following requirements in addition to any other requirements of applicable directives.

- a. The RSC will meet at least once in each six-month period and at the call of the chair.
- b. A representative of the commander (that is, the commander or someone at the executive level in the organization who is not a radiation user) should chair the RSC. The RSO should be recorder and will be a voting member. The installation RSO may be a non-voting member.
- c. The RSO will provide a copy of the minutes of each RSC meeting to the installation RSO.

1-8. General

- a. Although a commander may assign radiation safety functions and the organizational location of the RSO (or LSO) to anywhere in the organization, the RSO and LSO will have direct access to the commander for radiation safety purposes as necessary.
- b. Keep personnel exposure to ionizing radiation at a level as low as is reasonably achievable (ALARA).
- c. Organizations involved in research, development, testing, and evaluation (RDTE), and in acquisition of equipment that emits radiation or contains RAM will-
 - (1) Identify hazards and controls and incorporate protection measures or identify operational restrictions before fielding.
 - (2) Process residual risks for acceptance per AR 70-1 and AR 385-16 before fielding materiel.
- d. Proponents of technical publications will include radiation safety requirements about siting, operation, and maintenance of commodities and systems that contain RAM or emit radiation, as appropriate.
- e. Army overseas controls of radiation sources will be at least as protective as are Army domestic controls.
- f. Use risk management to identify the options and residual risk for decision by the decision authority. See FM 25-101 and FM 101-5 for a detailed discussion of steps for performing the risk management process.

1-9. Deviations

- a. Limit deviations to only those from Army radiation safety standards and procedures. Deviations from Federal and DOD regulations and standards and from NRC license, Army reactor permit, and ARA conditions, including those implemented in technical publications, are not authorized.
- b. The following personnel may authorize deviations from Army standards and procedures (para a above). (Deviations from personnel radiation exposure standards require TSG's approval.)
 - (1) Each MACOM commanding general.
 - (2) The Superintendent, U.S. Military Academy.
 - (3) The Chief, National Guard Bureau (NGB). (The Chief, NGB may sub-delegate deviation authority to the State Adjutant Generals.)
- c. Only personnel listed in paragraph b above may approve residual risk levels deemed to be high or extremely high. Authority to accept residual risk will be per FM 101-5. For the purpose of this paragraph, the personnel listed in paragraph b above are considered MACOM commanding generals.
- d. Grant deviations for 1 year or less. The respective approval authority may approve deviation renewals provided conditions cited in the original deviation remain the same.
- e. Any accident or mishap occurring under an approved deviation will cause automatic termination of the approval until the respective approving authority completes an investigation and re-validates the deviation.

- f. Forward requests through command channels to HQDA (DACS-SF), WASH DC 20310-0200, for waivers and exceptions to Federal or DOD radiation safety regulations. Prior approval from HQDA (DACS-SF), WASH DC 20310-0200, is required before such requests are sent to a Federal agency or to DOD. Prior approval of TSG is also required before requests for waivers or exceptions to Federal or DOD personnel radiation exposure standards are sent to a Federal agency or to DOD.

Chapter 2

Ionizing Radiation Sources

2-1. General

- a. Materiel. AR 70-1 applies to developmental and non-developmental materiel containing radiation sources.
- b. Compliance with NRC regulations and NRC license, Army reactor permit, and ARA conditions.
 - (1) All Army personnel using RAM will comply with all applicable NRC regulations and conditions of NRC licenses, Army reactor permits, and ARAs held by their own or by another command (paras 2-2a(2) and 2-3b(2)).
 - (2) Holders of NRC licenses, Army reactor permits, and ARAs will assure that all personnel using RAM are aware of applicable regulations and conditions as appropriate.
- c. Shielding and control designs. A qualified expert will design, review, and test shielding of and controls for access to radiation areas, high radiation areas, and very high radiation areas. Perform these procedures per applicable regulations and guidelines before routinely using radiation sources within the area. Each design for high radiation and very high radiation areas will receive an additional independent review by a qualified expert that the MACOM RSSO designates.
- d. Environmental requirements. See 10 CFR 51, 40 CFR, AR 200-1, and AR 200-2 for RAM environmental requirements.

2-2. Nuclear Regulatory Commission licenses

The NRC licenses special, source, and byproduct material in the U.S. and its possessions.

- a. Send applications for new licenses, license renewals, and license amendments through command channels to the MACOM headquarters for forwarding to the NRC.
 - (1) The MACOM commanding general may allow subordinate commanders to forward applications directly to the NRC without MACOM review.
 - (2) When compliance with conditions proposed in the application requires efforts of personnel of another command, obtain a letter of agreement from an authorized representative of that command (paras 1-4f(5) and 2-1b).
 - (3) The applicant or MACOM RSSO will provide a copy of all correspondence relating to applications to Commander, CHPPM, Aberdeen Proving Ground, MD 21010-5422.
 - (4) Tenant commanders will provide a copy of each NRC license, including all amendments, to the installation commander.
- b. Except as specified in paragraphs 1-9f and 2-2a, all Army personnel may communicate directly with the NRC without restriction. However, a person considering such communication should also consider whether information to be requested is obtainable from Army sources and whether information provided or obtained is of interest to the chain of command or other Army organizations.

2-3. Army radiation authorizations

- a. The Army uses ARAs to control specific Army ionizing radiation sources (including machines that emit ionizing radiation) that the NRC does not license. An ARA is required for all such sources except

- (1) Byproduct, source, or special material that the NRC has declared to be license-exempt (10 CFR 30, sections 30.14 through 30.20; 10 CFR 40, sections 40.13 and 40.14; and 10 CFR 70, section 70.14) or generally licenses (10 CFR 31; 10 CFR 40, sections 40.20 through 40.28; and 10 CFR 70, section 70.19).
 - (2) Less than 0.1 microcurie (μCi) [3.7 kilobecquerels (kBq)] of radium.
 - (3) Less than 1 (μCi) (37 kBq) of any naturally occurring or accelerator produced RAM (NARM) other than radium. See paragraph c(2) for other NARM exemptions.
 - (4) For electron tubes containing less than 10 (μCi) (370 kBq) of any NARM radioisotope.
 - (5) For machine-produced ionizing radiation sources not capable of producing a high radiation area or very high radiation area. (For example, medical and dental diagnostic x-ray systems do not require an ARA.) However, commanders will establish policies and procedures to assure that design and use of these excepted sources are in compliance with applicable radiation safety regulations and guidelines and that only appropriately trained and authorized personnel operate them.
 - (6) For Army nuclear reactors and Army reactor-produced RAM that remains at the reactor site. The Army Reactor Office issues Army reactor permits for these sources (AR 50-7).
- b. Forward applications for new ARAs, ARA renewals, and ARA amendments through command channels to MACOM headquarters for approval.
- (1) Use DA Form 3337, Application for Army Radiation Authorization (appendix B) for new ARAs. Use either DA Form 3337 or a memorandum that refers to the original DA Form 3337 for ARA renewals and amendments.
 - (2) When compliance with conditions proposed in the application requires efforts of personnel of another command, obtain a letter of agreement from an authorized representative of that command (paras 1-4l(5) and 2-1b).
 - (3) The MACOM RSSO will assure that applications meet appropriate regulatory and advisory guidelines before sending approval through command channels to the applicant.
 - (4) Tenant commanders will provide a copy of each ARA, including all amendments, to the installation commander.
- c. The Army's ARA program will be similar to the NRC's licensing program. The Army will apply NRC regulations and guidance, modified as necessary, in its control of ARA ionizing radiation sources. Most ARA conditions will be similar to standard NRC license conditions.
- (1) When an ARA applicant possesses or is applying for a NRC license to which ARA RAM use can be linked the application need only reference the NRC license. The issued ARA may reference the NRC license and incorporate the expiration date and all conditions of the NRC license.
 - (2) The NRC's regulations regarding license-exempt concentrations (10 CFR 30.14) and quantities (10 CFR 30.18) will be applied similarly to NARM with respect to ARA exemption upon HQDA approval. Applicants for such exemptions will send supporting documents through command channels to HQDA (DACS-SF), WASH DC 20310-0200.
- d. The MACOM RSSO will provide a copy of all correspondence relating to ARA applications to Commander, CHPPM, Aberdeen Proving Ground, MD 21010-5422.
- e. A sample ARA is in figure 2-1.

2-4. Army radiation permits

Non-Army agencies (including civilian contractors) require an Army radiation permits (ARP) to use, store, or possess ionizing radiation sources on an Army installation (32 CFR 655.10). (For the purpose of this paragraph, ionizing radiation source means any source that, if held or owned by an Army organization, would require a specific NRC license or ARA.)

- a. The non-Army applicant will apply by letter with supporting documentation (para b below) through the appropriate tenant commander to the installation commander. Submit the letter so that the installation commander receives the application at least 30 days before the requested start date of the permit.

- b. The ARP application will specify start and stop dates for the ARP and describe for what purposes the applicant needs the ARP. The installation commander will approve the application only if the applicant provides evidence to show that one of the following is true.
 - (1) The applicant possesses a valid NRC license or Department of Energy (DOE) radiological work permit that allows the applicant to use the source as specified in the ARP application.
 - (2) The applicant possesses a valid Agreement State license that allows the applicant to use RAM as specified in the ARP application, and the applicant has filed NRC Form-241, Report of Proposed Activities in Non-Agreement States, with the NRC in accordance with 10 CFR 150.20. An ARP issued under this circumstance will be valid for no more than 180 days in any calendar year.
 - (3) For NARM and machine-produced ionizing radiation sources, the applicant has an appropriate State authorization that allows the applicant to use the source as specified in the ARP application or has in place a radiation safety program that complies with Army regulations.
 - (4) For overseas installations, the applicant has an appropriate host-nation authorization as necessary that allows the applicant to use the source as specified in the ARP application and has in place a radiation safety program that complies with Army regulations. (Applicants will comply with applicable status-of-forces agreements [SOFAs] and other international agreements.)
- c. All ARPs will require applicants to remove all permitted sources from Army property by the end of the permitted time.
- d. Disposal of RAM by non-Army agencies on Army property is prohibited. However, the installation commander may authorize radioactive releases to the atmosphere or to the sanitary sewerage system that are in compliance with all applicable Federal, DOD, and Army regulations. (The installation commander also will give appropriate consideration to State or local restrictions on such releases.)
- e. A sample ARP is in figure 2-2.

2-5. Decommissioning records

- a. Holders of NRC licenses will establish and maintain decommissioning records in accordance with 10 CFR 30.35(g), 40.36(f), and 70.25(g), as applicable.
- b. Holders of ARAs will establish and maintain decommissioning records similar to those that the NRC requires.
- c. Holders of NRC licenses and ARAs will provide information about the location of use and storage of RAM to the installation commander for the installation RAM history records (para 1-4j(3)).

2-6. Transfer and transport

- a. Transfer radioactive material only to persons authorized to receive and possess it.
 - (1) The holder of the commodity license or ARA will in accordance with technical publications and applicable instructions establish transfer of Army radioactive commodities.
 - (2) For all other RAM, the shipper will obtain and retain appropriate evidence (for example, a copy of the recipient's ARA or NRC or Agreement State license) before shipping the RAM.
- b. Domestic shipments of RAM will be in accordance with applicable NRC (10 CFR 71), Department of Transportation (DOT) (49 CFR), and U.S. Postal Service (39 CFR) regulations and per DOD 4500.9-R (Part II). International shipments of RAM will be per applicable U.S. and International Atomic Energy Agency (IAEA) transportation regulations.
- c. Do not transfer radium and items containing radium to non-DOD agencies or activities (except for disposal as radioactive waste).

2-7. Radioactive waste disposition

- a. Do not bury radioactive waste on Army property.
- b. Coordinate with and obtain the approval of the Chief, Army Low-Level Radioactive Waste Disposal Division, U.S. Army Industrial Operations Command, ATTN: AMSIO-DMW, Rock Island, IL 61299-6000, for all disposal by burial on non-Army property of radioactive wastes.
 - (1) This includes approval for the off-site storage, packaging, shipment, treatment, and final disposition of such unwanted low-level RAM.
 - (2) Project managers of special projects, such as U.S. Army Corps of Engineers environmental restoration projects that generate unusually large amounts of radioactive waste may arrange for radioactive waste disposal as part of the project. However, they will coordinate such actions with the Chief, Army Low-Level Radioactive Waste Disposal Division (para 1-4d(3)(b)).
- c. Release of RAM to the atmosphere or to the sanitary sewerage system will comply with all applicable NRC and EPA regulations. (Also, give appropriate consideration to State or local restrictions on such releases.)
- d. If allowed by applicable regulations or by NRC license, Army reactor permit, or ARA conditions, RAM may be held for decay and subsequent disposal without regard to radioactivity. However, disposal of such material may still require special handling as hazardous waste (AR 40-5).

2-8. Survey instruments

Calibrate radiation survey instruments used for health or safety purposes at least annually using National Institute of Standards and Technology (NIST)-traceable radiation sources (AR 750-43 and TB 750-25).

- a. Some instruments may require more frequent calibration. Consult applicable technical publications and with TMDE personnel for appropriate calibration intervals as necessary.
- b. Calibration sources will be of a type and activity appropriate for the intended use of the instrument.

DEPARTMENT OF THE ARMY
HQ, MACOM
CITY, STATE, AND ZIP CODE

REPLY TO ATTENTION OF

XXXX-XX (11-XXm)

15 January 2000

MEMORANDUM FOR Commander, U.S. Army Activity, Installation, City,
State XXXXX-XXXX

SUBJECT: Army Radiation Authorization (ARA) No. XXX-XX

1. Reference memorandum, HQ, U.S. Army Activity, XXXX-XX-X, 15 November 1999, subject: Application for Renewal of Army Radiation Authorization No. XXX-XX, and enclosures thereto.

2. In accordance with referenced memorandum ARA No. XXX-XX is amended in its entirety to read as follows:

a. Expiration date: 31 January 2002.

b. Description of machine-produced ionizing radiation source and of radioactive material, its chemical and/or physical form, and maximum amount at any one time authorized under this ARA: See enclosure.

c. Authorized use: See enclosure.

d. Radiation Safety Officer: CPT Dan Hamilton.

e. Conditions: See enclosure.

3. Except as specifically provided otherwise in this ARA, conduct your program in accordance with the statements, representations, and procedures in the documents, including any enclosures, listed: referenced memorandum.

4. Our point of contact is Mr. John A. Manfre, MACOM Radiation Safety Staff Officer, DSN XXX-XXXX.

FOR THE COMMANDER:

Encl

as

RUPERT K. THORNE

LTC, GS

Adjutant

Figure 2-1. Sample Army radiation authorization

DEPARTMENT OF THE ARMY INSTALLATION

CITY, STATE, AND ZIP CODE

October 7, 1999

Radiation Safety Office

Mr. Peter H. Myers

President, Myers and Associates, Inc.

19900 W. 49th Street

Austin, Texas 78799

Dear Mr. Myers:

This letter responds to your application dated September 20, 1999, for an Army radiation permit to use a lead-paint analyzer containing no more than 30 millicuries (1.11 gigabecquerels) of cadmium-109. Your application meets the requirements of Army Regulation 11-9 (The Army Radiation Safety Program) and of title 32, Code of Federal Regulations, part 655, section 655.10.

The (Installation) Commander hereby permits you to use the lead-paint analyzer on this installation during the period October 8 through November 22, 1999 in accordance with the terms specified in your application.

You must remove all radioactive material from the installation by the end of the permitted time and provide evidence to indicate that you have done so. We do not permit disposal of radioactive material on Army property. Reapply if you wish to use the lead-paint analyzer on this installation after November 22, 1999.

Sincerely,

John A. Manfre

Radiation Safety Officer

Figure 2-2. Sample Army radiation permit

Chapter 3 Lasers

3-1. General

- a. The design of Army laser safety programs will follow applicable guidelines in ANSI Z136.1 and ANSI Z136.3. Military-exempt laser users will comply with laser safety requirements in applicable technical publications.
- b. Army laser range safety guidance is in AR 385-63 and MIL-HBK 828.
- c. Use a type-classified or commercial class IIIb or class IV laser on an Army range only if the DOD Laser Systems Safety Working Group or CHPPM has performed a prior laser hazard evaluation for that specific kind of laser.
 - (1) A list of approved lasers is in MIL-HDBK-828. Send requests for approval of an unlisted laser through command channels to Commander, CHPPM, ATTN: MCHB-DC-OLO, Aberdeen Proving Ground, MD 21010-5422.
 - (2) Use an unlisted class IIIb and class IV laser on an Army range for RDTE purposes only. Users of such lasers will comply with paragraph a.
- d. Only a qualified expert will design, review, and test controls for access to a class IIIb or IV laser facility. Meet this requirement in accordance with applicable directives before routinely using class IIIb or IV lasers within such a facility. A qualified expert will design or review for adequacy all radiation safety SOPs (standing operating procedures) for each such facility.
- e. Use only class I, class II, and class IIIa lasers indoors on Army installations as hand-held laser pointing devices. Do not use class IIIb or class IV lasers for such purposes.

3-2. Military-exempt lasers

- a. Although exempt, military-exempt lasers will meet as many of the laser safety standards in 21 CFR 1040 as practical.
- b. Proponents of military-exempt lasers will include laser safety requirements in technical publications about siting, operation, and maintenance of these lasers and laser systems.
- c. Dispose of unwanted military-exempt lasers in accordance with DOD 4160.21-M-1. Do not dispose of potentially usable lasers or laser parts through utilization outside DOD, donation, or sale without the prior approval of the Deputy Undersecretary of Defense (Environmental Security) or designee. Send requests for such disposition through supply channels to the commanding general of the appropriate materiel readiness command.
- d. Military-exempt lasers will not include lasers intended primarily for indoor classroom training and demonstration, industrial operations, scientific investigations, or medical applications.
- e. Commanding General, USACHPPM, will maintain records for all military-exempt lasers that indicate types of laser products and manufacturers.

Chapter 4 Radiofrequency electromagnetic radiation

4-1. General

- a. The Army will comply with RF (radiofrequency) radiation safety program elements in DODI 6055.11. Type-classified RF EMR (electromagnetic radiation) emitting system users will comply with radiation safety requirements in applicable technical publications.
- b. Adopt no practice and conduct no operation involving planned exposure of personnel to RF levels in excess of the applicable maximum permissible exposures in DODI 6055.11.
- c. Do not use radiofrequency protective clothing for routine use to protect personnel. Protective equipment, such as electrically insulated gloves and shoes for protection against RF shock and burn or for insulation from the ground plane is permissible where necessary for compliance with induced current limits in DODI 6055.11.

- d. Identify, attenuate, or control potentially hazardous radiofrequency (RF) electromagnetic fields and other radiation hazards associated with Army electronic equipment by engineering design, protective equipment, administrative actions, or a combination thereof.
- e. Proponents of RF electromagnetic radiation-emitting systems will include radiation safety requirements in technical publications about siting, operation, and maintenance of these systems.

4-2. Measurement and evaluation of RF fields

Use measurement procedures and techniques recommended in IEEE C95.3 as basic guidance for evaluating RF hazards.

- a. Commanding General, CHPPM, will maintain records of surveys, reports, calculations, and control measures for each type-classified RF EMR emitter.
- b. Where multiple RF EMR emitters are located in fixed arrangements, RF evaluation data will include a determination of weighted contributions from expected simultaneously operated emitters.

Chapter 5

Radiation safety standards, dosimetry, and recordkeeping

5-1. General

Personnel exposure limits in this chapter do not apply to doses or exposure due to background radiation, due to any medical administration the individual has received, or due to voluntary participation in medical research programs.

5-2. Ionizing radiation

- a. Personnel exposure standards. Table 5-1 summarizes the Federal personnel radiation exposure standards that the Army follows.
 - (1) Unrestricted areas. The dose in any unrestricted area from external sources will not exceed 2 millirems (mrem) [0.02 millisievert (mSv)] in any one hour.
 - (2) Nuclear Regulatory Commission jurisdiction. Standards for exposure to ionizing radiation emitted from NRC-licensed RAM are in 10 CFR 20. The Army also applies these standards to Army reactors and to a combination of exposures to NRC-licensed RAM and other ionizing radiation sources.
 - (3) Occupational Safety and Health Administration (OSHA) jurisdiction. Federal standards for occupational exposure to all other ionizing radiation sources are in OSHA regulations (29 CFR 1910.1096 and 1926.53). However, adhere to NRC standards for all ionizing radiation sources when NRC standards are more protective than OSHA standards.
- b. Dosimetry. All occupationally exposed personnel using AIRDC dosimetry services will wear a whole-body dosimeter (worn closest to the source of radiation exposure on the trunk between the shoulders and waist). Wear supplemental dosimeters as necessary to monitor exposures to specific organs or areas, such as the thyroid, finger, hand, lens of eye, and fetus or embryo.
 - (1) Monitor, using AIRDC-supplied dosimeters (see para(2)), occupational exposure of all personnel working in Army facilities or on Army projects (including Army Corps of Engineers civil works projects) for:
 - (a) Adults likely to receive, in 1 year from sources external to the body, a dose in excess of 10 percent of any of the occupational limits in table 5-1.
 - (b) Minors and declared pregnant women likely to receive, in 1 year from sources external to the body, a dose in excess of 10 percent of any of the applicable limits in table 5-1.
 - (c) Individuals entering a high or very high radiation area.

- (2) Personnel at Army government-owned contractor-operated (GOCO) facilities and contractor personnel who are working in Army facilities and require dosimetry will use AIRDC-supplied dosimeters unless a written contract specifically exempts them. (Non-GOCO contractor personnel working under provisions of an ARP may use contractor-supplied dosimetry.)
 - (3) AIRDC dosimeters may be used to monitor the exposure of other personnel and for area monitoring. Evaluate requirements for continued use of AIRDC dosimetry for such purposes periodically (at least annually).
 - (4) DA PAM 40-18 contains instructions for wearing supplemental dosimeters.
- c. Bioassay.
- (1) Monitor occupational intake of RAM and, as necessary, assess the committed effective dose equivalent (CEDE) for:
 - (a) Adults likely to receive, in 1 year, an intake in excess of 10 percent of applicable annual limits of intake (ALI). The ALIs for NRC-licensed RAM are in table 1, columns 1 and 2, 10 CFR 20, appendix B. The Surgeon General will provide, as necessary, ALIs and related air and water concentrations for radioisotopes used under ARA authority and not listed in 10 CFR 20, appendix B to the Army RSO for promulgation.
 - (b) Minors and declared pregnant women likely to receive, in 1 year, a CEDE in excess of 0.05 rem (0.5 mSv).
 - (2) Intake of RAM may be monitored and the CEDE assessed for other individuals. Evaluate the requirement for continued intake monitoring periodically (at least annually).
 - (3) All Government- and contractor-provided bioassay will be in accordance with procedures in ANSI N13.30.
- d. Dosimetry and bioassay records.
- (1) All personnel will complete DD Form 1952, Dosimeter Application and Record of Occupational Radiation Exposure, before receiving AIRDC dosimetry or participating in a routine bioassay program.
 - (2) The RSO will provide a copy of determinations of administrative doses (para e), determinations of non-Army occupational dose histories (obtained from somewhere other than AIRDC), bioassay results, and results of assessing CEDE by bioassay or by determination of the time-weighted air concentrations to which an individual has been exposed [that is, derived air concentration (DAC)-hours] to the AIRDC for archiving.
 - (3) The RSO will provide a copy of each DD Form 1952 and calendar year ADR for routinely monitored personnel to the supporting medical treatment facility or occupational health clinic (AR 40-66). (Examples: A visitor monitored only during a short-term visit of a few days is not routinely monitored. A student or intern monitored over a period of a few months is routinely monitored.)
- e. Administrative doses.
- (1) Only TSG may approve assigning an administrative dose in place of any AIRDC-recorded occupational dose equivalent that exceeds a value in table 5-1.
 - (2) RSOs will estimate TEDE (total effective dose equivalent) or CEDE when they cannot determine it from dosimetry or bioassay (for example, if a dosimeter was lost, damaged, or believed to be deliberately exposed). The estimate of the administrative dose may be based on any of the following.
 - (a) Occupancy or workload information and radiation dose levels at the radiation source operator location.
 - (b) Data supplied by a supplemental dosimeter.
 - (c) Average of the individual's previous occupational dose for the preceding 6 to 12 months if conditions prevailed similar to those during the period for which the dose is being estimated.

- (d) Recorded doses accrued by coworkers performing similar duties under similar circumstances.
- (3) The RSO will document the reason for the administrative dose assignment and the method used to estimate it.
 - (a) For alleged overexposures, the RSO will forward request for approval of the administrative dose, with supporting documentation, through command channels to TSG.
 - (b) For all other administrative dose assignments, the RSO will provide a report to Chief, AIRDC, to be included with the person's records in the CDRR.
- f. Other requirements. Federal requirements for security of RAM; control of access to radiation areas, high radiation areas, and very high radiation areas; caution signs; posting and labeling requirements; radioactive material shipping and receiving; and so on are in 10 CFR, 29 CFR 1910.1096 and 1926.53, 49 CFR, and other applicable documents listed in the References section (app A).

5-3. Radioactive contamination

In the absence of other regulatory or advisory guidance, a surface is contaminated if either the removable or total radioactivity is above the levels in table 5-2.

- a. If a surface cannot be decontaminated promptly to levels below those in table 5-2, control, mark, designate, or post it per applicable regulations.
- b. Always reduce radioactive contamination to levels ALARA.
- c. Local commanders may use contamination standards more strict than those in table 5-2 but will not use standards less strict without applying risk management principles (para 1-9).

5-4. Nonionizing radiation

See table 5-3 for a description of the electromagnetic radiation spectrum. Refer to the following indicated references for personnel radiation exposure standards for the following types of nonionizing radiation.

- a. Lasers: ANSI Z136.1 and ANSI Z136.3.
- b. Ultraviolet, visible, infrared, and extremely low frequency electromagnetic radiation and static electric fields: (latest edition of) American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVsTM) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIsTM).
- c. Radiofrequency electromagnetic radiation: DODI 6055.11.
- d. Static magnetic fields: International Commission on Non-Ionizing Radiation Protection (ICNIRP), "Guidelines on Limits of Exposure to Static Magnetic Fields," *Health Physics*, vol. 66, January, 1994, pp. 100-106.

Table 5-1.
Army Personnel Ionizing Radiation Exposure Standards.

| Category | Maximum ^{1,2,3} |
|--|---|
| Member of the general public | 100 mrem (1 mSv) (TEDE) in calendar year ⁴ |
| Fetus/embryo of occupationally exposed declared pregnant woman | 500 mrem (5 mSv) (DDE of mother + ED due to radionuclides in fetus/embryo) for entire pregnancy |
| Occupational exposure of adults | 5 rem (0.05 Sv) (TEDE) in calendar year |
| Lens of the eye | 15 rem (0.15 Sv) (EDE) in calendar year ³ |
| Individual organ | 50 rem (0.5 Sv) (DDE + CDE) in calendar year |
| Skin or extremity | 50 rem (0.5 Sv) (SDE) in calendar year |
| Occupational exposure of minors | 10% of limits for adults |

-
1. From 10 CFR 20. Refer to 10 CFR 20 for detailed standards.
 2. Abbreviations: TEDE = total effective dose equivalent; DDE = deep dose equivalent; ED = effective dose; EDE = effective dose equivalent; CDE = committed dose equivalent; SDE = shallow dose equivalent.
 3. OSHA standard for occupational exposure of adults and for the lens of the eye is $1\frac{1}{4}$ rem in calendar quarter. OSHA standard for skin of whole body is $7\frac{1}{2}$ rem in calendar quarter. OSHA standard for hands and forearms; feet and ankles is $18\frac{3}{4}$ rem in calendar quarter.
 4. The dose in any unrestricted area from external sources, exclusive of the dose contributions from patients administered radioactive material and released in accordance with applicable regulations, will not exceed 2 mrem (0.02 mSv) in any one hour.
-

Table 5-2.
Surface Radioactivity Values in dpm/100 cm²

| Nuclide ^a | Removable ^{b, c} | Total (Fixed + Remov- able ^{b, d}) |
|---|---------------------------|--|
| nat U, ²³⁵ U, ²³⁸ U, and associated decay products | 1,000 | 5,000 |
| Transuranics ²²⁶ Ra, ²²⁸ Ra, ²³⁰ Th, ²²⁸ Th, ²³¹ Pa, ²²⁷ Ac, ¹²⁵ I, ¹²⁹ I | 20 | 500 |
| nat Th, ²³² Th, ⁹⁰ Sr, ²²³ Ra, ²²⁴ Ra, ²³² U, ¹²⁶ I, ¹³¹ I, ¹³³ I | 200 | 1,000 |
| Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ⁹⁰ Sr and others noted above ^e | 1,000 | 5,000 |
| Tritium and tritiated compounds ^f | 10,000 | NA |

- a. See para 5-3 for applicability of this table. This table is extracted from 10 CFR 835, appendix D. The values in this table apply to radioactive contamination deposited on, but not incorporated into the interior of, the contaminated item. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, apply the limits established for alpha- and beta-gamma-emitting nuclides independently.
- b. 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 associated with the instrumentation.
- c. The amount of removable radioactive material per 100 cm² of surface area should be determined by swiping the area with dry filter or soft absorbent paper, 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.) When removable contamination on objects of surface area less than 100 cm² is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. Except for transuranics and ²²⁸Ra, ²²⁷Ac, ²²⁸Th, ²³⁰Th, ²³¹Pa 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 surface contamination levels are within the limits for removable contamination.
- d. The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm² is less than three times the value 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 $\frac{1}{n} \sum_{i=1}^n S_i \geq 3G$, where $S_i \geq G$ is the dpm/100 cm² 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 cm² area exceeds 3G.
- e. This category of radionuclides includes mixed fission products, including the ⁹⁰Sr which is present in them. It does not apply to ⁹⁰Sr which has been separated from the other fission products or mixtures where the ⁹⁰Sr has been enriched.
- f. Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface radioactivity value provided in this table is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore a "Total" value does not apply.

Table 5—3.
Electromagnetic Radiation.

| REGION | WAVELENGTH | FREQUENCY | AUTHORITY |
|--------------------------------|-----------------------|-----------------------------|------------------|
| Ionizing (gamma and x rays) | < 100 nm | > 3 PHz ($E > 12.4$ eV) | NRC and OSHA |
| Ultraviolet (UV) | 100 to 380-400 nm | 0.75-0.79 to 3 PHz | ACGIH |
| Visible (light) | 380-400 to 760-780 nm | 380-390 to 750-790 THz | ACGIH |
| Infrared (IR) | 760-780 nm to 1 mm | 300 GHz to 380-390 THz | ACGIH |
| Radiofrequency | 1 mm to 100 km | 3 kHz to 300 GHz | DOD |
| Extremely low frequency | > 100 km | < 3 kHz | ACGIH |
| Static electric fields | NA | NA | ACGIH |
| Static magnetic fields | NA | NA | ICNIRP |

Notes.

1. Unit abbreviations: nm = nanometer (10^{-9} m); mm = millimeter (10^{-3} m); km = kilometer (10^3 m); PHz = petahertz (10^{15} Hz); THz = terahertz (10^{12} Hz); GHz = gigahertz (10^9 Hz); kHz = kilohertz (10^3 Hz); and eV = electron volt ($1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$).
2. Wavelength x frequency = speed of light = $3 \times 10^8 \text{ m s}^{-1}$.
3. Authority = The regulating authority for personnel exposure for the purposes of this regulation (para 5-4).

Chapter 6

Special reporting requirements

6-1. General

- a. Reporting requirements of AR 40-5, AR 385-40, and DA PAM 40-18 apply for radiation accidents, incidents, and over-exposures. Additional requirements are in paras b and 6-2.
- b. **IMMEDIATELY EVACUATE PERSONNEL SUSPECTED OF EXPERIENCING POTENTIALLY DAMAGING EYE EXPOSURE FROM LASER RADIATION TO THE NEAREST MEDICAL FACILITY FOR AN EYE EXAMINATION (See FM 8-50). LASER EYE INJURIES REQUIRE IMMEDIATE SPECIALIZED OPHTHALMOLOGIC CARE TO MINIMIZE LONG-TERM VISUAL ACUITY LOSS. MEDICAL PERSONNEL SHOULD OBTAIN MEDICAL GUIDANCE FOR SUCH EMERGENCIES FROM THE WALTER REED ARMY INSTITUTE OF RESEARCH DETACHMENT AT BROOKS AFB (Commercial [800] 473-3549).**
- c. Notify the installation or activity public affairs officer at the onset of the accident or incident in order to activate public affairs contingency measures (AR 360-5). Radiation accidents or incidents attract the attention of local and national media quickly. Early disclosure of accurate information is vital to maintaining the confidence of both the internal and external public.

6-2. Ionizing radiation

Federal reporting requirements for accidents, incidents, and over-exposures are in 10 CFR 20, subpart M and in 29 CFR 1910.1096(m) and 1926.53(o).

- a. Send information copies of all reports required by 10 CFR 20.2201 through 20.2205, 29 CFR 1910.1096(m), or 29 CFR 1926.53(o) and of any other accident or incident report to the NRC or OSHA through command channels to HQDA (DACS-SF), WASH DC 20310-0200.
- b. Reports through command channels will meet the same time requirements, as do required reports to the NRC and OSHA. For example, if the NRC requires immediate telephonic notification, follow it with immediate telephonic notification through the chain of command to HQDA (DACS-SF), WASH DC 20310-0200.

Appendix A Publications

Section I Required Publications

ANSI N13.30

American National Standards Institute, Performance Criteria for Radiobioassay. (Cited in para 1-4e(6).) (This publication may be obtained from American National Standards Institute, 1430 Broadway, New York, NY 10018.)

ANSI Z136.1

American National Standards Institute, American National Standard for Safe Use of Lasers. (Cited in paras 1-4k(e), 1-4n(5), 3-1a, and 5-4a.) (This publication may be obtained from the Laser Institute of America, Suite 125, 2424 Research Parkway, Orlando, FL 32826.)

ANSI Z136.3

American National Standards Institute, American National Standard for the Safe Use of Lasers in Health Care Facilities. (Cited in paras 3-1a, and 5-4a.) (This publication may be obtained from the Laser Institute of America, Suite 125, 2424 Research Parkway, Orlando, FL 32826.)

AR 40-5

Preventive Medicine. (Cited in paras 1-4g(3), (4), and (6); 1-4n(4); 2-7d; and 6-1a.)

AR 40-10

Health Hazard Assessment Program (HHA) in Support of the Army Materiel Acquisition Decision Process. (Cited in para 1-4g(5).)

AR 40-13

Medical Support-Nuclear/Chemical Accidents and Incidents. (Cited in para 1-4g(2).)

AR 40-66

Medical Record Administration. (Cited in para 5-2d(3).)

AR 50-7

Army Reactor Program. (Cited in paras 1-5b and 2-3a(6).)

AR 70-1

Systems Acquisition Policy and Procedure. (Cited in paras 1-8c and 2-1a.)

AR 200-1

Environmental Protection and Enhancement (Cited in para 2-1d.)

AR 200-2

Environmental Effects of Army Actions. (Cited in para 2-1d.)

AR 360-5

Public Information. (Cited in para 6-1c.)

AR 385-10

Army Safety Program. (Cited in para 1-4c(2).)

AR 385-40

Accident Reporting and Records. (Cited in para 6-1a.)

AR 385-63

Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat. (Cited in para 3-1b.)

AR 750-43

Army Test, Measurement and Diagnostic Equipment Program. (Cited in paras 1-4d(4) and 2-8.)

DA PAM 40-18

Personnel Dosimetry Guidance and Dose Recording Procedures for Personnel Occupationally Exposed to Ionizing Radiation. (Cited in paras 1-4g(7), 1-4i(5)(b), 5-2b(4), and 6-1a.)

DOD 4160.21-M-1

Defense Demilitarization Manual. (Cited in para 3-2c.)

DOD 4500.9-R (Part II)

Defense Transportation Regulation - Cargo Movement. (Cited in para 2-6b.)

DODI 6055.1

DOD Occupational Safety and Health Program (Cited in para 1-4i(5)(a).)

DODI 6055.11

Protection of DOD Personnel from Exposure to Radiofrequency Radiation and Military Exempt Lasers. (Cited in paras 4-1a through c, 1-4g(7), 1-4j(4), and 5-4c.)

FM 8-50

Prevention and Medical Management of Laser Injuries. (Cited in para 6-1b.)

FM 25-101

Battle Focused Training. (Cited in para 1-8f.)

FM 101-5

Staff Organization and Operations. (Cited in paras 1-8f and 1-9c.)

IEEE C95.3

Institute of Electrical and Electronics Engineers, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields RF and Microwave. (Cited in para 4-2.) (This publication may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017.)

MIL-HDBK-828

Laser Range Safety. (Cited in paras 3-1b and 3-1c(1).) (This publication may be obtained from the Standardization Documents Order Desk, Building 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094.)

SB 11-206

Personnel Dosimetry Supply and Service for Technical Ionizing Radiation Exposure Control. (Cited in para 1-4d(2)(a).)

TB 750-43

Army Test, Measurement, and Diagnostic Equipment (TMDE) Calibration and Repair Support Program. (Cited in paras 1-4d(4) and 2-8.)

Title 10, CFR, Chapter I

Nuclear Regulatory Commission. (Cited in paras 1-4d(2), 1-4d(2)(b) through (e); 2-1d; 2-3a(1) and (4); 2-3c(2); 2-4b(2); 2-5a; 5-2a(1), c(1)(a), and f; 6-2; and 6-2a.)

Title 21, CFR, Subchapter J

Radiological Health. (Cited in paras 3-2a.)

Title 29, CFR, Part 1910

Occupational Safety and Health Standards. (Cited in paras 1-4d(2)(d), 5-2a(2) and f, 6-2, and 6-2a.)

Title 32, CFR, Part 655

Radiation Sources on Army Land. (Cited in para 2-4.)

Title 39, CFR

U.S. Postal Service. (Cited in para 2-6b.)

Title 40, CFR

Environmental Protection Agency. (Cited in para 2-1d.)

Title 49, CFR

Department of Transportation. (Cited in paras 2-6b and 5-2f.)

TM 3-261

Handling and Disposal of Unwanted Radioactive Material. (Cited in para 1-4d(3).)

Unnumbered Publication

ACGIH Threshold Limit Values (TLVs™) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs™). (Cited in para 5-4b.) (This publication may be obtained from the American Conference of Governmental Industrial Hygienists, Technical Affairs Office, 1330 Kemper Meadow Dr., Cincinnati, OH 45240.)

Unnumbered publication

International Commission on Non-Ionizing Radiation Protection (ICNIRP), Guidelines on Limits of Exposure to Static Magnetic Fields, *Health Physics*, vol. 66, pp. 100-106. (Cited in para 5-4d.)

Section II

Related Publications

A related publication is merely a source of additional information. The user does not have to read it to understand this regulation.

AR 11-2

Management Control

AR 11-34

The Army Respiratory Protection Program

AR 25-400-2

The Modern Army Recordkeeping System (MARKS)

AR 50-5

Nuclear Surety

AR 55-38

Reporting of Transportation Discrepancies in Shipments

AR 70-6

Type Classification of Army Materiel

AR 190-54

Nuclear Reactor Security Program

AR 210-10

Installations—Administration

AR 385-16

System Safety Engineering and Management

AR 700-64/DLAM 4145.8/NAVSUPINST 4000.34/AFR 67-8/MCO P4400.105

Radioactive Commodities in the DOD Supply Systems

AR 700-93

Processing and Shipping DOD Sponsored Retrograde Materiel Destined for Shipment to the United States, Its Territories, Trusts, and Possessions

AR 725-50

Requisitioning, Receipt, and Issue System

AST-1500Z-100-93

Identification Guide for Radioactive Sources in Foreign Materiel (This publication is available from Commander, U.S. Army Foreign Science and Technology Center, ATTN: IAFSTC-PO, 220 Seventh St. NE, Charlottesville, VA 22901-5396.)

DODI 6055.8

Occupational Radiation Protection Program

IEEE C95.1

Institute of Electrical and Electronics Engineers, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz (This publication may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017.)

NBS Handbook 107

Radiological Safety in the Design and Operation of Particle Accelerators (The National Bureau of Standards is now known as the National Institute of Standards and Technology) (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

NBS Handbook 111

Radiation Safety for x-ray Diffraction and Fluorescence Analysis Equipment (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

NBS Handbook 114

General Safety Standards for Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies up to 10 MeV (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

NCRP Reports

Approximately 100 numbered reports on a variety of radiation safety topics (These publications may be obtained from the National Council on Radiation Protection and Measurements, 7910 Woodmont Ave., Suite 1016, Bethesda, MD 20814.)

NRC Regulatory Guide 8.13

Instruction Concerning Prenatal Radiation Exposure (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

NRC Regulatory Guide 8.29

Instruction Concerning Risks from Occupational Radiation Exposure (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

TB 43-0116

Identification of Radioactive Items in the Army

TB 43-0121

Inspection and Certification of RADIAC Meters (Dosimeters)

TB 43-0122

Instructions for the Safe Handling and Identification of U.S. Army Communications-Electronics Command-Managed Radioactive Items in the Army Inventory

TB 43-0216

Safety and Hazard Warnings for Operation and Maintenance of TACOM Equipment

TB 43-0133

Hazard Criteria for CECOM Radiofrequency and Optical Radiation Producing Equipment

TB 43-0137

Transportation Information for CECOM Radioactive Commodities (Use this bulletin for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

TB 43-0141

Safe Handling, Maintenance, Storage, and Disposal of Radioactive Commodities Managed by the U.S. Army Troop Support and Aviation Material Readiness Command

TB 43-180

Calibration and Repair Requirements for the Maintenance of Army Materiel

TB 385-4

Safety Requirements for Maintenance of Electrical and Electronic Equipment

TB MED 502

Respiratory Protection Program

TB MED 506

Occupational Vision

TB MED 521

Management and Control of Diagnostic X-Ray, Therapeutic X-Ray, and Gamma-Beam Equipment

TB MED 522

Control of Health Hazards from Protective Material Used in Self-Luminous Devices

TB MED 523

Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound

TB MED 524

Control of Hazards to Health from Laser Radiation

TB MED 525

Control of Hazards to Health from Ionizing Radiation Used by the Army Medical Department

Title 10, CFR, Part 835

Occupational Radiation Protection

TM 5-315

Transportability Guidance for Safe Transport of Radioactive Materials (Use this manual for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

TM 55-315

Transportability Guidance for Safe Transport of Radioactive Materials (Use this manual for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

TM 55-4470-400-12-1

Transportability Guidance for Nuclear Reactor Irradiated Fuel Elements (Use this manual for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

Section III

Prescribed Forms

DA Form 3337

Application for Army Radiation Authorization. (Cited in para 2-3b(1).)

Section IV

Referenced Forms

DA Form 11-2-R

Management Control Evaluation Certification Statement

DD Form 1952

Dosimeter Application and Record of Occupational Radiation Exposure

NRC Form 241

Report of Proposed Activities in Non-Agreement States

Appendix B

Sample application for Army Radiation Authorization (DA Form 3337)

| APPLICATION FOR ARMY RADIATION AUTHORIZATION | |
|---|--|
| For use of this form, see AR 11-9, the proponent agency is DAG | |
| 1. THIS IS AN APPLICATION FOR (Check appropriate item) <input type="checkbox"/> NEW ARA <input type="checkbox"/> AMENDMENT TO ARA NUMBER _____ <input type="checkbox"/> RENEWAL OF ARA NUMBER _____ | 2. NAME, MAILING ADDRESS, AND E-MAIL ADDRESS OF APPLICANT (Include ZIP Code) |
| 3. ADDRESSES WHERE AUTHORIZED IONIZING RADIATION SOURCES WILL BE USED OR POSSESSED | |
| 4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION | 5. TELEPHONE NUMBER AND FAX NUMBER |
| <p>Items 6 through 12 may be continued on the following page or on 8 1/2 x 11 paper. The type and scope of information to be provided should be adequate to show complete compliance with applicable regulations and guidance. (If you can link use of radioactive material to a valid Nuclear Regulatory Commission (NRC) license, provide number and expiration date of the license and only submit items that differ from the NRC license application and associated documents.)</p> | |
| 6. RADIATION SOURCE(S) | |
| a. RADIOACTIVE MATERIAL: (Element and mass number, chemical and/or physical form, and maximum amount that you will possess at any one time.) | b. ACCELERATOR(S) AND X-RAY SYSTEM(S) CAPABLE OF PRODUCING "HIGH RADIATION AREA" OR "VERY HIGH RADIATION AREA": (Describe) |
| 7. PURPOSE(S) FOR WHICH IONIZING RADIATION SOURCE(S) WILL BE USED | 8. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE |
| 9. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS | 10. FACILITIES AND EQUIPMENT (Describe rooms or areas, shielding, safety devices, monitoring equipment, and so on.) |
| 11. RADIATION SAFETY PROGRAM | 12. WASTE MANAGEMENT |
| 13. CERTIFICATION | |
| <p>The applicant understands that all statements and representations made in this application are binding upon the applicant. The applicant and any official executing this certification on behalf of the applicant, named in item 2, certify that all information contained in this application is true and correct to the best of their knowledge and belief.</p> | |
| 14. NAME, RANK, AND TITLE OF CERTIFYING OFFICER | 15. SIGNATURE |
| | 16. DATE (YYYYMMDD) |

DA FORM 3337, MAY 1999

DA FORM 3337, MAR 00, IS OBSOLETE

USAPA V1.00

ITEMS 6 THRU 12 (Continued)

SAMPLE

PAGE 2, DA FORM 3337, MAY 1999

USAPA 17-03

Appendix C

Management Control Evaluation Checklist

C-1. Function

The function covered by this checklist is radiation safety.

C-2. Purpose

The purpose of this checklist is to assist commanders and radiation safety officers in evaluating the key management controls listed below. It is not intended to cover all controls.

C-3. Instructions

Answers must be based on the actual testing of key management controls (for example, document analysis, direct observation, sampling, simulation, other). Answers that indicate deficiencies must be explained and corrective action indicated in supporting documentation. These management controls must be evaluated at least once every five years. Certification that this evaluation has been conducted must be accomplished on DA Form 1121R (Management Control Evaluation Certification Statement).

C-4. Test questions

- a. If required (para 1-4k(1)), has a person been designated to be radiation safety officer?
- b. If required (para 1-4k(2)), has a written radiation safety SOP been established?
- c. Are all personnel occupationally exposed to radiation receiving appropriate radiation safety training?
- d. Are all radiation sources secured against unauthorized use and removal?
- e. If the unit possesses radioactive commodities, has a written SOP been established to assure compliance with radiation safety requirements of applicable technical publications?
- f. Are all controllable quantities of radioactive material and radiation-producing sources held by the unit under appropriate authority (for example, a Nuclear Regulatory Commission license, an Army radiation authorization, or as part of a radioactive commodity)?
- g. Is all radioactive waste disposed of properly?
- h. Are all radiation survey instruments used for health and safety appropriately calibrated?
- i. For Army laser ranges have all type-classified or commercial class IIIb or class IV lasers received appropriate evaluation before their use?
- j. Are all unwanted military-exempt lasers disposed of properly?
- k. Are all accidents and incidents involving excessive personnel radiation exposure or excessive radioactive contamination of facilities, equipment, or the environment promptly reported through appropriate channels?
- l. Do all personnel occupationally exposed to ionizing radiation or radioactive material above applicable levels (paras 5-2b(1) and c(1)) participate in an appropriate dosimetry or bioassay program?
- m. Is the dose in all unrestricted areas less than 2 millirems (0.02 millisieverts) in any one hour?

C-5. Supersession

This is a new checklist.

C-6. Comments

Help make this a better tool for evaluating management controls. Submit comments to HQDA (DACS-SF), WASH DC 20310-0200.

Glossary

Section I

Abbreviations

ACGIH

American Conference of Governmental Industrial Hygienists

ACSIM

Assistant Chief of Staff for Installation Management

ADR

automated dosimetry report

AFB

United States Air Force Base

AIRDC

Army Ionizing Radiation Dosimetry Center

ALARA

as low as is reasonably achievable

ALI

annual limit of intake

ANSI

American National Standards Institute

AR

Army Regulation

ARA

Army Radiation Authorization

ARP

Army Radiation Permit

ARSC

Army Radiation Safety Council

ASA(I&E)

Assistant Secretary of the Army (Installations and Environment)

BEI™

biological effectiveness index (ACGIH trademark)

Bkd

background

CDRR

Central Dosimetry Records Repository

CECOM

U.S. Army Communications-Electronics Command

CEDE

committed effective dose equivalent

CFR

Code of Federal Regulations

CG

Commanding General

CHPPM

U.S. Army Center for Health Promotion and Preventive Medicine

cm

centimeter

DA

Department of the Army

DAC

derived air concentration

DASAF

Director of Army Safety

DOD

Department of Defense

DODI

Department of Defense Instruction

DOE

Department of Energy

dpm

disintegrations per minute

DOT

Department of Transportation

DSN

Defense Switching Network

EMR

electromagnetic radiation

EPA

U.S. Environmental Protection Agency

eV

electron volt

FY

fiscal year

GHz

gigahertz

GOCO

Government-owned contractor-operated

Gy

gray

h

hour

HHA

health hazard assessment

HQDA

Headquarters, Department of the Army

Hz

hertz

IAEA

International Atomic Energy Agency

ICNIRP

International Commission on Nonionizing Radiation Protection

IEEE

Institute of Electrical and Electronics Engineers

IR

infrared

kBq

kilobecquerel

kHz

kilohertz

km

kilometer

LSO

laser safety officer

m

meter

MACOM

major Army command

MARKS

Modern Army Recordkeeping System

METL

mission-essential task list

 μ Ci

microcurie

mg

milligram

MIL-HDBK

military handbook

 μ m

micrometer

mm

millimeter

MOS

military occupational specialty

mrad

millirad

mSv

millisievert

MTF

medical treatment facility

NARM

naturally occurring or accelerated produced radioactive material

NBS
National Bureau of Standards (now named the National Institute of Standards and Technology)

NCRP
National Council on Radiation Protection and Measurements

NGB
National Guard Bureau

NIST
National Institute of Standards and Technology

nm
nanometer

NORM
naturally occurring radioactive material

NRC
U.S. Nuclear Regulatory Commission

NSN
National stock number

NVLAP
National Voluntary Laboratory Accreditation Program

OSHA
Occupational Safety and Health Administration

PHz
petahertz

RAM
radioactive material

RDTE
research, development, testing, and evaluation

RF
radiofrequency

RSC
radiation safety committee

RSO
radiation safety officer

RSSO
radiation safety staff officer

SB
supply bulletin

SI
Système Internationale (International System)

SOFA
status of forces agreement

SOP
standing operating procedure

SSI
specialty skill identifier

Sv

sievert

TACOM

U.S. Army Tank-Automotive and Armaments Command

TB

technical bulletin

TB MED

technical bulletin (medical)

TEDE

total effective dose equivalent

THz

terahertz

TLV™

threshold limit value (ACGIH trademark)

TM

technical manual

TMDE

test, measurement, and diagnostic equipment

TOE

table of organization and equipment

TSG

The Surgeon General

U.S.C.

United States Code

CHPPM

U.S. Army Center for Health Promotion and Preventive Medicine

USAMC

U.S. Army Materiel Command

UV

ultraviolet

Section II

Terms

Absorbed dose

The energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray (Gy).

Administrative dose

The total effective dose equivalent that a radiation safety officer assigns when dosimetry is inaccurate or has been misused or lost.

Agreement State

Any State with which the Atomic Energy Commission or the NRC has entered into an effective agreement in which the State assumes many of the NRC's functions.

ALARA

Acronym for "as low as is reasonably achievable" means making every reasonable effort to maintain exposures to radiation as far below applicable dose limits as is practical consistent with the purpose for which the activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations and in relation to utilization of nuclear energy, radioactive materials, and ionizing radiation in the public interest.

Annual limit of intake (ALI)

The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year that would result in a committed effective dose equivalent of 5 rems (0.05 Sv) or a committed dose equivalent of 50 rems (0.5 Sv) to any organ or tissue.

Army regulation

A directive that sets forth missions, responsibilities, and policies, and establishes procedures to ensure uniform compliance with those policies.

Army Reserve facilities

Pertains to those facilities normally employed for the administration and training of Army Reserve units, in any entire structure or part thereof, including any interest in land, Army Reserve Center, and storage and other use areas.

Background radiation

Radiation from cosmic sources; naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material); and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation. Background radiation does not include radiation from source, by-product, or special nuclear materials that the NRC regulates or from NARM that the Army regulates.

Becquerel (Bq)

The SI unit of radioactivity equivalent to one nuclear transformation per second.

Bioassay (radiobioassay)

The determination of kinds, quantities or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement (*in vivo* counting) or by analysis and evaluation of materials excreted or removed from the human body (*in vitro* counting).

Byproduct material

Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

Committed dose equivalent

The dose equivalent to organs or tissue of reference that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

Committed effective dose equivalent

The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues.

Commodity, radioactive

See Radioactive commodity

Condition

The status of personnel and equipment (readiness) as they interact with the operational environment during mission planning and execution.

Control

Action taken to eliminate hazards or reduce their risk.

Curie (Ci)

A unit of radioactivity equal to 37 billion becquerels.

Declared pregnant woman

A woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

Decommission

To remove (as a facility) safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of the NRC license, Army reactor permit, or Army radiation authorization.

Deep-dose equivalent

Applies to external whole-body exposure and is the dose equivalent at a tissue depth of 1 centimeter (1000 mg/cm^2).

Derived air concentration (DAC)

The concentration of a given radionuclide in air that, if breathed for a working year of 2,000 hours under conditions of light work (inhalation rate 1.2 cubic meters of air per hour), results in an inhalation of one ALI.

Develop the Force

One of the Army's four core capabilities. This capability includes the processes of developing doctrine; developing requirements; acquiring, training and sustaining people; and identifying and developing leaders. This core capability encompasses the various functions that must be accomplished to create tactical units that comprise the Operational Force.

Deviation

A departure from the requirements of this regulation.

Direct and Resource the Force

One of the Army's four core capabilities comprised of four core processes: planning and policy development; direction and assessment; financial management; and information management. These processes have six functions: Leadership; Human Resource Management; Force Management; Military Strategy; Acquisition and Logistics Management; and Installations & Facilities Management.

Dose equivalent

The product of absorbed dose in tissue, quality factor and all other necessary modifying factors at the location of interest in tissue. The units of dose equivalent are the rem and sievert (Sv).

Effective dose equivalent

The sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated. The units of dose equivalent are the rem and sievert (Sv).

Electromagnetic radiation

Electric and magnetic fields that oscillate at right angles to each other and to their direction of propagation and that travel at the speed of light in a vacuum (300,000 kilometers per second). Electromagnetic radiation includes gamma rays, x rays, ultraviolet radiation, visible light, infrared radiation, radiofrequency radiation, and extremely low frequency electromagnetic radiation (see table 5-3).

Electron volt (eV)

A unit of energy equal to 1.6×10^{-19} joule.

Exposure

In risk management, the frequency and length of time subjected to a hazard.

Extremely low frequency (ELF) electromagnetic radiation

Electromagnetic radiation with a frequency less than 3 kHz.

Eye dose equivalent

Applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 centimeter (300 mg cm^2).

Giga- (G)

An SI unit prefix indicating a factor of one billion (10^9).

Gray (Gy)

The SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule/kilogram (100 rads).

Hazard

Any real or potential condition that can cause injury, illness, death of personnel, damage to or loss of equipment or property, or mission degradation.

Hertz (Hz)

The SI unit of frequency equivalent to one vibration (cycle) per second.

High radiation area

An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

Infrared (IR) electromagnetic radiation

Electromagnetic radiation with a wavelength between 760-780 nm and 1 mm.

Installation

A grouping of facilities located in the same vicinity, which support particular functions. Installations may be elements of a base. Land and improvements permanently affixed thereto which are under the control of the Department of the Army and used by Army organizations. Where installations are located contiguously, the combined property is designated as one installation and the separate functions are designated as activities of that installation. In addition to those used primarily by troops, the term installation applies to real properties such as depots, arsenals, ammunition plants (both contractor and Government operated), hospitals, terminals, and other special mission installations. For the purposes of this regulation, United States Army Regional Support Commands are installations.

Ionizing radiation

Charged subatomic particles and ionized atoms with kinetic energies greater than 12.4 eV, electromagnetic radiation with photon energies greater than 12.4 eV, and all free neutrons and other uncharged subatomic particles (except neutrinos and antineutrinos).

Kilo- (k)

An SI unit prefix indicating a factor of 1000.

Laser

A device that produces an intense, coherent, directional beam of light by stimulating electronic or molecular transitions to lower energy levels. An acronym for light amplification by stimulated emission of radiation. Lasers are classified by degree of potential hazard (see 21 CFR 1040.10 and ANSI Z136.1 for comprehensive definitions of laser hazard classes).

- a. Class I lasers emit at levels that are not hazardous under any viewing or maintenance conditions. They are exempt from control measures. (However, as a matter of good safety practice avoid intrabeam viewing in case the laser is mislabeled.)
- b. Class II lasers (low-power) emit in the visible light portion of the electromagnetic spectrum. They are a potential eye hazard only for prolonged intrabeam viewing. Eye protection is normally afforded by the aversion response including the blink reflex.
- c. Class III (medium-power) lasers emit in the infrared, visible, or ultraviolet portions of the electromagnetic spectrum. They are a hazard for direct intrabeam and specular reflection viewing. Diffuse reflection is not normally a hazard.
 - (1) Class IIIa lasers, even though they emit at class III power levels, have special beam characteristics that make them eye-safe except when viewed through magnifying optics.
 - (2) Class IIIb lasers are all other class III lasers.
- d. Class IV (high-power) lasers emit in the infrared, visible, or ultraviolet portions of the electromagnetic spectrum. They are hazardous for direct intrabeam exposure and sometimes diffuse reflection exposure to the eyes or skin. They may also produce fire, material damage, laser-generated air contaminants, and hazardous plasma radiation.

Low-level radioactive waste

See Radioactive waste, low-level.

Materiel readiness command

A major subordinate command of the U.S. Army Materiel Command responsible for National Inventory Control Point (NICP) and National Maintenance Point (NMP) functions for assigned items (AR 725-50).

Member of the public

Any individual except when that individual is receiving an occupational dose.

Micro- (μ)

An SI unit prefix indicating a factor of one one-millionth (10^{-6}).

Military-exempt lasers

Those lasers and laser systems that the U.S. Food and Drug Administration has exempted from the provisions of 21 CFR 1040.10 and 1040.11 and of 21 CFR 1002 (except 21 CFR 1002.20) (exemption no. 76-EL-01 DOD). These laser products are used exclusively by DOD components and are designed for actual combat or combat training operations or are classified in the interest of national security.

Milli- (m)

An SI unit prefix indicating a factor of one one-thousandth (0.001).

Naturally occurring or accelerator produced radioactive material (NARM)

Radioactive material not classified as byproduct, special, or source material; NARM includes NORM (naturally occurring RAM).

Nonionizing radiation

Electromagnetic radiation with photon energies less than 12.4 eV

Occupational dose

The dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation or to radioactive material from regulated and unregulated sources of radiation, whether in the possession of the employer or other person. Occupational dose does not include dose received from background radiation; from any medical administration the individual has received; from exposure to patients administered radioactive material and released in accordance with applicable regulations; from voluntary participation in medical research programs; or as a member of the public.

Optical radiation

See Visible light.

Peta- (P)

An SI unit prefix indicating a factor of one million billion (10^{15}).

Probability

The likelihood that an event will occur.

Project the force

One of the Army's four core capabilities. This capability includes the processes of tailoring, mobilizing and projection of land power, and supporting organizational training. Recognized as the overriding capability by which the Army will be measured is the ability to rapidly deploy ready forces into a distant area of operations and keep them coming as dictated by the tempo of battle.

Qualified expert

A person who, by virtue of training and experience, can provide competent authoritative guidance about certain aspects of radiation safety. Being a qualified expert in one aspect of radiation safety does not necessarily mean that a person is a qualified expert in a different aspect. Forward requests for determination of whether a certain individual is a qualified expert through command channels to the MACOM RSSO as necessary. Forward these requests to HQDA (DACS-SF), WASH DC 20310-0200, for further evaluation as necessary.

Quality factor

The modifying factor [listed in 10 CFR 20.1004, tables 1004(b).1 and 1004(b).2] that is used to derive dose equivalent from absorbed dose.

Rad

A unit of absorbed dose. One rad is equal to an absorbed dose of 0.01 joule/kilogram (0.01 gray).

Radiation

For the purposes of this regulation, unless otherwise specified, radiation includes both ionizing and nonionizing radiation.

Radiation area

An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem (0.05 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

Radiation safety

For the purposes of this regulation, a scientific discipline whose objective is the protection of people and the environment from unnecessary exposure to radiation. Radiation safety is concerned with understanding, evaluating, and controlling the risks from radiation exposure relative to the benefits derived. Same as *health physics and radiation protection*.

Radiation safety committee

An advisory committee for the commander to assess the adequacy of the command's radiation safety program. Same as *radiation control committee and radiation protection committee*.

Radiation Safety Officer

The person that the commander designates, in writing, as the executive agent for the command's radiation safety program. Same as *radiation protection officer or health physics officer*.

Radiation safety program

A program to implement the objective of radiation safety.

- a. The Army's radiation safety program includes all aspects of:
 - (1) Measurement and evaluation of radiation and radioactive material pertaining to protection of personnel and the environment.
 - (2) Army compliance with Federal and DOD radiation safety regulations.
 - (3) The Army's radiation dosimetry, radiation bioassay, radioactive waste disposal, radiation safety training, and radiation instrument TMDE and calibration programs.
- b. A command's radiation safety program includes all aspects of:
 - (1) Measurement and evaluation of radiation and radioactive material within the command as they pertain to protection of personnel and the environment.
 - (2) Compliance with Federal, DOD, and Army radiation safety regulations.

Radioactive commodity

An item of Government property made up in whole or in part of radioactive material. A national stock number (NSN) or part number is assigned to commodities containing radioactive material greater than 0.01 Ci.

Radioactive waste

Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act, as amended, or is of sufficient quantity to require an Army radiation authorization, and is of negligible economic value considering the cost of recovery.

Radioactive waste, low-level

Material the NRC classifies as low-level radioactive waste (see 10 CFR 62.2); waste not classified as high-level radioactive waste (spent nuclear fuel), as transuranic waste, or as uranium or thorium tailings and waste; material acceptable for burial in a land disposal facility (10 CFR 61).

Radiobioassay

See bioassay.

Radiofrequency (RF) electromagnetic radiation

Electromagnetic radiation with frequencies between 3 kHz and 300 GHz.

Radiofrequency (RF) controlled environment

Locations where RF exposure may be incurred by persons who are aware of the potential for occupational exposure, by other cognizant persons, or as the incidental result of transient passage through areas where analysis shows the exposure levels may be above those shown in DODI 6055.1, table 6-2-1, but do not exceed those shown in DODI 6055.1, table 6-1-1. Existing physical arrangements or areas, such as fences, perimeters, or weather deck(s) of a ship may be used in establishing a controlled environment.

Radiofrequency (RF) uncontrolled environments

Locations where RF exposures do not exceed permissible exposure levels in DODI 6055.1, table 6-2-1. Such locations generally represent living quarters, workplaces, or public access areas where personnel would not expect to encounter higher levels of RF energy.

Recorder, RSC

The person directly responsible for the accuracy and completeness of the RSC minutes. The recorder may designate someone else to take notes at RSC meetings (for example, an assistant or secretary). The recorder should be the RSO to help assure that the minutes meet regulatory requirements.

Rem

A unit of any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem = 0.01 sievert).

Residual Risk

The level of risk remaining after controls have been identified and selected for hazards that may result in loss of combat power. Controls are identified and selected until residual risk is at an acceptable level or until it cannot be practically reduced any further.

Risk

Chance of hazard or bad consequences; exposure of chance of injury or loss. Risk level is expressed in terms of hazard probability and severity.

Risk assessment

The identification and assessment of hazards (first two steps of the risk management process).

Risk decision

The decision to accept or not accept the risk(s) associated with an action; made by the commander, leader, or individual responsible for performing that action.

Risk management

A logical five step thought process, applicable to any situation or environment, for identifying and controlling hazards to protect the force.

Risk management integration

The process by which individuals or organizations develop plans to embed risk management into all that they do.

Severity

The expected consequence of an event in terms of degree of injury, property damage, or other mission impairing factors (loss of combat power, adverse publicity, and so on), that should occur.

Shallow dose equivalent

Applies to the external exposure of the skin or an extremity and is taken as the dose equivalent at a tissue depth of 0.007 centimeter (7 mg cm^{-2}) averaged over an area of 1 square centimeter.

Sievert (Sv)

The SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor ($1 \text{ Sv} = 100 \text{ rem}$).

Source material

Uranium or thorium, or any combination thereof, in any physical or chemical form or ores that contain by weight one-twentieth of one percent (0.05%) or more of uranium, thorium, or any combination thereof. Source material does not include special nuclear material.

Special nuclear material

Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, or any material artificially enriched by any of the foregoing.

Sustain the Force

One of the Army's four core capabilities. This capability includes the processes of acquiring, maintaining and sustaining equipment; maintaining and sustaining land operations; acquiring and sustaining infrastructure and operating installations.

Tera- (T)

An SI unit prefix indicating a factor of one trillion (10^{12}).

Total effective dose equivalent

The sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Type classification

A designation the Army uses to indicate acceptability for service use (AR 70-61).

Ultraviolet (UV) electromagnetic radiation

Electromagnetic radiation with wavelengths between 100 nm and 380-400 nm.

United States Army Reserve Center

A home station facility, activity, or installation utilized for administration and training of United States Army Reserve units and personnel.

Unrestricted area

An area, access to which is neither limited nor controlled (for the purposes of ionizing radiation safety).

Very high radiation area

An area, accessible to individuals, in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in 1 hour at 1 meter from a radiation source or from any surface that the radiation penetrates.

Visible light

Electromagnetic radiation with wavelengths between 380-400 nm and 760-780 nm.

Weighting factor

For an organ or tissue, the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly.

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Commanding General,

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APPENDIX C
SAIC HEALTH PHYSICS PROCEDURES

HEALTH PHYSICS PROCEDURE

HP-02

REV. 1

ALARA PROGRAM

APPROVED BY: _____ DATE: _____
Radiation Safety Officer

APPROVED BY: _____ DATE: _____
EC/HS Manager

APPROVED BY: _____ DATE: _____
QA/QC Officer

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1.0 Purpose

This program establishes the policies for maintaining exposures to ionizing radiation As Low As Reasonably Achievable (ALARA). The ALARA Program helps ensure exposure of the general public and facility personnel to radiation and radioactive material is kept as far below site limits as is reasonably achievable.

2.0 Scope

This procedure applies to all SAIC and subcontractor activities that take place involving radioactive material at sites working under this Science Applications International Corporation (SAIC) radiation safety program.

3.0 References

- 3.1 10 CFR 20, "Standards for Protection Against Radiation".
- 3.2 HP-01, "Health Physics Manual".
- 3.3 HP-21, "Health and Safety Work Permits".
- 3.4 United States Army Corps of Engineers (USACE) EM 385-1-1, Section 06.E, "Ionizing Radiation".
- 3.5 USACE ER 385-1-50, "Ionizing Radiation Safety".
- 3.6 U.S.N.R.C. Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will be As Low As Is Reasonably Achievable".
- 3.7 U.S.N.R.C. Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Exposures As Low As Is Reasonably Achievable".

4.0 Definitions

- 4.1 ALARA – an acronym for as low as reasonably achievable. The term means making every reasonable effort to maintain exposures to radiation as far below the dose limits of the site as is practicable. ALARA as a philosophy must be understood to encompass all site activities involving exposure to radiation while taking into consideration cost versus benefit and other factors.
- 4.2 Reasonably – within the bounds of good sense and practicality.

5.0 Responsibilities

- 5.1 The RSO shall:

- 5.1.1 Incorporate the ALARA concept into training programs developed for site personnel.
- 5.1.2 Ensure that the ALARA Program is implemented in accordance with procedure requirements.
- 5.1.3 Establish an ALARA suggestion program.
- 5.1.4 Review ALARA suggestions for program incorporation.
- 5.1.5 Perform pre and post job ALARA reviews, as required by this procedure.
- 5.2 All site personnel have the responsibility to:
 - 5.2.1 Follow ALARA practices and procedures.
 - 5.2.2 Incorporate the ALARA concept into everyday work habits and activities.
 - 5.2.3 Make ALARA suggestions to the RSO when better methods or equipment could be utilized to reduce exposure to ionizing radiation.

6.0 Procedure

- 6.1 ALARA Program is comprised of the following elements:
 - 6.1.1 Development of an ALARA Policy Statement.
 - 6.1.2 Posting the ALARA Policy Statement so the access is available to all employees that work with radioactive materials or ionizing radiation.
 - 6.1.3 Development of procedural requirements to ensure the completion of pre- and post-job ALARA reviews and application of the ALARA concept in site design changes, work activity changes and/or work practices, as applicable.
 - 6.1.6 Establishment of lines of communication between the site management (SAIC and client) and site personnel such that information concerning the radiological hazards of site activities can be readily accessed by site personnel and clients.
 - 6.1.7 Assessment of ALARA performance indicators, such as: radiological incident reports, personnel contamination events, and cumulative dose reports.
 - 6.1.8 Reviewing ALARA suggestions for potential dose reduction, assigning responsibility for implementation, and following up each accepted suggestion to ensure incorporation into the program.

6.2 ALARA Policy Statement

6.2.1 The ALARA Policy Statement is contained in Attachment 1 or equivalent to this procedure.

6.2.3 The policy statement is used to clearly delineate the responsibilities for the successful implementation of the ALARA Program. It contains the description of the ALARA Program and its elements.

6.2.4 The policy statement should be provided to all employees during Radiation Worker Training (RWT).

6.3 Work Review

6.3.1 Pre- and Post-Job ALARA Reviews

6.3.1.1 Pre- and post-job ALARA reviews should be documented using Attachments 2 and 3 (or equivalent), respectively.

6.3.1.2 Any work activity that is likely to cause radiation exposures will have a pre-job ALARA review, and ALARA pre-job briefing conducted by the RSO in accordance with HP-21, "Health and Safety Work Permits".

6.3.1.3 A post-job ALARA review will be conducted for all work activities that require a pre-job review. All post-job reviews will be completed within 3 months of job completion or closure of the HSWP.

6.3.1.4 Pre and post-job ALARA reviews, upon completion, will be retained in the project files.

6.3.2 ALARA Goals

Due to changing radiological hazards and concentrations of radionuclides in the material handled at each site, the approach to ALARA goals is necessarily unique. The primary focus of ALARA goal setting will be through pre- and post-job reviews. All goals determined through pre-job reviews should be achievable and realistic.

6.4 ALARA Suggestion Program

7.0 Records

All records generated as a result of this procedure shall be maintained by the RSO until transmitted to the appropriate Central Records Facility.

Science Application International Corporation ALARA POLICY STATEMENT

(AS LOW AS REASONABLY ACHIEVABLE)

The goal of the SAIC ALARA program is to provide for the radiological safety of the general public and occupationally exposed personnel by limiting all exposures to ionizing radiation whether occupational or non-occupational, individual or collective, to the lowest reasonably achievable level.

SAIC Management has a strong commitment to the reduction of radiation exposure, including the review of initial design of site work practices with the goal of having the ALARA concept incorporated to the maximum extent practicable.

SAIC Management provides an opportunity for all site personnel to participate in the ALARA Program by making ALARA suggestions. The individuals in the decision making process for tasks involving occupational exposure are encouraged to make ALARA suggestions. Routine responsibilities for all site personnel include compliance with requirements of work permits, procedures and training, and participation in Pre- and Post-Job Reviews.

SAIC Management acknowledges its responsibility to incorporate the ALARA concept in all phases of site and employee activities.

The ALARA Program contains the following elements:

Pre and Post Job Reviews

Tracking and Trending of Occupational Exposures

Review of Radiological Incident Reports

Development of ALARA Procedures

ALARA Suggestions

Pre-Job ALARA Review

HSWP No: _____ - ____ . ____ ____ Date: _____

Client/Location/Site: _____

Material Type: _____

Job Description: _____

Personnel Performing Review: _____

Estimated Person-Hours: _____

Estimated Average General Area Dose Rate: _____

Estimated Average Derived Air Concentration: _____

Calculated External Exposure: _____

(Person hours X dose rate)

Calculated Internal Exposure: _____

(person hours X DAC X 2.5 mrem/DAC-hr)

Initial Person-Rem Estimate: _____

Goal: _____

Job Classification: ☐ Routine

☐ Non-routine

Pre-Job ALARA Review

NOTE:

Prior to performing the ALARA pre-job review the RSO should review previous job histories and/or interview personnel experienced in the task, as appropriate.

PRE-JOB REVIEW GUIDELINES

- | | | | |
|--|------------------------------|-----------------------------|------------------------------|
| • HSWP prepared | YES <input type="checkbox"/> | NO <input type="checkbox"/> | N/A <input type="checkbox"/> |
| • all equipment is operable and in good repair | YES <input type="checkbox"/> | NO <input type="checkbox"/> | N/A <input type="checkbox"/> |
| • dry runs or walkthroughs performed | YES <input type="checkbox"/> | NO <input type="checkbox"/> | N/A <input type="checkbox"/> |
| • special ventilation required | YES <input type="checkbox"/> | NO <input type="checkbox"/> | N/A <input type="checkbox"/> |
| • special dosimetry required | YES <input type="checkbox"/> | NO <input type="checkbox"/> | N/A <input type="checkbox"/> |
| • overall safety aspects of the job discussed | YES <input type="checkbox"/> | NO <input type="checkbox"/> | N/A <input type="checkbox"/> |
| • housekeeping responsibilities established | YES <input type="checkbox"/> | NO <input type="checkbox"/> | N/A <input type="checkbox"/> |

SPECIAL CONTROLS and / or COMMENTS: _____

(Attach additional pages)

REVIEW PERFORMED BY: _____

Job estimate: > 500 mrem/yr internal or external exposure.

RSO _____ Date _____

Project Manager _____ Date _____

Post Job ALARA Review

Job/Task: _____

Date: _____

HSWP No: _____

Total Person-Rem: _____ Estimated Person-Rem: _____

1. Was the Person-Rem estimate for the work accurate? ($\pm 25\%$) Yes ☐ No ☐
If "No" explain _____

2. Were exposure reduction suggestions implemented? Yes ☐ No ☐
If "No" explain _____

3. Were exposure reduction methods successful? Yes ☐ No ☐
If "No" explain _____

4. Were any Radiation Incident Reports written on this job? Yes ☐ No ☐
If "Yes" review and note cause(s) _____

5. Was new equipment identified during the course of work
that could enhance the work, save time or reduce dose? Yes ☐ No ☐
☐
If "Yes" – Identify and perform cost/benefit analysis _____

6. Did existing equipment perform well? Yes ☐ No ☐
If "No" explain _____

Post Job ALARA Review

7. Is refurbishment necessary? Yes ☐ No ☐
8. Was housekeeping satisfactory for the duration of the job? Yes ☐ No ☐
9. Were procedures adequate to the task? Yes ☐ No ☐

If "No" explain _____

RECOMMENDATIONS (derived from post-job review or de-brief with workers):

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

RSO: _____

Date: _____

Project Manger: _____

Date: _____

ALARA SUGGESTION FORM

HEALTH PHYSICS PROCEDURE

HP-03

REV. 1

RADIOLOGICAL LIMITS

APPROVED BY: _____ DATE: _____
Radiation Safety Officer

APPROVED BY: _____ DATE: _____
EC/HS Manager

APPROVED BY: _____ DATE: _____
QA/QC Officer

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1.0 Purpose

This procedure establishes the guidelines to determine site limits on surficial radiological contamination, individual dose, and the concentrations of radioactive material in air.

2.0 Scope

This procedure applies to all SAIC and subcontractor personnel at sites working under this SAIC radiation safety program.

3.0 References

- 3.1 10 CFR 20, "Standards for Protection Against Radiation"
- 3.2 HP-01, "Health Physics Manual"
- 3.3 HP-11, "Radiological Surveys"
- 3.4 USACE EM 385-1-1, Section 06-E, "Ionizing Radiation"
- 3.5 USACE ER 385-1-80, "Ionizing Radiation Safety"
- 3.6 USNRC Regulatory Guide 7.86, "

4.0 Definitions

- 4.1 Administrative Exposure Limit – A limit established in order to stress individual responsibility for maintaining exposures as low as reasonably achievable (ALARA) and to assist in the prevention of any individual exceeding regulatory exposure limits.
- 4.2 Committed Dose Equivalent (CDE) – the dose equivalent to organs or other tissues that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.
- 4.3 Committed Effective Dose Equivalent (CEDE) – the dose equivalent to the whole body that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.
- 4.4 Contamination - The deposition of radioactive material on accessible surfaces of structures, objects, equipment, or personnel that exceeds site surficial release limits pursuant to HP-03, "Radiological Limits". Contamination may be either "fixed" (e.g., not removable by rubbing with a dry smear) or "removable". Total contamination refers to fixed plus removable contamination.
- 4.5 Derived Air Concentration (DAC) - The concentration of a given radionuclide in air which, if breathed by Reference Man for a working year of 2,000 hours under conditions of light work (inhalation rate of 1.2 m³ per hour) results in an intake of one Annual Limit on Intake (ALI).
- 4.6 Declared Pregnant Woman – a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

- 4.7 Deep Dose Equivalent (DDE) – external whole body dose equivalent at a tissue depth of 1 cm (1000 mg/cm^2).
 - 4.8 Dose – a generic term meaning absorbed dose, effective dose equivalent, committed dose equivalent, or CEDE, total effective dose equivalent, or TEDE, etc. as used in this procedure.
 - 4.9 Extremity -
 - 4.10 Eye Dose Equivalent – external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 cm (300 mg/cm^2).
 - 4.11 Exposure – being exposed to ionizing radiation or to radioactive materials.
 - 4.12 Minimum Detectable Activity (MDA) - The smallest amount of radioactivity that can be detected given the conditions of a specific sample.
 - 4.13 Total Effective Dose Equivalent (TEDE) – the sum of the DDE and the CEDE.
 - 4.14 Total Organ Dose Equivalent (TODE) – the sum of the DDE and CDE.
 - 4.15 Shallow Dose Equivalent – the dose equivalent at a tissue depth of .007 centimeter averaged over an area of 1 square centimeter when applied to the external exposure of the skin or an extremity.
- 5.0 Responsibilities
- 5.1 The Radiation Safety Officer (RSO) shall:
 - 5.1.1 Calculate or approve existing administrative and/or project limits, and document the limits on Attachment 2, or equivalent.
 - 5.1.2 Post Attachment 2 (or equivalent) in an appropriate project work area as directed by the site RSO.
 - 5.2 Health Physics Technicians (HPTs) shall:
 - 5.2.1 Evaluate survey results against the project/site limits of Attachment 2, or equivalent.
- 6.0 Procedure
- 6.1 General Requirements
- 6.1.1 The following limits are project and site specific; administrative dose, surficial contamination, airborne DAC values, and personnel release. The RSO should use this procedure as a guideline to establish these limits.

- 6.1.2 Prior to the start of work, the RSO shall establish and/or calculate all applicable limits for a project or site, and document the limits on Attachment 2, "Site Limits", or equivalent.
- 6.1.3 Supporting information, such as source term and calculations, shall be attached, and filed in health physics files.
- 6.1.4 Attachment 2 (or equivalent) shall be revised during the project when determined necessary by the RSO. A copy of the most current Attachment 2 (or equivalent) should be posted at the site in an appropriate project work area.
- 6.1.5 Alternatively, previously established limits may be adopted for use at client sites when; the limits are contained in an approved document, and the limits are approved by the RSO.

6.2 Dose Limits

6.2.1 Regulatory Dose Limits

- 6.2.1.1 Individual doses for occupational workers shall not exceed 5 rem TEDE or 50 rem TODE per calendar year, excluding medical and background radiation exposures.
- 6.2.1.2 Individual doses for visitors and members of the general public shall not exceed 0.1 rem TEDE per calendar year.
- 6.2.1.3 The total radiation dose to the unborn child of a declared pregnant female shall not exceed 0.5 rem TEDE for the duration of pregnancy.
- 6.2.1.4 Doses to the skin, the eye and the extremities shall not exceed 50 rem, 15 rem, and 50 rem, respectively.

6.2.2 Administrative Dose Limits

- 6.2.2.1 Unless otherwise documented for the site, individual doses for visitors or the general public should not exceed 0.05 rem TEDE per calendar year from site activities.
- 6.2.2.2 Unless otherwise documented for the site on Attachment 2 (or equivalent), the more limiting of the following administrative dose limits shall apply to individual doses for radiation workers:
 - 6.2.2.2.1 TEDE limited to 0.5 rem/yr.
 - 6.2.2.2.2 TODE limited to 5.0 rem/yr.
 - 6.2.2.2.3 Eye Dose Equivalent limited to 1.5 rem/yr.

- 6.2.2.2.4 Shallow Dose Equivalent limited to 5 rem/yr.
- 6.2.2.2.5 Declared pregnant employees – 500 mrem for the entire gestation period. Declared pregnant females shall be limited to exposure rates less than 50 mrem per month unless otherwise approved by the RSO.
- 6.2.2.2.6 Cumulative Lifetime Exposure Limit limited to 1 rem per year of age.
- 6.2.2.3 Approval by the RSO is required for any employee to exceed an administrative dose limit, and shall be documented in the employee's exposure record.
- 6.2.2.4 Alternate site specific administrative dose limits may be established by the RSO, as documented on Attachment 2, or equivalent.

6.3 Surficial Contamination Limits

- 6.3.1 The RSO shall provide HPTs with project or site-specific surficial contamination limits on Attachment 2, or equivalent.
- 6.3.2 Using site characterization data, surficial contamination limits may be derived using Regulatory Guide 1.86 guidance, as presented in Attachment 1, "Regulatory Guide 1.86 Surface Contamination Limits" (or equivalent). Column 1 (Average) values should be used for total activity. Column 3 "Removable" values should be used for removable activity.
- 6.3.3 Surficial contamination limits may be derived by using the most conservative radionuclide present, or by weighting the radionuclides using the following equation:

$$\text{Weighted Limit (dpm/100cm}^2\text{)} = \frac{1}{F_1/\text{Limit}_1 + F_2/\text{Limit}_2 + F_3/\text{Limit}_3}$$

Where:

F = The fractional abundance of the radionuclide ($\geq 1\%$ abundance)

Limit = The radionuclide surficial contamination limit.

- 6.3.4 Alternate means of deriving project or site surficial contamination limit may be established by the RSO.

6.4 Derived Air Concentration Values

- 6.4.1 The RSO shall provide HPTs with project or site -specific DAC values on Attachment 2, or equivalent.

- 6.4.2 Using site characterization data, effective DAC values may be derived using the DAC values specified in 10 CFR 20 Appendix B, Table 1, Column 3.
- 6.4.3 Using site characterization data, effective air effluent concentration (AE) values may be derived using the AE values specified in 10 CFR 20 Appendix B, Table 2, Column 1.
- 6.4.4 DAC or AE values may be derived by using the most conservative radionuclide present, or by weighting the radionuclides using the following equation:

$$\text{Weighted DAC or AE } (\mu\text{Ci/ml}) = \frac{1}{F_1/\text{DAC}_1 + F_2/\text{DAC}_2 + F_3/\text{DAC}_3}$$

Where:

F = The fractional abundance of the radionuclide ($\geq 1\%$ abundance)

DAC = The radionuclide 10 CFR 20 Appendix B DAC or AE value

- 6.4.5 Alternate means of deriving site DAC or AE values may be established by the RSO, as documented in the SSHP, TWR, or equivalent document.

6.5 Personnel Release Limits

- 6.5.1 The RSO shall provide HPTs with site-specific total (direct frisk) personnel contamination limits on Attachment 2, or equivalent.
- 6.5.2 Personnel contamination release criteria should be calculated from the MDA of personnel release detection equipment, in accordance with HP-11, "Radiological Surveys" Attachment 2 "Radiological Survey Calculation" (or equivalent).
- 6.5.3 Personnel contamination scanning techniques and detection equipment shall be of sufficient sensitivity to detect less than 5000 dpm/100cm² beta or 100 dpm/100cm² alpha.

7.0 Records

All records generated as a result of this procedure shall be maintained by RSO until transmitted to the appropriate Central Records Facility.

Regulatory Guide 1.86 Surface Contamination Limits

| Nuclide ^a | Average ^{b,c} | Maximum ^{b,d} | Removable ^{b,e} |
|--|---|--|---|
| U-nat, U-235, U-238, and associated decay products | 5,000 dpm α /100 cm ² | 15,000 dpm α /100 cm ² | 1,000 dpm α /100 cm ² |
| Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129 | 100 dpm/100 cm ² | 300 dpm/100 cm ² | 20 dpm/100 cm ² |
| Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133 | 1,000 dpm/100 cm ² | 3,000 dpm/100 cm ² | 200 dpm/100 cm ² |
| Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above | 5,000 dpm β - γ /100 cm ² | 15,000 dpm β - γ /100 cm ² | 1,000 dpm β - γ /100 cm ² |

^a Where surface contamination by both alpha and beta-gamma-emitting nuclides exist, the limits established for alpha and beta-gamma-emitting nuclides should apply independently.

^b 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 associated with the instrumentation.

^c Measurements of average contaminant should not be averaged over more than 1 m². For objects of less surface area, the average should be derived for each such object.

^d The maximum contamination level applies to an area of not more than 100 cm².

^e The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination of objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

Site Limits

Project/Site: _____

| Type | Value | Units |
|--|-------|-------------------------|
| Occupational administrative dose | | mrem TEDE |
| Surficial total alpha <input type="checkbox"/> beta <input type="checkbox"/> contamination | | dpm/100cm2 direct frisk |
| Surficial removable alpha contamination | | dpm/100cm2 |
| Surficial removable beta contamination | | dpm/100cm2 |
| Occupational alpha DAC value | | μCi/ml |
| Occupational beta DAC value | | μCi/ml |
| Non-occupational alpha DAC value | | μCi/ml |
| Non-occupational beta DAC value | | μCi/ml |
| Personnel release alpha <input type="checkbox"/> beta <input type="checkbox"/> | | direct frisk |
| Personnel release direct frisk distance | | inches from surface |
| Personnel release direct frisk speed | | inches/second |
| | | |
| | | |

Notes:

- 1) Attach supporting information, such as source term and calculations.
- 2) Dose limits not listed are equivalent to the dose limits contained within the procedure, unless specified.
- 3) If a limit does not apply to the project/site, place an "N/A" in the "Value" column.
- 4) Any volumetric limits applicable to the site should be specified.

Approved By (RSO): _____ Date: _____

HEALTH PHYSICS PROCEDURE

HP-10

REV. 1

PERSONNEL AND EQUIPMENT DECONTAMINATION

APPROVED BY: _____ DATE: _____
Radiation Safety Officer

APPROVED BY: _____ DATE: _____
EC/HS Manager

APPROVED BY: _____ DATE: _____
QA/QC Officer

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1.0 Purpose

This procedure establishes guidelines for performing and documenting decontamination of personnel and equipment.

2.0 Scope

This procedure applies to decontamination at sites working under this SAIC radiation safety program.

3.0 References

- 3.1 10 CFR 20, "Standards for Protection Against Radiation"
- 3.2 HP-01, "Health Physics Manual"
- 3.3 HP-03, "Radiological Limits"
- 3.4 HP-11, "Radiological Surveys"
- 3.5 HP-22, "Radiological Reporting"
- 3.6 USACE Regulation No. EM385-1-1, Section 06.E, "Ionizing Radiation"
- 3.7 USACE Regulation No. ER-385-1-80, "Ionizing Radiation Safety"

4.0 Definitions

- 4.1 Contamination - The deposition of radioactive material on accessible surfaces of structures, objects, equipment, or personnel that exceeds site surficial release limits pursuant to HP-03, "Radiological Limits". Contamination may be either "fixed" (e.g., not removable by rubbing with a dry smear) or "removable". Total Contamination refers to fixed plus removable contamination.

4.2 Decontamination -

5.0 Responsibilities

5.1 The Radiation Safety Officer (RSO) shall:

- 5.1.1 Verify compliance with this procedure during planned and periodic audits of the radiation safety program.
- 5.1.2 Review incidents involving contamination pursuant to HP-22, "Radiological Reporting".

5.2 Health Physics Technicians (HPTs) shall:

- 5.2.1 Perform personnel decontamination in accordance with the requirements of this procedure.

- 5.2.2 Direct equipment decontamination in accordance with the requirements of this procedure.

6.0 Procedure

6.1 General Decontamination

- 6.1.1 Personnel or equipment shall be considered to be contaminated if any surface exceeds the contamination limits specified in HP-03, "Radiological Limits".
- 6.1.2 Surveys shall be performed and documented pursuant to HP-11, "Radiological Surveys".
- 6.1.3 Following decontamination, surfaces shall be resurveyed to determine if the surface meets release criteria.
- 6.1.4 Personnel performing decontamination shall wear protective clothing appropriate for the levels of contamination encountered.
- 6.1.5 Decontamination shall be performed starting at areas of low contamination levels and moving to higher levels of contamination.
- 6.1.6 The RSO shall be notified of all personal contamination incidents.

6.2 Personnel Decontamination

- 6.2.1 Decontamination shall be performed with the least possible insult to the individual. If skin irritation occurs, decontamination efforts shall be discontinued.
- 6.2.2 If extraordinary means (in excess of this procedure) are required to decontaminate an individual, or when decontaminating a wound, medical personnel shall direct the decontamination.
- 6.2.3 The temperature of personnel decontamination water should be lukewarm.
- 6.2.4 Decontaminate skin in the following manner:
 - 6.2.4.1 Survey the affected area to determine the magnitude and extent of the contamination. Document initial survey results on Attachment 1, "PCR" and/or Attachment 1 from HP-11, "Radiological Surveys."
 - 6.2.4.2 Wash the affected area thoroughly using soap and water (or, if water is not available, wipe the area with pre-moistened towelettes).

6.2.4.3 If multiple washings are not effective, consider wrapping the affected area in plastic to induce sweating.

6.2.4.4 Continue the decontamination effort until the contamination has been removed. If the contamination cannot be removed, contact the RSO.

6.2.5 During the decontamination process, care should be taken to avoid cross contamination of the hair, mouth, eye, or nose.

NOTE:

Lifesaving measures and medical attention to seriously injured personnel shall take precedence over personnel decontamination procedures.

6.2.6 To decontaminate nasal passages, have the individual use moderate nose blowing to remove the contamination. Nasal passages may be surveyed using cotton swabs. The RSO shall determine if a bioassay sample is required.

6.2.7 All contamination incidents shall be documented on Attachment 1, "Personnel Contamination Report" (PCR) and/or Attachment 1 from HP-11, "Radiological Surveys", and tracked on Attachment 2, "Personnel Contamination Log".

6.2.8 If radon is suspected as the cause of the contamination incident, attempt to verify by determining the half-life of the contaminant (i.e. on the decontamination materials), or performing an immediate lab analysis. Note the investigation results on the PCR.

6.2.9 If personnel contamination activity in excess of 15,000 dpm/100cm² is encountered, save the decontamination materials for lab analysis in order to support a skin dose evaluation, at the direction of the RSO.

6.3 Personal Clothing Decontamination

6.3.1 Personal clothing may be decontaminated by the following methods:

6.3.1.1 Attempt to remove the contamination by tape press.

6.3.1.2 Send the contaminated item to a licensed laundering vendor.

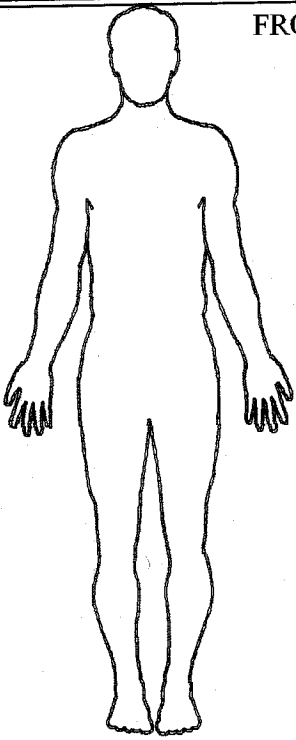
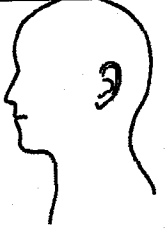


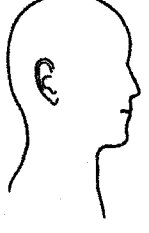


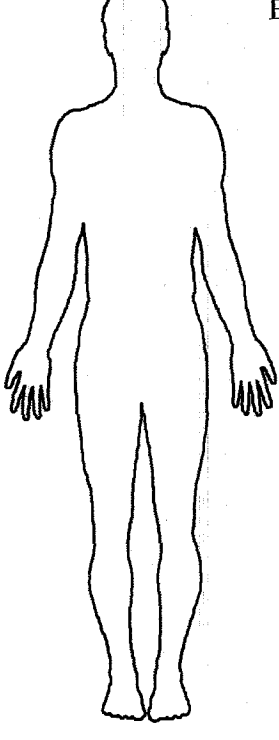
6.3.1.3 With the owner's permission, cut out the contaminated areas of the clothing or shoes and dispose of as radwaste.

6.3.1.4 Other appropriate methods as determined by the RSO.

PERSONNEL CONTAMINATION REPORT

Site: _____

| | | | | |
|---------------|-------------------|----------------------|-----------------------------|-------------------------|
| Employee Name | | SSN | Company | Date/Time of Occurrence |
| HSWP NO. | Inst. Type: _____ | Serial Number: _____ | Calibration Due Date: _____ | |
| | Inst. Type: _____ | Serial Number: _____ | Calibration Due Date: _____ | |

| | | | |
|---|--|--|--|
|  FRONT |    LEFT |    RIGHT |  BACK |
|---|--|--|--|

INDICATE THE CONTAMINATED AREAS IN THE DIAGRAM ABOVE

SPECIFY CALCULATED ACTIVITY IN UNITS OF DPM/100cm²

DESCRIBE THE CONTAMINATION INCIDENT, THE SITE LOCATION WHERE THE INDIVIDUAL BECAME CONTAMINATED, THE DECONTAMINATION METHODS USED, AND THE POST-DECONTAMINATION SURVEY RESULTS:

Initiated By: _____
Contaminated Individual: _____
Reviewed By: _____

Date: _____
Date: _____
Date: _____

6.4 Equipment Decontamination

6.4.1 Equipment shall be decontaminated in a restricted area (RA).

6.4.2 Loose contamination may be removed from equipment surfaces by one of the following methods:

6.4.2.1 Wiping the surface with a moist rag.

6.4.2.2 Vacuuming the surface with a high efficiency particulate (HEPA) filter equipped vacuum.

6.4.2.3 Spraying the equipment with pressurized hot water/steam.

6.4.3 Liquid waste generated during decontamination shall be collected so that the liquids may be contained, unless waived by the RSO.

6.4.4 Fixed contamination may be removed by removing the top surface layer using abrasive means (i.e. angle grinder, disc sander, sand blaster, etc.).

7.0 Records

All records generated as a result of this procedure shall be maintained by RSO until transmitted to the appropriate Central Records Facility.

Site: _____ Year: _____

REVIEWED BY _____ DATE _____

ADDENDIX D
RESPONSE TO SAIC COMMENTS

Maxim Technologies Response to SAIC comments on Niagara Fall Storage Site Demobilization plan, submitted January 24, 2005.

Comment and Response

1. Table of Contents - Section 2.0 is on page 1.

Response: Table of Contents has been revised.

2. Section 2, 1st para, last sentence - is there a word missing, or should "for" be deleted?

Response: Text revised.

3. Section 3.1, 7th para, 2nd sentence - "In order avoid reduce potential...." Please fix sentence.

Response: Text revised as follows: *"In order to reduce potential radiation exposures to site workers and visitors, a small apartment-sized"*

4. Appendix A - Please update. It refers to future Phase II activities (which are now complete) and data that has yet to be validated (which is now complete), etc.

Response: Updated as requested.

5. Please include Dave Lyerla's text and include any documents it refers to, if necessary. If these were provided in earlier documents, let's add a statement to that effect.

Response: The following text has been inserted into Section 2 beginning after the first paragraph:

All equipment, tools, supplies, etc... shall be surveyed for removable surface and fixed surface contamination. Surface limits will be applied in accordance with the U.S. NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors" and SAIC HP-03.

Unconditional site release of equipment will require 100% survey of all accessible surface areas that had the potential to contact radioactive materials. Process knowledge and survey results will be used to determine if an item needs additional monitoring (i.e., volumetric, non-accessible areas, etc...) to meet conditional or unconditional release as determined by the site RPM.

In the event that elevated activity in excess of the instrument MDA is identified, a reasonable precaution will be taken to reduce or remove the contaminant in accordance with HP-10 "Personnel and Equipment Decontamination" and HP-02 "ALARA Program".

All personnel that handle or have the potential to come into contact with equipment or supplies that requires radiological survey for release will be required to complete a personal survey, performed by an HPT, prior to entering designated clean areas or site exit. All site personnel will be surveyed to non-detectable limits (less than instrument MDA) to ensure contamination control. Personnel decontamination events will be performed and documented in accordance with HP-10.

6. I've attached a schedule that mirrors our proposal(s) a little bit better. It's a rough draft not and entirely thought through, so incorporate/modify as you see fit. As we discussed on the phone, it would be good to show more overlap on the tasks.

Response: New Schedule is provided in Table 3.

Appendix E

| Comment # | Reviewer | Comment | Response |
|-----------|----------|--|---|
| 1 | Rimer | Section 3.2: Please retain the following items on NFSS for future use: PPE, Decon equipment, Miscellaneous equipment (All used whale pumps and hoses to be put in IDW or trash as appropriate. New hose and pumps we can keep), shelving, tank heaters, extension cords, telephones and fax, refrigerator, polyethylene IDW tanks, and truck tanks (if Maxim doesn't want them)) | Comment noted, Table 1 has been amended to identify the items which the Buffalo District will retain, and disposition of items that will not be retained for future use. |
| 2 | Rimer | Section 3.2: Please dispose of sample lab containers and all but 4 of the fifty-seven 15 gallon carboys. | Section 3.2 has been revised as follows: <i>Four 15-gallon carboys which were previously used for storage of de-ionized water will be retained by the USACE-Buffalo District for future use. The remainder of the carboys will be cut with an electric reciprocating saw to reduce the volume of the carboys and facilitate containerization in polyethylene soil tote bags. These carboys will be disposed of as IDW at the WCS, Texas facility.</i> |
| 3 | Rimer | Section 6.1: IDW storage tanks to be cleaned of all solids with high pressure, rinsed three times and scanned for rad. | Section 6.1 has been revised as follows: <i>The interior of the IDW storage tanks will be cleaned of all solids with a high pressure wash, subject to three tap water rinses. Wash and rinse water will be collected and disposed of as liquid IDW. The tanks will be then be inverted and free water allowed drained. When dry, the interior of the tanks will be surveyed for unconditional release from the NFSS. The tanks will be righted and the hatchways will be sealed with polyethylene to prevent water from entering the tanks. The exterior of the tanks will be surveyed for radiological contamination and decontaminated as required based on the survey results.</i> |
| 4 | Rimer | Section 8.0: Make sure there is room for IDW waste from filtering, pumping and clean up operations on site. Also include on manifest, shipping papers and notification to states involved. | Demobilization activities which will generated liquid wastes will be performed prior to disposal of the Liquid IDW. Solid IDW resulting from from filtering, pumping and clean up operations on site will be included in the shipment of other solid IDW shipment. |
| 5 | Papura | Section 2: All equipment, tools, supplies, etc... shall be surveyed for removable surface and fixed surface contamination. Surface limits will be applied in accordance with the U.S. NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors" and SAIC HP-03. The Army has a regulation (AR 11-9 Table 5-2) that, while closely resembling Reg. Guide 1.86, should probably be cited instead of Reg Guide 1.86. All other references should be changed, and attention should be paid to ensure that the work complies with AR 11-9. http://www.army.mil/usapa/epubs/pdf/r11_9.pdf | AR 11-9 has been cited instead of Reg Guide 1.86. |

| Comment # | Reviewer | Comment | Response |
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| 6 | Papura | <p>Section 6.2: States: During the investigation of Building 401, Maxim collected concrete cores to assess radiological and chemical impacts to the Building 401 floors and the subsurface beneath the building.</p> <p>I would believe that it was intended to state assess not access.</p> | <p>Text has been revised as follows: <i>During the investigation of Building 401, Maxim collected concrete cores to assess radiological and chemical impacts to the Building 401 floors and the subsurface beneath the building.</i></p> |
| 7 | Papura | <p>Table 1: Under Maxim owned equipment, it appears that several items (Weber Grill, Microwave oven, etc.) will be surveyed for release that should have never entered a controlled and/or contaminated area. While this may be a conservative effort, many U.S. Government items (Fax machine, telephones) are not slated for any survey. We need a justification on why it is deemed important to perform a full release survey on Maxim equipment, yet government property of similar use and "process knowledge" is not. Or simply make changes to the surveyed items to be more consistent.</p> | <p>Section 3.3 has been revised as follows: <i>The following Maxim-owned equipment currently remains on the site: portable light stand, power inverter, microwave oven, desktop printer, Weber grill and two polyethylene truck tanks. The desk top printer microwave oven and Weber grill have never entered a controlled or contaminated area; therefore do not require survey prior to release from the site. The Weber grill and microwave oven will be removed from the site or disposed of a solid waste at the Modern Landfill.</i></p> <p><i>The portable light stand, power inverter and portable truck tanks will be scanned for radiological contamination during the demobilization activities. If the portable light stand and power inverter are determined to be unconditionally releasable from the site, these items will be removed from the facility and transported to Maxim's St. Louis facility. If these items are determined to be radiologically contaminated and decontamination is not deemed to be feasible, these materials will be disposed as IDW. The polyethylene truck tanks will be left at the NFSS for future site use. Table 1 has also been revised to reflect these changes to the disposition of these items.</i></p> |
| 8 | Rhodes | <p>As done previously, please submit an electronic daily field report to Dennis Rimer for submission to the project team. Additionally, if an item cannot be released for unrestricted use, the Site Superintendent (Dennis Rimer) shall be notified and the item should be reported in the daily report along with if the item was retained on-site or disposed of.</p> | <p>Section 3.0 has been revised as follows: <i>Maxim will submit an electronic daily field report to the Site Superintendent (Dennis Rimer) for submission to the project team. Additionally, if an item cannot be released for unrestricted use, the Site Superintendent (Dennis Rimer) will be notified and the item will be reported in the daily report along with the ultimate disposition of the item (conditional release or disposed of as IDW). At the completion of the demobilization activities, Maxim will to the USACE-Buffalo District a summary of equipment in each category and the final disposition of the items.</i></p> |

| Comment # | Reviewer | Comment | Response |
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| 9 | Rhodes | Are some sample containers preserved? If so, will that be a problem for disposal at Modern? | Text has been revised as follows: <i>Containers which contain a preservative will be emptied and rinsed prior to disposal as a solid waste at the Modern Landfill. Acid/base preservatives from the containers will be neutralized by mixing with tap water and the resulting liquid will be added to a liquid IDW tank prior to the Liquid IDW disposal.</i> |
| 10 | Rhodes | NFSS Office Facility Plan: Please ensure that Building 403 is labeled former Building 403 in future drawings. | Figure has been revised as requested. |

Appendix F: Final Comments and Responses

Comment: It should be noted in the Final Demobilization Plan that the fixed alpha release limit in AR 11-9 is less conservative than that in NRC Reg Guide 1.86, therefore, alpha release limits in NRC Reg guide 1.86 shall be used for demobilization activities.

Response: The text (Section 2) and Appendix B have been modified to incorporate reference to each of these release limits.

Comment: Once neutralized, can't the wastewater be disposed of via a sink (as opposed to being included with the IDW water)?

Response: The text (Section 3.2) has been modified to indicate that small quantities of acid present in sample containers will be neutralized with water to a pH in the 6-9 range and discharged to the sink in Building 429.