DEPARTMENT OF VETERANS AFFAIRS
NEBRASKA-WESTERN IOWA HEALTH CARE SYSTEM

Omaha
4101 Woolworth Avenue
Omaha NE 68105-1873

Lincoln
600 S 70th Street
Lincoln NE 68510-2493

Grand Island
2201 N Broadwell Avenue
Grand Island NE 68803-2196

In Reply Refer To: 636/

April 7, 2011
U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington D.C. 20555-0001

Re: Alan J Blotcky Reactor Facility, License R-57, Docket #50-131

The Reactor Safeguards Committee (RSC) for Alan J. Blotcky Reactor Facility wishes to provide the Nuclear Regulatory Commission with the following 'Work Plan" for pre-decommissioning activities scheduled to start April 25, 2011 at the Omaha VA Hospital. This Work Plan was prepared for the VA Nebraska-Western Iowa Health Care System by AECOM, 10 Patewood Drive Greenville, SC 29615.

Nancy Gregory
Acting CEO/Director NWIHCS
Department of Veteran Affairs.

FSME90
FSME

AECOM

Prepared for
VHA's Veterans Service Center
4141 Rockslide Road, Suite 110
Severn Hills, Ohio 44131

Prepared by
AECOM
10 Patewood Drive
Greenville, SC 29615
GSA No. GS-10F-0115K

AJ Blotcky Reactor Facility
Material Removal List
VA Nebraska-Western Iowa Health Care System
Omaha, Nebraska
Order No. VA701-BP-004/VA-101-G05020
March, 2011

Prepared by:

_____ _____

Chris Higgins, Site Supervisor Date

Approved by:

_____ _____

Kevin Taylor, PE, CHP, Project Manager Date

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Prepared for
VHA's Veterans Service Center
4141 Rockslide Road, Suite 110
Severn Hills, Ohio 44131

Prepared by
AECOM
10 Patewood Drive
Greenville, SC 29615
GSA No. GS-10F-0115K

Introduction

As per the scope of work, a preliminary investigation of the site was performed in order to organize a list for the removal of items from the AJB Reactor area. The investigation was performed on <arch 16-18, 2011 by Chris Higgins, AECOM Health Physicist.

Material Removal List for AJB Reactor

In order to perform pre-decommissioning activities, a list of the materials to be surveyed has been compiled. The following list describes the type of material as well as its current location. Every item will receive a complete documented survey; all surveys will be thoroughly documented. Those items demonstrated as having surface total and removable residual contamination levels below those specified in the US Nuclear Regulatory Commission's Regulatory Guide 1.86 (RG 1.86) will be released from the radioloigcally controlled area of the reactor room (B526) and disposed of though normal means, while any items discovered with residual radioactive contamination levels above the RG 1.86 limits will be identified and placed in a radioactive materials storage area. AECOM will perform these operations under existing standard operating procedures and a Work Plan approved by the VA. The figure on the following page shows the layout of the basement reactor facility, with the rooms labeled. Following that is a list of items and pictures documenting the major or example items that will be surveyed for free-release.

Items potentially contaminated or activated with large the large areas of inaccessibility will be surveyed to the extent practicable, inventoried, and placed in a radioactive material storage container. Such items include pipes stored on a shelf in room B540A. The ends of these pipes have been covered, presumably because of the potential for internal contamination. AECOM will not remove any protective covering but will survey the exterior surfaces of the pipes prior to placing them in the radioactive material storage container. Other potentially contaminated material that is packaged or wrapped in plastic will not be opened and surveyed.

AECOM will remove all "Radioactive Material" labels from Items that have been surveyed and are shown to meet the release criteria prior to releasing the items from the controlled area. Other items that are marked with painted words or symbols will place in the radioactive material storage inventory (e.g., yellow radioactive waste containers).

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VHA's Veterans Service Center
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10 Patewood Drive
Greenville, SC 29615
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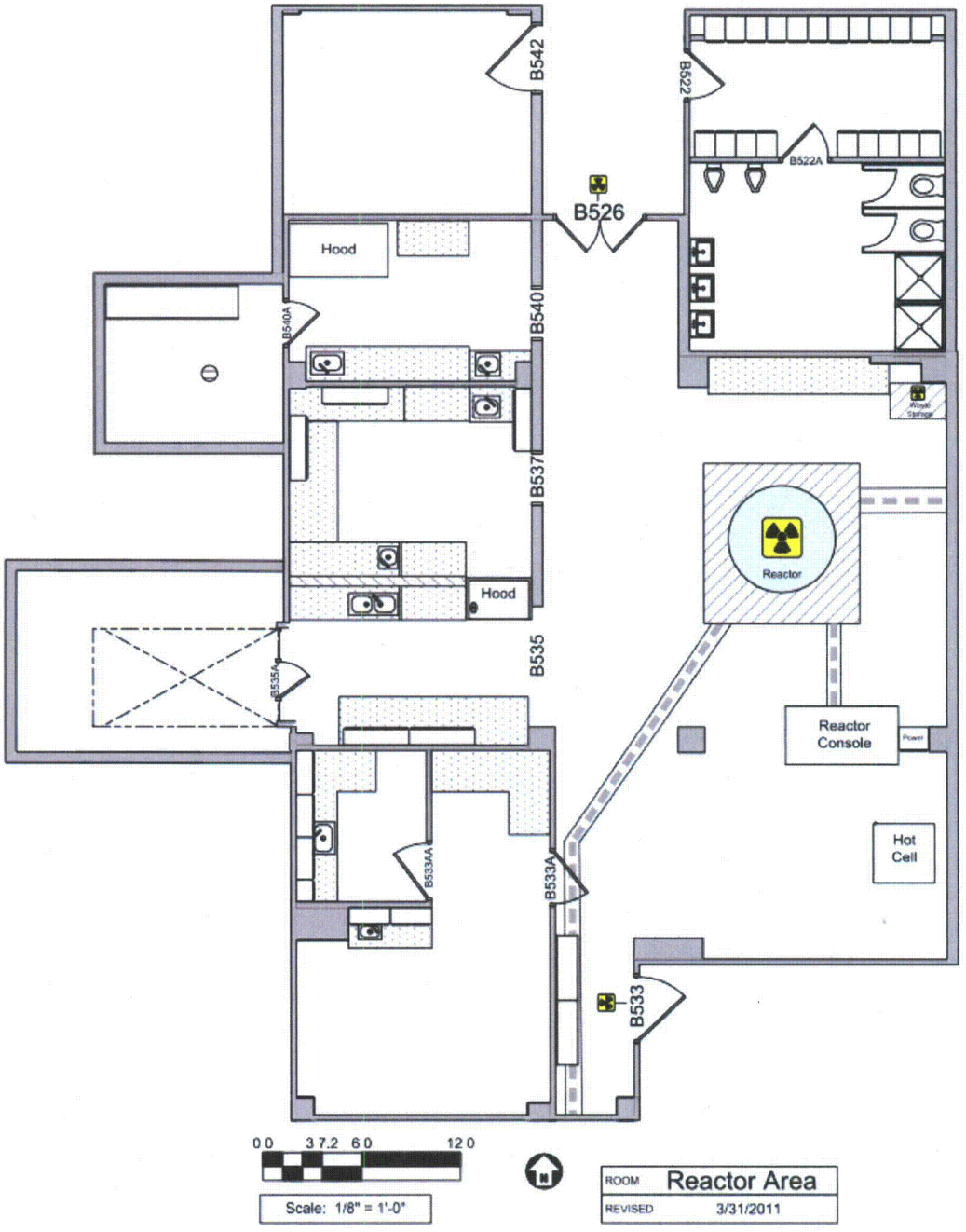
Nebraska/Western Iowa Health Care System-Omaha



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VHA's Veterans Service Center
4141 Rockslide Road, Suite 110
Severn Hills, Ohio 44131

Prepared by
AECOM
10 Patewood Drive
Greenville, SC 29615
GSA No. GS-10F-0115K

Table 1 – Radioisotope Reactor Research Laboratory, Omaha VAMC

Room or Area Number New (old)	Description	Former Use	Current Use
B522 (SW 1)	Locker Room	Accessible by hospital staff for storage of personal items	Accessible by hospital staff for storage of personal items
B522A (SW 1A)	Restroom and shower	Accessible by hospital staff	Currently accessible by hospital staff
B546 (SW 2)	Radioisotope Reactor Research Laboratory	Research activities and storage; contains 1 of 2 fume hoods	None
B533A (SW 2A)	Office	Office of staff researcher	None
B533AA (SW 2B)	Office/Darkroom	Darkroom, office, and storage space	None
B537 (SW 2C)	Nuclear research lab and office	Sample preparation	None
B535A (SW 2D)	Walk-in Cooler	Cold storage	None
B540 (SW 2E)	Nuclear research lab and office	Sample preparation; contains 1 of 2 fume hoods	None
B540A (SW 2F)	Isotope and general storage	Storage of irradiated samples	None

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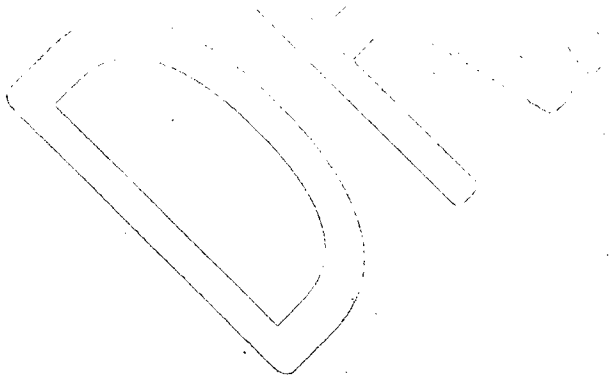
The following is a written list of items to be removed, followed by photographs of individual items:

a) Glass cabinet
b) Wood cabinet
c) Steel tables
d) Short and long lead plugs
e) Lead collimator
f) Misc. shelving and material on shelves
g) Ceiling tiles
h) Trash bag
i) Lead shields, source holders, and bricks
j) Trash box
k) Chairs
l) Steel cabinets
m) Rolling cart plastic
n) Steel shelves
o) Aluminum trash can
p) Entire cold storage room shell (B535A)
q) Assorted desks
r) Filing cabinets
s) Old computers and steel desk
t) Lead storage box
u) Trash
v) Lab bench (3ft x 12ft x 3.5ft)



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Room B540

Glass Cabinet

Wood Cabinet

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Severn Hills, Ohio 44131

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Steel tables (Note: Vent hood will not be released)

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Severn Hills, Ohio 44131

Prepared by
AECOM
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Room B540A

Short lead plugs that once covered source storage caves in the south wall of the room

Long lead plugs that were inserted into the source holders embedded in the floor

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Lead collimator (shield) for low-background source counting

Miscellaneous shelving and material

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Room B537

Ceiling Tiles

Bag of trash

(Note: The bag will be emptied and individual items surveyed)

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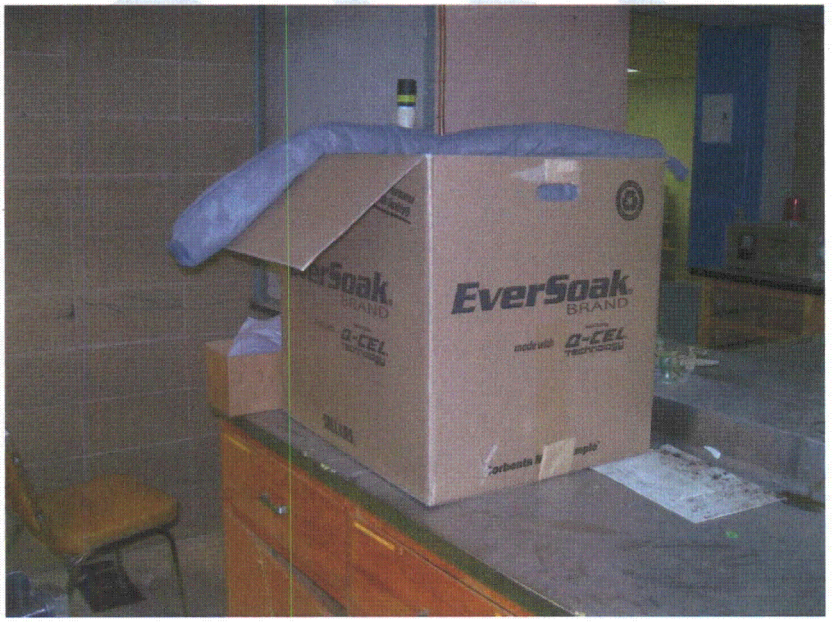
Lead Shields



Box of trash (Note: The box will be emptied and individual items surveyed)

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Severn Hills, Ohio 44131

Prepared by
AECOM
10 Patewood Drive
Greenville, SC 29615
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Chairs

AECOM

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VHA's Veterans Service Center
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Severn Hills, Ohio 44131

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10 Patewood Drive
Greenville, SC 29615
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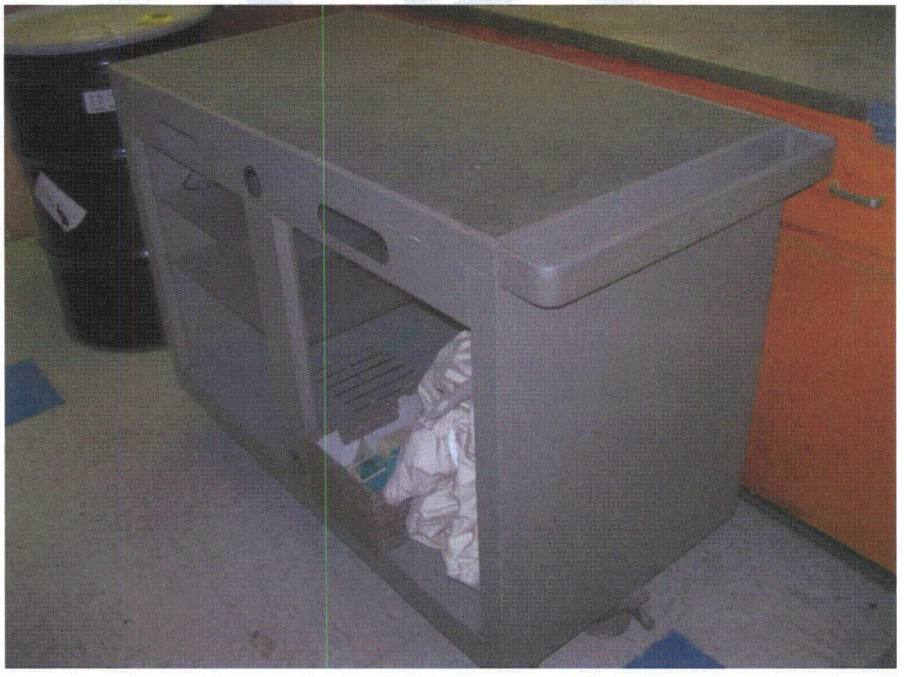
Room B535

Steel Cabinet



Plastic Rolling Cart

AECOM

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VHA's Veterans Service Center
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Severn Hills, Ohio 44131

Prepared by
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Steel Cabinet

Lab Bench and Drawers (3 ft x 3.5 ft x 12 ft)

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Prepared by
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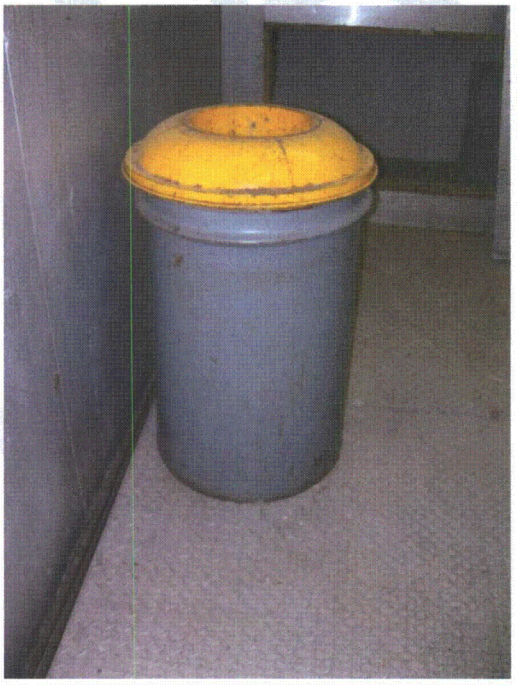
Room B535A (Cold Storage)

Steel Shelves



Aluminum Trash Can

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VHA's Veterans Service Center
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Severn Hills, Ohio 44131

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AECOM
10 Patewood Drive
Greenville, SC 29615
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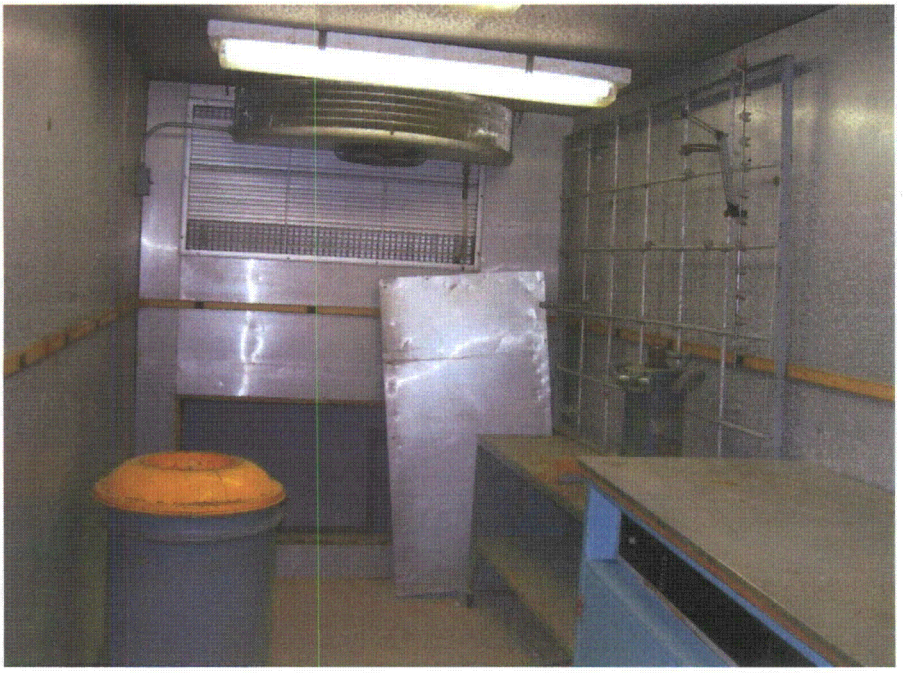

Aluminum and foam walls of the cold storage room

(Note: The entire room will be dismantled and surveyed.)

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AECOM
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Greenville, SC 29615
GSA No. GS-10F-0115K

Room B533A

Assorted Desks and chairs

Filing cabinets (Note: Reactor operating records and other records pertinent to the decommissioning of the laboratory will be included in the release surveys but will not be removed from the controlled area.)

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10 Patewood Drive
Greenville, SC 29615
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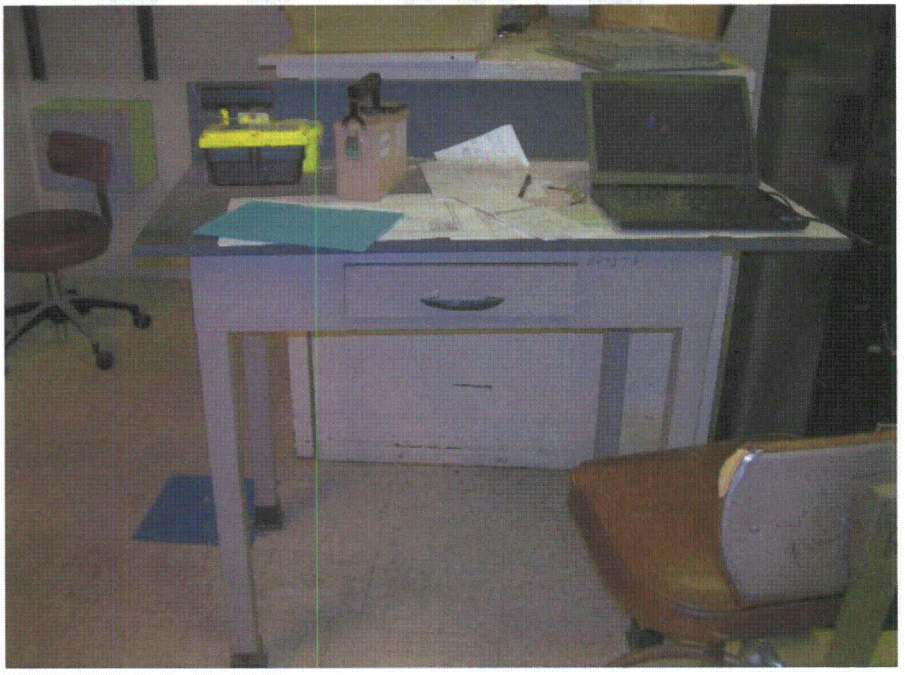
Room B526

Old computers and monitors, steel desk and chair



Steel desk and chair

AECOM

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Lead Source Storage Box (most likely released in place) and assorted trash

Lead Brick

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Severn Hills, Ohio 44131

Prepared by
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Lead block and miscellaneous material

Small Lead pigs

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Lead rolling containers

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AJ Blotcky Reactor Facility Additional Characterization Work Plan

VA Nebraska-Western Iowa Health Care System

Omaha, Nebraska
Order No. VA701-BP-004/VA-101-G05020
March, 2011

AECOM

Prepared for
VHA's Veterans Service Center
4141 Rockslide Road, Suite 110
Severn Hills, Ohio 44131

Prepared by
AECOM
10 Patewood Drive
Greenville, SC 29615
GSA No. GS-10F-0115K

Prepared by:

_____ _____

Chris Higgins, Site Supervisor Date

Approved by:

_____ _____

Kevin Taylor, PE, CHP, Project Manager Date

Contents

1 INTRODUCTION

The Alan J. Blotcky (AJB) reactor facility located within the US Department of Veterans Affairs (VA) Medical Center (VAMC) in the city of Omaha, Douglas County, Nebraska maintains US Nuclear Regulatory Commission (NRC) Facility Operating License R-57. The reactor is housed in the basement of the southwest wing of the medical center building. The Omaha VAMC is part of the VA Nebraska-Western Iowa Health Care System.

The reactor is a Training, Research, Isotopes, and General Atomics (TRIGA) MARK I Reactor, owned by the VA. Operated by the Omaha VAMC, the reactor is licensed pursuant to 10 CFR Part 50 (Domestic Licensing of Production and Utilization Facilities) under Facility License R-57. The reactor is a pool-type facility that was previously fueled with standard TRIGA fuel elements enriched to less than 20% uranium-235 zirconium hydride. Fuel elements were removed in June 2002 and shipped to the United States Geological Survey (USGS) TRIGA reactor in Denver, Colorado.

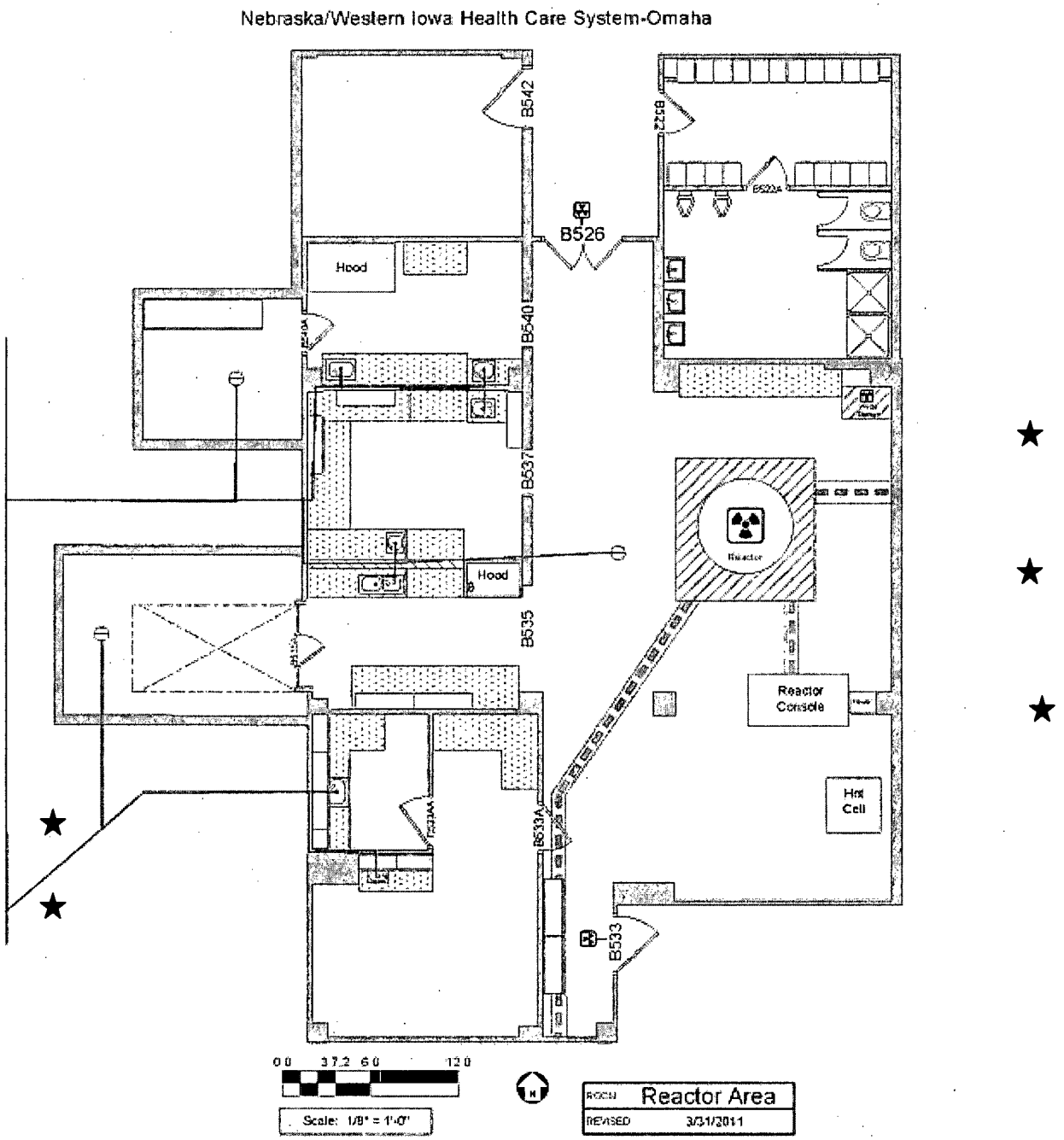
The VAMC building is constructed of brick and reinforced concrete, including the floors, walls, and ceiling. Entrance to the reactor laboratory is normally through the secured door marked SW 2 on Figure 1. The area to the left of the access door serves as a health physics control point.

Table 1 lists the rooms and areas within the Radioisotope Reactor Research Laboratory (B526). Samples to be irradiated were typically prepared in either room B526 or B540. Isotopes were stored in the isotope storage area B540A. Looking at various drawings, the room use sometimes changed; a list of the various room use noted on the drawings is provided.

The reactor room ventilation supply provides heated or cooled 100% outside air to the reactor laboratory through six ceiling ducts. The exhaust exits the reactor room to the outside air by means of an exhaust fan installed in the outside wall of the building. In addition, two laboratory fume hoods are operated continuously and exhaust by means of fans installed on the roof of the medical center. Since the blower for the hood exhaust is on the roof, resulting in the entire duct having a negative pressure, any leakage would be into the duct, eliminating the potential for exposure within the medical center.

A previous characterization of the reactor facility was reported in 2003. This characterization included rooms, ventilation systems, drainage systems, cooling systems, storage areas, the reactor structures, and outside areas. The purpose of the characterization survey was to collect sufficient survey data to allow VA to develop a detailed Decommissioning Plan (DP, March 2004). Upon its initial review of the draft DP, NRC requested that additional characterization be performed to support conclusions and objectives presented in the DP. The specific items noted in the Request for Additional Information (RAI) were subject of discussion during an on-site meeting between VA and NRC in October 2010, as well as subsequent teleconference discussions. This Additional Characterization Work Plan provides the procedures to be used in addressing the RAI items. The Sampling and Analysis Plan (SAP, Section 4) describes the survey protocols AECOM will implement to further characterize the AJB reactor facility and obtain the data required to revise the Decommissioning Plan.

In general, this additional characterization will include soil and water filter resin samples and other contamination samples to identifying the isotope mix for residual contamination and waste. This Work Plan also describes a host of "pre-decommissioning" activities to further refine the decommissioning work plan and simplify those activities. The pre-decommission activities are described in Section 5, Pre-Decommissioning Task Plan. These activities will assist the eventual decommissioning contractor to complete license termination and the activities will enable a revision to the DP suitable for acceptance by the NRC.



★ Proposed soil sample locations (approximate).

Figure 1 - Radioisotope Reactor Research Laboratory, Omaha VAMC

Table 1 – Radioisotope Reactor Research Laboratory, Omaha VAMC

Room Number New (old)	Description	Former Use	Current Use
B522 (SW 1)	Locker Room	Accessible by hospital staff for storage of personal items	Accessible by hospital staff for storage of personal items
B522A (SW 1A)	Restroom and shower	Accessible by hospital staff	Currently accessible by hospital staff
B546 (SW 2)	Radioisotope Reactor Research Laboratory	Research activities and storage; contains 1 of 2 fume hoods	None
B533A (SW 2A)	Office	Office of staff researcher	None
B533AA (SW 2B)	Office/Darkroom	Darkroom, office, and storage space	None
B537 (SW 2C)	Nuclear research lab and office	Sample preparation	None
B535A (SW 2D)	Walk-in Cooler	Cold storage	None
B540 (SW 2E)	Nuclear research lab and office	Sample preparation; contains 1 of 2 fume hoods	None
B540A (SW 2F)	Isotope and general storage	Storage of irradiated samples	None

2 ORGANIZATION AND RESPONSIBILITIES

2.1 Schedule Overview

The detailed task schedule (Appendix A) illustrates the multi-tasking approach that will be applied to conduct all onsite activities within 4 weeks. Key tasks of the schedule are listed below.

Mobilization
Setup work areas
Training
Task Planning
Characterization
Sample resin bed
Sample metals
Collect soil samples
Collect samples from piping, ventilation, etc.
Swipe the facility
Pre-Decommissioning
Free Release Lead
Free Release Miscellaneous Material (trash, office furniture, etc.)
Remove 'interference'
Consolidate exempt check sources
Manage the polonium – beryllium source
Package any radioactive material discovered
De-Mobilization

2.2 Project Personnel

The AJB project will be staffed with the following key project personnel: the AECOM Project Manager, Mr. Kevin Taylor, and the AECOM Site Supervisor. The project team leadership will be supported by on-site heath physics (HP) technicians and decontamination technicians. Additional project support may be provided by AECOM professional staff of health physicists, radiological engineers, and environmental engineers. The general duties of the key project personnel are commensurate with the descriptions in to the AECOM North American Radiation Safety Program (RSP) (S3NA-516-PR).

2.3 Site Health and Safety

2.3.1 Industrial Safety

All work conducted by AECOM personnel and their subcontractors will be conducted in accordance with a site-specific Health and Safety Plan (HASP). Site training for all workers includes a review of the HASP prior to the start of site activities. The Site Supervisor has full responsibility for maintaining a safe work site and to ensure all evolutions are completed safely while assuming responsibilities of the Site Health and Safety Officer and Site Radiation Safety Officer [together Site Safety Officer (SSO)]. AECOM's regional safety manager will be a

technical resource on industrial safety matters. Non-radiological safety issues will be addressed using Task Hazard Analyses (THA) as set forth by the HASP. All site personnel will have authority to stop work under any perceived unsafe conditions.

2.3.2 Radiation Safety

While the HASP discusses radiological safety as well as industrial safety, all radiological work will be performed in accordance with the AECOM North American RSP and a project-specific Radiation Protection Plan (RPP). Per the RSP, a project-specific RPP will be the primary means of providing the administrative controls under which work in radiologically controlled areas will be performed. The RPP will provide the controls that ensure the work is accomplished in a radiologically safe manner while maintaining personnel radiation exposure as low as is reasonably achievable (ALARA). The RPP will also be prepared in accordance with the AJB Reactor Facility Radiation Protection Program (Rev 7-02) unless noted in the RPP. The RPP will be reviewed and approved by an AECOM Certified Health Physicist (CHP) and the AJB Reactor Safeguards Committee. Personnel who enter controlled radiological area under the RPP will comply with the requirements, instructions, and precautions of the RPP.

2.4 Radioactive Material Management

This Work Plan does not address the shipping of radioactive waste as none will ship from the ABJ at this time (other than one Po-Be source described in Section 5.4.1). However, the accumulation of small amounts of radioactive material is expected to occur. This material, consisting of any contaminated 'interference' (i.e. counter tops, office equipment) will be stored in a B-12 or like container to await the eventual disposition during final decommissioning. A full inventory of the stored radioactive material will be affixed to the storage container and copies will be provided to VA project management personnel. Contaminated materials that are also hazardous or universal wastes, such as lead, will be segregated from the nonhazardous materials.

The radioactive or potentially radioactive samples will be sent to an independent laboratory for analysis. Shipped in accordance with 49 CFR 173, the samples will most likely be transported as UN 2910 "excepted package-limited quantity of material." A screening process, where each sample will be scanned for gamma and a one gram aliquot will be screened in a Ludlum Model 2929 or like instrument for alpha and beta. If it is determined any sample exceeds the excepted package limit, it will be shipped according to proper shipping regulations. AECOM's Site Supervisor is a certified in shipping radioactive materials in accordance with US Department of Transportation (DOT) regulations.

2.5 Equipment and Instrumentation

It is not expected that any large pieces of equipment will be utilized during the characterization/pre-decommissioning activities as no large scale demolition will take place. The only foreseeable item may be a pneumatic pallet jack that is available at the facility. AECOM will make requests to borrow available manual equipment from the VAMC's shipping and receiving area, also located in the basement. While not expected, AECOM will also request powered equipment and an operator from the VAMC, if it becomes necessary.

A direct push soil sampler, such as a Geoprobe®, and operator will be procured from a local source in accordance with AECOM's federal subcontracting procedures.

As necessary, AECOM will supply high efficiency particulate air (HEPA) filter-equipped air-handling carts and/or HEPA-equipped vacuum cleaners. Along with the HEPAs, AECOM will also have several air samplers. Air will be sampled on a per task basis. All air samples will be screened for alpha, beta, and gamma radiation levels. This equipment will be provided by AECOM's existing inventory or it will be procured in accordance with AECOM's federal subcontracting procedures.

Radiation survey instruments capable of detecting the alpha, beta, and gamma radiations will be used during the operations and surveys. These instruments will likely include gas proportional detectors, Geiger-Müller (GM) detectors, alpha beta (phoswich) detectors, gamma scintillation (NaI) detectors, and swipe/sample counters. All instruments used onsite will be managed according to AECOM standard operating procedures for radiological services SOP01 and SOP02. Records of calibration and instrument control logs shall be maintained. Instrument control logs plot daily source response checks relative to the acceptable response range. All instruments will be calibrated. Instruments will be procured (rented) in accordance with AECOM's federal subcontracting procedures.

3 SITE ACTIVITIES

3.1 Mobilization and Work Area Setup

The purpose of mobilization is to ensure the efficient and timely movement of personnel and equipment to the site. Mobilization activities include:

- Travel of project personnel to the area
- Shipping and receiving instruments, equipment, and supplies
- Kick-off meeting with project personnel

AECOM will setup a project office in one or more offices in the vicinity of the ABJ Reactor. Offices will be in uncontrolled areas, preferably Room SW 3. Filing systems will be established to maintain site records.

A suitable space, such as room B542, will be used as an equipment storage area and sample counting room. While the laboratory areas will generally not require radiological controls, dose rates and contamination levels will be routinely monitored in the laboratory spaces to verify the effectiveness of radiological controls used. These surveys will be documented.

Prior to commencing the decommissioning activities the exterior areas around the building available for project use will be finalized and each work area will have radiological control area (RCA) boundaries established to include postings, frisking stations and step-off pads where appropriate. A staging area for clean equipment and materials will be established outside the RCAs. Empty radioactive material containers will be staged inside the B526 area gate.

3.2 Training

General site and project orientation training will be provided by the Site Supervisor. This will cover general project goals, work schedule, project schedule, and other general topics. The Site Supervisor will also provide the Site Safety Orientation, which includes a review of the HASP, THAs, and RPP. Site personnel are required to sign the HASP and RPP following training.

AECOM's Site Supervisor is trained as a Radiation Worker and will act as an escort for personnel not fully trained as Radiation Workers that must enter a radiologically controlled area. All site personnel will receive a minimum of Radiation Worker Awareness Training in accordance with the AECOM RSP.

Personnel working on-site will receive training in the hazards of working with lead. The AJB Reactor contains many different types of lead; bricks, slabs, and small vial container to name a few. AECOM personnel will undergo training in accordance with AECOM Safety, Health, and Environment (SHE) Standard Operating Procedure (SOP) 507, "Lead."

3.3 Task Hazard Analysis

Prior to the start of specific tasks that include any destructive or dismantlement work, the Site Supervisor will prepare a THA specifying the anticipated impacts to the facility and facility systems and present this plan to Project Manager for review. A THA is utilized for primarily safety purposes. The THA will include a detailed description of the proposed task; anticipated impacts on utility systems; identification of any modifications to the building's structure; and radiological and safety impacts.

3.4 Daily Safety Briefings

The Site Supervisor will conduct a daily safety briefing at the beginning of each work shift. The briefing will review the day's planned work activities and applicable THAs. All personnel present must sign the daily briefing attendance record.

4 SAMPLING AND ANALYSIS PLAN

As discussed in the Requests for Additional Information (RAI) from the NRC and addressed in the responses to the RAIs, in order to fully revise the DP, some additional characterization should be executed. The characterization efforts recommended by the NRC include sampling and analyzing outside soil, contamination in vents and drain lines, and activated and contaminated materials. These samples will be analyzed for the purpose of identifying the isotopes of concern, determining the appropriate mix of isotopes, and establishing one or more Derived Concentration Guideline Levels (DCGL).

The Site Supervisor will keep a log of all material samples and surveys and provide each sample and survey record a unique identification number. As appropriate, the Site Supervisor will also document sample and survey locations with digital photographs.

Off-site analytical services will be procured in accordance with AECOM's federal subcontracting procedures.

4.1 Resin Bed Sampling

The reactor tank water filter resin bed demineralizer tank, located in the cooling system "vault" or "pit" on the east side of the reactor facility will be sampled in a layered approach to determine the mix of isotopes that may be applicable to the contamination in and around the reactor. The analysis will include hard-to-detect (HTD) isotopes as well as gamma spectroscopy for activated metals. A minimum of three samples will be collected. The minimum three samples should be collected from within the cylindrical container at the top, middle, and bottom of the tank. The three layers should insure a complete view of any contaminates.

Prior to the shutdown of the water circulation and opening of the resin tank, AECOM will perform and document an exterior gamma radiation survey of the tank using a gamma exposure rate meter. The resin tank is less than a meter in height permitting relatively easy access to all layers.

The sample collection processes includes.

1. Close by-pass valves around the resign bed and then turn off the water circulation pumps. This will ensure no water will flow through the system during the sampling process.
2. Loosen clamps from the out flow and inflow lines. It is expected the lines will be empty after the bypass valves are engaged, however, AECOM employees will capture any water in buckets and the floor covered in plastic. (While the reactor water tests clean for any radioactivity, AECOM will take these steps to reduce the possibility of cross contamination.)
3. Remove the six hex head bolts from the top of the resign bed tank.
4. Sample the resin at the three locations previously described with a variable split spoon or similar sampling tool.
5. Pour any collected water back into the resin tank.
6. Replace the lid to the tank and tighten all bolts.
7. Reassemble out flow and inflow lines before restarting the pump.

Personnel collecting samples will, at a minimum, wear disposable latex or nitrile gloves and disposable coveralls (Tyvek or equivalent). Samples will be placed in a glass or plastic containers that are consistent with the needs of the laboratory receiving the samples. Samples will be labeled with a unique identification number, name of sampling technician, and time and date of sample. Sample volumes will be sufficient to perform the required analysis. The necessary volume will be recommended by the laboratory.

Sample containers will be surveyed for surface contamination prior to packaging. Samples will be shipped in accordance with all applicable DOT regulations.

Sampling equipment and tools will be thoroughly decontaminated with an appropriate decontamination solution such as Mass Effect (or like cleaner). The sampling equipment will be scanned for alpha, beta, and gamma contamination before the next sample is captured. This process will be repeated after each sample is collected. Volumes of potentially contaminated water shall not be generated. Investigation derived wastes (IDW) will be managed as described in Section 4.7.

Resin samples will analyzed for the isotopes listed in Table 2 using the stated technique and equivalent methods. Analytical methods are selected based on potential contaminants and to confirm or dismiss uncertain results from the previous sampling effort.

Table 2 – Resin Analytical Requirements

Isotope or Isotope Series	Technique	Method
Tritium (H-3)	liquid scintillation counting	EML HASL 300
Carbon-14 (C-14)	liquid scintillation counting	EERRF – C01
Iron-55 (Fe-55)	liquid scintillation counting	Column Separation
Nickel-59/63 (Ni-59/63)	liquid scintillation counting	EML HASL 300
Polonium-210 (Po-210)	alpha spectroscopy	EML HASL 300
Plutonium-241 (Pu-241)	liquid scintillation counting	EML HASL 300
Plutonium isotopes	alpha spectroscopy	EML HASL 300
Uranium isotopes	alpha spectroscopy	EML HASL 300
Thorium isotopes	alpha spectroscopy	EML HASL 300
Gamma emitting isotopes	Gamma spectroscopy*	EML HASL 300

* Gamma spectroscopy analysis will identify activation products such as cobalt-57, cobalt-60, zinc-65 and europium-152; fission products such as cesium-137; and naturally occurring isotopes such as actinium-228, radium-226, and lead-214.

4.2 Activated Metal Analysis

There are several pieces of activated metal currently outside of the reactor pool including stainless steel cables and aluminum cable clamps. Samples of these items will be collected and analyzed to help establish the nuclide distribution in activated materials. The goal will be to collect at least one sample each of stainless steel and aluminum. The combination of the activated metals contained within samples of stainless steel and aluminum benefit future waste profiling needs and estimates of the activity of internal reactor components. Levels of activation isotopes such as Co-57, Co-60, and Cs-137 can facilitate the calculation of other isotopes which could also be present.

Before activated materials are handled, they will be surveyed to determine if extremity dosimetry is required. AECOM has an administrative dose limit of 20 rem/yr for extremity dose for Radiation Workers. Dose monitoring is required if doses are expect to exceed 10% of this limit. Therefore, if contact gamma exposure rates exceed 500 mR/hr, ring dosimeters will be required for personnel handling activated metal samples. Also, to keep doses ALARA, personnel should avoid handling activated metals with their hands and should use tools such as tongs to handle

the items. Gamma exposure rate measurements taken in March 2011 indicate that the contact exposure rate on the items expected to be samples is about 1.2 mR/hr and, therefore, ring dosimeters are not expected to be necessary.

Samples will be placed into appropriate containers, labeled, and packaged for transport in accordance with DOT regulations. The metals will be cut with shears or wire cutters for either shipping or general size reduction. Prior to packaging the metal samples, removable surface contamination samples will be collected and examined.

Activated metal samples will be analyzed by gamma spectroscopy at an off-site laboratory for identification of gamma-emitting isotopes including common activation products. Results will only approximate the materials as the laboratory will not likely have an appropriate calibration standard for the specific geometry of each sample. AECOM will work closely with the laboratory to determine the best sample preparation and analytical approach. The laboratory will be requested to maintain the samples in their inventory for further analysis as necessary. All sample collection activities will be allowable under the reactor facility Technical Specifications, approved by VA project management personnel, and performed in accordance with the project RPP.

4.3 Surface Contamination Surveys

Another goal of the characterization effort is to collect removable surface contamination samples (swipes) throughout the reactor facility and analyze for tritium, carbon-14, and other HTD isotopes. During the previous characterization, the only HTD analysis was for tritium in only 10% of the removable contamination swipes. The floor in B526, B540, and B540A will be divided into 1-meter square grids and a 100 cm^2 swipe and a direct alpha and beta total contamination measurement will be taken in each grid square. Previously only a total of 13 tritium smears were collected in this area with only one smear (on the floor in B540A) with detectable activity above the instrument's (a Packard LSC) detection limit.

Swipes and direct alpha and beta measurements will also be taken in other locations likely to accumulate contamination and in areas where the previous characterization efforts identified alpha or beta contamination. These locations will include the following:

- Reactor pool covers
- Reactor bridge and bridge components
- Pneumatic transfer trench
- Trench surrounding top of reactor
- Cooling system "vault" floor

Swipes should be taken in low-dust areas. Dust can collect radon daughter products and dusty samples can result in cloudy scintillation fluid which can impact the analytical results. As necessary, additional swipes will be collected to quantify radon daughter activity using an alpha/beta sample counter (Ludlum Model 2929 or equivalent). This technique involves counting swipes multiple times and documenting the decreasing activity of the sample as the radon daughters decay away.

Sampling technicians will log swipes into a sample log as they are collected providing each with a unique identification number.

A Packard TriCabb 2100 TR liquid scintillation counter (LSC) located at the Omaha VAMC will be available for analyzing these swipes. The LSC will require a multi-point calibration with applicable quench standards. AECOM will work with VA personnel for access to a calibrated LSC and also work with VA personnel to ensure that the LSC is reporting acceptable results.

Based on information provided by various publications (ISO 1988, Packard ABA-006, and DOE 1994), the following procedure for collecting and preparing LSC swipe samples will be used:

1. With a dry 2 cm^2 paper filter or a cotton swab, swipe an area of approximately 100 cm^2 or the entire area of concern if less than 100 cm^2
2. Place the filter paper into a 15 mL LSC vial
3. Add 10 mL of non-hazardous liquid scintillation cocktail such as Ultima Gold ™
4. Label the LSC vial with the sample number

These samples will then be analyzed using protocols established for the VA's LCS (either existing or project-specific). AECOM anticipates reporting H-3 (5.7 keV average), Nickel-63 (17.1 keV average), and C-14 (49.5 keV average), and total beta activity for each swipe.

4.4 Ventilation System Surveys

Removable contamination swipes will be collected from inside the air exhaust system that originates with the two vent hoods in the reactor area. Swipes will be taken at multiple locations inside the hoods, inside the ventilation ducts at the point the ventilation goes vertical from the basement level (in room B526), and at access points on the top of the roof. Any sampling access openings in the ductwork will be closed following collection. At the time this plan takes place, any other available access points identified by the VA will also be sampled.

The removable contamination surveys will be collected in several different ways. Depending on the location and accessibility of the samples, it may consist of 100 cm^2 swipes or cotton swabs. In either case, the swipes or swabs will be screened for alpha and beta activity with a Ludlum Model 2929 swipe counter, or like instrument. Additionally, samples will be collected and analyzed in an LSC as described above to discover hard to detect isotopes. All results will be appropriately documented.

Sampling equipment and tools will be thoroughly decontaminated using a non-toxic spray cleaner and disposable towels. All tools and equipment will be surveyed for removable and fixed contamination before being placed back into general service. Volumes of potentially contaminated water shall not be generated. IDW will be managed as described in Section 4.7

4.5 Sanitary Sewer and Embedded Piping Surveys

Sanitary sewer drain lines in the reactor facility will be surveyed and sampled through sink and floor drains and other access points both inside and outside the facility. Figure 1 shows the location of the approximate drain lines. Access points outside the building including two locations to the east side of the building and one on the west side. On the east side, the sewer is easily accessible approximately 20 feet from the building exit near the bottom of the exterior

stairs and again about ten feet south,. On the west side of the reactor building, the sewer can be accessed and 15 feet south of the new oil generator.

If pipes or pipe sections are to be removed, an external radiation survey will first be performed. Sample gloves and disposable coveralls will be worn when accessing pipes and drain lines.

Pneumatic tubing formerly used for sample transport into the reactor vessel will likewise be sampled.

Sample technicians will collect swipes and/or swabs of the pipe/tube interiors and analyze the samples in a LCS as detailed in the previous section. However, samples will be screened with hand-held instruments or a scintillation counter such as a Ludlum Model 2929 prior to placing them in the scintillation vials. If a sufficient volume of sediment/sludge can be collected from a drain line or sewer line, a sample will be collected for off-site laboratory analysis of isotopes and isotope series provided in Table 2. The minimum sample volume will be determined by the analytical requirements of the off-site laboratory.

Sample containers that will be shipped off-site will be surveyed for surface contamination prior to packaging. Samples will be shipped in accordance with all applicable DOT regulations.

Sampling equipment and tools will be thoroughly decontaminated using a non-toxic spray cleaner and disposable towels. All tools and equipment will be surveyed for removable and fixed contamination before being placed back into general service. Volumes of potentially contaminated water shall not be generated. IDW will be managed as described in Section 4.7.

4.6 External Soil Samples

Previous characterization activities collected surface and subsurface soil samples from inside and outside the reactor facility. While no radioactive contamination was identified in any of these samples, these samples were analyzed using only gamma spectroscopy which will not identify hard to detect beta-emitting isotopes such as tritium and nickel-63. To determine if soil outside the reactor area is contaminated with hard to detect isotopes and other isotopes of concern, additional surface and subsurface soil sampling will be conducted. AECOM will collect approximately seven soil samples from the exterior of the facility near the two "hatches" that provide access to the basement area. Analysis will include isotopes and isotope series provided in Table 2.

The proposed soil sample locations are provided in Figure 1. Final sampling locations will be determined following a utility clearance by the VA. Using direct-push sampling technology, such as a Geoprobe®, a minimum of four soil samples will be collected from two locations west side of the building. At each location, one sample will consist of a composite of the first 12-inches of soil. The second sample at each location will be collected in the 2-foot interval that is at the level of either drain lines leaving the reactor area or just below the basement floor level (about 12 to 15 feet). Groundwater is not expected at these depths.

The remaining three samples will be collected on the east side of the building in the vicinity of the circulation equipment vault and cooling tower. Each sample will consist of a composite of the first 12-inches of soil beneath the cement walkway. There are no drains below the basement floor level on east side of the building.

A background sample will be collected from surface soil at a nearby location. This will be analyzed in the same manner as the other seven samples.

Samples will be analyzed for the isotopes listed in Table 2 using the stated technique and equivalent methods. Analytical methods are based on potential contaminants and to confirm or dismiss uncertain results from the previous sampling effort.

Personnel collecting samples will, at a minimum, wear disposable latex or nitrile gloves and steel-toed boots, safety glasses, and hard hat while working near the operating Geo-Probe. Samples will be placed in a glass or plastic containers that are consistent with the needs of the laboratory receiving the samples. Samples will be labeled with a unique identification number, name of sampling technician, and time and date of sample. Sample volumes will be sufficient to perform the required analysis. The necessary volume will be noted by the laboratory.

Sample containers will be surveyed for surface contamination prior to packaging. Samples will be shipped in accordance with all applicable DOT regulations.

As with any sampling, the utmost care will be taken to ensure no cross contamination will occur. After the sampling of each individual point tooling will be handled as radiologically contaminated and the appropriate PPE will be utilized (gloves, safety glasses, etc.). The sampling equipment will be cleaned with an appropriate decontamination solution such as Mass Effect or like cleaner. The sampling equipment will be scanned for alpha, beta, and gamma contamination before the next sample is collected. This process will be repeated prior to each sample and at the end of the sampling event. Volumes of potentially contaminated water shall not be generated. IDW will be managed as described in Section 4.7.

4.7 Investigation Derived Waste

AECOM personnel will collect potentially contaminated IDW, such as swipes; scintillation vials; and disposable gloves, towels, and coveralls in yellow "RAD BAGS" labeled for contaminated materials. These bags will be placed in the radioactive materials storage bin described in Section 5.3 and remain on-site to be disposed of during the overall reactor decontamination efforts. "RAD BAGS" and their contents will be listed on the container's inventory.

5 PRE-DECOMMISSIONING TASK PLAN

The laboratories and work spaces in the controlled area around the reactor will be prepared for the decommissioning. Some generalized housekeeping done at this stage will allow for a better cost estimate and fewer delays in the decommissioning effort. Additionally, an area that is well prepared for the contractor will allow the decommissioning contractor to concentrate soley on decommissioning activities. A draft list of expected "free release" materials from the reactor room area will be compiled for review under separate document. These pre-decommissioning tasks will in no way affect the current Technical Specifications for the reactor. AECOM possess a radioactive materials license for decommissioning activities issued by the State of Texas. While the license is not required and will not be implemented for the scope of work described in this Work Plan, AECOM will utilize SOPs that were developed and are maintained for use with its Texas license.

The survey methodologies to be employed for the free release of tools, equipment, instrumentation and applicable materials will conform to AECOM Radiological Services Group SOP 14, *Radioactive Materials Release*. This SOP was prepared in accordance with the NRC's Office of Inspection and Enforcement (IE) Circular 81-07, *Control of Radioactively Contaminated Material* and *Information Notice 85-92, Surveys of Waste Before Disposal from Nuclear Reactor Facilities.* These same release criteria can be found in the better known Regulatory Guide 1.86, *Termination of Operating Licenses for Nuclear Reactors*. Materials to be free released will be surveyed in low-background areas and shown not to have total or removable contamination or activation in excess of the free release criteria provided in Table 3.

Table 3: Applicable Gross Contamination Release Limits

EMISSION	REMOVABLE dpm/100 cm^2	TOTAL (Fixed and Removable) dpm/100 cm^2
Alpha	20	100
Beta-Gamma	200	1000
Tritium	1000	5000

5.1 Lead Release

To reduce the amount of non-radioactive material on the site AECOM will free release as much lead as possible. Lead at the ABJ Reactor comes in several forms: there are several dozen small "lead pigs", the source wall plugs, a large lead box, and miscellaneous lead items. A previous characterization did completely survey the lead pigs for free release, so at this time confirmatory surveys will be undertaken. The plugs have never been thoroughly examined, but were swiped in the initial survey detecting no loose contamination.

All the lead surveys will be documented. Any contaminated lead will be inventoried and stored separate from the clean lead.

Sample Decay Shield

The large lead shield box that was used for shielding recently activated materials during the reactor operations will be surveyed to the extent practical. The large box is currently sealed shut and will entail a partial dismantlement before a survey is possible. There is an access point at the top of the box which has been investigated; however, the contents of the lower potions are currently unknown. Upon the opening of the seal box, continuous health physics monitoring and PPE considered necessary by the AECOM Site Supervisor will ensure the safe handling of the materials within the box (if any). If the box cannot be removed, it will be surveyed in placed and free released. All surveys will be fully documented.

5.2 Miscellaneous Loose Materials

Much of the reactor area still contains many loose materials needing removal to create space for the future decommissioning. These materials consist of computers, office furniture, papers, and boxes. Surveys will generally include 100% scan of all accessible surfaces for alpha, beta/gamma contamination. Also, removable contamination swipe samples will be examined for

gross alpha/beta in a Ludlum Model 2929 or like instrument. Swipe samples generally cover a 100 cm^2 area for each square meter of material.

If general areas swipes on floor and wall surfaces or in fume hoods indicate HTD isotopes, swipes from items considered potentially impacted in a similar manner will be analyzed in a LSC. For example, if a wall surface indicates tritium contamination, swipes taken on cabinet located along that wall will be analyzed for tritium and other HTD isotopes.

For multiple items of the same thing, such as books stored in the same area, surveys will not be performed on each item but a representative portion of the items.

After materials are free released from the space, VA will handle disposition of the materials in accordance with appropriate VA policies.

Materials to be free released will be surveyed in low-background areas and shown not to have total or removable contamination or activation in excess of the free release criteria provided in Table 3. Materials that cannot be adequately surveyed or do not meet free release criteria will not be released. Survey records will be maintained for all materials free released, documenting that they met the release criteria.

All wastes generated and materials released from the AJB during the project will either be free released or inventoried and placed in radioactive materials storage containers.

5.3 Interference Removal

Once the above tasks have been completed, the final undertaking of pre-decommissioning will be interference removal. Removal of the reactor core assembly out of the building may be through the basement cold storage room (which has direct access to ground level). The interior liner of the cold storage room will be removed to provide access and evaluation of the foundation structure. Materials will be surveyed as described above. Once accessible, the wall behind the room liner will also be surveyed for total and removable contamination.

Additional free-releasable obstacles will be removed to ease the future Decommissioning Contractor efforts. As time allows, laboratory benches and cabinets, exclusive of the contaminated fume hoods, will be disassembled. Materials will be surveyed as released as described above. Once accessible, the walls behind the benches and cabinets will be surveyed for total and removable contamination.

5.4 Radioactive Material

During pre-decommissioning activities, AECOM may encounter small amounts of radioactive materials. An example of this could be some of the loose materials mentioned above. Any contaminated items will be placed in a separate container solely for radioactive materials storage. AECOM will arrange for a standard radioactive storage container (such as a B-12 waste box) to place such items in. AECOM will keep a detailed inventory of items placed in the storage container. The container would ultimately be managed by the decommissioning contractor.

5.4.1 Sources

Several small check sources may be scattered throughout the facility. While many check sources are exempt from regulatory requirements, AECOM employees will consolidate sources discovered at the site and determine which are regulated and which are exempt. The sources will be inventoried and placed in a separate storage container. However, these sources will likely not be disposed of with other low level radioactive waste due to limitations at most disposal facilities.

The AJB Reactor also has a polonium-beryllium (Po-Be) neutron source containing polonium-210 (half life = 138 days). AECOM will dispose of this item in the most reasonable way possible. The initial activity of the source in 1966 was 7 curies and it has decayed to an activity of immeasurable amount.

The Po-Be source has a gamma exposure rate reading of 1.2 mR/hr on contact. This exposure rate is most likely from activation products of the stainless steel that encapsulates the source. Options for disposal of the source include the Los Alamos National Laboratory Off-Site Source Recovery Program (OSRP) or a broker licensed to store or destroy the source (such as NSSI in Houston, Texas).

AECOM employees will ship the source according to DOT and IATA regulations. DOT regulations allow for certain expected instruments and articles to be shipped using the UN2911 shipping category. Shipping as UN2911 allows the small amount of radioactive material to be shipped using a common carrier as long as the package contact dose is low enough. However, it may be determined by the OSRP that the source needs to be shipped as low-level radioactive waste under a radioactive waste manifest. To ship the source as a waste, a certified waste transport company will be required to transport the source.

AECOM anticipates determining the final disposal path for the Po-Be source prior to mobilization for characterization and pre-decommissioning activities.

5.4.2 Contaminated Lead

Contaminated lead will be stored separately from other radiologically contaminated or activated materials. No contaminated lead will be placed in radioactive waste shipping/disposal containers.

6 LIST OF PROCEDURES AND REFERENCES

1. AECOM S3NA-516-PR, *Radiation Safety Program*
2. AECOM S3NA-513-PR, *Lead*
3. AECOM Radiological Services Group, SOP 01, *Portable Detection Equipment*
4. AECOM Radiological Services Group, SOP 02, *Scaler Operations*
5. AECOM Radiological Services Group, SOP 05, *Document Control*
6. AECOM Radiological Services Group, SOP 07, *Grid Systems and Surveys*
7. AECOM Radiological Services Group, SOP 08, *Sample Chain of Custody*
8. AECOM Radiological Services Group, SOP 12, *Swipe Samples*

9. AECOM Radiological Services Group SOP 14, *Radioactive Materials Release*
10. AECOM Radiological Services Group, SOP 19, *Air Samples*
11. US Nuclear Regulatory Commission Office of Inspection and Enforcement (IE) Circular 81-07,*Control of Radioactively Contaminated Material*
12. US Nuclear Regulatory Commission Information Notice 85-92, *Surveys of Waste Before Disposal from Nuclear Reactor Facilities*
13. US Nuclear Regulatory Commission Regulatory Guide 1.86, *Termination of Operating Licenses for Nuclear Reactors*

Appendix A

Project Schedule

Characterization and Pre-Decommisisoning Work Shcedule
AJB Reserach Reactor Facility
Omaha, Nebraska

	Monday	Tuesday	Wednesday	Thursday	Friday		Monday	Tuesday	Wednesday	Thursday	Friday		Monday	Tuesday	Wednesday	Thursday	Friday		Monday	Tuesday	Wednesday	Thursday	Friday
	4/25/2011	4/26/2011	4/27/2011	4/28/2011	4/29/2011		5/2/2011	5/3/2011	5/4/2011	5/5/2011	5/6/2011		5/9/2011	5/10/2011	5/11/2011	5/12/2011	5/13/2011		5/16/2011	5/17/2011	5/18/2011	5/19/2011	5/20/2011
Mobilization																							
Travel																							
Setup Work Area																							
Training																							
Characterization																							
Task Planning																							
Grid Floor																							
General Area Surveys																							
Ventilation Surveys																							
Drain Line Surveys																							
Demineralizer Sampling																							
Wall Surveys																							
Soil Sampling																							
Activated Metal Sampling																							
Ship samples																							
Pre-Decommissioning																							
Task Planning																							
Release Surveys																							
Dozier Wall Removal																							
Interferance Removals																							
Material Staging																							
Po-Be Source Shipment																							
Project Debrief Meeting																							
Demobilization																							