U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH
Great Lakes Environmental Research Laboratory
4840 South State Rd.
Ann Arbor, Michigan 48108

June 8, 2015

Materials Licensing Section
U.S. Nuclear Regulatory Commission, Region III
2443 Warrenville Road, Suite 210
Lisle, IL 60532-4352

Re: Radioactive Materials License 21-16544-01, Docket Number 030-11209

To Whom It May Concern:

Please terminate the radioactive materials license issued to the U. S. Department of Commerce/NOAA/ Great Lakes Environmental Research Laboratory (GLERL), License Number 21-16544-01. All use of licensed radioactive materials has ceased and a final status survey was completed to verify that the facilities can be released for unrestricted use.

Radioactive waste was shipped offsite by a licensed contractor. The completed form, NRC Form 314, and the final report for the final status survey are attached. Please let me know if you have any general questions or contact Kim Kulpanowski at 734-741-2074 or kim.a.kulpanowski@noaa.gov for specific questions about this request.

Sincerely,

Deborah H. Lee, PE, PH, D.WRE
Director

Attachments

NRC FORM 314 (02-2014)
10 CFR 30.36(j)(1); 40.42(j)(1); 70.38(j)(1); and 72.54(k)(5)(1)(1)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0028 EXPIRES: 02/28/2017

CERTIFICATE OF DISPOSITION OF MATERIALS

LICENSEE NAME AND ADDRESS	LICENSE NUMBER	DOCKET NUMBER
U.S. DOC/NOAA/Great Lakes Environmental Research Laboratory 4840 S. State Road Ann Arbor, MI 48108	21-16544-01	030-11209
	LICENSE EXPIRATION DATE: January 31, 2017	

A. LICENSE STATUS (Check the appropriate box)

☐ This license has expired. ☑ This license has not yet expired; please terminate it.

B. DISPOSAL OF RADIOACTIVE MATERIAL

(Check the appropriate boxes and complete as necessary. If additional space is needed, provide attachments)

The licensee, or any individual executing this certificate on behalf of the licensee, certifies that:

☐ 1. No radioactive materials have ever been procured or possessed by the licensee under this license.

☑ 2. All activities authorized by this license have ceased, and all radioactive materials procured and/or possessed by the licensee under this license number cited above have been disposed of in the following manner.

☐ a. Transfer of radioactive materials to the licensee listed below:

☑ b. Disposal of radioactive materials:

☐ 1. Directly by the licensee:

☐ 2. By licensed disposal site:

☑ 3. By waste contractor:

Bionomics Inc., 1550 Bear Creek Road, Oak Ridge TN 37830

☑ c. All radioactive materials have been removed such that any remaining residual radioactivity is within the limits of 10 CFR Part 20, Subpart E, and is ALARA.

C. SURVEYS PERFORMED AND REPORTED

☑ 1. A radiation survey was conducted by the licensee. The survey confirms:

☐ a. the absence of licensed radioactive materials

☑ b. that any remaining residual radioactivity is within the limits of 10 CFR 20, Subpart E, and is ALARA.

☑ 2. A copy of the radiation survey results:

☑ a. is attached; or ☐ b. is not attached (Provide explanation); or ☐ c. was forwarded to NRC on: _____ Date

☐ 3. A radiation survey is not required as only sealed sources were ever possessed under this license, and

☐ a. The results of the latest leak test are attached; and/or ☐ b. No leaking sources have ever been identified.

The person to be contacted regarding the information provided on this form:

NAME	TITLE	TELEPHONE *(Include Area Code)*	E-MAIL ADDRESS
Kim Kulpanowski	RSO	(734) 741-2235 or -2074	kim.a.kulpanowski@noaa.gov

Mail all future correspondence regarding this license to:

U.S. DOC/NOAA/Great Lakes Environmental Research Laboratory, Attn: Kim Kulpanowski, 4840 S. State Road, Ann Arbor, MI 48108

C. CERTIFYING OFFICIAL

I CERTIFY UNDER PENALTY OF PERJURY THAT THE FOREGOING IS TRUE AND CORRECT

PRINTED NAME AND TITLE	SIGNATURE	DATE
Deborah Lee, Director, Great Lakes Environmental Research Lab	Deborah H Lee	6-12-15

WARNING: FALSE STATEMENTS IN THIS CERTIFICATE MAY BE SUBJECT TO CIVIL AND/OR CRIMINAL PENALTIES. NRC REGULATIONS REQUIRE THAT SUBMISSIONS TO THE NRC BE COMPLETE AND ACCURATE IN ALL MATERIAL RESPECT. 18 U.S.C. SECTION 1001 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFICATE OF DISPOSITION OF MATERIALS

PLEASE READ THESE INSTRUCTIONS BEFORE COMPLETING NRC FORM 314.

Subpart E of 10 CFR Part 20 establishes the radiological criteria for license terminations/decommissioning of facilities licensed under 10 CFR Parts 30, 40, 50, 60, 61, 70, and 72, as well as other facilities subject to the Commission's jurisdiction under the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended.

INSTRUCTIONS

Section B, Item 2.
Licensees should describe the specific radioactive material transfer actions. If radioactive wastes were generated in terminating this license, the licensee should describe the disposal actions taken, including the disposition of low-level radioactive waste, mixed waste, greater-than-Class-C waste, and sealed sources.

Section B, Item 2.a.
The information provided concerning the transfer of radioactive material to another licensee should specify the date of the transfer, the name of the licensee recipient, an individual contact name and telephone number for the licensee recipient, and the recipient's NRC or Agreement State license number.

Section B, Item 2.b.
For disposal of radioactive materials, licensees should describe the specific disposal method or procedure (e.g., decay-in-storage). For those cases when radioactive materials are disposed of by a licensed disposal site or by a waste contractor, the licensee should specify the name, address, and telephone number of the licensed disposal site operator or waste contractor.

Section B, Item 2.c.
"Residual radioactivity," as defined in 10 CFR 20.1003, means radioactivity in 'areas' (structures, materials, soils, etc.) remaining as a result of activities (licensed and unlicensed) under the licensee's control from sources used by the licensee, excluding background radiation. ALARA is defined in 10 CFR 20.1003.

FILE CERTIFICATES AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND CERTIFICATES TO:

LICENSING ASSISTANT SECTION
NUCLEAR MATERIALS SAFETY BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
2100 RENAISSANCE BOULEVARD, SUITE 100
KING OF PRUSSIA, PA 19406-2713

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND CERTIFICATES TO:

MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

IF YOU ARE LOCATED IN:

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MISSISSIPPI, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND CERTIFICATES TO:

MATERIAL RADIATION PROTECTION SECTION
U. S. NUCLEAR REGULATORY COMMISSION, REGION IV
1600 E. LAMAR BOULEVARD
ARLINGTON, TX 76011-4511

Final Status Survey of the Great Lakes Environmental Research Laboratory's Lake Michigan Field Station and R/V Laurentian

prepared by:

BMT Designers & Planners Inc
4401 Ford Ave, Suite 1000
Alexandria, VA 22302
(703) 920-7070

Integrated Environmental Management, Inc.
a Plexus Company
7130 Minstrel Way, Suite 215
Columbia, MD 21045
(443) 319-8055

Report No. 2005006/G-5570, Rev. 0
May 29, 2015

Final Status Survey of the Great Lakes Environmental Research Laboratory's Lake Michigan Field Station and R/V Laurentian

Submitted to:

Great Lakes Environmental Research Laboratory
4840 S. State Road
Ann Arbor, Michigan 48108
(734) 741-2235

by:

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1 INTRODUCTION

1.1 Purpose

The Lake Michigan Field Station,(herein referred to as LMFS), and R/V Laurentian are named as radiologically restricted areas on License No. 21-16544-01, issued to the U. S. Department of Commerce/NOAA Great Lakes Environmental Research Laboratory (GLERL) by the U. S. Nuclear Regulatory Commission (USNRC). In order to remove the LMFS and R/V Laurentian from the listing of restricted areas and terminate License No. 21-16544-01, the Department of Commerce/NOAA, radiation safety staff must demonstrate that there are no radiological issues of concern therein. To that end, BMT Designers and Planners (BMT) was contracted to perform and document a final status survey demonstrating that these areas may be released for unrestricted use (i.e., without regard for their radiological constituents).

BMT subcontracted Integrated Environmental Management, Inc., a Plexus Company (Plexus-IEM) to assist in this task.[1] The scope of work included the preparation of a work plan based on the objective of acquiring data of sufficient quantity and quality to meet the requirements for the final status survey. The work plan was implemented, the data were acquired/analyzed, and there is no evidence of residual radioactivity (total or removable) in excess of the conservatively-derived USNRC screening criteria within the LMFS facility and the R/V Laurentian. In addition, because all gross measurement data were below the screening criteria, no statistical analyses were required.

The purpose of this report is to provide a description of the final status survey approach, the findings of the survey, and a statement as to the eligibility of the LMFS facility and the R/V Laurentian for release for unrestricted use. Included herein is background information about LMFS operations, a description of the facility, a listing of the radionuclides of concern at the site, a presentation of the release criteria, the survey objectives and design, the results of the survey, and a statement that the LMFS and R/V Laurentian are eligible for release for unrestricted use. Representatives of GLERL were given an opportunity to review and comment on a draft before the publication of this report.

1.2 Background

The LMFS, located at 1431 Beach Street, in Muskegon, Michigan, has been operating in that location since 1990, with radioactive material usage since 1994. In 1990, the GLERL assumed ownership of the former Coast Guard base at Muskegon, Michigan on the south side of the channel, between Muskegon Lake and Lake Michigan. That site includes three buildings and research vessel dock next to the main building.

The Federal Government established the Muskegon Life Saving Station in 1879, and a building was constructed at the current location in 1905. In 1915, the property and buildings were transferred to the Coast Guard. Since 1990, NOAA has invested in the facility by renovating Building 1, the original structure in 1905, to primarily office spaces and Building 2 (circa 1940's) renovations in 2013, adding office and maintenance shops. Building 3 was constructed in the 1960's and converted to laboratories in the 1990's. The laboratory provides environmental and ecosystem research in support of the Great Lakes and coastal marine environments.

The R/V Laurentian is an eighty foot steel-hulled vessel, that was built in 1974 for use by the University of Michigan. In 2002, a partnership agreement between GLERL and the University

[1] IEM is licensed by the Maryland Department of the Environment (MDE License No. MD-31-281-01), a USNRC Agreement State, to perform the types of radiation-related services required for this project. However, the final status survey was performed under the applicable terms and conditions of the LMFS license.

provided for a lease, whereby GLERL assumed responsibility for the vessel's operation, maintenance, and scheduling of ship time. The R/V Laurentian is equipped with wet and dry laboratories with basic laboratory equipment for processing chemical, physical, and biological samples. Licensed radioactive tracers were used in the onboard laboratory.

License No. 21-16544-01 authorizes the use of radioactivity for the performance of a variety of fate and transport studies. When radioactivity use in specific laboratories ceased, the remaining radioactivity was collected and staged as radioactive waste. Waste containers were subsequently shipped offsite for disposal at a licensed facility. The experimental waste water was disposed of into the building's sewer system as authorized by the USNRC license.

Other radionuclides that were at the site were in the form of sealed radiation sources used by the laboratory as measurement or calibration standards. The electron capture detector, used in a gas chromatograph, was routinely leak tested at six month intervals and all results were below the allowable limit of 0.005 microcurie per sample. All of the sources, including the electron capture detector, were all transferred to another licensee or returned to the manufacturer.

All work with licensed radioactivity ceased at LMFS and the R/V Laurentian on April 30, 2013. All remaining staged waste was shipped off-site on January 14, 2015. There was no evidence of packaged waste, bulk radioactivity, or sealed sources at the site during the on-site portion of the final status survey.

1.3 Facility Description

The LMFS Building 3, consists of offices and laboratories in a single-floor building with a total area of approximately 5,000 square feet (approximately 473 m^2). Four laboratories in Building 3 and the Hazardous Materials Storage Building were designated as restricted areas where licensed radioactive materials were authorized to be used (approximately 1,600 square feet or 150 m^2) and are thus subject to the final status survey. The wet laboratory in the R/V Laurentian was also designated as a restricted area on the USNRC license.

A list of specific areas subject to final status survey is provided in Table 8.1. Figure 9.1 is a floor plan of the building. The floor plan for the R/V Laurentian is provided in Figure 9.2.

Each of the laboratories is equipped with benches and cabinets for storage. The floors are covered with floor tiles. Most of the laboratories have at least one sink, with connections to a sanitary sewer that discharges to the public-owned water treatment works (POTW). One of the laboratories, Room 304, is equipped with a bench hood and a ventilation fan with airborne discharge to the roof of the building.

The Hazmat Storage Building, located outside Building 3, was purchased for the storage of hazardous materials on site, and was added to the license to allow for the storage of radioactive materials and waste, if necessary. It has three shelves and a metal floor grating over a secondary containment sump, with an interior area of approximately 49 square feet (ft^2).

1.4 Contaminant Identification

The LMFS and R/V Laurentian were licensed to use a variety of radioactive materials in an unsealed form. Most of the isotopes listed on the license were never present at the sites. The only long lived radioactive materials used in an unsealed form were Carbon-14 (C-14) and tritium (H-3). Table 8.2 contains the source term applicable to the final status survey effort.

1.5 Results of Previous Surveys

Routine wipe tests and direct radiation surveys were performed routinely by LMFS on selected surfaces in each laboratory as required by their license. The frequency of surveys varied according to the type of experiment in process, but were generally completed by the designated authorized user (or representative) on a monthly basis. The areas listed in Table 8.1 were surveyed by the RSO or the Deputy RSO in accordance with the conditions of their license.[2,3]

The action level for the historical surveys was stated as being "three times background". If any direct survey or wipe test result exceeded this level, the area was decontaminated and re-surveyed before the routine surveillance in that area was deemed complete. The RSO's records, maintained over the history of the license, show that there were no significant spills of radioactive material within any of the restricted areas or large releases of material to the sewer.

A radiation survey of each laboratory, adjacent areas, and the HAZMAT storage building performed on September 30, 2014, revealed no removable gross beta activity, with a measurement detection limit of less than 10 dpm/100cm^2. Direct scans for beta radiation were performed using a calibrated, gas flow proportional counter with a sensitive area of approximately 100 cm^2, again revealed no detectable fixed activity above a detection level of about 33 dpm/100cm^2, at a scan rate of approximately two inches per second.[4]

1.6 Organization

The final status survey of the LMFS facility was performed under the direction of Ms. Kim Kulpanowski, the RSO for LMFS, Duane Gossiaux, GLERL Deputy RSO and Mr. David Kindig, PE, of BMT. The survey team was directed by Mr. Bill Thomas, CHP, CIH, of Plexus-IEM, and included Mr. Steve Baker from Plexus-IEM. Carol Berger, CHP, FHPS, also of Plexus-IEM, provided program management and technical review of the deliverables. Appendix 10.1 contains the qualifications of the members of the survey team.

1.7 Approach

The objective of the final status survey was to collect data of sufficient quality and quantity to support a decision on release eligibility. The surveys performed by the RSO were deemed adequate for classifying the areas. These resulted in the need for two Class 3 survey areas, six Class 2 areas, and the remainder of the site designated as non-impacted.

A work plan was developed to describe the manner in which radiation measurements would be collected and analyzed.[5] The Plan, RSP-116, was reviewed by the RSO before the work was initiated, and is included herein as Appendix 10.2.

The survey team initiated the investigation with the understanding that if actual radiological conditions anywhere at the facility were not as anticipated, the release process would be discontinued in that location. The affected area would then be subject to the acquisition of characterization data sufficient to guide the necessary remedial actions. As will be shown in subsequent sections of this report, no remedial actions are required at the site.

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[2] Conversation between Kim Kulpanowski (LMFS RSO) and Bill Thomas (Plexus-IEM), March 30, 2015.

[3] USNRC License 21-16544-01, Condition 22, Requirements of the Radiation Protection Program

[4] The RSO maintains similar survey records collected previously with similar results.

[5] Integrated Environmental Management, "Final Status Surveys at the Great Lakes Research Laboratory", RSP-116, March 25, 2015.

The survey team mobilized to the site on March 30, 2015, implemented the provisions of the work plan, and then departed on April 1, 2015. Appendix 10.3 contains the Field Activity Daily Logs that were maintained while on-site.

2 RELEASE CRITERIA

2.1 Applicable Regulations

The USNRC has established criteria for ensuring that facilities and property used for licensed operations present a tolerable radiological risk to people and the environment once licensed operations cease. The radiation dose that the USNRC believes presents a tolerable risk, as published in the USNRC regulations, Title 10, Code of Federal Regulations, Part 20.1402 (10 CFR 20.1402), reads as follows:

> *"A site will be considered acceptable for unrestricted release where the residual radioactivity that is distinguishable from background radiation results in a total effective dose equivalent to an average member of the critical group that does not exceed twenty-five millirem per year (25 mrem/yr), including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA)..."*

The level of residual radioactivity permissible at the LMFS facility that would ensure compliance with USNRC's radiation dose objective may be determined by means of comparing final status survey results with screening criteria, established by the U.S. Nuclear Regulatory Commission (USNRC). As described in NUREG 1575, the Multi-agency Radiation Survey and Site Investigation Manual (MARSSIM), if the level of residual radioactivity in any of the survey units is less than the screening criteria, then they may be released for unrestricted use.[6]

The Alternative Simplified Method specified in NUREG 1757, Volume 2, Appendix B was selected as the approach for demonstrating compliance based on the assumption that (1) the areas to be surveyed have minimal potential for residual contamination above the screening criteria, (2) the facilities meet the condition requirements under the simplified approach (e.g., no volumetric surface contamination); and (3) there is a high probability of producing survey data of sufficient quantity and quality necessary to demonstrate that the facilities can be released for unrestricted use without further investigation.[7]

2.2 Derived Concentration Guideline Levels

The USNRC prepared tables of screening values for release of facilities or structures that are based on highly conservative assumptions and parameters, and recommends the use of these values in lieu of site-specific derived concentration guideline levels (DCGL) for Group 2 decommissioning sites. These values, found in Tables H.1 and H.2 of NUREG-1757, Volume 2 and SECY-98-242, *Screening Table for Building-Surface Contamination, Guidance in Support of the Final Rule on Radiological Criteria for License Termination* (USNRC 1998), were developed with the USNRC's *DandD* dose modeling code for building surface contamination.

For the final status survey of the LMFS facility and the R/V Laurentian, the USNRC's screening values were used in the place of site-specific DCGLs since Group 2 decommissioning candidates, as is applicable to the LMFS, and consequently do not require the use of site-specific DCGLs, detailed exposure pathway analysis or verification. The screening values represent surface

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[6] U.S. Nuclear Regulatory Commission, Multi-agency Radiation Survey and Site Investigation Manual, NUREG-1575, Revision 1, August, 2000.

[7] U.S. Nuclear Regulatory Commission, Consolidated Decommissioning Guidance Characterization, Survey, and Determination of Radiological Criteria, Volume 2, Appendix B, NUREG 1757, Revision 1, September, 2006.

concentrations of individual radionuclides that are deemed in compliance with the unrestricted release dose limit in 10 CFR 20.1402, or less than 25 millirem per year.[8]

As described in Section 1.4, above, the source term at the LMFS facility includes C-14 and H-3. The DCGL values for each of these isotopes were deemed equivalent to the USNRC's screening values, as shown in Table 8.3. For measurement purposes, the most limiting of these was selected.

[8] NUREG 1757, Volume 2, Appendix B.

3 QUALITY ASSURANCE

3.1 Data Quality Objectives

The MARSSIM Data Quality Objectives (DQO) process as it pertains to site investigations and surveys involves the evaluation of seven elements that address the fundamental decisions to be made and their inputs. These must be resolved before the overall project objectives can be met. The following are the seven DQO steps that were addressed :

- State the problem;
- Identify the decision;
- Identify inputs to the decision;
- Define the study boundaries;
- Develop the decision rule;
- Specify tolerable limits on decision error; and
- Optimize the design.

The following subsections provide an overview of the DQO process as it was applied to the final status survey of the LMFS facility.

3.1.1 State the Problem

The global problem to be resolved and the end point of the decommissioning effort, is the release of the LMFS facility and the R/V Laurentian, for unrestricted use. The primary decision-maker in regards to the investigation are representatives of the USNRC. Resources available to address the problem are provided by the LMFS and its contractors, BMT and Plexus-IEM.

3.1.2 Identify the Decision

The principal study question for the final status survey is as follows: *Can the LMFS facility and the R/V Laurentian, be released for unrestricted use by demonstrating compliance with applicable release criteria and using the MARSSIM-recommended methodologies*? If the survey data demonstrate that release criteria can be met, then unrestricted release of the site can be accomplished. Therefore, the primary decision statement for the final status survey is: "*Determine whether or not all of the survey units at the LMFS and the R/V Laurentian, satisfy the USNRC's screening criteria and are eligible for release*".

There are a number of interim decisions that needed to be resolved before the decision in regard to site release can be made. However, several decisions specified in the MARSSIM DQO process were determined not to be applicable for this final status survey because the licensee's site (1) qualifies as a Group 2 decommissioning site and (2) was eligible for evaluation under the NUREG-1757 Alternative Simplified Method. This method allows the licensee the ability to compare survey results directly to the release criteria defined in Chapter 2, above. Therefore, the modified list of MARSSIM decisions used for this site includes:

- Disposition of materials and equipment;

- Areas eligible for expedited release;
- Area classifications, including confirmation of non-impacted areas;
- Selection of judgmental and bias measurements;
- Instrument selection;
- Minimum Detectable Counts (MDC) and scan MDC requirements;
- Removable or fixed contamination levels; and
- Identifying operable units and survey units.

3.1.3 Identify Inputs to the Decision

Inputs to decision-making for the LMFS facility and the R/V Laurentian, came from operating procedures, historical site reports, and inventory records for open forms of radioactive material and sealed sources. The information contained in these records describes areas within the laboratory where radioactive material was handled and/or stored and identified those areas where there exist the potential for contamination on building surfaces and on the surfaces of materials and equipment. The information contained in these records supports the design of this final status survey and was used to identify the radionuclides of concern, assign survey units and survey unit classification (i.e., Class 1, 2 or 3). It was also used to select measurement types (i.e., direct, smear, etc.) for building and equipment surfaces, sinks, etc. necessary to meet the MARSSIM requirements for demonstrating that potentially impacted areas can be released for unrestricted use. The final status survey data would then provide a comprehensive assessment and be used to confirm that the LMFS facility and the R/V Laurentian, can be released for unrestricted use.

It is important to note that the use of radionuclides at the LMFS and on the R/V Laurentian, were closely monitored and action levels for fixed and removable contamination were established at the detection of the available radiation monitoring equipment. It was therefore a reasonable expectation that the potential for identifying contamination above the aforementioned DCGLs was unlikely.

3.1.4 Define the Study Boundaries

The descriptions of historical laboratory uses at the LMFS facility and the R/V Laurentian, were used to assign MARSSIM area classifications and further subdivide the areas into appropriate Survey Units (SUs) for planning and completion of the final status surveys.

The rooms identified by the GLERL RSO as potentially impacted, specifically Rooms 301, 302, 304, 305 were designated as MARSSIM Class 2 for purposes of the final status survey. This classification was based on historical use of licensed radioactive material and potential for residual contamination to be present above the release screening criteria. The hallways and Bay Area were designated a Class 3 area based on a limited potential for contamination that is not expected to be above the screening release criteria. The Hazmat storage building was originally classified as a Class 1 area in RSP-116, based on the traditional use of this type of area. The RSO confirmed that there was no history of any spills or releases in the Hazmat storage building and previous radiation surveys indicated no radioactivity in excess of background.[9] The RSO confirmed the types of materials and

[9] Personal conversation with Kim Kulpanowski, GLERL RSO and Bill Thomas, Plexus-IEM, March 31, 2015.

methods of storage with the facility management in 2012.[10] The building was re-classified as a Class 2 area for the purposes of the FSS.

The final status survey addressed concerns regarding risks from residual radioactivity. A realistic list of potential radionuclides of concern (i.e., source term) was extracted from site documents and inventory records by eliminating radionuclides that are not expected to be present based upon prior removal and/or disposal. All remaining radionuclides that were handled in the lab and documented in site inventory records were included as radionuclides. This list of radionuclides was reaffirmed through evaluation of operational records and discussions with site employees. Screening criteria for each radionuclide were based upon USNRC screening values as shown in NUREG-1757, Appendix H. Site conditions at the LMFS facility and the R/V Laurentian were consistent with the *DandD* computer code default input parameters used to develop the release screening criteria. It therefore meets the requirements of the MARSSIM Alternative Simplified Method for a Group 2 decommissioning.

3.1.5 Develop the Decision Rule

The final status survey of the LMFS facility and the R/V Laurentian was performed in order to acquire data and information for use in assessing radiological conditions. Decisions on the type and extent of measurement were incorporated in the survey design, which met final status survey requirements in order to ensure the viability of the Alternative Simplified Method and the expedited release option.

The decision rules used during the final status survey were based on individual action levels and their associate actions. Some of the activities for which action levels were defined were to identify small areas of elevated activity and confirm the radionuclides of concern. Stationary measurement action levels for identifying small areas of elevated activity or the need for test-decon activities were set at 50% of the most limiting release screening criteria.

3.1.6 Specify Tolerable Limits on Decision Error

Tolerable limits for Type I and Type II decision error were set at 5 %. MDC and Scan MDC values were calculated to ensure that measurement sensitivity is sufficient to demonstrate that the screening DCCLw and $DCGL_{EMC}$ values are not exceeded. Detection methods were confirmed to be adequate to meet these MDC and Scan MDC requirements.

The decision error related to action level response had minimal impact on decisions during the final status survey except for the response to the radionuclide of concern assessment and investigation. The final status survey included total direct beta measurements, gamma exposure rate measurements, and laboratory sampling and analysis of smear samples for beta activity to ensure a comprehensive investigation.

3.1.7 Optimize the Design

Due to the use of the Alterative Simplified Method, optimization to minimize decision error during the final status survey was not required. Evaluating parameters such as area classifications, survey unit designations, the use of screening release criteria, the selection of scanning, sampling and direct measurements for characterization, action levels, detection limits, grid specifications, Type I and Type II error rates, etc. for optimal design took place prior to data acquisition.

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[10] Email with Gary Fahnenstiel, LMFS and Kim Kulpanowski, NOAA RSO, May 16, 2012.

3.2 Survey Design

The Alternative Simplified Method outlined in NUREG-1757 is applicable to the LMFS facility and the R/V Laurentian; those areas are defined as a Class 2 survey category. As such, the termination survey design consisted of the following, as outlined in Section 8.2 of NUREG-1757, Vol. 1:

- Scanning the surfaces in the areas of the facility where licensed material was used or stored;
- Evaluations of total and removable radioactive material in each area exhibiting elevated radiation levels or at a frequency of one wipe comprising 100 cm^2 per 300 square feet; and
- Evaluations of radiation levels at one meter from surfaces (e.g., floors, walls).

In addition, attention was paid to drains, air vents and other fixtures that were in use in the various areas to confirm that no residual radioactivity of significance was present therein.

3.2.1 Survey Unit Identification and Reference Coordinates

A reference coordinate system was established in each survey unit to satisfy that required number of measurements. Survey maps that depict sample/measurement locations and the reference number provided by the instrument data logger were used to record data.

For the Class 3 areas, there was no limit on survey unit dimensions. The area of each of the laboratories in Building 3 and the laboratory in the R/V Laurentian were less than 100 m^2 and surveyed as a separate survey unit, each designated as a Class 2 survey area.

3.2.2 Survey Unit Classification

Rooms scheduled for final status survey were divided into discrete survey units of a specific size and shape for which separate decisions relative to the release screening criteria/DCGL were made. Impacted areas are those areas with a potential of being contaminated. Non-impacted areas are those that do not have a potential for being contaminated and were thus not surveyed as part of the final survey.

Survey units were classified either as Class 2 or Class 3 as described above. In general, a Class 2 survey unit was an impacted area where there was the potential for concentrations of residual radioactivity that does not exceed the DCGL. A Class 3 survey unit was an impacted area where there was no expectation of residual radioactivity greater than a fraction of the DCGL. The RSO had previously completed radiation measurements for both fixed and removable activity in the rooms and Hazmat Storage Building. Table 8.1 shows the area classifications and survey unit designations, based on unit size and potential for contamination.

3.2.3 Statistical Tests

Compliance with the DCGL for building surfaces was demonstrated by collecting direct measurements and smears throughout each survey unit. These measurements were designed to be compared directly to the screening DCGL values as authorized for the Alternative Simplified Method (NUREG 1757, Appendix B) and do not require statistical tests provided that all results are below the release criteria.

All measurement results were indeed below the screening DCGL values, which thus confirms the use of the Alternative Simplified Method is a valid approach for the LMFS facility and the R/V Laurentian. Therefore, these data can be used to justify a determination that the surveyed locations are eligible for release for unrestricted use.

3.2.4 Number of Measurements

The number of stationary measurements within the Class 2 survey units included scanning at least 50 percent of the accessible area and 10 static measurements. The number of stationary measurements within the Class 3 survey units included scanning at least 10 percent of the area and at least 5 static measurements. One 100 cm^2 smear sample was collected at each static measurement position.

3.2.4.1 Direct Beta and Exposure Rate Measurements

Stationary beta measurements were made on the structural surfaces of each survey unit. Measurements were conducted by integrating the total counts over a one-minute count time. Measurements were made in high-use locations within the rooms, and at biased locations, such as fume hoods and sinks, where residual radioactivity was most likely to be present. Scanning surveys were also completed on floors, walls, fume hoods and counter surfaces throughout each Class 2 survey unit.

Ambient exposure rates were also measured in each of the survey units. For these measurements, the sensitive portion of the detector was held at a height of approximately one meter from any floor or wall surface, meaning they are representative of the exposure rate potential to humans.

3.2.4.2 Removable Activity Measurements

Smears for removable radioactivity were taken at each direct measurement location and analyzed for beta radiation by direct counting. In addition, a separate set of smears was also analyzed for the presence of H-3. All removable activity measurements were reported in units of dpm/100cm^2. The USNRC release screening values for surface contamination assume a 10% removable fraction, which was the designated DCGL for removable activity.

3.2.4.4 Probability of Exceeding the DCGL

Determining the probability of exceeding the DCGL is not applicable to this final status survey since the Alternative Simplified Method (NUREG 1757, Appendix B) was used for demonstrating compliance with the screening DCGL values.

3.2.4.5 Decision Error Percentiles

Use of Decision Error Percentiles is not applicable to this final status survey since the Alternative Simplified Method (NUREG 1757, Appendix B) was used for demonstrating compliance with the screening DCGL values.

3.2.4.6 Number of Data Points

As required for the Alternative Simplified Method, the number of stationary measurements within Class 2 survey units included 50% scans and 10 static measurements. One 100 cm^2 smear sample was collected at each static measurement location.

3.2.5 Location of Measurements and Grid Spacing

Once the number of stationary measurements necessary for demonstrating compliance with the release criteria was determined, it was important to determine the locations of each measurement point based on the survey grid. It was also important to determine whether the minimum detectable activity for scanning (MDA for beta radiation) is below the $DCGL_{EMC}$. If this condition was not met, the number of measurements collected in each survey unit needed to be increased to account for the lack of scanning sensitivity. For the survey effort at the LMFS facility, scanning MDA values did not exceed the 50 % of the $DCGL_{EMC}$.

3.2.6 Relative Shift

The relative shift is not applicable to this final status survey since the Alternative Simplified Method (NUREG 1757, Appendix B) was used for demonstrating compliance the screening DCGL values.

3.2.7 Decision Error

There are two types of decision errors applicable to the survey and analytical results. These are Type I (α) and Type II (β) errors. A Type I error, or false positive, refers to the probability that a survey result/measurement is above the release criteria when in fact it is not. A Type II error, or false negative, is the probability of determining that a result/measurement is below the release criteria when it is not.

The probability of making decision errors can be controlled by adopting an approach called hypothesis testing. In this case, the null hypothesis (H_o) will be treated like a baseline condition. As specified in MARSSIM, H_o is that residual radioactivity in the survey unit which exceeds the applicable release criterion. This means that the site or survey area will be assumed to be contaminated until proven otherwise. For testing the survey data from Survey Units, both Type I (α) and Type II (β) were set at 0.05 or 5 percent, meaning 95% confidence in the final conclusions.

3.2.8 Elevated Measurement Criteria

Elevated measurement criteria (EMC) are discussed in NUREG 1575 and describes the method to evaluate an elevated result obtained during the FSS.[11] The EMC provides assurance that small areas of elevated activity receive proper attention and that any area having the potential for significant dose contribution is identified.

For the Alternative Simplified Method of surveys, NUREG-1757 specifies that "hot spot" criteria must be less than three times the DCGL.[12] Therefore these values, shown in Table 8.4, were applicable to the data acquired.

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[11] U.S. Nuclear Regulatory Commission, Multi-agency Radiation Survey and Site Investigation Manual, NUREG-1575, Revision 1, Chapter 8, August, 2000.

[12] U.S. Nuclear Regulatory Commission, Consolidated Decommissioning Guidance Characterization, Survey, and Determination of Radiological Criteria, Volume 2, Appendix B, NUREG 1757, Revision 1, September, 2006.

4 INSTRUMENTATION

4.1 Selection Criteria

Instruments used for the final status survey of the LMFS facility were selected for their ability to reliably detect the radionuclides present at the facility (see Appendix 10.4). The field instruments were also selected based upon their stability and reliability under the environmental and physical conditions they are used. They were utilized for direct measurement of radioactivity at specific ambient locations, on surfaces, and in discrete areas of interest (i.e., fume hoods, sinks). Removable activity on surfaces was also determined from swipes that were analyzed using appropriate counting equipment.

4.2 Instrument Calibration

Pre-qualified vendors calibrated the instruments under approved procedures using calibration sources traceable to the National Institute of Standards and Technology (NIST) and pursuant to the provisions of ANSI N323, ANSI N42.17A and Plexus-IEM's specifications.

All instrumentation used during the final status survey were calibrated, checked and used in a controlled manner, with performance documented. All portable instruments were calibrated by a licensed commercial calibration service using National Institute of Standards and Technology (NIST) traceable sources and calibration equipment. Instrument calibration included:

- High voltage calibration;
- Discriminator threshold calibration;
- Window calibration;
- Alarm operation verification;
- Scaler calibration verification.

The calibration of the detectors included:

- Operating voltage determination;
- Calibration constant determination; and
- Dead time correction determination.

Labels showing the instrument identification number, calibration date and calibration due date were attached to all portable instruments. A copy of all relevant calibration records are shown in Appendix 10.4.

4.3 Calibration Sources

All radiation sources used for on-site instrument calibration, daily checks and efficiency determinations were selected according to the instrument's response to the radionuclides of interest and were traceable to NIST standards. The sealed-radiation sources were brought to the site and health physics technicians controlled the use and storage of the radiation sources and performed the instrument response checks and efficiency determination. At the end of the on-site effort, all sealed sources were accounted for and removed from the site.

All sources used for on-site instrument calibration, daily checks or efficiency determinations were representative of the instrument's response to the identified radionuclides. Specifically, Tc-99 was used to confirm the instrument response to beta radiation.

4.4 Response Checks

All instruments and detectors were inspected and source checked routinely when in use to verify proper operation. The checks ensure constancy in instrument response, verify the detector is operating properly, and demonstrate that the measurement results were not the result of detector contamination or failure.

Instrument response was checked each day before the instrument was used. The check sources were used to duplicate the same type of radiation that was being measured with the particular instrument using a specified source-detector alignment that could be easily repeated. If the instrument failed its response check, it was not to be used until the problem was resolved.

Labels showing the instrument identification number, calibration date and calibration due date were attached to all portable instruments and recorded in applicable data sheets. Appendix 10.4 contains the daily response checks for the instruments used during the final status survey.

4.5 Minimum Detectable Activity

Minimum Detectable Activity (MDA) is defined as the smallest amount or concentration of radioactive material that will yield a net positive count with a 5% probability of falsely interpreting background responses as true activity. The MDA is dependent upon count times, geometry, sample size, detector efficiency, background, and for scanning the scanning rate and the efficiency of the surveyor.[13] Nominal detection sensitivities were calculated using the guidance in NUREG-1507. From there, instruments were selected to achieve detection sensitivities of less than the $DCGL_W$ for direct, static measurements and less than the $DCGL_{EMC}$ for scan surveys.

The required MDAs for direct measurements, surface scanning and removable activity measurements were set based on detection sensitivity. Since the MDAs for scanning were equal to or less than the applicable DCGL, the scanning MDAs did not affect the number of measurements or samples required to evaluate a specific survey unit for compliance with release criteria.

4.5.1 Direct Beta Measurements

The equation that was used for calculating the MDA for direct measurements of beta activity is:

$$MDA = \frac{\frac{2.71}{t_s} + 3.29\sqrt{\frac{R_b}{t_s} + \frac{R_b}{t_b}}}{E \times \frac{A}{100}}$$

where MDA = Minimum detectable activity (dpm/100 cm^2), R_b = Background count rate (cpm), t_b = Background count time (minutes), t_s = Sample count time (minutes), A = Detector area (cm^2), and E = Detector efficiency (counts/disintegration).

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[13] U.S. Nuclear Regulatory Commission, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", NUREG/CR-1507, December, 1997.

4.5.2 Beta Scans

The equation that was used for calculating the MDA for beta scans (MDA_{SCAN}) is:

$$MDA_{SCAN} = \frac{d' \times \sqrt{b_i} \times \frac{60}{i}}{E_i \times E_s \times \sqrt{p} \times \frac{A}{100}}$$

where MDA = Minimum detectable activity (dpm/100 cm^2), d' = Decision error assumed to be 3.28 for α =0.05 and β=0.95, I = Observation counting interval (scan speed divided by detector width), b_i = Background count per observation interval, E_i = Detector efficiency, E_s = Surface efficiency (assumed to be 0.5 for beta measurements), p = Surveyor efficiency (Assumed to be 0.5), and A = Detector area (cm^2).[14,15] Appendix 10.5 shows the various instrument parameters.

[14] ISO-7503 recommends using a surface efficiency based on the type of radiation and radiation energy in the absence of experimentally derived values. A surface efficiency of 0.25 is recommended for beta radiation with a maximum beta energy between 150 keV and 400 keV.

[15] International Organization for Standardization (ISO), "Evaluation of Surface Contamination", ISO 7503, 1988.

5 DATA EVALUATION

5.1 Radiological Measurement Methods

Once all surveys were complete, the data were reviewed and evaluated to demonstrate that the residual radioactivity on building surfaces is less than the applicable $DCGL_W$. Individual results that were distinguishable from background but below the applicable DCGL were then subject to the following sum of fractions test to adjust the DCGLs for the potential presence of other radionuclides to ensure the total dose potential remains below 25 millirem total effective dose equivalent (TEDE) if multiple radionuclides were present:

$$\frac{C_1}{DCGL_1} + \frac{C_2}{DCGL_2} + ... \frac{C_n}{DCGL_n} < 1$$

where C = the measured concentration of the radionuclide, and DCGL = the DCGL for that radionuclide, "n". All measurement results were below the most restrictive release criterion, thus the unity rule was not applied.

5.2 Data Validation

The survey data were reviewed to verify that they were authentic, appropriately documented and technically defensible.[16] The review criteria for data acceptability included the following items:

- The instruments used to collect the data were capable of detecting the radiation of interest at or below the DCGL in Class 2 areas and less than 0.5 DCGL for Class 3 areas.
- The calibration of the instruments used to collect the data was less than twelve (12) months old;
- Instrument response was checked with satisfactory results before the instrument was used;
- The MDAs and assumptions used to develop them were appropriate for the instruments and the survey methods used to collect the data;
- The final survey data set consisted of qualified measurements that were representative of the current facility status and collected as prescribed by the survey design; and
- The data were properly recorded.

A discrepancy existed if one or more of these criteria were not met. In that case, the discrepancy was to be reviewed by the Project Manager and the reasons for the acceptability of the data or the corrective actions taken to restore data acceptability were to be documented. In fact, all of the aforementioned criteria were met.

[16] Data that were input to spreadsheets were also reviewed by Plexus-IEM's Quality Assurance Officer for transcription errors.

5.3 Requirements for Release

A survey unit met the requirements for release for unrestricted use provided (1) an adequate number of measurements were taken; (2) the mean result in each survey unit was less than the applicable DCGL, and (3) the EMC evaluation was passed.

5.4 Survey Records

The survey team maintained records of surveys in the survey packages for each area. Each survey package included the following records depending upon the survey design and protocols:

- Survey package worksheet giving the package identification, survey location information, general survey instructions and any specific survey instructions;
- Survey Unit Diagram of the area to be surveyed as available;
- Photographs of the survey area to show special or unique conditions; and
- Data sheets to record the results of the surveys and analyses.

Data and document control included the maintenance of the raw data files, translated data files (spreadsheets), and documentation of all corrections made to the data. All electronic databases were backed up daily.

6 RESULTS

Radiation measurements (i.e., stationary, scanning, measurements for removable activity and exposure rate) were performed in all rooms that were potentially impacted. As described below, the elements of the work plan (see Appendix 10.2) were completed to determine if any of the surfaces exceeded the DCGL established for the site.

6.1 Rooms 301, 302, 304 and 305 (Class 2)

These rooms were previously used to prepare and count the water and algae samples for the presence of C-14 or H-3. Floor surfaces, walls, benchtops and the fume hood in Rooms 301, 302, 304 and 305 were scanned with a Ludlum Model 43-93 beta detector coupled to a Ludlum Model 2360 data logger. The Class 2 scan coverage of floors was 50% of the accessible surface area. A one minute integrated count was acquired in scaler mode at each measurement location. A summary of the measurement results is provided in Table 8.5 for each of the rooms. Appendix 10.6 contains the survey data, demonstrating that none of the scan results exceeded the DCGL for C-14.

Smears for gross beta radiation were collected at the same locations as where total radioactivity measurements were performed, with results summarized in Table 8.6. Smears for gross beta radiation were collected over an approximately 100 square centimeter area. Each smear was counted for gross beta radiation. Appendix 10.6 contains the measurement results. Selected samples were submitted for the presence of H-3, using a liquid scintillation counter. The results are provided in Table 8.7. All measurement results were below the applicable removable activity limits (i.e., 10% of the applicable DCGL).

6.2 Bay Area and Hallways (Class 3)

These areas were adjacent to the rooms where the radioactive materials were used. Floor surfaces, and walls were scanned with a Ludlum Model 43-93 beta detector coupled to a Ludlum Model 2360 data logger. The Class 3 scan coverage of floors was at least 10% of the accesible surface area. A one minute integrated count was acquired in scaler mode at each measurement location. A summary of the measurement results is provided in Table 8.5 for each of the hallways and the Bay Area. Appendix 10.6 contains the measurement results, demonstrating that none of the scan results exceeded the DCGL for C-14.

Smears for gross beta radiation were collected at the same locations as where total radioactivity measurements were performed, with results summarized in Table 8.6. Smears for gross beta radiation were collected over an approximately 100 square centimeter area. Each smear was counted for gross beta radiation. Appendix 10.6 contains the measurement results. Selected samples were submitted for the presence of H-3, using a liquid scintillation counter. The results are provided in Table 8.7. All measurement results were below the applicable removable activity limits (i.e., 10% of the applicable DCGL).

6.3 Hazmat Storage Building (Class 2)

The Hazmat Storage Building was used to store containers of hazardous materials used in Building 3. It was not a common practice to store containers and drums of packaged radioactive materials in the Hazmat Storage Building. It was surveyed as a MARSSIM Class 2 survey area. The radiation survey covered 100% of the accessible areas, including the walls, shelves and metal grating, were scanned with a Ludlum Model 43-93 beta detector coupled to a Ludlum Model 2360 data logger. A one minute integrated count was acquired in scaler mode at each measurement location that was accessible. A summary of the measurement results is provided in Table 8.5 for Hazmat Storage Building. Appendix 10.6 contains the survey data, demonstrating that none of the scan results exceeded the DCGL for C-14.

Smears for gross beta radiation were collected at the same locations as where total radioactivity measurements were performed, with results summarized in Table 8.6. Smears were also collected between the grate on the floor and the sump. The smears for gross beta radiation were collected over an approximately 100 square centimeter area. Each smear was counted for gross beta radiation. Appendix 10.6 contains the measurement results. Selected samples were submitted for the presence of H-3, using a liquid scintillation counter. The results are provided in Table 8.7. All measurement results were below the applicable removable activity limits (i.e., 10% of the applicable DCGL).

6.4 R/V Laurentian (Class 2)

The laboratory in the R/V Laurentian was below deck and enclosed the test equipment where C-14 or H-3 were used. Floor surfaces, walls, and benchtops in the room below deck were scanned with a Ludlum Model 43-93 beta detector coupled to a Ludlum Model 2360 data logger. The Class 2 scan coverage of floors was approximately 50% the accessible surface area. A one minute integrated count was acquired in scaler mode at each measurement location. A summary of the measurement results is provided in Table 8.5 for the laboratory. Appendix 10.6 contains the survey results, demonstrating that none of the scan results exceeded the DCGL for C-14.

Smears for gross beta radiation were collected at the same locations as where total radioactivity measurements were performed, with results summarized in Table 8.6. Smears for gross beta radiation were collected over an approximately 100 square centimeter area. Each smear was counted for gross beta radiation. Appendix 10.6 contains the measurement results. Selected samples were submitted for the presence of H-3, using a liquid scintillation counter. The results are provided in Table 8.7. All measurement results were below the applicable removable activity limits (i.e., 10% of the applicable DCGL).

6.4 General Area Exposure Rate Measurements

General area exposure rates were measured within the survey units using a calibrated, gamma scintillation detector, Ludlum Model 19. The meter was held at a height of approximately one meter above the ground surface while slowly (i.e., one to two feet per second) traversing the survey unit. Measurement results were not distinguishable from background in any of the rooms in Building 3, including the Hazmat Storage Building. These results are shown in Appendix 10.6.

6.5 Photographs

Photographs of the various measurement locations within the LMFS were collected during the on-site portion of the final status survey. Selected photos that are representative of the key areas are included herein as Appendix 10.8.

7 CONCLUSIONS

A final status survey of the LMFS's facility in Muskegon, Michigan and the R/V Laurentian was performed as a means of demonstrating whether the site is eligible for release for unrestricted use. Sufficient data were collected to support decisions with respect to the release status of the facility. The data show that there is no residual radioactivity in any of the impacted areas that even approach, much less exceed the DCGLs. In addition, because all gross activity results, both individually and combined, were below the DCGLs, there was no need for statistical analysis. Finally, because the DCGLs for the LMFS facility and the R/V Laurentian were set to be equivalent to the USNRC's conservatively-derived screening values in NUREG-1757, an analysis to demonstrate the resulting dose potential is ALARA is not required. Therefore, the LMFS facility and the R/V Laurentian are considered eligible for release for unrestricted use.

8 TABLES

Table 8.1 - Survey Units and Area Classifications

Room Numbers	Area Classification	Area Dimensions (footprint - m^2)
301	2	38
302	2	38
303	3	30
304	2	38
305	2	76
Bay Area	3	38
Hallways in Building 3	3	19
Hazmat Storage Building	2	8
R/V Laurentian	2	19
Other Rooms Identified by the RSO	3	Variable

Table 8.2 - Radionuclides Authorized for Use at LMFS

Radionuclide	Chemical form	Maximum Authorized Quantity (millicuries)
Antimony-125	Any	2
Cadmium-109	Any	2
Calcium-45	Any	5
Carbon-14	Any	99
Cerium-139	Any	2
Cerium-141	Any	2
Cerium-144	Any	2
Cesium-134	Any	2
Cesium-137	Any	11
Chlorine-36	Any	5
Chromium-51	Any	2
Cobalt-60	Any	2
Hydrogen-3	Any	500
Iodine-129	Any	1
Iron-59	Any	2
Iron-65	Any	10
Manganese-54	Any	2
Mercury-203	Any	2
Phosphorous-32	Any	10
Phosphorus-33	Any	50
Polonium-209	Any	10 microcuries
Polonium-210	Any	2
Scandium-46	Any	2
Selenium-75	Any	2
Silver-110m	Any	2
Sodium-22	Any	2
Strontium-85	Any	2
Sulphur-35	Any	50
Tin-113	Any	1
Zinc-65	Any	2

Table 8.3 - DCGLs and Action Levels for Building Surfaces

Radionuclide	Emission	DCGL ($dpm/100\ cm^2$)	Action Level (50% of DCGL)
H-3	β	120,000,000	60,000,000
C-14	β	3,700,000	1,850,000
Gross Beta (19% efficiency assumption including backscatter and 2-π geometry)	β	703,000 cpm/100 cm^2 above background, based on C-14	351,000 cpm/100 cm^2 above background

Table 8.4 - Elevated Measurement Criteria (EMC) for Building Surfaces

Radionuclide	Emission	DCGL (dpm/100 cm^2)	EMC (dpm/100 cm^2)
H-3	β	120,000,000	360,000,000
C-14	β	3,700,000	11,100,000

Table 8.5 - Scan and Stationary Measurement Results Summary

Room	Survey Unit	Type of Survey	Results (dpm/100cm²)				Number of Measurements	Eligible for Release? (Y/N)
			Mean	SD	Max	MDC		
301	3308	Scan	-861	489	300	1,667	96	Y
		Stationary	2,506	269	3,024	1,029	12	
302	3306	Scan	-763	457	1,436	1,477	200	Y
		Stationary	2,001	307	2,537	912	11	
303	3311	Scan	-831	475	499	1,667	42	Y
		Stationary	2,745	200	3,010	1,029	4	
304	3301/3302	Scan	-941	498	523	1,501	217	Y
		Stationary	1,950	341	2,430	927	10	
305	3303/3307	Scan	-1,144	506	742	1,705	281	Y
		Stationary	2,393	252	2,710	1,052	22	
Bay area	3310	Scan	-9	486	1,732	1,477	173	Y
		Stationary	2,811	252	3,154	912	7	
Hallways	3304	Scan	-827	431	174	1,501	69	Y
		Stationary	2,070	133	2,295	927	5	
Hallways	3309	Scan	-228	593	1,569	1,667	62	Y
		Stationary	3,371	213	3,623	1,029	6	
Hazmat Storage Building	3313/3314	Scan	-1,293	381	295	1,512	422	Y
		Stationary	1,757	201	2,107	933	10	
R/V Laurentian	3305	Scan	-1,478	384	-456	1,477	248	Y
		Stationary	1,428	236	1,852	912	13	
Beta DCGL			3.7_6x10					

Table 8.6 - Removable Contamination Survey Results

Room	Survey Unit	Results (dpm/100cm^2)				Eligible for Release? (Y/N)
		Mean	SD	Max	MDA	
301	3308	18	52	94	240	Y
302	3306	12	35	65	240	Y
304	3301/3302	25	60	152	240	Y
305	3303/3307	-14	59	65	240	Y
Bay area	3310	21	32	80	240	Y
Hallway	3304	14	49	80	240	Y
Hallway	3309	4	5	7	240	Y
Hazmat Storage Building	3313/3314	22	58	94	240	Y
R/V Laurentian	3305	15	47	116	240	Y
Beta DCGL		$3.7x10^5$				

Table 8.7 - Removable Tritium Survey Results

Room	Sample Number	Results (dpm/100cm^2)				Eligible for Release? (Y/N)
		Mean	SD	Max	MDA	
302	07,08	23	11	30	50	Y
304	04, 05, 06	33	12	46	50	Y
305	02, 03	12	10	19	50	Y
Bay area	09	46	--	46	50	Y
Hazmat Storage Building	10	55	--	55	50	Y
R/V Laurentian	01	3	--	3	50	Y
Tritium DCGL		1.2×10^8				

Note: These samples were counted using a calibrated liquid scintillation counter and reported by RSO, Inc, on April 9, 2015, Lab Work Order 2015-247. The certificate of analysis is provided in Appendix 10.7 of this report.

9 FIGURES

Figure 9.1 - Floor Plan of the LMFS Buildings

RADIATION SURVEY FLOORPLAN
MUSKEGON FACILITY BUILDING #3

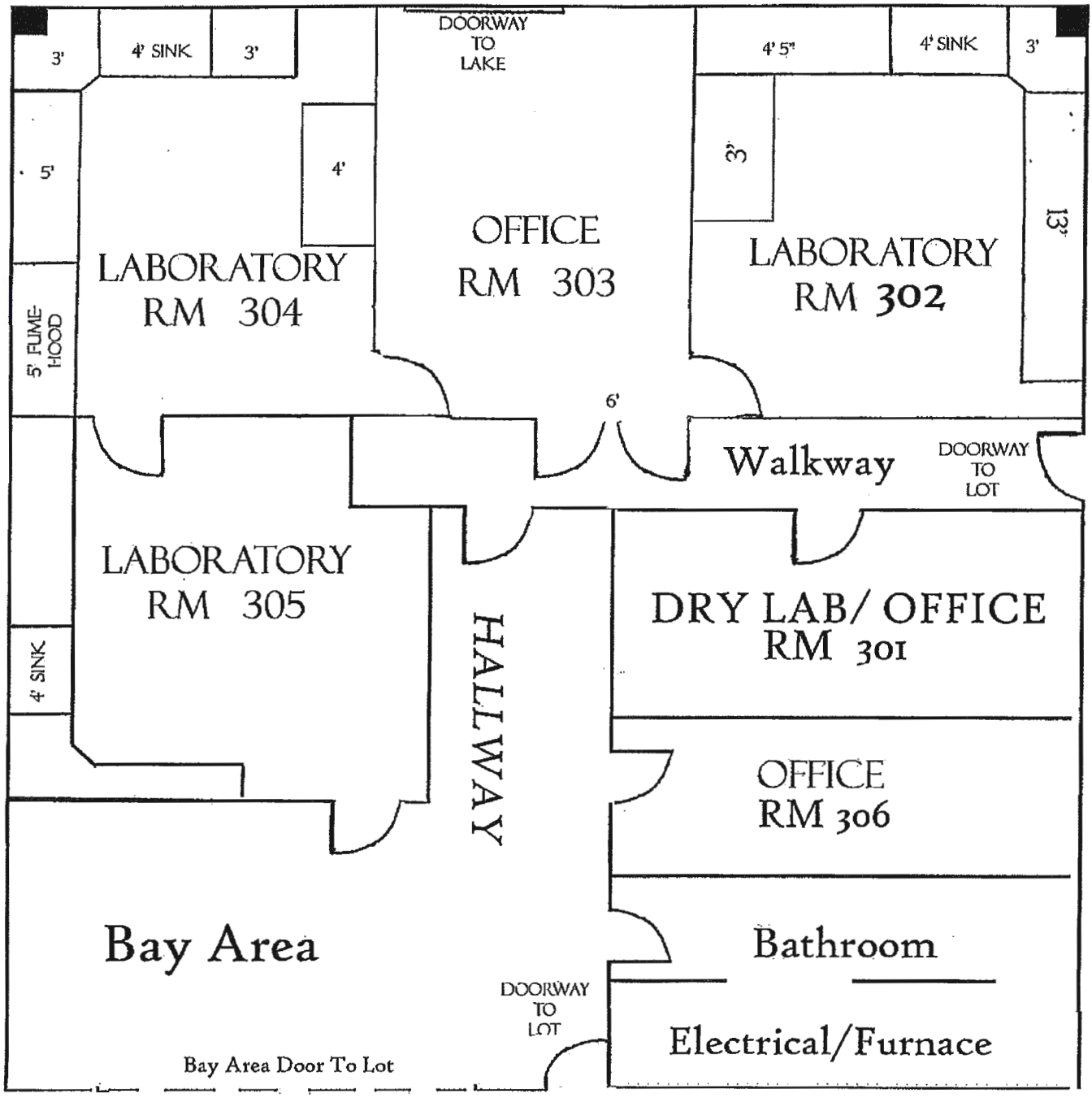
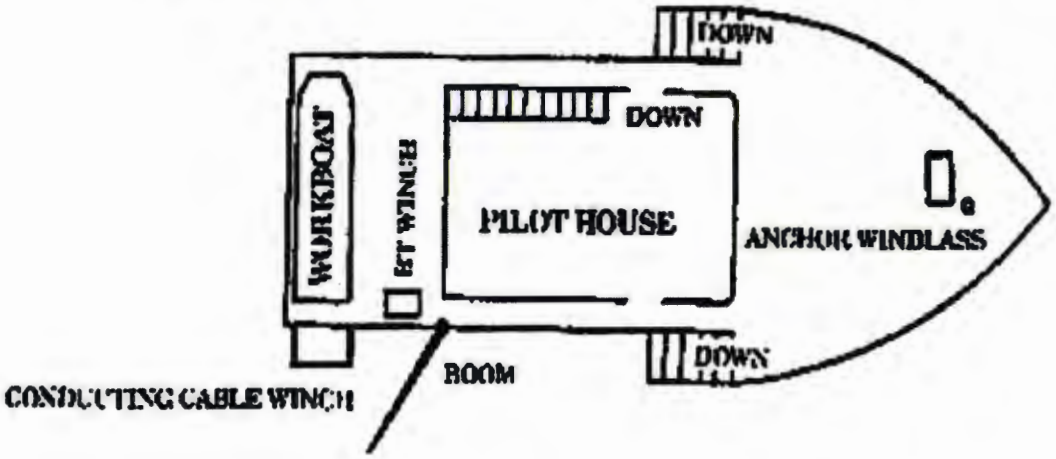
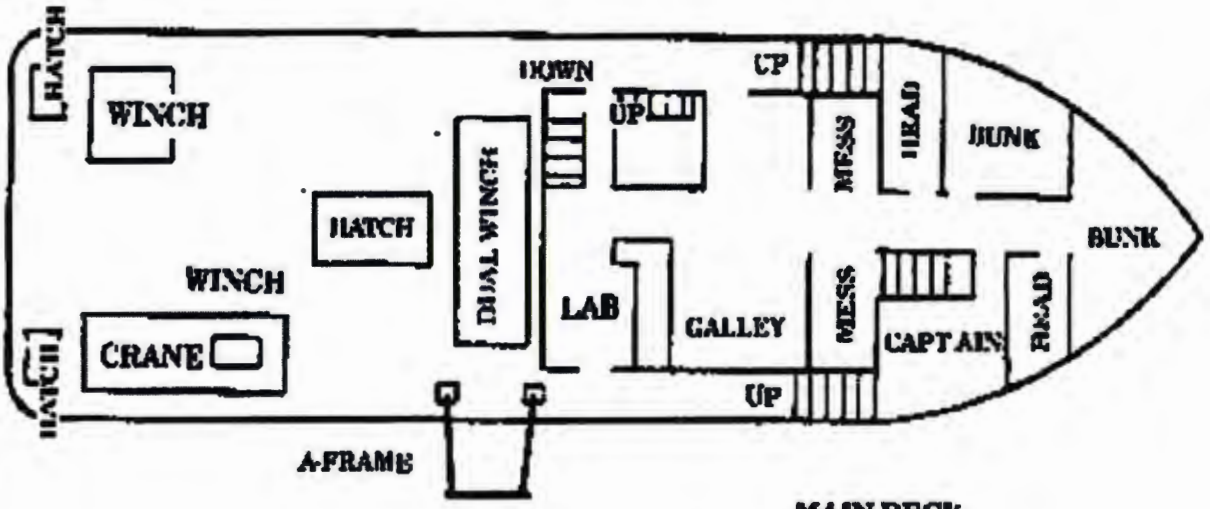


Figure 9.2 - Floor Plan of R/V Laurentian

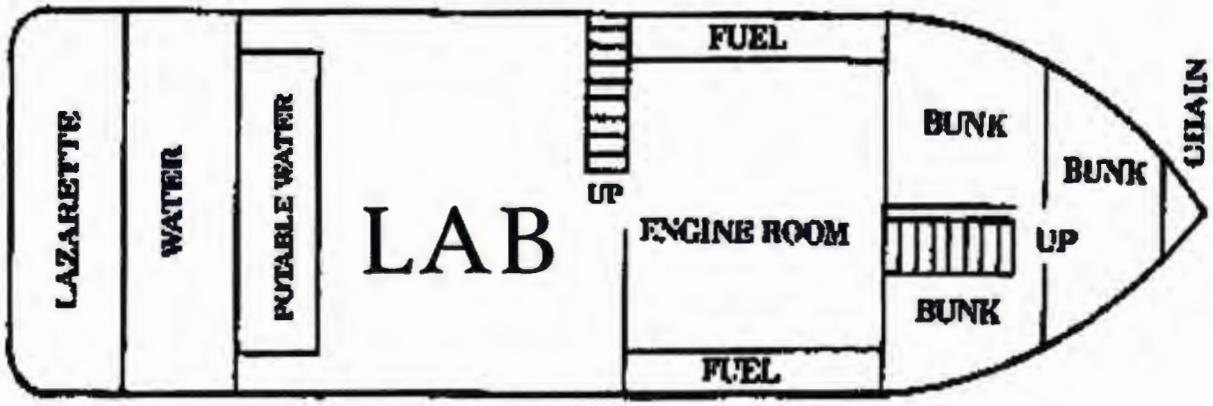
R/V LARENTIAN
DECK PLANS



UPPER DECK



MAIN DECK



10 APPENDICES

Appendix 10.1 - Personnel Qualifications

BILLY R. THOMAS

Introduction

Mr. Thomas is Vice President of IEM's Consulting Division and has over 31 years of senior-level experience in radiological and industrial hygiene activities with emphasis on systems to minimize personnel exposures to radioactive and hazardous materials, compliance with federal and state regulations, site and facility audits. Mr. Thomas has developed and implemented comprehensive programs for radiation and chemical protection programs. He is actively involved in all aspects of health and safety including regulatory compliance, site decommissioning, program evaluation, applied health physics, occupational safety, training and project management.

Credentials

M.S., Environmental Health, University of Oklahoma, 1981

B.S., Health Physics, Oklahoma State University, 1976

OSHA Thirty-hour Construction Safety and Health Training, 2011.

OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Training. Initial training 1987 and updated each year.

Eight-hour OSHA Supervisor Training, 1987.

Lead Abatement Training for Supervisors, University of Cincinnati. 1996.

Asbestos Abatement Supervisor Course, Asbestos Consulting and Training Systems, 1997.

Authorized User - Maryland Department of the Environment Radioactive Materials License No. MD-31-281-01.

Certifications, Registrations and Licenses

Certified Health Physicist (Comprehensive Practice), American Board of Health Physics, 1988. Recertified: 2008.

Certified Industrial Hygienist (Comprehensive Practice), American Board of Industrial Hygiene, 1984. Recertified : 2007.

Authorized User - MDE Radioactive Materials License No. MD-31-281-01.

Experience

2002-Present
Vice President, Consulting Division, Integrated Environmental Management, Inc. Findlay, Ohio. As the director of the company's consulting division, Mr. Thomas is responsible for selecting and coordinating the services of senior-level consultants in the areas of radiation safety and industrial hygiene. In addition, he maintains and ensures all members of the division maintain a track record of technical excellence, cost and schedule control, and innovation in solving environmental and health/safety problems for both government and commercial clients.

2008-Present
Adjunct Instructor, College of Science, University of Findlay, Findlay, Ohio. Serves as instructor for Environmental, Safety and Occupational Health Management program in the College of Science. Presents classes for both the graduate and undergraduate in topics related to safety management and industrial hygiene.

1999-2002
Senior Health Physicist, Integrated Environmental Management, Inc. Findlay, Ohio. Provides high-quality radiation protection services to commercial and government clients. As a member of the client's response team, works with clients to promote an understanding of what is required to achieve and/or maintain compliance in the eyes of all pertinent regulatory agencies, individually or jointly; develop and overall strategy for achieving compliance and reduce liabilities in a technically-sound, legally defensible, and fiscally-conservative business manner; recommend specific solutions that are compatible with the client's operating philosophy; and provide insights into future regulatory issues and their impact as input to the client's long-range business planning and cost forecasting process.

1993-1999
Director of Health and Safety, The IT Group, Findlay, Ohio. Originally joined OHM Remediation Services in 1993. The IT Group purchased OHM in 1998. Duties including conducting site and facility health and safety audits, determination of personal protective equipment and respiratory protection equipment, supervising the development and implementation of site specific health and safety plans, and providing industrial hygiene training and services. He had direct accountability for health and safety compliance, including regulatory compliance with federal, state and local agencies. He implemented a comprehensive health and safety program for demolition and remediation activities by the Midwest region, which accumulated 2.3 million man-hours from March, 1994 to July, 1997 without a single lost time injury.

1990-1993
Health and Safety Manager, IT Corporation, St. Louis, Missouri. Provided direction day-to-day for laboratory operations in the areas of health physics, industrial hygiene, hazardous waste management, and laboratory safety. Served as the Radiation Safety Officer for the USNRC Broad Scope license for the use of by-product and source material at the laboratory .

1988-1990
Director of Corporate Health and Safety, Burlington Environmental, Columbia, Illinois. Responsible for designing and implementing health and safety programs to limit exposures to hazardous chemicals and radioactive material during sampling and remediation activities. Developed procedures and conducted training classes for field service personnel to correctly use personal protective equipment and perform air monitoring to evaluate personnel exposures.

1983-1988
Senior Health Physicist, IT Corporation, Oak Ridge, Tennessee. Provided health physics and industrial hygiene consulting to government and commercial clients. Served as the project manager for several remedial decontamination projects involving hazardous and radioactive materials. His experience included:

1976-1983
Senior Research Industrial Hygienist, Dow Chemical, Midland, Michigan and Tulsa, Oklahoma. Provided health and safety support for employees in manufacturing facilities, including plastic and other intermediate chemical production. Assigned as lead health physicist for decontamination projects at several nuclear power plants. From 1977 to 1980, Mr. Thomas served as the radiation safety officer for a NRC broad scope license to authorize the use of mixed fission products and special nuclear material used in manufacturing and research applications at Dow Chemical. The program included a TRIGA reactor, two small accelerators, sealed radioactive sources and tracers for a variety of research programs. Mr. Thomas directed all elements of the health physics program

including training, standard operating procedures, exposure assessment and documentation. Mr. Thomas later (1981 - 1983) served as the radiation safety officer for the field services division where sealed sources and mixed fission products were used in treatment systems. This assignment had responsibilities in 22 states for approximately 3,000 employees. Mr. Thomas directed the use of radioactive materials licenses in 16 different states and a NRC license for the use of these radioactive materials.

Professional Memberships

Health Physics Society (Plenary member)

American Academy of Health Physics

American Industrial Hygiene Association

American Academy of Industrial Hygiene

Appointments and Awards

Ohio Radiation Advisory Council. Appointed by Governor Taft in 2002. Elected Chair of the Council each year from 2004 through 2011. Appointment expires in 2015.

Ohio Utility Radiological Safety Board, Citizen's Advisory Council. Elected Chair in 2001 and 2002.

Member of the Working Group for the ANSI/AIHA Z88 Standard, Respiratory Protection, 2010-Present.

Member of the Working Group for the ANSI/HPS N43.8 Standard, Classification of Industrial Ionizing Radiation Gauging Devices, 2006-2008.

Director of the State of Ohio Low Level Radioactive Waste Facility Development Authority Board. Appointment by the Speaker of the Ohio State Legislature in 1997.

Chairman's Award for Safety Excellence, OHM Remediation Services, 1996, 1997

Senior Technical Associate, International Technology Corporation, 1991.

Member of the People to People Ambassador Delegation visiting the People's Republic of China, 1987. Invited speaker to review health physics practices.

Project Experience

Risk Assessments
Mr. Thomas served as the task manager to develop a baseline human heath risk assessment for a confidential client who previously processed enriched uranium and manufactured fuel pellets. The risk assessment was developed for potential exposures both hazardous chemicals and radioactive materials found in soil and groundwater. The assessment incorporated the requirements of the USEPA Risk Assessment Guidance for Superfund (RAGS) as well as requirements established by the State authorities.

Emergency Response/Preparedness
Mr. Thomas developed a Emergency Response and Preparedness Manual for a Canadian client who manufactured uranium pellets for nuclear power reactors. The manual was prepared in accordance with the guidance provided by the Canadian Nuclear Safety Commission (CNSC) and the U.S. Nuclear Regulatory Commission (USNRC). The manual addressed the resources to mobilize to an emergency, involving both hazardous chemicals and radioactive uranium in several different chemical forms. The manual was implemented by the client and approved by the CNSC.

Program Reviews

A commercial client, licensed by the USNRC required an evaluation of their internal dosimetry program. Mr. Thomas prepared a procedure to measure both internal and external exposure. The procedure satisfied the recommendations established by the NCRP and ANSI as well as requirements established by the USNRC.

Mr. Thomas also served on several audit teams to review the health physics programs at DOE site, including Rocky Flats, Los Alamos and the Nevada Test Site. The criteria for the audits were based on the DOE Technical Safety Appraisal objectives. Mr. Thomas worked with the program personnel to correct deficiencies and measure the effectiveness of the programs.

Member of Technical Advisory Group for Martin-Marietta Energy Systems. The Advisory Group provided oversight of the Federal Facility Agreement regarding the operation of the Low Level Radioactive Waste Tank Systems implemented for Oak Ridge National Laboratory. Made recommendations to implement standard industry practices for the purposes of reducing personnel exposures to hazardous and radioactive materials. Reviewed the elements of the industrial hygiene relating to the engineering controls and administrative controls implemented to reduce exposures to hazardous materials. Evaluated the effectiveness of the health physics programs for the purposes of reducing personnel exposures to radiation to as low as reasonably achievable.

Reviewed the industrial hygiene and health physics programs being implemented at each of the Martin-Marietta Energy Systems facilities. Used the Technical Safety Appraisal guidelines developed by DOE to critique the effectiveness of the programs begin implemented. Worked with each respective program managers, responsible for the H&S program, to develop an action plan to upgrade the program and track the progress of the changes.

Member of the Management Advisory Team for Martin Marietta Energy Systems Gaseous Diffusion Plants. The Advisory team reviewed the effectiveness of the Health and safety programs being implemented including the health physics and industrial hygiene programs. The Advisory Group was responsible for reviewing each of the health and safety programs and making recommendations for areas of improvement.

As the Project CIH at the Fernald Feed Materials Production Center, performed health-and-safety review of engineering improvements at DOE uranium metals production facility. Improvements included new ventilation systems, radioactive materials handling systems, and decontamination of the facility. Recommended health physics and industrial hygiene controls to minimize worker's exposure, and updated air monitoring programs for both workplace exposures and effluent sampling.

Decommissioning Planning

Mr. Thomas worked as part of a project team to develop decommissioning plans for eight (8) different facilities licensed to process radioactive materials. The decommissioning plans established the derived concentration guidelines levels for a variety of radioactive isotopes, including enriched uranium, thorium and byproduct radioactive materials. The potential exposures to future residents were limited to less than twenty-five millirem per year and evaluated over a period of 1,000 years. The plans were compliant with the requirements established by the USNRC and NUREG 1757. Each plan was approved by the USNRC and implemented by the client in order to decommission the facility and terminate the license.

A commercial client required a plan to survey, remediate and ultimately release the building surfaces for unrestricted use. Mr. Thomas established the release criteria using and developed a procedure to complete the radiation survey. The procedure was consistent with

the requirements established by the USNRC and NUREG-1575, MARSSIM.

Non-Ionizing Radiation Safety
Mr. Thomas completed radiation surveys to evaluate potential exposures to electromagnetic frequency (EMF) radiation in commercial manufacturing facilities. The evaluation of personal exposures were compared to recommendations published by the ACGIH and OSHA. Recommendations were provided to the clients to limit personnel radiation exposures and verify that exposures were acceptable.

Project Health and Safety
Safety and Health Manager, Kansas City PRAC II, Kansas City District. Duties on this HTRW contract included the development of safety and health plans as well as procedures to be implemented at each of the KC PRAC projects. Developed SSHP for specific KC PRAC projects including, Ottawa, Illinois, Galena, Kansas, Mead Nebraska, and Fort Riley, Kansas. Mr. Thomas provided specific support on the KC PRAC projects including:

Developed the site specific health and safety plan and radiation protection plan to excavate soil contained radioactive radium generated by a luminous processing company (i.e., Ottawa Radiation Sites, Ottawa, Illinois). This project involved the excavation of radioactive contamination from nearby residences and selected sites in the city. Worked with State of Illinois and the EPA to implement an effective contamination control program, including air sampling and personnel monitoring for radium. Provided radiation worker training for the work crew and directed the on-site health physics and industrial hygiene program for the initial phases of the project. Conducted site inspections and project audits on a periodic basis.

Duties on this HTRW contract for the USACE Omaha District (Rapid Response II) included the development of program procedures and policies to work on multiple USACE projects. Developed SSHP for specific Rapid projects, including work at Joliet, Illinois, Ames, Iowa and Des Moines, Iowa. Mr. Thomas conducted site inspections and provided technical support for the implementation of the site safety and health program for RR/IR task orders.

Developed the site specific health and safety plan for the excavation and disposal of approximately 1,000 cubic yards of radioactive uranium wastes and contaminated soils at the Ames Laboratory Chemical Disposal Site (Ames, Iowa). Developed the radiation protection program to be implemented by project employees to reduce exposures to ionizing radiation to as low as reasonable achievable. Contaminated materials were packaged and shipped for disposal in Clive, Utah.

Served as Safety and Health Manager, USACE, TERC Number 1. Duties on this contract included the development of SSHP for work at Ellsworth AFB in Rapid City SD and KI Sawyer AFB in Michigan. Mr. Thomas provided support for some of the TERC projects including:

Served as Project CIH. In that capacity, developed the site specific health and safety plan to excavate radioactive materials from disposal trenches at OU2 and OU 7 at Ellsworth AFB. Developed radiation protection plan as well as the release criteria to be implemented to document that the site was free of contamination. Worked with the USAF Radiation Safety Committee to establish protocols to identify plutonium in soil and verify that debris was handled correctly.

Served as Project CIH. In that capacity, developed the site specific safety and health plan for the USACE Omaha District (PRAC) project to excavate and treat lead-contaminated soil from smelter emissions at the Tarracorp Industries site (Granite Illinois). Treatment was completed by stabilizing the soil using a pugmill. This process delists the soils to a "special

waste" classification, resulting in key cost savings in disposal. To date, over 300 residential sites have been remediated, and over 100,000 tons of soil have been processed. Excavation, transportation, and disposal of wastes containing battery chips have also taken place. Developed the elements of the air monitoring program. The air monitoring program was sufficient to evaluate the personnel exposures to airborne lead dust, as well as the fugitive emission from the exclusion zone. Performed periodic site visits to review results of the air sampling program and confirm that exposures were acceptable.

Served as Health and Safety Manager during the excavation of contaminated construction debris from the Weldon Spring Site Remedial Action Program (WSSRAP) site. Materials in the quarry were accumulated from a munitions manufacturing facility at Weldon Spring, as well as the demolition of buildings from the Mallinckrodt site used during the Manhattan project. Personnel exposures to uranium and thorium were documented, as well as nitroaromatics and asbestos. Mr. Thomas completed site inspections to evaluate the effectiveness of the health and safety plan and review the results of employee exposure monitoring.

Served as Health and Safety Manager during the demolition of selected manufacturing buildings at the WSSRAP. The demolition projects involved the controlled demolition of nine buildings. Employees encountered radioactive uranium as well as asbestos containing materials and cadmium based paints. Mr. Thomas evaluated the construction safety program as well as industrial hygiene program during the demolition tasks.

Served as Health and Safety Manager during the remediation of facilities at the Piketon Gaseous Diffusion Plant in Portsmouth, Ohio. Included was remediation of a chromic acid tank, and the removal of the lead liner in Building X700, demolition of an incinerator in Building X705A. Mr. Thomas prepared the health and safety plan to document the methods necessary to reduce employee exposure to hazardous materials, both chemical and radiation exposures. Project personnel encountered hot environments in Building X700 where chromic acid and uranium were present.

Served as Health and Safety Manager during the remediation of mixed waste that was buried in several burial pits at the Ames Laboratory in Ames, Iowa. Mr. Thomas participated in the planning and execution of the project, including presentations at the public hearings that were provided by the DOE to the public. The waste in the burial pits contained a variety of hazardous materials, including radioactive uranium, thorium, and asbestos as well as volatile organics including methyl ethyl ketone and trichloroethylene. Mr. Thomas prepared the health and safety plan for the project which described the industrial hygiene practice, the construction safety requirements, and the elements of the health physics program. Mr. Thomas evaluated the controls that were implemented and verified that employee exposures were reduced to as low as reasonably achievable.

Served as Department Manager of a commercial radiochemistry laboratory to analyze samples from a variety of commercial and government facilities, including facilities operated by the DOE. Services were provided to a variety of DOE facilities including Fernald, Idaho National Energy Laboratory, Lawrence Livermore National Laboratory, Nevada Test Site, Oak Ridge National Laboratory, Paducah Gaseous Diffusion Plant, Rocky Flats, WSSRAP, and the Y12 Production Facility. Supervised the analysis of various environmental media to be analyzed for specific radioactive isotopes including uranium, plutonium, thorium, and radium. Other analyses were performed for fission products and gross methods including alpha and beta analysis. Served as the RSO for the broad-scope license issued to the laboratory by the NRC.

Performed waste management assessments for four different DOE facilities. Principal investigator for hazardous and mixed waste policies, procedures and practices.

Recommended program changes and upgrades. Worked at the following facilities, including: Portsmouth Gaseous Diffusion Plant, Piketon, Ohio; K25 Gaseous Diffusion Plant, Oak Ridge, Tennessee; Paducah Gaseous Diffusion Plant, Paducah, Kentucky; and Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Served as project manager for the Industrial Hygiene department at Los Alamos National Laboratory (HSE-5). Responsibilities included reviewing and making recommendations for several of the programs being implemented by HSE-5for the National Laboratory. These programs included asbestos controls, carcinogen control, sampling strategies and hazardous waste site characterization. Mr. Thomas also developed a sampling strategy to evaluate personnel exposures to hazardous materials. Mr. Thomas evaluated the asbestos management program at Los Alamos Laboratory. He reviewed the work performed by the IH department, including project oversight and air monitoring. He inspected work sites established by contractors including Pan American Services to assess compliance with LANL procedures and OSHA regulations.

Served as project manager to prepare mixed waste and radiative waste management plans and programs for waste generated during the remedial investigation at the Nevada Test Site. The programs required coordination between the Remedial Investigation contractor, the DOE Operations Area office and the facility receiving the waste for disposal.

Developed and implemented the collection and analysis of radiation measurement to assess the concentration of uranium in the soil surrounding the Fernald Feed Materials Production Center's manufacturing facility. This work was performed for the USDOE as part of the site wide Remedial Investigation/ Feasibility study.

Served as Health Physics Supervisor and during chemical cleaning of the primary cooling system at Dresden Nuclear Power Station, Unit 1. Mr. Thomas was responsible for assessment of engineering controls to reduce personnel exposures to radiation. The techniques were successful to remove more than 750 curies of cobalt-60 and other activation corrosion products. Personnel exposures were less than 7 man-rem over the entirety of the project.

Provided support to decommission a facility that manufactured neutron sources (Am-Be) for nuclear power plants and radiography applications. The hot cells and glove boxes were segmented and packages in Type B shipping containers; the TRU waste shipped to Idaho Falls for storage and ultimate disposal by the USDOE. Drums of remote handled TRU were repackaged and characterized in order to satisfy the waste acceptance criteria for the USDOE. All work was performed in containments designed to minimize the spread of radioactive contamination, both airborne and surface contamination. Exposures to remediation workers was maintained below 1,000 millirem per person for the 15 month project; external exposures to gamma and neutron radiation were minimized. Internal exposures to TRU, including plutonium and americium were evaluated and verified to satisfy the requirements of the USNRC.

STEVEN J. BAKER

Introduction

Mr. Baker is a Senior Project Manager and radiation protection specialist with over 20 years of professional experience in RCRA/CERCLA environmental site investigations, waste removal actions, and site remediation tasks. He has a proven record for completing tasks on-time, on-budget, and exceeding client expectations for project quality and completeness. He has particular expertise in orchestrating complicated logistical tasks, developing detailed project documentation, researching and identifying historical records, and interfacing with clients and Federal/State/Local regulatory authorities. He is also experienced in evaluating regulatory requirements, developing working relationships with clients and regulators and achieving/negotiating compromise between opposing points of view. In addition, Mr. Baker has extensive background in applying historical aerial photography as a site investigation tool.

Credentials

Bachelor of Arts (BA), Geography, University of Southern California, Los Angeles, CA.

40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training (OSHA 29 CFR 1910.120), 1991

Annual 8-hour HAZWOPER Refresher Training (OSHA 29 CFR 1910.120), 1992 - 2014

Confined Space Training (OSHA 29 CFR 1910.146), 1997, 2008

Project Management Training, 2012

American Heart Association First Aid, CPR, and AED Training, renewed 2012

Environmental Regulatory Audit Training, 1995

Resource Conservation and Recovery Act (RCRA)/Superfund Industry Assistance Hotline Training (six-week training course), 1990

Certifications, Registrations and Licenses

The following information, although dated, is provided as evidence of past abilities to obtain Federal security clearances. Acquiring future security clearance(s), if required, is strongly assumed/presumed.

Secret clearance - Central Intelligence Agency (CIA), effective 05 March, 1993. Status: Inactive.

Top Secret/Special Compartmentalized Information (SCI) clearance issued by the U.S. Defense Industrial Security Clearance Office (DISCO), Special Background Investigation (SBI), issued 15 June, 1987. Status: Inactive.

Experience

2012-Present

Project Manager, Integrated Environmental Management, Inc., Gaithersburg, Maryland Duties include managing new as well as on-going project activities at client sites where radiological concerns and/or compliance responsibilities have been identified. He also provides non-radiological and general environmental technical consulting to clients and to IEM. He manages project budgets, project staffing, logistics, and actionable regulatory considerations. In addition, he participates in field data collection site surveys and investigation efforts.

2003 - 2012

Project Manager, BMT Designers & Planners, Arlington, Virginia - Project Manager involved in investigations at a BMT "legacy" client at the Plum Island Animal Disease Center (PIADC) in New York. These activities included managing investigations involving groundwater contaminated with petroleum products and conducting initial surveys and feasibility studies of biological decontamination options that could be considered in the future decontaminatin of a former 40,000 square-foot infectious disease laboratory. Other Program responsibilities included responsibility for managing new projects associated with a USDA Cattle Dip Vat (DCV) Program and waste management activities at a former nuclear reactor test facility at the Walter Reed Army Medical Center (Annex). The CDV Program is designed to investigate arsenic and organic pesticide contamination in soils associated with tick removal activities along the US-Mexican border. The Walter Reed Project focuses on more traditional removal and waste separation (disposal and recycling) activities associated with the final decommissioning of a former reactor test facility. In a similar vein, Mr. Baker also provided project management services (in a subcontractor capacity) at two additional radiologically-impacted sites. One of these sites (Colonie Site, Colonie, New York) was subject to U.S. Army Corps of Engineers management and oversight. The other, a former rare earths processing plant in Oklahoma, is subject to Nuclear Regulatory Commission license decommissioning requirements. Duties for each project included: developing cost estimates for site activities; arranging for project staffing; interacting with clients; providing progress reporting and invoicing services, and developing project plans, reports, and associated deliverables.

1994 - 2003

Project Manager, BMT Entech, Inc., Herndon, Virginia, 1994 - 2003 -

Project Manager responsible for directing RCRA and CERCLA-associated investigations of USDA's (subsequently DHS's) Plum Island Animal Disease Center, Long Island, New York. These duties included managing long-duration RCRA and CERCLA investigation and removal projects in the field and directing Entech personnel and subcontractors in the successful completion of tasks at this high profile site. Other duties associated with this term of employment included participating in initial CERCLA investigatory activities at the 6,000-acre USDA Agricultural Research Service (USDA/ARS) Headquarters in Beltsville Maryland, serving as a mid-level field sampling team leader at a U.S. Army RCRA investigation site in Indiana, conducting compliance audits for several USDA facilities, and conducting historical aerial imagery assessments at numerous Formally Utilized Defense Sites (FUDS). Most of the FUDS activities were conducted under contract to other consultants supporting US Army Corps of Engineer (USACOE) Districts.

1990-1994

Regulatory Specialist, Halliburton NUS Corporation/Brown & Root Environmental, Gaithersburg, Maryland - Regulatory analyst supporting the development of large operating permits and/or plans for various Federal Facilities that required munitions destruction permits, oil spill prevention plans, NEPA impact statements, and environmental site investigations. Other analyst duties included developing "information briefs" on regulatory topics and supporting "graphic guidance" development materials for new regulatory requirements. During the period of employment, Mr. Baker also served as a field technician and junior/mid-level environmental scientist on a variety of environmental investigations at Federal DOD, and DOE sites around the nation. Other duties included the maintenance of a "living library" of Federal environmental regulations for an Environmental Management Headquarters office of DOE in Washington D.C.

1990

Regulatory Information Specialist, Geo/Resources Consultants, Inc., Washington, D.C. -

Information Specialist/Environmental Consultant for EPA's RCRA Superfund Industrial Assistance Hotline. This position required extensive training and independent research and reading of pertinent RCRA and CERCLA statutes and regulatory rulemakings as well as large collections of regulatory interpretive memos and policy statements in order to become proficient in understanding and conveying information to interested parties seeking information on these environmental programs. Upon completion of the training program, duties centered on providing prompt, accurate, and factual information concerning the regulatory programs to callers of diverse backgrounds and varying degrees of regulatory knowledge. The position also required continual review of

new regulatory and support data, development and maintenance of personal research/reference files, research into difficult caller questions that could not be immediately addressed over the phone, interaction with EPA's technical, legal, and policy research staff, and development and maintenance of specialty area files for the hotline's central research library.

1986-1990
Imagery Analyst, Greenhorne & O'Mara, Greenbelt, Maryland - Intelligence Analyst conducting numerous classified Planning Terrain Analysis Data Base (PTADB) and Tactical Terrain Analysis Data Base (TTADB) studies for DOD in various geographic areas of the world. These studies were conducted using DOD satellite imagery and focused on military equipment mobility impediments posed by native vegetation and soils. Similar studies involving availability of water resources in arid environments were also conducted under separate DOD contracts for the Defense Mapping Agency.

Geographer conducting site assessments for the Federal Emergency Management Agency (FEMA) Flood Insurance Program. This activity involved assessing the merits of specific requests for flood insurance exemptions based on engineering, hydrology data, and map interpretation. Requests for such exemptions were the result of petitions from individual landowners and developers whose properties were located within FEMA's regulatory flood zone. These determinations resulted in the generation of letters of approval or denial for exemptions and involved extensive phone discussions with appellants and their consultants.

1980-1986
Imagery Analyst, The Bionetics Corporation, Warrenton, Virginia - Imagery Analyst involved in hundreds of in-depth air photo interpretation studies and reviews of CERCLA "Superfund" waste disposal sites and U.S. Army installations. These studies, conducted under contract with the US Environmental Protection Agency (EPA), were based on the use and interpretation of historical aerial photographs and supplemental collateral site data. These studies were created to assist state and Federal environmental agencies in documenting and identifying past site activity found to pose a threat to human health and the environment. These reports were also used as exhibits in litigation efforts conducted by the Federal government. Additional duties and responsibilities included interacting with public and private officials as well as conducted periodic onsite inspections.

Professional Memberships

Awards

Project Experience

Publications

Co-author. Aerial Photography as a Tool Pollution Engineering Magazine, November, 2002.

CAROL D. BERGER

Introduction

Ms. Berger has over 35 years experience in nuclear and radiological activities with emphasis in strategic planning, radiation dosimetry, instrumentation, and applied health physics. As a co-founder of Integrated Environmental Management, Inc. (IEM), Ms. Berger is actively involved in performance of radiological dose assessments, regulatory interactions, site decommissioning, program evaluations, program development, pathway analyses, risk assessments, dosimetry evaluations, assessment and control of sources of non-ionizing radiations, waste management programs, environmental monitoring programs, and detection and quantification of low-levels of radioactivity.

Credentials

M.S., Health Physics, San Diego State University, San Diego, California; 1979

M.S., Radiation Physics, San Diego State University, San Diego, California; 1977

B.S., Physics/Chemistry, San Diego State University, San Diego, California; 1972

Certifications, Registrations and Licenses

Certified Health Physicist (Comprehensive), American Board of Health Physics, 1983 (Re-certified through 2015)

Alternate Radiation Safety Officer - Maryland Department of the Environment Radioactive Materials License No. MD-31-281-01.

Authorized User - Maryland Department of the Environment Radioactive Materials License No. MD-31-281-01.

Maryland Department of the Environment - Service Registration No. 358-000.

Radiation Health Physicist Registration - Cabinet for Health Services, Commonwealth of Kentucky, Certificate No. 3013.

U. S. Department of Energy "Q" Security Clearance (*expired*).

Experience

1994-Present
President and Founder, Integrated Environmental Management, Inc., Gaithersburg, Maryland. Provides high-quality strategic environmental management services to commercial and government clients. As a member of the client's response team, works with clients to promote an understanding of what is required to achieve and/or maintain compliance in the eyes of all pertinent regulatory agencies, individually or jointly; develop an overall strategy for achieving compliance and reduce liabilities in a technically-sound, legally-defensible, and fiscally-conservative business manner; recommend specific solutions that are compatible with the client's operating philosophy; and provide insights into future regulatory issues and their impact as input to the client's long-range business planning and cost forecasting process.

1989-1994
Senior Technical Consultant, IT Corporation/Nuclear Sciences, Washington, D.C. - Performed health physics consulting for government and commercial facilities in Internal and External Dosimetry; Radiation Monitoring; Environmental Monitoring; Instrumentation; Emergency Response and Preparedness; Site Decommissioning; Radioactive Waste Management; Radiation Risk Assessment; Training; Licensing and Regulatory Negotiations; and Non-ionizing Radiation

1986-1989
Senior Health Physicist, IT Radiological Sciences Laboratory, Knoxville, Tennessee - Performed health physics consulting for government and commercial facilities in Internal and External Dosimetry; Radiation Monitoring; Environmental Monitoring; Applied Health Physics; Instrumentation; Radioactive Waste Management; Training; and Non-ionizing Radiation.

1983-1986
Radiation Dosimetry Group Leader, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Responsible for internal and external dose assessment and programs for ORNL employees, visitors and contractors. Experience included Internal and External Dose Assessment; Monitoring Program Design and Implementation; Instrumentation Development; Site Characterizations; Personnel Management; and Training.

1978-1983
Internal Dose Group Leader, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Responsible for development of the ORNL Whole Body Counter Facility for detection and quantification of the actinides in-vivo. Experience included: Internal Dose Assessment; Monitoring Program Design and Implementation; Instrumentation Development; Special Studies; Personnel

Management; and Training.

1978-1986
Adjunct Faculty, Oak Ridge Associated Universities, Oak Ridge, Tennessee - Professional training courses and general classes in the following health physics and radiation protection areas: Internal Dose Assessment; In-vivo Monitoring and Bioassay Methodologies; Instrumentation, and Applied Health Physics.

1979-1980
Health Physics and Dosimetry Task Group Member, President's Commission on the Accident at Three Mile Island, Washington, D.C. Tasks included: Internal Dose Assessment from Whole Body Counting Results; Estimates of Source Term from in-plant Monitoring Systems; Atmospheric Dispersion Modeling and Population Dose Assessment; and Development of Health Physics Sequence of Events.

Professional Memberships

American Academy of Health Physics (President, 1995; Executive Committee, 1995-1997; Chair of Strategic Planning Committee, 1997; Chair of Professional Standards and Ethics Committee, 2003-2006)

National Council on Radiation Protection and Measurements (Program Area Committee 2 on Operational Radiation Safety, which serves as a national resource for information on operational radiation safety and formulates guidance regarding the application of operational radiation safety principles, 2008-2011)

Health Physics Society (Fellow Member, 2006; Publications Committee, 1999-2001)

American Board of Health Physics, Comprehensive Panel of Examiners (1989-1993).

ANSI Standards Committee (ANSI N13.41) on Multiple Dosimetry; 1986 to 2011 (Working Group Chairman, 1990-1996 and 2007-2011).

ANSI Standards Committee (ANSI N13.39) on Internal Dosimetry Programs (1994 to 2001).

ASTM Task Group E-10.04.27 "Transuranic Wound Analysis" (1986 to 2000).

National Council on Radiation Protection and Measurements (NCRP) Scientific Committee 46-10, "Assessment of Occupational Exposures from Internal Emitters" (1989-1995).

Steering Committee Member, U. S. Department of Energy Task Group on the Education of Future Health Physicists (1989-1991).

Baltimore-Washington Chapter, Health Physics Society (Treasurer, 1993-1994, Board of Directors, 1998-2000)

East Tennessee Chapter - Health Physics Society (President, 1986; President-Elect, 1985; Secretary, 1981-1982).

San Diego Chapter - Health Physics Society (Charter member).

Purdue University, Advisory Council Member for the School of Health Sciences (1995-1998).

DOE/IAEA Whole Body Counter Intercalibration Committee (1980-1986).

Consultant to Knoxville Academy of Medicine, Mass Casualty Simulation (1984-1985).

Technical reviewer and referee for *Health Physics*, *Nuclear Technology*, *Radiation Protection Management* and *Radiation Protection Dosimetry*.

Publications

Over 30 professional publications; over 40 oral presentations; over 500 technical reports; over 50 training courses taught; and 11 books or book chapters.

Awards

American Academy of Health Physics - Third recipient of the Joyce B. Davis Memorial Award for professional achievement and ethical behavior in the practice of health physics (July, 2006, Providence, Rhode Island).

Consultant to the National Cancer Institute to Evaluate Devices and Techniques to Determine Previous Radiation Exposure under Public Law 98-54 (Award for participation presented by Oak Ridge Associated Universities in April, 1988.).

IT Corporation Distinguished Technical Associate - June, 1992.

Appendix 10.2 - Work Plan RSP-116

TABLE OF CONTENTS

THIS DOCUMENT IS A CONTROLLED COPY IF SIGNED IN RED BELOW (SEE RSP-003)

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1 PURPOSE

This Radiation Safety Procedure (RSP) is intended for use in implementing the requirements of the final status survey at the Great Lakes Environmental Research Laboratory (GLERL), operated by the National Oceanic and Atmospheric Administration (NOAA) in Muskegon, Michigan.

2 SCOPE

This RSP is applicable to the acquisition of data necessary for decision-making on the contamination status of the GLERL. Surveys performed for other than this purpose or on other material types are exempt from the provisions of this RSP.

Note: Integrated Environmental Management, Inc., a Plexus Company (IEM) is under contract to NOAA for the performance of this work. Therefore, work on-site will be directed by and under the supervision of the NOAA Radiation Safety Officer (RSO) and Point of Contact on-site, Kim Kulpanowski, Telephone: (734) 741-2074 or Email: kim.a.kulpanowski@noaa.gov.

3 REFERENCES

3.1 Integrated Environmental Management, Inc., Radiation Safety Procedure No. RSP-002, "Definitions".

3.2 Integrated Environmental Management, Inc., Radiation Safety Procedure No. RSP-007, "Training in Radiation Protection".

3.3 Integrated Environmental Management, Inc., Radiation Safety Procedure No. RSP-008, "Instrumentation".

3.4 Integrated Environmental Management, Inc., Radiation Safety Procedure No. RSP-009, "Contamination Control".

3.5 Integrated Environmental Management, Inc., Radiation Safety Procedure No. RSP-018, "Surveillance".

3.6 Integrated Environmental Management, Inc., Radiation Safety Procedure No. RSP-020, "Tailgate Safety Training".

3.7 Integrated Environmental Management, Inc., Radiation Safety Procedure No. RSP-026, "Sample Collection".

3.8 Integrated Environmental Management, Inc., Standard Operating Procedure No. SOP-013, "Field Project Management".

3.9 Integrated Environmental Management, Inc., Radiation Safety Procedure No. RSP-039, "Operation of the Ludlum Model 2360 Scaler/ratemeter Data Logger".

3.10 MARSSIM - U. S. Nuclear Regulatory Commission, NUREG-1575 (Rev. 1), "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)", August, 2000.

3.11 USNRC, 1974 - U. S. Nuclear Regulatory Commission, USNRC Regulatory Guide No. 1.86, "Termination of Operating Licenses for Nuclear Reactors", June, 1974.

3.13 USNRC, 2006 - U. S. Nuclear Regulatory Commission, USNRC NUREG 1757, "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria", Volume 2, Revision 1, September, 2006.

4 DEFINITIONS

The definition of terms used in this RSP that may not be commonly understood shall be found in RSP-002.

5 PROCEDURE

5.1 Responsibilities

5.1.1 The Vice President, Nuclear Solutions, shall supply adequate resources to ensure compliance with this procedure.

5.1.2 The Project Manager shall:

5.1.2.1 Ensure current and proper calibration of all radiation detection instruments in the active inventory.

5.1.2.2 Ensure the instrument being used for screening meets the requirements outlined herein.

5.1.2.3 Maintain instrument calibration certificates on file for all radiation detection instruments used to implement this RSP.

5.1.2.4 Assure that all Health Physics Technicians are properly trained in the provisions of this procedure.

5.1.2.5 Verify compliance with this procedure during screening performed on behalf of clients.

5.1.3 Health Physics Technicians shall:

5.1.3.1 Verify that only calibrated radiation detection instruments are used.

5.1.3.2 Follow this procedure when acquiring the final status survey data.

5.1.3.3 Periodically review this procedure.

5.1.3.4 Maintain a controlled copy of this procedure in the field for the duration of the on-site effort.

5.1.3.5 Notify the Project Manager if revisions to this procedure are necessary.

5.2 Measurement Criteria

5.2.1 The radionuclides of potential concern at the GLERL are H-3 and C-14, both of which emit beta particles.

Note: Isotopes with a half-life less than 120 days do not represent a significant radiation hazard for the purposes of the final status survey and may be excluded from the design of the survey (see USNRC, 2006).

5.2.2 The following are the release criteria for the project:

Radionuclide of Concern	Total (i.e., fixed plus removable) (dpm/100 cm2)	Removable (dpm/100 cm2)	Reference
Tritium (H-3)	1.2E+08	1.2E+07	NUREG-1757, 2006, Table H.1
Carbon - 14	3.7E+06	3.7E+05	NUREG-1757, 2006, Table H.1

Note: The USNRC established screening values for each of the radionuclides of potential concern in NUREG 1757. These values were used to create this table.

5.2.3 Final status surveys shall be designed to demonstrate, to a reasonable degree of scientific certainty, that total (fixed plus removable) residual radioactivity is below 3,700,000 dpm/100cm^2 of beta activity.

5.2.4 The elevated measurement criterion ($DCGL_{EMC}$) is 11,100,000 dpm/100cm^2 of total (fixed plus removable) beta activity.

5.2.5 Equipment, materials and personnel may be released from a restricted (work) area under the following conditions:

5.2.5.1 Total (fixed plus removable) alpha and beta activity (limits applied independently) is less than 1,000 disintegrations per minute (dpm) per 100 square centimeters.

Note: Equipment and material release criteria are taken from Reg. Guide 1.86 (Reference USNRC, 1974).

5.2.5.2 Removable alpha and beta activity (limits applied independently) are less than 200 disintegrations per minute (dpm) per 100 square centimeters (USNRC, 1974);

5.2.5.3 Equipment/material release from the restricted areas shall require approval by the NOAA RSO; and

5.2.5.4 The radiological status of all equipment and materials shall be documented as required in RSP-009.

5.3 Instrumentation Requirements

5.3.1 The following instruments may be used for data acquisition:

Probe Model	Meter Model	Purpose
Ludlum 44-10 Pancake GM	Ludlum Model 12 (or equivalent)	Scans or stationary counts for total gross beta activity in small areas
Ludlum Model 44-116 Beta Detector (100 cm2)	Ludlum Model 2224 Scaler, Ratemeter (or equivalent)	Scans or stationary counts for total gross beta activity
Ludlum Model 44-116 Beta Detector (100 cm2)	Ludlum Model 2360 Scaler, Ratemeter, Data Logger	Scans or stationary counts for total gross beta activity
Ludlum Model 43-93 or 43-89 Alpha/Beta Phoswich (105 cm2)	Ludlum Model 2224 Scaler, Ratemeter (or equivalent)	Scans or stationary counts for total gross beta activity
Ludlum Model 43-68 Alpha/Beta Proportional Counter (100 cm2)	Ludlum Model 2224 Scaler, Ratemeter (or equivalent)	Stationary counts for total gross beta activity
Ludlum Model 239-1F Alpha/Beta Proportional Counter (floor monitor)	Ludlum Model 2360 Scaler, Ratemeter, Data Logger	Scans for total gross beta activity
Liquid Scintillation Counter	n.a.	Removable activity (smear counting)
Ludlum Model 43-10-1	Ludlum 2929 Dual Channel Scaler	Removable activity (smear counting)

5.3.2 As applicable, detectors shall be connected to a rate meter capable of providing the necessary voltage to the detector and providing a read-out in "counts per minute".

Note: The detector voltage should be set according to the manufacturer's recommendations and at the voltage used during the most recent calibration.

5.3.3 Detectors and rate meter pairs shall be calibrated daily before each use and as necessary to confirm instrument response as described in Section 5.4, below.

5.4 Daily Instrument Response Checks

5.4.1 Response checks shall be conducted and recorded daily before use or whenever instrument performance is questioned in order to:

5.4.1.1 Assure constancy in instrument response;

5.4.1.2 Verify the detector is operating properly;

5.4.1.3 Determine efficiencies and detection limits, as applicable;

5.4.1.4 Confirm its response is similar to its calibrated response; and

5.4.1.5 Demonstrate that measurement results are not the result of detector contamination or failure.

5.4.1.6 If an instrument fails a response check, it shall not be used until the problem is resolved.

5.4.2 Check Sources

5.4.2.1 All sealed radiation sources used for daily instrument response checks shall be representative of the instrument's response to the identified radionuclides and traceable to NIST.

5.4.2.2 The source used to set instrument efficiencies shall be Tc-99.

5.4.2.3 The efficiency used to convert total and removable activity count rates into radioactivity levels shall be adjusted for the lower instrument counting efficiencies for C-14.

Note: An efficiency correction of 7% of the Tc-99 efficiency is typical.

5.4.2.4 The Project Manager shall control the use and storage of radiation sources while they are in the field.

5.4.3 Response Check Procedure

5.4.3.1 The response of each instrument shall be entered into a spreadsheet entitled "Daily Instrument Response Checks" (see Attachment 8.1 for an example of the spreadsheet cells).

5.4.3.2 One spreadsheet shall be maintained for each instrument (detector plus meter) in use at the project site.

5.5 Mobilization

5.5.1 See the Field Project Authorization Form (SOP-013) prepared by the Project Manager for the listing of equipment, supplies, licensing and other instructions.

5.5.2 All field personnel shall:

5.5.2.1 Participate in a readiness review lead by the Project Manager in advance of mobilizing to the site.

5.5.2.2 Receive radiation safety training as required in RSP-007.

5.5.2.3 Participate in NOAA-mandated safety training the first day on site, if so required.

5.5.2.4 Participate in a daily safety briefing as required in RSP-020, with documentation maintained by the Project Manager.

5.6 Data Collection Provisions

5.6.1 Final status surveys shall be performed in the following specific order within each room:

Note: The specific order is necessary in order to ensure one measurement does not interfere with accurate data acquisition for any follow-up measurements.

5.6.1.1 Surface scans.

5.6.1.2 Marking of numbers, survey items and measurement locations on surfaces.

Caution: Do not mark stationary measurement locations in the exact spot where the measurements are to be performed. Chalk or paint markings will interfere with data acquisition.

5.6.1.3 Stationary measurements

5.6.1.4 Contamination survey measurements (smear collection)

5.6.1.5 Quality control measurements (duplicate or biased)

5.6.1.6 Smear counting.

5.6.2 Each room shall be assigned a unique survey number by the Project Manager (see Attachment 8.2).

5.6.3 Each measurement location (i.e., stationary count and smear) shall be assigned a unique location number.

5.6.4 The rooms units listed in Attachment 8.2 shall be subject to final status survey.

5.6.5 Each room shall have the following measurements performed:

5.6.5.1 Scan 50% of the floor area;

5.6.5.2 Scan 50% of the cabinet tops;

5.6.5.3 Conduct one total radioactivity measurement inside of the sink (if present);

5.6.5.4 Scan 100% of the floor of each hood (if present);

5.6.5.5 Conduct at least ten (10) total radioactivity measurement within the aforementioned scan area; and

5.6.5.6 Scan a portion of any walls that exhibit discolored or potential impacts from former operations.

Note: Surveyor judgement should be used to determine whether and what portion of the walls should be surveyed.

5.6.5.7 Collect one smear from each of the following locations, as applicable:

5.6.5.7.1 In each sink;

5.6.5.7.2 On the floor in front of each sink;

5.6.5.7.3 On the floor in front of each hood;

5.6.5.7.4 On the hood deck; and

5.6.5.7.5 On the inside of the hood, near the exhaust.

5.6.5.8 Collect duplicate smears as required in 5.9.2, below.

5.6.6 The hallways adjacent to survey units shall have the following measurements performed:

5.6.6.1 Scan 10% of the floor area;

5.6.6.2 Conduct at least three total radioactivity measurement within the aforementioned scan area; and

5.6.6.3 Conduct at least three smears within the aforementioned scan area.

5.7 Performing Surface Scans

5.7.1 Scan data shall be acquired as instructed in RSP-018 and RSP-039.

5.7.2 The scan speed shall be no greater than two inches per second ($\leq$ 5 cm/sec), using a data logger to capture scan data.

5.7.3 After acquisition, scan data shall:

5.7.3.1 Be converted into spreadsheet format as instructed in RSP-039; and

5.7.3.2 Entered (copied) into a spreadsheet entitled "Scan Results" (see Attachment 8.3 for an example of the spreadsheet cells).

5.7.4 One spreadsheet shall be maintained for each room and associated hallway.

5.8 Performing Stationary Counts

5.8.1 Stationary count data shall be acquired as instructed in RSP-018.

5.8.2 The duration of each stationary count shall be no less than one minute.

5.8.3 Raw data may be captured by one of the following methodologies:

5.8.3.1 In a data logger as instructed in RSP-039; or

5.8.3.2 On a "Stationary Count Results" (see Attachment 8.4); or

5.8.3.3 On a "Raw Data Capture Sheet" (see Attachment 8.5).

5.8.4 Duplicate measurements shall be performed:

5.8.4.1 Once per room, or

5.8.4.2 Once every 10 measurements.

5.8.5 After acquisition, stationary count data shall:

5.8.5.1 Be converted into spreadsheet format as instructed in RSP-039 if captured in a data logger; and

5.8.5.2 Entered into a spreadsheet entitled "Stationary Count Results" (see Attachment 8.4 for an example of the spreadsheet cells).

5.9 Performing Removable Contamination Surveys

5.9.1 Removable contamination surveys shall be performed as instructed in RSP-018.

5.9.2 Duplicate smears shall be collected immediately adjacent to an original collection location:

5.9.2.1 Once per room or hallway; or

5.9.2.2 Once every 10 smears.

5.9.3 Smears shall be analyzed via a calibrated, gross beta scintillator or a liquid scintillation counter.

5.9.4 Smear data shall be reviewed for the presence of contamination. The room number shall be listed.

5.10 Evaluating Inaccessible Areas

Note: An inaccessible area is one that is too small to permit access by a radiation detector.

5.10.1 Attempt to collect removable activity from that location using a smear.

5.10.2 Document the location on the applicable survey map and describe the nature of the covering.

5.10.3 Photograph the location.

5.11 Photographs

5.11.1 If so authorized, photographs shall be made to assist in documenting on-site activities and for future reference.

Note: Approval to collect photographs shall be secured from the NOAA RSO in advance of mobilizing to the site.

5.11.2 At a minimum, one photograph of each room shall be obtained.

5.11.3 The Project Manager, or designee, shall maintain a photo log that includes the photograph number, the date of the photo, and a short descriptive phrase.

5.12 End of Day Activities

5.12.1 Check all mylar windows on survey instruments for light leaks and replace same as required.

Note: Window changes can cause elevated phototube response that can take a few hours to clear.

5.12.2 Project team members shall deliver all hard-copy notes, records and log entries made during the day to the Project Manager for safe keeping.

6 EXEMPTION PROVISIONS

6.1 Minor changes to this RSP that do not reduce the inherent compliance with the Final Status Survey Plan (FSSP) shall be permitted pursuant to the written authorization of the RSO and the Vice President.

6.2 Variances and exceptions to this RSP that are not in compliance with the FSSP shall be permitted pursuant to the written authorization of applicable NOAA representatives.

7 DOCUMENTATION

7.1.1 Field Logs

7.1.1.1 Project activities in a field log (bound and with numbered pages), a Field Activity Daily Log form, or equivalent method of data and information recording.

Note: The contents of the logs shall be subsequently transferred to an electronic format for inclusion in the project records.

7.1.1.2 Field logs shall be reviewed by the Project Manager at least weekly and after any significant event.

7.1.1.3 Each entry into a field log shall be legible, factual, detailed, complete and shall be signed and dated by the individual making the entry.

7.1.1.4 If a mistake is made, the error shall have a single line drawn through it, with the initials of the person making the correction written next to the line.

Note: No erasures or "white out" use is permitted.

7.1.1.5 Electronic copies of all field notes and log entries shall be forwarded to the Project Manager as soon as possible but before demobilizing from the site.

7.1.2 Survey Packages

7.1.2.1 A survey package shall be prepared for each room.

7.1.2.2 Each survey package should contain the following, if so required by the Project Manager:

7.1.2.2.1 A cover sheet (see Attachment 8.6).

7.1.2.2.2 A copy of the applicable calibration certificate for each instrument used to acquire data.

7.1.2.2.3 A copy of the applicable "Daily Instrument Response Check" sheet.

7.1.2.2.4 A copy of the applicable "Scan Results" sheet.

7.1.2.2.5 A copy of the applicable "Stationary Count Results" sheet.

7.1.2.2.6 A copy of the applicable "Wipe Test Results" from the liquid scintillation counter.

7.1.2.3 Each page of the survey package shall be reviewed for completeness and accuracy and initialed/dated in the bottom right corner by the Project CHP and the Quality Assurance Officer.

7.1.3 Electronic Records

7.1.3.1 To avoid damage or loss, all electronic data shall be protected.

7.1.3.2 All electronic information acquired for the project shall be downloaded from its collection device (e.g., laptop computers, data loggers, etc.), or scanned if hard copy, on a daily basis and forwarded to the IEM server.

Note: There are multiple levels of redundant and recoverable storage/backup on the IEM server.

8 ATTACHMENTS

8.1 Daily Instrument Response Check

8.2 Laboratories to be Surveyed

8.3 Room Scan Results

8.4 Stationary Count Results

8.5 Raw Data Capture Sheet

8.6 Survey Package Cover Sheet

ATTACHMENT 8.1

Daily Instrument Response Checks
(See server copy)

ATTACHMENT 8.2
Laboratories to be Surveyed

Room No.	Description (Classification)	Approximate Area (ft^2)
301	Building 3 (Class 2)	400
302	Building 3 (Class 2)	400
304	Building 3 (Class 2)	400
305	Building 3 (Class 2)	400
Building 3	Adjacent Hallways/Bay Area (Class 3)	200
Waste Shed	Outdoor shed outside of Building 3 (Class 1)	200
Vessel	R/V Laurentian (Class 2)	200

ATTACHMENT 8.3

Scan Results
(See server copy)

ATTACHMENT 8.4

Stationary Count Results
(See server copy)

ATTACHMENT 8.5

RAW DATA CAPTURE SHEET
(See Server Copy)

ATTACHMENT 8.6
SURVEY PACKAGE COVER SHEET

Room No.: *Type Here*	**Survey No.**: *Type Here*	**Area Description**: *Type Here*
Package Approved by:	**Name (signature):**	**Name (type):**
Project Manager		Bill R. Thomas, CHP, CIH
Project CHP		Carol D. Berger, CHP
Quality Control Officer		Cathryn N. Chang

Discussion of anomalous data including any areas of elevated direct radiation detected during scanning that exceeded the investigation level or measurement locations in excess of the $DCGL_W$:

Type Here

Statement that each room satisfied the $DCGL_W$ and the $DCGL_{EMC}$, if any sample points exceeded the $DCGL_W$:

Type Here

Description of any changes in the initial assumptions relative to the extent of residual radioactivity:

Type Here

Other comments or remarks:

Type Here

Appendix 10.3 - Field Activity Daily Logs

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

FIELD ACTIVITY DAILY LOG

Facility: Lake Michigan Field Station, Building 3	
Date: March 30, 2015	Job/Task Number: 2005006.05
Client Name: NOAA, Great Lakes Environmental Research Laboratory	
Address of Work Site: 1431 Beach St., Muskegon, MI 49441-1098	
Description of Work FSS for Bldg 3	

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS

Arrived on site at (insert date and time): 0745 3/30/2015

0800 met w/ Kim K + Duane G to discuss elements of job + Survey

0845 Toured Bldg 3 + waste storage shed
R/V Lawrentian is offsite. Steve B + Duane G travel tomorrow.

0930 Setup equipment. Complete instrument response

1005 Instruments checked out. Source check
Survey Room 304. Scan floor + cabinets

1120 leave site for lunch

1230 Return to site
Survey in Room 304 + 301

1555 Stop survey download data

1615 meet w/ client to highlights of the day

1630 leave the site

Departed site at (insert date and time): 1630 3/30

Changes from Plans and Specifications, and Other Special Orders and Important Decisions:	
Weather Conditions: Clear, 35°F,	Important Telephone Calls and Interactions:
Personnel on Site: Steve Baker Bill Thomas	
Name (print): Bill Thomas	Signature: Bill Thomas

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

FIELD ACTIVITY DAILY LOG

Facility: Lake Michigan Field Station, Building 3

Date: Mar 31, 2015 | Job/Task Number: 2005006.05

Client Name: NOAA, Great Lakes Environmental Research Laboratory

Address of Work Site: 1431 Beach St., Muskegon, MI 49441-1098

Description of Work FSS for Bldg 3

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS

Arrived on site at (insert date and time): 0750 3/31

0750 Some check + update datalogger
0930 Meet w/ Kim K + Duane J
0940 Steve B + Duane J left site for A/V convention
Bill Thomas assisted post sweep w/ Kim K
1000 Bill T left site for copy needs
1115 Bill T back from staples
1120 Steve Baker returned from A/V Convention
1130 Lunch
1250 Return to survey
Room 301 Bill T
Room 302 Steve B
Bay Area
1530 Room 303 Bill T done

Departed site at (insert date and time): 1615 3/31/2015

Changes from Plans and Specifications, and Other Special Orders and Important Decisions:

None

Weather Conditions:

Important Telephone Calls and Interactions: None

Personnel on Site: Steve Baker - Bill Thomas

Name (print): Bill Thomas | Signature: BTT

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

FIELD ACTIVITY DAILY LOG

Facility: Lake Michigan Field Station, Building 3	
Date: 4/1/2015	Job/Task Number: 2005006.05
Client Name: NOAA, Great Lakes Environmental Research Laboratory	
Address of Work Site: 1431 Beach St., Muskegon, MI 49441-1098	
Description of Work FSS in Bldg 3	

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS

Arrived on site at (insert date and time): 0800 4/1/15

0810 Instrument response and check background
0820 Survey waste storage shed
0830 Survey Refers to manbaton in Room 305
1050 Finish SW 3312 Equipment

1140 Swamp complete. Data uploaded to computer

1215 Pack up equipment. Meet w/ client to bldg walkthru

1330 to site

Departed site at (insert date and time): 1330 4/1/2015

Changes from Plans and Specifications, and Other Special Orders and Important Decisions:

None

Weather Conditions:	Important Telephone Calls and Interactions: None
Personnel on Site: Steve Baker Bill Thomas	
Name (print): Bill Thomas	Signature: Bill

Appendix 10.4 - Instrument Records

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 2360 SERIAL# 307127

Owner: IEM

DATE: 01/15/15 LOCATION: Griffin Inst.

TECH: D.Steimel DATE LAST CAL EXPIRES: 12/12/14

Reason For Calibration: (•) Due For Calibration ( ) Repair (See Remarks)

( ) Other (See Remarks) ( ) Due and Repair (See Remarks)

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 SERIAL #: 134715 CAL. DUE: 12/08/15

[✓] Audio Response [✓] Geotropism CABLE LENGTH: 39"

CONDITION: Sat AF MECHANICAL ZERO: 0 AL MECHANICAL ZERO: 0

NEW BATTERIES: (•) Yes ( ) No BATTERY CHECK: Sat

HV (+/-10%)	AS FOUND HV	AS LEFT HV	WINDOW SETTINGS:	A.F.	A.L.
500 V:	500	A.F.	BT (3.5 mV +/- 1 mV):	3.5	A.F.
1000 V:	1000	A.F.	BW (30 mV +/-3 mV):	30	A.F.
1500 V:	1500	A.F.	AT (120 mV +/-10 mV):	120	A.F.

RATE METER / SCALER

SCALE	RATE CPM	AS FOUND		% ERROR	AS LEFT	% ERROR	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100		0.0%	A.F.					
	250	250		0.0%	A.F.		248	0.8%	A.F.	
	400	395		1.3%	A.F.					
x1 or x10	1000	1000		0.0%	A.F.					
	2500	2450		2.0%	A.F.					
	4000	3950		1.3%	A.F.					
x10 or x100	10K	10	K	0.0%	A.F.					
	25K	24.5	K	2.0%	A.F.					
	40K	39.5	K	1.3%	A.F.					
x100 or x1000	100K	100	K	0.0%	A.F.					
	250K	245	K	2.0%	A.F.					
	400K	395	K	1.3%	A.F.					

Is the As Found Data Within 20% of the Set Point?: (•) Yes ( ) No

Overload Light: (•) Adjusted / Verified ( ) Not Adj.

REMARKS:

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: 01/15/16

INSTRUMENT MARRIED WITH 43-89 # RN014452

Performed/Reviewed by: DS D.Steimel Date: 1/15/2015 Entered by: RS Initials

Calibrations performed to ANSI N323A-1997 standards.

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 43-89 PROBE # RN014452

Owner: IEM

DATE: 01/15/15 LOCATION: Griffin Inst
TECH: D.Steimel DATE LAST CAL EXPIRES: 12/12/14

REASON FOR CALIBRATION:

(●) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair

CABLE LENGTH: 39" INPUT SENSITIVITY: DUAL

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2360 SERIAL #: 307127 CAL. DUE: 01/15/16

NIST TRACEABLE SOURCES USED

Source Number	Isotope	4 pi Activity	Assay Date	2 pi Activity
99TC470-1814	Tc99 SS	31,330 dpm	05/27/14	19,600 cpm
2697-00	Sr90	12,200 dpm	03/01/00	8,530 cpm
99TH470-1815	Th230	24,052 dpm	09/05/14	10,930 cpm
2696-00	Pu239	18,600 dpm	12/02/09	9,370 cpm

Condition: (●) Sat ( ) Unsat

Efficiencies from last cal.:

Pu: Th: 15.72% Sr:
Tc ss: 8.96% C14: Tc Ni:

As Found (AF) Efficiencies:

HV / Vernier:	Tc-99 Source Response Nickel (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Tc-99 Source Response Stainless Steel (CPM):		
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	A ch.	B ch.	Net Eff.
675 / N/A				3419	1210	18.48%	1	230	1	3272	9.71%

Net A to B Xtalk: <10%	B to A Xtalk: <1%
22.3%	<1%

	Pu239	Tc99 Ni	Tc99 ss	Th-230	Sr90	C-14
AF CPM:	3419		3272	3665	2360	
AF 4 pi eff:	18.48%		9.71%	15.23%	24.95%	
AF 2 pi eff:	*36.48%*		*15.52%*	*33.52%*	*35.69%*	

Is as found efficiency within 20% of the efficiency from the last cal? (●) Yes ( ) No (See Remarks)

Note: If the as found data is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the plateau section and go directly to remarks.

GRIFFIN INSTRUMENTS

PROBE #: **RN014452**
Date: 01/15/15

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
625	18	1590	4.7%	3037	411	16.4%	2	126	8.6%	<1%
650	15	2052	6.0%	3274	559	17.7%	2	174	10.5%	<1%
675	18	2948	8.6%	3361	913	18.2%	1	258	16.3%	<1%
A.F. PLAT.										

Alpha / Beta Bkg (cpm)

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	C-14	Sr-90
	CPM:						
	4 pi AL Efficiencies:						
	2 pi AL Efficiencies:						

PROBE #: **RN014452**
Date: 01/15/15

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
600	1	1688	5.1%	2210	296	11.9%	0	99	8.2%	<1%
625	1	3162	9.6%	2939	375	15.9%	1	157	6.9%	<1%
650	5	3970	12.0%	3189	472	17.2%	1	202	7.8%	<1%
675	2	4460	13.6%	3393	697	18.3%	0	208	12.6%	<1%
A.L. PLAT.										

Alpha / Beta Bkg (cpm) 1 156

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	C-14	Sr-90
650 / N/A	CPM:	3145		3889	3490		2540
	4 pi AL Efficiencies:	16.99%		11.92%	14.51%		27.93%
	2 pi AL Efficiencies:	*33.55%*		*19.05%*	*31.92%*		*39.95%*

GRIFFIN INSTRUMENTS

REMARKS: Replaced white out mylar. A.F. taken after mylar change. A.F. had low beta eff. & high cross talk. Replaced scint.

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: 01/15/16

INSTRUMENT MARRIED WITH 2360 # 307127

Performed/Reviewed by: DS D. Steinel Date: 1/15/2015 Entered by: DS Initials

2 pi efficiencies denoted in italics.

Calibrations performed to ANSI N323A-1997 standards.

RSP-008, ATTACHMENT 8.15

INSTRUMENT RESPONSE RECORD (10-POINT CHECK)

GENERAL INFORMATION

Measurement Location:	IEM Office	
Meter Model No./Serial No.:	2360	307127
Probe Model No./Serial No.:	43-89	RN014452
Check Source No. (α/β/γ):	2400-98	2398-98
Check Source DPM (α/β/γ):	12700	19200
Probe Area (in cm2)	125	
Scaler Count time (min):	1	Note: For ratemeters, response should be "1"
Response Switch:	X10	
Performed by:	Sumlin	
Date:	2/23/15	

	Alpha			Beta			Gamma (Count Rate Instrument)			Gamma (Exposure Rate Instrument)	
Measurement No.	Check Source Counts	Check Source Count Rate (cpm)	$(x-x_{ave})^2$	Check Source Counts	Check Source Count Rate (cpm)	$(x-x_{ave})^2$	Check Source Counts	Check Source Count Rate (cpm)	$(x-x_{ave})^2$	Check Source Exposure Rate (uR/hr)	$(x-x_{ave})^2$
1	2257	2257	246	2522	2522	1384		0	0		#DIV/0!
2	2220	2220	2777	2476	2476	77		0	0		#DIV/0!
3	2317	2317	1962	2512	2512	740		0	0		#DIV/0!
4	2319	2319	2144	2463	2463	475		0	0		#DIV/0!
5	2252	2252	428	2551	2551	4382		0	0		#DIV/0!
6	2275	2275	5	2415	2415	4872		0	0		#DIV/0!
7	2322	2322	2430	2454	2454	949		0	0		#DIV/0!
8	2315	2315	1789	2538	2538	2830		0	0		#DIV/0!
9	2263	2263	94	2464	2464	433		0	0		#DIV/0!
10	2187	2187	7344	2453	2453	1011		0	0		#DIV/0!
Mean		*2273*	*19222*		*2485*	*17154*		*0*	*0*	*#DIV/0!*	*#DIV/0!*
Sigma squared		*2136*			*1906*			*0*		*#DIV/0!*	
Sigma		*46*			*44*			*0*		*#DIV/0!*	
2 sigma		*92*			*87*			*0*		*#DIV/0!*	
3 sigma		*139*			*262*			*0*		*#DIV/0!*	

Acceptable Ranges	Two sigma (cpm)		Three sigma (cpm)	
	From	To	From	To
Alpha	2180	2365	2134	2411
Beta	2397	2572	2223	2747
Gamma (CR)	0	0	0	0
Gamma (ER) uR/hr	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Efficiency

Acceptable Ranges	Two sigma		Three sigma	
	From	To	From	To
Alpha	0.17	0.19	0.17	0.19
Beta	0.12	0.13	0.12	0.14

DO NOT WRITE IN CELLS BELOW OR PRINT FOR FSS REPORT - FOR BLOCK COPYING PURPOSES ONLY

Cut and Paste Sections	10-pt. Check	2s Low	2s High	3s Low	3s High
	Alpha Eff.	0.17	0.19	0.17	0.19
	Beta Eff.	0.12	0.13	0.12	0.14
	Gamma (CR)	0.00	0.00	0.00	0.00
	Gamma (ER)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 2360 SERIAL# 287562

Owner: IEM

DATE: 07/31/14 **LOCATION:** Griffin Inst

TECH: E.M. Glenn **DATE LAST CAL EXPIRES:** 08/06/14

Reason For Calibration: (•) Due For Calibration ( ) Repair (See Remarks)

( ) Other (See Remarks) ( ) Due and Repair (See Remarks)

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 **SERIAL #:** 114512 **CAL. DUE:** 10/14/14

[✓] Audio Response [✓] Geotropism **CABLE LENGTH:** 39"

CONDITION: Sat **AF MECHANICAL ZERO:** 0 **AL MECHANICAL ZERO:** 0

NEW BATTERIES: ( ) Yes (•) No **BATTERY CHECK:** Sat

HV (+/-10%)	AS FOUND HV	AS LEFT HV	WINDOW SETTINGS:	A.F.	A.L.
500 V:	500	A.F.	BT (3.5 mV +/- 1 mV):	3.5	A.F.
1000 V:	1000	A.F.	BW (30 mV +/-3 mV):	26	30
1500 V:	1500	A.F.	AT (120 mV +/-10 mV):	115	120

SCALE	RATE CPM	AS FOUND		% ERROR	AS LEFT	% ERROR	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100		0.0%	A.F.					
	250	250		0.0%	A.F.		250	0.0%	A.F.	
	400	400		0.0%	A.F.					
x1 or x10	1000	1000		0.0%	A.F.					
	2500	2500		0.0%	A.F.					
	4000	4000		0.0%	A.F.					
x10 or x100	10K	10	K	0.0%	A.F.					
	25K	25	K	0.0%	A.F.					
	40K	40	K	0.0%	A.F.					
x100 or x1000	100K	100	K	0.0%	A.F.					
	250K	250	K	0.0%	A.F.					
	400K	400	K	0.0%	A.F.					

Is the As Found Data Within 20% of the Set Point?: (•) Yes ( ) No

Overload Light: (•) Adjusted / Verified ( ) Not Adj.

REMARKS:

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: 07/31/15

INSTRUMENT MARRIED WITH 43-93 **# PR238109**

Performed/Reviewed by: E.M. Glenn **Date:** 7/31/2014 **Entered by:** ____ Initials

Calibrations performed to ANSI N323A-1997 standards.

Model 2360 Log Data **Date: 07/31/2014** **Time: 01:50:06 PM** **Page: 1**

Header 1: Jack
Header 2: SN287562
Header 3: SN: PR 238109
Header 4: GE
Header 5: TPP
Header 6: Manf Bldg
Location: M&E

Calibration Due Date: 07/31/2015
Model 2360 Date: 07/31/2014
Model 2360 Time: 01:49:01 PM

Logged Samples: 0

User PC Scaler Count Time: 1.0 minutes

Alpha Ratemeter Alarm Setpoint:	999999
Beta Ratemeter Alarm Setpoint:	999999
Alpha + Beta Ratemeter Alarm Setpoint:	999999
Alpha Scaler Alarm Setpoint:	999999
Beta Scaler Alarm Setpoint:	999999
Alpha + Beta Scaler Alarm Setpoint:	999999

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 43-93 PROBE # PR238109

Owner: IEM

DATE: 07/31/14 LOCATION: Griffin Inst

TECH: E.M. Glenn DATE LAST CAL EXPIRES: 08/06/14

REASON FOR CALIBRATION:

(●) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair

CABLE LENGTH: 39" INPUT SENSITIVITY: dual

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2360 SERIAL #: 287562 CAL. DUE: 07/31/15

NIST TRACEABLE SOURCES USED

Source Number	Isotope	4 pi Activity	Assay Date	2 pi Activity
00TC470-0654	Tc99 SS	17,300 dpm	06/15/09	10,800 cpm
99TH470-1815	Th230	24,800 dpm	08/03/09	12,600 cpm
2696-00	Pu239	18,500 dpm	12/02/09	9,370 cpm
2697-00	Sr90	12,200 dpm	03/01/00	8,530 cpm

Efficiencies from last cal.:

Condition: (●) Sat ( ) Unsat Pu: Th: 18.83% Sr:

Tc ss: 14.50% C14: Tc Ni:

As Found (AF) Efficiencies:

HV / Vernier:	Tc-99 Source Response Nickel (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Tc-99 Source Response Stainless Steel (CPM):		
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	A ch.	B ch.	Net Eff.
800 / N/A				4104	609	22.18%	1	207	1	2633	14.02%

Net A to B Xtalk: <10% 8.9%

B to A Xtalk: <1% <1%

	Pu239	Tc99 Ni	Tc99 ss	Th-230	Sr90	C-14
AF CPM:	4104		2633	4765	2731	
AF 4 pi eff:	**22.18%**		**14.02%**	**19.21%**	**29.22%**	
AF 2 pi eff:	***43.79%***		***22.46%***	***37.81%***	***41.79%***	

Is as found efficiency within 20% of the efficiency from the last cal? (●) Yes ( ) No (See Remarks)

Note: If the as found data is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the plateau section and go directly to remarks.

GRIFFIN INSTRUMENTS

PROBE #: **PR238109**
Date: 07/31/14

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
N/A										

Alpha / Beta Bkg (cpm) 1 207

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	C-14	Sr-90
800 / N/A	CPM:	4104		2633	4765		2731
	4 pi AL Efficiencies:	**22.18%**		**14.02%**	**19.21%**		**29.22%**
	2 pi AL Efficiencies:	***43.79%***		***22.46%***	***37.81%***		***41.79%***

REMARKS: Replaced mylar due to pin-holes and white out. A.F. data taken after repair.

Does Instrument Meet Final Acceptance Criteria?: (●) Yes ( ) No

Calibration Sticker Attached?: (●) Yes ( ) No

Date Instrument is Due For Next Calibration: **07/31/15**

INSTRUMENT MARRIED WITH **2360** **# 287562**

Performed/Reviewed by: E.M. Glenn AE Date: 7/31/2014 **Entered by:** AE **Initials**

2 pi efficiencies denoted in italics.

Calibrations performed to ANSI N323A-1997 standards.

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 12 NS SERIAL# 143593

Owner: IEM

DATE: 10/30/14 LOCATION: Griffin Inst

TECH: D. Steimel DATE LAST CAL EXPIRES: 10/30/14

Reason For Calibration: (•) Due For Calibration ( ) Repair (See Remarks)
( ) Other (See Remarks) ( ) Due and Repair (See Remarks)

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 SERIAL #: 134715 CAL. DUE: 11/26/14

MODEL: SERIAL #: CAL DUE:

[x] Fast/Slow Switch working properly [x] Audio Response [x] Geotropism CABLE LENGTH 39"

CONDITION: Worn AF MECHANICAL ZERO: 0 AL MECHANICAL ZERO: 0

NEW BATTERIES: (•) Yes ( ) No BATTERY CHECK: Sat

HV RANGE 400 - 1500 VOLTS ( ) N/A (•) Sat ( ) Unsat

HV (+/-10%)	AS FOUND HV	AS LEFT HV
500 V:		
1250 V: 1000 V for 177s		
2000 V: 1500 V for 177s		

AF INPUT SENSITIVITY (mV): 35 AL INPUT SENSITIVITY (mV) : A.F.

RATE METER

SCALER

SCALE	RATE CPM	AS FOUND		% ERROR	AS LEFT	% ERROR	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100		0.0%	A.F.					
	250	250		0.0%	A.F.					
	400	400		0.0%	A.F.					
x1 or x10	1000	1000		0.0%	A.F.					
	2500	2500		0.0%	A.F.					
	4000	4000		0.0%	A.F.					
x10 or x100	10K	10	K	0.0%	A.F.					
	25K	25	K	0.0%	A.F.					
	40K	40	K	0.0%	A.F.					
x100 or x1000	100K	100	K	0.0%	A.F.					
	250K	250	K	0.0%	A.F.					
	400K	400	K	0.0%	A.F.					

Is the As Found Data Within 20% of the Set Point?: (•) Yes ( ) No

REMARKS:

Does Instrument Meet Final Acceptance Criteria?: (•) Yes ( ) No

Calibration Sticker Attached?: (•) Yes ( ) No

Date Instrument is Due For Next Calibration: 10/30/15

INSTRUMENT MARRIED WITH 44-9 # PR151746

Performed/Reviewed by: D. Steimel Date: 10/30/2014 Entered by: DS Initials

Calibrations performed to ANSI N323A-1997 standards.

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 44-9 PROBE # PR151746

Owner: IEM

DATE:	10/30/14	LOCATION:	Griffin Inst
TECH:	D. Steimel	DATE LAST CAL EXPIRES:	10/30/14

REASON FOR CALIBRATION:

(●) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair

CABLE LENGTH: 39" INPUT SENSITIVITY: 35mV

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: 2221 SERIAL #: 196059 CAL. DUE: 07/17/15

NIST TRACEABLE SOURCES USED

Source Number	Isotope	4 pi Activity	Assay Date	2 pi Activity
99TC470-1814	Tc99 SS	31,330 dpm	05/27/14	19,600 cpm
2697-00	Sr90	12,200 dpm	03/01/00	8,530 cpm

PHYSICAL CONDITION: Sat EFF. FROM LAST CAL.: 12.91% BKG: 35 HV 900V

AF CPM Tc99: 4176 4142 4019 AVG: 4112.3 AF Sr90 CPM: 2511

Tc99 4 pi EFF: 13.01% Sr90 4 pi EFF: 28.83%

Tc99 2 pi EFF: 20.80% *Sr90 2 pi EFF: 41.24%*

AL CPM Tc99: AVG: AL Sr90 CPM:

TC-99 4 pi EFF: Sr90 4 pi EFF:

Tc99 2 pi EFF: *Sr90 2 pi EFF:*

Is the as found efficiency within 20% of eff. from last cal.?	(●) Yes	( ) No *See Remarks
Saturation Test Satisfactory	(●) Yes	( ) No
Reproducibility: Are the individual counts within 10% of the average?	(●) Yes	( ) No
Does the probe meet final acceptance criteria?	(●) Yes	( ) No
Calibration sticker attached?	(●) Yes	( ) No

Remarks:

DATE PROBE IS DUE FOR NEXT CALIBRATION: 10/30/15

INSTRUMENT MARRIED WITH 12 NS # 143593

Performed/Reviewed by: D. Steimel Date: 10/30/2014 Entered by: DS Initials

Geometry: Flat surface unless otherwise stated. 2 pi efficiencies italicized.

Calibrations performed to ANSI N323A-1997 standards

RSP-008, ATTACHMENT 8.15
INSTRUMENT RESPONSE RECORD (10-POINT CHECK)

GENERAL INFORMATION

Measurement Location:	IEM HQ		
Meter Model No./Serial No.:	M12 NS	143593	
Probe Model No./Serial No.:	44-9	PR151746	
Check Source No. (α/β/γ):	NA	2398-98	NA
Check Source DPM (α/β/γ):	NA	19200	1 uCi
Probe Area (in cm2)	15.51		
Scaler Count time (min):	1		
Response Switch:	x10		
Performed by:	S. Baker		
Date:	11/14/14		

Beta - "Set 1"

Note: For ratemeters, response should be "1"

slow

	Alpha			Beta			Gamma (Count Rate Instrument)			Gamma (Exposure Rate Instrument)	
Measurement No.	Check Source Counts	Check Source Count Rate (cpm)	$(x-x_{ave})^2$	Check Source Counts	Check Source Count Rate (cpm)	$(x-x_{ave})^2$	Check Source Counts	Check Source Count Rate (cpm)	$(x-x_{ave})^2$	Check Source Exposure Rate (uR/hr)	$(x-x_{ave})^2$
1	NA	#VALUE!	#VALUE!	2400	2400	6006	NA	#VALUE!	#VALUE!	NA	#VALUE!
2	NA	#VALUE!	#VALUE!	2425	2425	2756	NA	#VALUE!	#VALUE!	NA	#VALUE!
3	NA	#VALUE!	#VALUE!	2500	2500	506	NA	#VALUE!	#VALUE!	NA	#VALUE!
4	NA	#VALUE!	#VALUE!	2600	2600	15006	NA	#VALUE!	#VALUE!	NA	#VALUE!
5	NA	#VALUE!	#VALUE!	2600	2600	15006	NA	#VALUE!	#VALUE!	NA	#VALUE!
6	NA	#VALUE!	#VALUE!	2500	2500	506	NA	#VALUE!	#VALUE!	NA	#VALUE!
7	NA	#VALUE!	#VALUE!	2450	2450	756	NA	#VALUE!	#VALUE!	NA	#VALUE!
8	NA	#VALUE!	#VALUE!	2400	2400	6006	NA	#VALUE!	#VALUE!	NA	#VALUE!
9	NA	#VALUE!	#VALUE!	2400	2400	6006	NA	#VALUE!	#VALUE!	NA	#VALUE!
10	NA	#VALUE!	#VALUE!	2500	2500	506	NA	#VALUE!	#VALUE!	NA	#VALUE!
Mean		*#VALUE!*	*#VALUE!*		*2478*	*53063*		*#VALUE!*	*#VALUE!*	*#DIV/0!*	*#VALUE!*
Sigma squared		*#VALUE!*			*53072*			*#VALUE!*		*#VALUE!*	
Sigma		*#VALUE!*			*230*			*#VALUE!*		*#VALUE!*	
2 sigma		*#VALUE!*			*461*			*#VALUE!*		*#VALUE!*	
3 sigma		*#VALUE!*			*1382*			*#VALUE!*		*#VALUE!*	

Acceptable Ranges	Two sigma (cpm)		Three sigma (cpm)	
	From	To	From	To
Alpha	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Beta	2017	2938	1095	3860
Gamma (CR)	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Gamma (ER) uR/hr	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Efficiency

Acceptable Ranges	Two sigma		Three sigma	
	From	To	From	To
Alpha	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Beta	0.11	0.15	0.06	0.20

DO NOT WRITE IN CELLS BELOW OR PRINT FOR FSS REPORT - FOR BLOCK COPYING PURPOSES ONLY

Cut and Paste Sections	10-pt. Check	2s Low	2s High	3s Low	3s High
	Alpha Eff.	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Beta Eff.	0.11	0.15	0.06	0.20
	Gamma (CR)	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Gamma (ER)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 19 PROBE # 300777

Owner: IEM

DATE: 01/16/15 LOCATION: Griffin Inst
TECH: E.M. Glenn DATE LAST CAL EXPIRES: 12/13/14

(●) Due For Calibration ( ) Other (See Remarks) Cable Length: 39"
( ) Repair (See Remarks) ( ) Due and Repair I.S.: 29mV

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2221 SERIAL #: 183997 CAL. DUE: 07/03/15

SOURCE #: 99-1816 ISOTOPE: Cs137 ACTIVITY: 1.23 uCi ASSAY DATE: 08/12/99

GEOMETRY: Jig upside down with source underneath, activity side up.

Physical Condition: (●) Sat ( ) Unsat

Efficiency From Last Calibration: Previous HV Set Point: V

Counts (CPM) Background (CPM) Net CPM:

AF Efficiency:

Is the AF efficiency within 20% of the efficiency from the last calibration? ( ) Yes (●) No

Reproducibility: 120170 121660 119700 Average: 120510.00

Are the individual counts within 10% of the average? (●) Yes ( ) No

High Voltage:	Source Response (CPM):	Background (CPM):	Net CPM:
600	91520	750	90770
625	96100	1040	95060
650	97200	1350	95850
675	100490	980	99510
700	117670	1420	116250
725	117590	1340	116250
750	119310	1180	118130
775	121650	1210	120340
800	123340	1150	122190

HV	RESPONSE	BACKGROUND	NET CPM	
750 V	120170	1330	118840	Efficiency: 6.21%

REMARKS: Replaced broken "reset" button.

Does Instrument Meet Final Acceptance Criteria?: (●) Yes ( ) No

Calibration Sticker Attached?: (●) Yes ( ) No

Date Instrument is Due For Next Calibration: 01/16/16

INSTRUMENT MARRIED WITH #

Performed/Reviewed by: E.M. Glenn EMG Date: 1/16/2015 Entered by: EMG Initials

Calibrations performed to ANSI N323A-1997 standards

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 19 SERIAL# 300777

Owner: IEM

DATE: 01/16/15 LOCATION: Griffin Inst

TECH: E.M. Glenn DATE LAST CAL EXPIRES: 12/13/14

REASON FOR CALIBRATION: Due for Calibration

NIST TRACEABLE EQUIPMENT AND SOURCES USED DURING CALIBRATION

PULSER MODEL: 500 PULSER SERIAL: 114512 PULSER CAL DUE: 10/15/15

SOURCE NUMBER: 10250 ISOTOPE: Cs137 ASSAY DATE: 08/30/07

☑ Fast/Slow Switch working properly ☑ Audio Response ☑ Geotropism AF HV: 700V AL HV: 750V

Input Sensitivity: 29 mV TEMP: 66.4 F BARO PRESS: 29.29" HUMIDITY: 20%

Desired Reading		A.F.Data	A.F. % ERROR	A.L.Data	A.L. % ERROR
4 mR/hr	5000 Scale	3.6	10.0%	3.85	3.8%
2.5 mR/hr	5000 Scale	2.3	8.0%	2.5	0.0%
1 mR/hr	5000 Scale	1	0.0%	1.1	10.0%
400 uR/hr	500 Scale*	400	0.0%	A.F.	
250 uR/hr	500 Scale*	250	0.0%	A.F.	
100 uR/hr	500 Scale*	100	0.0%	A.F.	
200 uR/hr	250 Scale*	200	0.0%	A.F.	
125 uR/hr	250 Scale*	125	0.0%	A.F.	
50 uR/hr	250 Scale*	50	0.0%	A.F.	
40 uR/hr	50 Scale*	40	0.0%	A.F.	
25 uR/hr	50 Scale*	25	0.0%	A.F.	
10 uR/hr	50 Scale*	10	0.0%	A.F.	
20 uR/hr	25 Scale*	20	0.0%	A.F.	
12.5 uR/hr	25 Scale*	12.5	0.0%	A.F.	
5 uR/hr	25 Scale*	5	0.0%	A.F.	

CPM/uR/Hr 178

*Pulsed Scale

Is the As Found Data Within 20% of the Set Point?:

◉ Yes ○ No, See Remarks

REMARKS: Replaced broken "reset" button.

Does Instrument Meet Final Acceptance Criteria?: ◉ Yes ○ No

Calibration Sticker Attached?: ◉ Yes ○ No

Date Instrument is Due For Next Calibration: 01/16/16

Performed/Reviewed by: E.M. Glenn EG Date: 1/16/2015 Entered by: EG Initials

Calibrations performed to ANSI N323A-1997 standards.

RSP-008, ATTACHMENT 8.15
INSTRUMENT RESPONSE RECORD (10-POINT CHECK)

GENERAL INFORMATION

Measurement Location:	IEM Office		
Meter Model No./Serial No.:	19	300777	
Probe Model No./Serial No.:	N/A	N/A	
Check Source No. (α/β/γ):	N/A	N/A	960316
Check Source DPM (α/β/γ):	N/A	N/A	1 uCi
Probe Area (in cm2)	N/A		
Scaler Count time (min):	N/A	Note: For ratemeters, response should be "1"	
Response Switch:	Fast		
Performed by:	Sumlin		
Date:	2/23/15		

	Alpha			Beta			Gamma (Count Rate Instrument)			Gamma (Exposure Rate Instrument)	
Measurement No.	**Check Source Counts**	**Check Source Count Rate (cpm)**	**$(x-x_{ave})^2$**	**Check Source Counts**	**Check Source Count Rate (cpm)**	**$(x-x_{ave})^2$**	**Check Source Counts**	**Check Source Count Rate (cpm)**	**$(x-x_{ave})^2$**	**Check Source Exposure Rate (uR/hr)**	**$(x-x_{ave})^2$**
1		#VALUE!	#VALUE!		#VALUE!	#VALUE!		#VALUE!	#VALUE!	280	36
2		#VALUE!	#VALUE!		#VALUE!	#VALUE!		#VALUE!	#VALUE!	280	36
3		#VALUE!	#VALUE!		#VALUE!	#VALUE!		#VALUE!	#VALUE!	270	16
4		#VALUE!	#VALUE!		#VALUE!	#VALUE!		#VALUE!	#VALUE!	280	36
5		#VALUE!	#VALUE!		#VALUE!	#VALUE!		#VALUE!	#VALUE!	270	16
6		#VALUE!	#VALUE!		#VALUE!	#VALUE!		#VALUE!	#VALUE!	260	196
7		#VALUE!	#VALUE!		#VALUE!	#VALUE!		#VALUE!	#VALUE!	260	196
8		#VALUE!	#VALUE!		#VALUE!	#VALUE!		#VALUE!	#VALUE!	280	36
9		#VALUE!	#VALUE!		#VALUE!	#VALUE!		#VALUE!	#VALUE!	280	36
10		#VALUE!	#VALUE!		#VALUE!	#VALUE!		#VALUE!	#VALUE!	280	36
Mean		*#VALUE!*	*#VALUE!*		*#VALUE!*	*#VALUE!*		*#VALUE!*	*#VALUE!*	*274*	*640*
Sigma squared		*#VALUE!*			*#VALUE!*			*#VALUE!*		*71*	
Sigma		*#VALUE!*			*#VALUE!*			*#VALUE!*		*8*	
2 sigma		*#VALUE!*			*#VALUE!*			*#VALUE!*		*17*	
3 sigma		*#VALUE!*			*#VALUE!*			*#VALUE!*		*25*	

Acceptable Ranges	Two sigma (cpm)		Three sigma (cpm)	
	From	To	From	To
Alpha	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Beta	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Gamma (CR)	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Gamma (ER) uR/hr	257	291	249	299

Efficiency

Acceptable Ranges	Two sigma		Three sigma	
	From	To	From	To
Alpha	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Beta	#VALUE!	#VALUE!	#VALUE!	#VALUE!

DO NOT WRITE IN CELLS BELOW OR PRINT FOR FSS REPORT - FOR BLOCK COPYING PURPOSES ONLY

Cut and Paste Sections	**10-pt. Check**	**2s Low**	**2s High**	**3s Low**	**3s High**
	Alpha Eff.	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Beta Eff.	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Gamma (CR)	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Gamma (ER)	257.13	290.87	248.70	299.30

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 2929 SERIAL# 126129

Owner: IEM

DATE: 01/19/15 **LOCATION:** Griffin Inst

TECH: E.M. Glenn **DATE LAST CAL EXPIRES:** 01/20/15

Reason For Calibration: (●) Due For Calibration ( ) Repair (See Remarks)

CABLE LENGTH: 39" ( ) Other (See Remarks) ( ) Due and Repair (See Remarks)

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 **SERIAL #:** 114512 **CAL. DUE:** 10/15/15

MODEL: **SERIAL #:** **CAL DUE:**

Condition: (●) Sat ( ) Unsat

AF Mechanical Zero: 0

AL Mechanical Zero: 0

Scaler Function Check	As Found	As Left		
Beta Channel Window (4-50 mV):	3.9-48	A.F.		
Alpha Channel Window (175 mV, 120 for 3030):	175	A.F.		
Alpha Counts w/Pulser @ 10,000 CPM:	9,983	A.F.	% Error:	0.2%
Beta Counts w/Pulser @ 10,000 CPM:	9,982	A.F.	% Error:	0.2%
HIGH VOLTAGE POWER SUPLY CAL. (2929 only)				
1 KV Reading (R-5 on HV Board):	1	A.F.		
Max HV (1500 V +):	(●) Sat	( ) Unsat		

REMARKS:

Does Instrument Meet Final Acceptance Criteria?: (●) Yes ( ) No

Calibration Sticker Attached?: (●) Yes ( ) No

Date Instrument is Due For Next Calibration: **01/19/16**

INSTRUMENT MARRIED WITH **43-10-1** **# PR132239**

Performed/Reviewed by: E.M. Glenn **Date:** 1/19/2015 **Entered by:** EMG Initials

Calibrations performed to ANSI N323A-1997 standards

GRIFFIN INSTRUMENTS

CALIBRATION CERTIFICATE FOR 43-10-1 PROBE # PR132239

Owner: IEM

DATE: 01/19/15 **LOCATION:** Griffin Inst

TECH: E.M. Glenn **DATE LAST CAL EXPIRES:** 01/20/15

REASON FOR CALIBRATION:

(●) Due For Calibration ( ) Repair (See Remarks) ( ) Other (See Remarks) ( ) Due and Repair

CABLE LENGTH: 39" **INPUT SENSITIVITY:** dual

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2929 **SERIAL #:** 126129 **CAL. DUE:** 01/19/16

NIST TRACEABLE SOURCES USED

Source Number	Isotope	4 pi Activity	Assay Date	2 pi Activity
00TC470-0654	Tc99 SS	17,300 dpm	06/15/09	10,800 cpm
94TH470-1593	Th230	16,672 dpm	05/27/14	7,671 cpm
L7-434	Pu239	18,084 dpm	09/01/14	9,131 cpm
2697-00	Sr90	12,200 dpm	03/01/00	8,530 cpm
PX-726	C14	48,780 dpm	01/21/08	18,660 cpm

Condition: (●) Sat ( ) Unsat

Efficiencies from last cal.:

Pu:		Th:	32.39%	Sr:	
Tc ss:	27.28%	C14:		Tc Ni:	

As Found (AF) Efficiencies:

HV / Vernier:	Tc-99 Source Response Nickel (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Tc-99 Source Response Stainless Steel (CPM):		
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.	A ch.	B ch.	Net Eff.
950 / 3.76				6778	214	37.48%	0	54	1	4771	27.27%

Net A to B Xtalk: <10%	B to A Xtalk: <1%
2.3%	<1%

	Pu239	Tc99 Ni	Tc99 ss	Th-230	Sr90	C-14
AF CPM:	6778		4771	5122	3513	6312
AF 4 pi eff:	37.48%		27.27%	30.72%	40.52%	12.83%
AF 2 pi eff:	*74.23%*		*43.68%*	*66.77%*	*57.96%*	*33.54%*

Is as found efficiency within 20% of the efficiency from the last cal? (●) Yes ( ) No (See Remarks)

Note: If the as found data is within 10% of the last calibration and the B-A Xtalk is <1% and the A-B Xtalk is <10%, then the technician may N/A the plateau section and go directly to remarks.

GRIFFIN INSTRUMENTS

PROBE #: PR132239
Date: 01/19/15

PLATEAU AND SET POINT DATA

HV / Vernier:	Tc-99 Source Response SS (CPM):			Pu-239 Source Response (CPM):			Background (CPM):		Net A to B Xtalk: <10%	B to A Xtalk: <1%
	A ch.	B ch.	Net Eff.	A ch.	B ch.	Net Eff.	A ch.	B ch.		
900 / 3.58	0	4334	24.8%	6545	161	35.4%	1	40	1.8%	<1%
925 / 3.68	0	4397	25.1%	6752	199	36.6%	0	57	2.1%	<1%
950 / 3.78	1	4897	28.1%	6916	222	37.4%	1	41	2.6%	<1%
975 / 3.88	0	4945	28.3%	6683	247	36.1%	1	55	2.8%	<1%
1000 /4.00	0	4990	28.4%	6848	346	37.0%	1	75	3.8%	<1%

Alpha / Beta Bkg (cpm) 1 53

HV / Vernier		Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	C-14	Sr-90
975 / 3.86	CPM:	6686		4891	5134	6797	3696
4 pi AL Efficiencies:		**36.97%**		**27.97%**	**30.79%**	**13.83%**	**42.88%**
2 pi AL Efficiencies:		***73.21%***		***44.80%***	***66.91%***	***36.14%***	***61.04%***

REMARKS: Replaced loose / wrinkled mylar.

Does Instrument Meet Final Acceptance Criteria?: (●) Yes ( ) No

Calibration Sticker Attached?: (●) Yes ( ) No

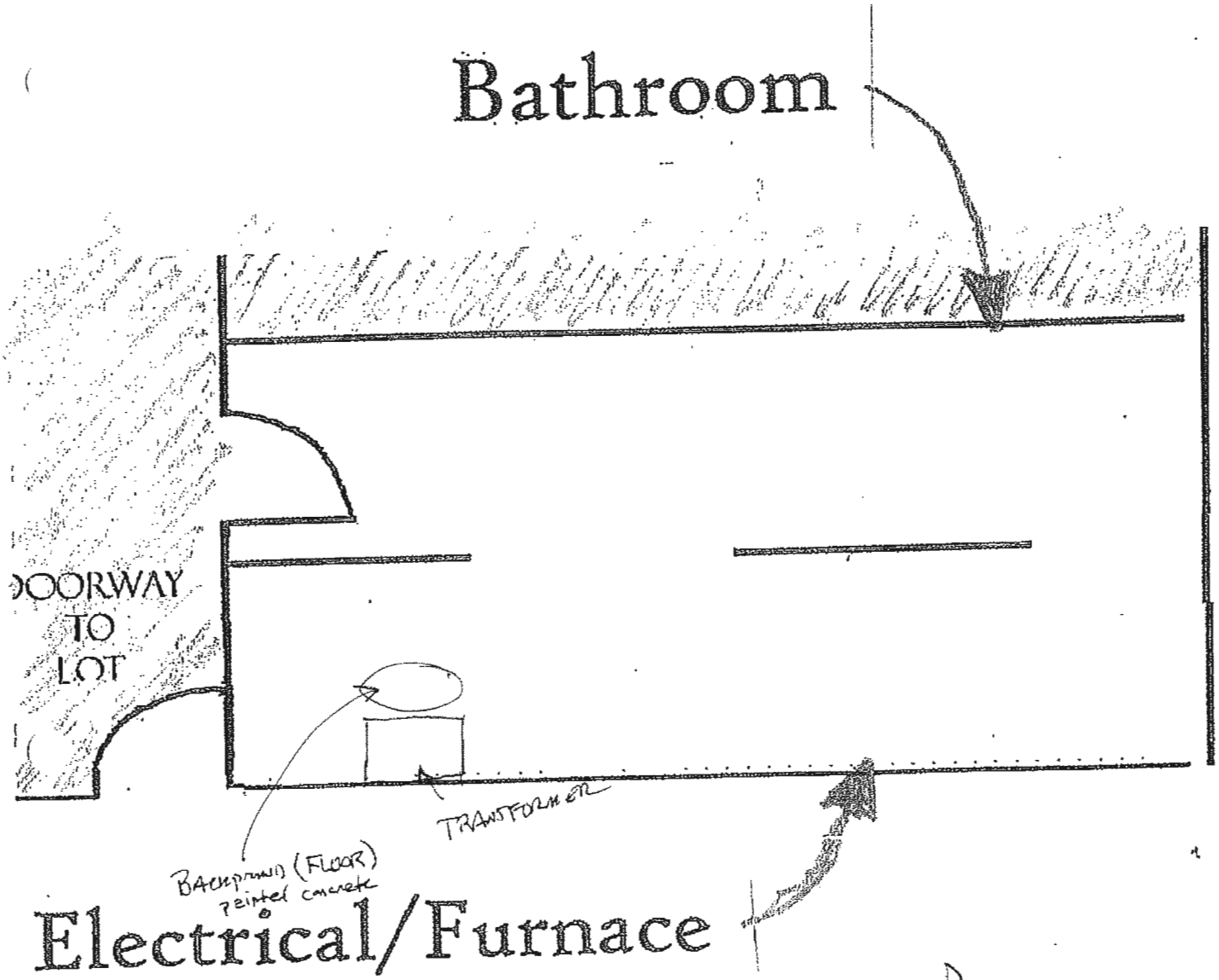
Date Instrument is Due For Next Calibration: 01/19/16

INSTRUMENT MARRIED WITH 2929 #126129

Performed/Reviewed by: E.M. Glenn **Date:** 1/19/2015 **Entered by:** ____ **Initials**

2 pi efficiencies denoted in italics.

Calibrations performed to ANSI N323A-1997 standards.


Bathroom
DOORWAY
TO
LOT
TRANSFORMER
BACKGROUND (FLOOR)
painted concrete
Electrical/Furnace
3/30/15 SBaum
INSTRUMENT BACKGROUND
Location

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
CONTAMINATION SURVEY INSTRUMENT DATA SHEET

RN014452 307127

Project No: 2005006.05	Detector			Meter		
Site Location/Background Location: NOAA MYKERSON MI UTILITY RM - BLDG 3	Type: 43-89	Serial No. 307127 SB	Probe Area (cm²) 125	Type: 2360	Serial No: ~~RN014452~~ SB	Operating Voltage: 650
Check Source No: 2398-98	Check Source No:			Check Source No:		
Radionuclide: Tc 99 / Activity: 19200 dpm / Date: 8-6-98	Radionuclide:	Activity:	Date:	Radionuclide:	Activity:	Date:

Date 2015	Start of Shift Background (cpm for a 1 minute count)								End of Shift Background (cpm for a 1 minute count)								Daily Source Check (α)		Daily Source Check (β)		MDA** - Scaler Mode (dpm)		Bat. OK	HV OK	Initials
	Alpha				Beta				Alpha				Beta				Source (cpm)	Eff.	Source (cpm)	Eff.	α	β			
	1	2	3	Av.	1	2	3	Av.	1	2	3	Av.	1	2	3	Av.									
3/30	—	—	—	—	233	214	229		—	—	—	—	229	198	212				2435				✓	✓	SB
3/31	—	—	—	—	229	198	212		—	—	—	—	222	201	209				2491				✓	✓	SB
4/1	—	—	—	—	209	243	197		—	—	—	—	222	226	237				2473				✓	✓	SB

** $MDA = \frac{2.71 + 4.65\sqrt{BKG_{avg} \times t}}{t \times E \times \frac{A}{100}}$

where MDA = the activity level (dpm/100 cm²), BKG_{avg} = the background count rate for this measurement type (cpm), t = the measurement duration (min), E = instrument efficiency, and A = probe area (cm²).

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
CONTAMINATION SURVEY INSTRUMENT DATA SHEET

Project No: 2005006.05			Detector			Meter		
Site Location/Background Location: NOAA - MUSKEGON MI - UTILITY Rm - B443			Type: 43-93 ~~2360~~	Serial No. PR238109	Probe Area (cm^2) 100	Type: 2360	Serial No: 28756Z	Operating Voltage: 800
Check Source No: 2398-98			Check Source No:			Check Source No:		
Radionuclide: Tc 99	Activity: 19,200	Date: 8·6·98	Radionuclide:	Activity:	Date:	Radionuclide:	Activity:	Date:

Date 2015	Start of Shift Background (cpm for a 1 minute count)								End of Shift Background (cpm for a 1 minute count)								Daily Source Check (α)		Daily Source Check (β)		MDA* - Scaler Mode (dpm)		Bat. OK	HV OK	Initials
	Alpha				Beta				Alpha				Beta				Source (cpm)	Eff.	Source (cpm)	Eff.	α	β			
	1	2	3	Av.	1	2	3	Av.	1	2	3	Av.	1	2	3	Av.									
3/30	—	—	—	—	231	261	257		—	—	—	—	NOT COLLECTED						3450				✓	✓	SB
3/31	—	—	—	—	265	236	227		—	—	—	—	231	226	245				3470				✓	✓	SB
4/1	—	—	—	—	247	221	250		—	—	—	—	247	219	229				3693				✓	✓	SB

** $MDA = \frac{2.71 + 4.65\sqrt{BKG_{avg} \times t}}{t \times E \times \frac{A}{100}}$

where MDA = the activity level (dpm/100 cm^2), BKG_{avg} = the background count rate for this measurement type (cpm), t = the measurement duration (min), E = instrument efficiency, and A = probe area (cm^2).

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
CONTAMINATION SURVEY INSTRUMENT DATA SHEET

Project No: 2005006.05			Detector			Meter		
Site Location/Background Location: NOAA MUSKEGON - UTILITY RM - BLDG 3			Type: 44-9	Serial No. PR151746	Probe Area (cm^2) 15	Type: M12	Serial No: 143593	Operating Voltage: 900
Check Source No: 2398-98			Check Source No:			Check Source No:		
Radionuclide: TC 99	Activity: 19,200	Date: 8-6-98	Radionuclide:	Activity:	Date:	Radionuclide:	Activity:	Date:

Date 2015	Start of Shift Background (cpm for a 1 minute count)								End of Shift Background (cpm for a _____ minute count)								Daily Source Check (α)		Daily Source Check (β)		MDA** - Scaler Mode (dpm)		Bat. OK	HV OK	Initials
	Alpha				Beta				Alpha				Beta				Source (cpm)	Eff.	Source (cpm)	Eff.	α	β			
	1	2	3	Av.	1	2	3	Av.	1	2	3	Av.	1	2	3	Av.									
3/30	—	—	—	—	50	40	40		—	—	—	—							2400				✓	✓	SB
4/1	—	—	—	—	40	50	40		—	—	—	—	40	40	40				2400				✓	✓	SB

** $MDA = \frac{2.71 + 4.65\sqrt{BKG_{avg} \times t}}{t \times E \times \frac{A}{100}}$

where MDA = the activity level (dpm/100 cm^2), BKG_{avg} = the background count rate for this measurement type (cpm), t = the measurement duration (min), E = instrument efficiency, and A = probe area (cm^2).

Appendix 10.5 - Survey Instrument Parameters

Parameter	Model 43-93 (beta)	Model 19 (gamma)
probe area (cm2)	88	
DCGL Beta/C-14 (dpm/100 cm2)	3,700,000	
50% DCGL	1,850,000	
Beta MDC (dpm/100 cm2)	812	
DCGL response (cpm)	631	
MDCR Beta (net cpm), NUREG 1575, Table 6.6, instrument response level (IRL)	120	
Beta Scan Sensitivity (gross cpm IRL), NUREG 1575, Table 6.6	380	
Beta Scan MDC - using MDCR values from NUREG 1575, Table 6.6 (use 5 cm/sec only with 239-1F monitor)	1,928	
* 43-93: recommend scan 2 cm/sec to achieve required beta sensitivity		
Gamma exposure rate Action Level (NaI - 5 cm/sec scan rate)- if above AL, take additional readings and also collect beta and alpha readings if hot spot is identified		10 uR/hr

Appendix 10.6 - Final Status Survey Data and Results

Survey Unit Summary

Client Name:	NOAA - GLERL
Client No.:	2005006
Task No.:	5
Job Description:	FSS for the facility
Site Location (City,State):	Muskegon, Michigan
Building Name:	Building 3
Floor No:	NA
Room ID:	304
Survey Unit No.:	SU 3301 and 3302
Survey Unit MARSSIM Classification:	2
Survey Unit Dimensions (m2):	25.1
Gross Removable Alpha DCGLw (dpm/100 cm2):	0
Gross Removable Beta DCGLw (dpm/100 cm2):	370000
Gross Alpha DCGLw (dpm/100 cm2):	0
Gross Beta DCGLw (dpm/100 cm2):	3700000
Exposure Rate DCGLw (uR/hr @ 1m):	10
Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Gross Beta DCGL-EMC (dpm/100 cm2):	11000000
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	11000000

Measurement	Units	SU Mean	SU Max	$DCGL_W$ Flag	$DCGL_{EMC}$ Flag	No. Measurements	Flag
Gross alpha scan	dpm/100 cm^2	0	0			0	
Gross beta scan	dpm/100 cm^2	-941	523			217	
Stationary gross alpha	dpm/100 cm^2	0	0			0	
Stationary gross beta	dpm/100 cm^2	1950	2430			10	
Removable gross alpha	dpm/100 cm^2	0	0			0	
Removable gross beta	dpm/100 cm^2	25	152			10	
Exposure rate	MicroR/hr	0	0		N.A.	1	

Survey Design

		Notes
Client Name:	NOAA - GLERL	
Client No.:	2005006	
Task No.:	5	
Job Description:	FSS for the facility	
Site Location (City,State):	Muskegon, Michigan	
Building Name:	Building 3	
Floor No:	NA	
Room ID:	304	
Survey Unit No.:	SU 3301 and 3302	Two individual sets of survey data collected in this room
Survey Unit MARSSIM Classification:	2	Should be 1, 2, 3, "special", or leave blank
Survey Unit Dimensions (m2):	25.1	Approximated
Percent Unaccessible (%):	20%	Under bench cabinetry and inst/samples materials staged
Gross Removable Alpha DCGLw (dpm/100 cm2):	0	This calc not used in project
Gross Removable Beta DCGLw (dpm/100 cm2):	3.7E+05	MARSSIM assumption
Gross Alpha DCGLw (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGLw (dpm/100 cm2):	3.70E+06	RSP-116, Section 5.2
Exposure Rate DCGLw (uR/hr @ 1m):	10	Not specified in RSP-116, but added as a supplemental su
Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
ROCs:	C14, H3	RSP-116, Section 5.2
Scan Speed (cm/sec):	2	RSP-116, Section 5.7
Stationary Count Time (min):	1	RSP-116, Section 5.8
Smear Count Time (min):	1	RSP-116, Section 5.9
Gross alpha surface efficiency:	0.25	MARSSIM default assumption
Gross beta surface efficiency:	0.5	MARSSIM default assumption
Surveyor detection efficiency:	0.5	MARSSIM default assumption
Minimum No. of Scan Measurements:	0	100% scans not performed
Minimum No. of Stationary Measurements:	10	MARSSIM default assumption
Minimum No. of Smear Measurements:	10	MARSSIM default assumption
Minimum No. of Exposure Rate Measurements:	1	MARSSIM default assumption

Instrumentation Information

Project No.: 2005006

Survey Unit No.: SU 3301 and 3302

Scans		*Notes*	
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	219	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc	
Date of Measurement:	03/30/15		
Data acquired by (initials):	SJB		
Stationary Measurements			
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	219	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc	
Date of Measurement:	03/30/15		
Data acquired by (initials):	SJB		
Applicable gross alpha material background (dpm/100 cm2)	#DIV/0!	**Surface Description:**	
Applicable gross beta material background: (dpm/100 cm2)	0	**Surface Description:**	Background Included
Removable Activity Measurements			
Meter Model No.:	2929		
Meter SN:	126129		
Probe Model No.:	44-01		
Probe SN:	PR132239		
Probe size (cm2):	100	based on smear area coverage	
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	43	Start/End Shift Average	
Background Count time (min):	1	Columbia, MD office	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1383	Per annual instrument calibration doc - C14	
Date of Analysis:	04/02/15		
Data Acquired by (initials):	SJB		
Exposure Rate Measurements			
Meter Model No.:	19		
Meter SN:	300777		
Probe Model No.:	NA		
Probe SN:	NA		
Background (uR/hr @ 1m)	5	Elect/Furnace Room	
Date of Measurement:	04/01/15		
Data acquired by (initials):	BRT		

Scan Results

Project No.:	2005006
Survey Unit No.:	SU 3301 and 3302
MARSSIM Class:	2
SU Area (m2):	25.1
Date of Measurement:	03/30/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		-941
Standard Deviation		498
Minimum		-2121
Maximum		523
N		217

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
3301 - 1		185		-34		-456		1501						
2		189		-30		-403		1501						
3		180		-39		-523		1501						
4		165		-54		-725		1501						
5		184		-35		-470		1501						
6		171		-48		-644		1501						
7		143		-76		-1020		1501						
8		168		-51		-685		1501						
9		169		-50		-671		1501						
10		223		4		54		1501						
11		189		-30		-403		1501						
12		182		-37		-497		1501						
13		209		-10		-134		1501						
14		195		-24		-322		1501						
15		213		-6		-81		1501						
16		197		-22		-295		1501						
17		148		-71		-953		1501						
18		102		-117		-1570		1501						
19		178		-41		-550		1501						
20		216		-3		-40		1501						
21		220		1		13		1501						
22		151		-68		-913		1501						
23		136		-83		-1114		1501						
24		177		-42		-564		1501						
25		161		-58		-779		1501						
26		79		-140		-1879		1501						
27		185		-34		-456		1501						
28		179		-40		-537		1501						
29		228		9		121		1501						
30		197		-22		-295		1501						
31		151		-68		-913		1501						
32		130		-89		-1195		1501						
33		135		-84		-1128		1501						
34		184		-35		-470		1501						
35		156		-63		-846		1501						
36		162		-57		-765		1501						
37		164		-55		-738		1501						
38		140		-79		-1060		1501						
39		127		-92		-1235		1501						
40		137		-82		-1101		1501						
41		134		-85		-1141		1501						
42		194		-25		-336		1501						
43		164		-55		-738		1501						
44		156		-63		-846		1501						
45		204		-15		-201		1501						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
46		178		-41		-550		1501						
47		174		-45		-604		1501						
48		258		39		523		1501						
49		202		-17		-228		1501						
50		191		-28		-376		1501						
51		187		-32		-430		1501						
52		166		-53		-711		1501						
53		147		-72		-966		1501						
54		199		-20		-268		1501						
55		184		-35		-470		1501						
56		148		-71		-953		1501						
57		202		-17		-228		1501						
58		164		-55		-738		1501						
59		161		-58		-779		1501						
60		162		-57		-765		1501						
61		150		-69		-926		1501						
62		202		-17		-228		1501						
63		180		-39		-523		1501						
64		120		-99		-1329		1501						
65		138		-81		-1087		1501						
66		143		-76		-1020		1501						
67		196		-23		-309		1501						
68		119		-100		-1342		1501						
69		215		-4		-54		1501						
70		199		-20		-268		1501						
71		119		-100		-1342		1501						
72		198		-21		-282		1501						
73		167		-52		-698		1501						
74		180		-39		-523		1501						
75		169		-50		-671		1501						
76		119		-100		-1342		1501						
77		154		-65		-872		1501						
78		171		-48		-644		1501						
79		205		-14		-188		1501						
80		158		-61		-819		1501						
81		145		-74		-993		1501						
82		177		-42		-564		1501						
83		183		-36		-483		1501						
84		154		-65		-872		1501						
85		129		-90		-1208		1501						
86		130		-89		-1195		1501						
87		147		-72		-966		1501						
88		123		-96		-1289		1501						
89		119		-100		-1342		1501						
90		172		-47		-631		1501						
91		136		-83		-1114		1501						
92		132		-87		-1168		1501						
93		167		-52		-698		1501						
94		168		-51		-685		1501						
95		183		-36		-483		1501						
96		242		23		309		1501						
97		124		-95		-1275		1501						
98		163		-56		-752		1501						
99		119		-100		-1342		1501						
100		154		-65		-872		1501						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
101		176		-43		-577		1501						
102		115		-104		-1396		1501						
103		76		-143		-1919		1501						
104		99		-120		-1611		1501						
105		108		-111		-1490		1501						
106		165		-54		-725		1501						
107		131		-88		-1181		1501						
108		132		-87		-1168		1501						
109		117		-102		-1369		1501						
110		126		-93		-1248		1501						
111		137		-82		-1101		1501						
112		128		-91		-1221		1501						
113		150		-69		-926		1501						
114		156		-63		-846		1501						
115		120		-99		-1329		1501						
116		97		-122		-1638		1501						
117		112		-107		-1436		1501						
118		106		-113		-1517		1501						
119		138		-81		-1087		1501						
120		137		-82		-1101		1501						
121		130		-89		-1195		1501						
122		118		-101		-1356		1501						
123		194		-25		-336		1501						
124		138		-81		-1087		1501						
125		186		-33		-443		1501						
126		71		-148		-1987		1501						
127		134		-85		-1141		1501						
128		141		-78		-1047		1501						
129		126		-93		-1248		1501						
130		130		-89		-1195		1501						
131		182		-37		-497		1501						
132		167		-52		-698		1501						
133		185		-34		-456		1501						
134		181		-38		-510		1501						
135		168		-51		-685		1501						
136		162		-57		-765		1501						
137		136		-83		-1114		1501						
138		156		-63		-846		1501						
139		146		-73		-980		1501						
140		166		-53		-711		1501						
141		113		-106		-1423		1501						
142		157		-62		-832		1501						
143		147		-72		-966		1501						
144		93		-126		-1691		1501						
145		85		-134		-1799		1501						
146		126		-93		-1248		1501						
147		123		-96		-1289		1501						
148		182		-37		-497		1501						
149		130		-89		-1195		1501						
150		123		-96		-1289		1501						
151		221		2		27		1501						
152		180		-39		-523		1501						
153		101		-118		-1584		1501						
154		132		-87		-1168		1501						
155		126		-93		-1248		1501						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
156		138		-81		-1087		1501						
157		152		-67		-899		1501						
158		119		-100		-1342		1501						
159		180		-39		-523		1501						
160		111		-108		-1450		1501						
161		84		-135		-1812		1501						
162		123		-96		-1289		1501						
163		104		-115		-1544		1501						
164		108		-111		-1490		1501						
165		124		-95		-1275		1501						
166		126		-93		-1248		1501						
167		126		-93		-1248		1501						
168		105		-114		-1530		1501						
169		165		-54		-725		1501						
170		218		-1		-13		1501						
171		183		-36		-483		1501						
172		198		-21		-282		1501						
173		163		-56		-752		1501						
174		210		-9		-121		1501						
175		209		-10		-134		1501						
176		172		-47		-631		1501						
177		134		-85		-1141		1501						
178		168		-51		-685		1501						
179		116		-103		-1383		1501						
180		135		-84		-1128		1501						
181		173		-46		-617		1501						
3302 - 1		86		-133		-1785		1501						
2		65		-154		-2067		1501						
3		158		-61		-819		1501						
4		125		-94		-1262		1501						
5		61		-158		-2121		1501						
6		106		-113		-1517		1501						
7		137		-82		-1101		1501						
8		133		-86		-1154		1501						
9		150		-69		-926		1501						
10		145		-74		-993		1501						
11		89		-130		-1745		1501						
12		116		-103		-1383		1501						
13		143		-76		-1020		1501						
14		116		-103		-1383		1501						
15		62		-157		-2107		1501						
16		112		-107		-1436		1501						
17		104		-115		-1544		1501						
18		176		-43		-577		1501						
19		120		-99		-1329		1501						
20		148		-71		-953		1501						
21		123		-96		-1289		1501						
22		138		-81		-1087		1501						
23		110		-109		-1463		1501						
24		87		-132		-1772		1501						
25		143		-76		-1020		1501						
26		112		-107		-1436		1501						
27		68		-151		-2027		1501						
28		107		-112		-1503		1501						
29		116		-103		-1383		1501						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
30		109		-110		-1477		1501						
31		87		-132		-1772		1501						
32		109		-110		-1477		1501						
33		81		-138		-1852		1501						
34		129		-90		-1208		1501						
35		131		-88		-1181		1501						
36		137		-82		-1101		1501						

Stationary Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3301 and 3302
MARSSIM Class:	2
SU Area (m2):	25.1
Date of Measurement:	03/30/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		1950
Standard Deviation		341
Minimum		1517
Maximum		2430
N		10

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Net Alpha (gross counts)	Net Beta (gross counts)	Shielded Alpha (gross counts)	Shielded Beta (gross counts)	Unshielded Alpha (gross counts)	Unshielded Beta (gross counts)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Flag	Beta Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
3302-37		117				117		117		1570		3						
38		132				132		132		1772		3						
39		171				171		171		2295		3						
40		138				138		138		1852		3						
41		131				131		131		1758		3						
42		113				113		113		1517		3						
43		157				157		157		2107		3						
44		132				132		132		1772		3						
45		181				181		181		2430		3						
46		181				181		181		2430		3						

Removable Activity Results

Project No.:	2005006
Survey Unit No.:	SU 3301 and 3302
MARSSIM Class:	2
SU Area (m2):	25
Date of acquisition:	3/30/15
Smears acquired by (initials):	SJB
Date of Measurement:	04/02/15
Smears analyzed by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		25
Standard Deviation		60
Minimum		-58
Maximum		152
Median		29
N		10

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Smear No.	Smear Gross Counts (alpha)	Smear Gross Counts (beta)	Smear Gross Count Rate (cpm alpha)	Smear Gross Count Rate (cpm beta)	Net Smear Count Rate (c/m alpha)	Net Smear Count Rate (c/m beta)	Alpha Activity (dpm/100 cm2 alpha)	Beta Activity (dpm/100 cm2 beta)	MDA Alpha (dpm)	MDA Beta (dpm)	DCGL Flag (alpha)	DCGL Flag (beta)
3302	1		53		53		10		72		240		
3302	2		41		41		-2		-14		240		
3302	3		48		48		5		36		240		
3302	4		48		48		5		36		240		
3302	5		41		41		-2		-14		240		
3302	6		39		39		-4		-29		240		
3302	7		50		50		7		51		240		
3302	8		46		46		3		22		240		
3302	9		35		35		-8		-58		240		
3302	10		64		64		21		152		240		

Exposure Rate Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3301 and 3302
MARSSIM Class:	2
SU Area (m2):	25.1
Date of Measurement:	04/01/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data	
Parameter	**Exposure Rate (uR/hr)**
Mean	0
Standard Deviation	#DIV/0!
Minimum	0
Maximum	0
N	1

Duplicate Analysis					
S-Exp. Rate	**Dup-Exp. Rate**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Survey Location	**Gross Exposure Rate (uR/hr)**	**Net Exposure Rate (uR/hr)**	**MDA (uR/hr)**	**DCGL Flag**	**MDA Flag**
1	5	0	13		

Survey Unit Summary

Client Name:	NOAA - GLERL
Client No.:	2005006
Task No.:	5
Job Description:	FSS for the facility
Site Location (City,State):	Muskegon, Michigan
Building Name:	Building 3
Floor No:	NA
Room ID:	305
Survey Unit No.:	SU 3303 and 3307
Survey Unit MARSSIM Classification:	2
Survey Unit Dimensions (m2):	82
Gross Removable Alpha DCGLw (dpm/100 cm2):	0
Gross Removable Beta DCGLw (dpm/100 cm2):	370000
Gross Alpha DCGLw (dpm/100 cm2):	0
Gross Beta DCGLw (dpm/100 cm2):	3700000
Exposure Rate DCGLw (uR/hr @ 1m):	10
Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Gross Beta DCGL-EMC (dpm/100 cm2):	11000000
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	11000000

Measurement	Units	SU Mean	SU Max	$DCGL_W$ Flag	$DCGL_{EMC}$ Flag	No. Measurements	Flag
Gross alpha scan	dpm/100 cm^2	0	0			0	
Gross beta scan	dpm/100 cm^2	-1144	742			281	
Stationary gross alpha	dpm/100 cm^2	0	0			0	
Stationary gross beta	dpm/100 cm^2	2393	2710			22	
Removable gross alpha	dpm/100 cm^2	0	0			0	
Removable gross beta	dpm/100 cm^2	-14	65			8	
Exposure rate	MicroR/hr	0	0		N.A.	1	

Survey Design

		Notes
Client Name:	NOAA - GLERL	
Client No.:	2005006	
Task No.:	5	
Job Description:	FSS for the facility	
Site Location (City,State):	Muskegon, Michigan	
Building Name:	Building 3	
Floor No:	NA	
Room ID:	305	Sinks, Refrigerators, Incubator
Survey Unit No.:	SU 3303 and 3307	Two individual sets of survey data collected in this room
Survey Unit MARSSIM Classification:	2	Should be 1, 2, 3, "special", or leave blank
Survey Unit Dimensions (m2):	82	
Percent Unaccessible (%):	20%	Equip on bench tops, refrig and incubator, bench cabinets
Gross Removable Alpha DCGLw (dpm/100 cm2):	0	This calc not used in project
Gross Removable Beta DCGLw (dpm/100 cm2):	3.7E+05	MARSSIM assumption
Gross Alpha DCGLw (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGLw (dpm/100 cm2):	3.70E+06	RSP-116, Section 5.2
Exposure Rate DCGLw (uR/hr @ 1m):	10	Not specified in RSP-116, but added as a supplemental su
Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
ROCs:	C14, H3	RSP-116, Section 5.2
Scan Speed (cm/sec):	2	RSP-116, Section 5.7
Stationary Count Time (min):	1	RSP-116, Section 5.8
Smear Count Time (min):	1	RSP-116, Section 5.9
Gross alpha surface efficiency:	0.25	MARSSIM default assumption
Gross beta surface efficiency:	0.5	MARSSIM default assumption
Surveyor detection efficiency:	0.5	MARSSIM default assumption
Minimum No. of Scan Measurements:	0	100% scans not performed
Minimum No. of Stationary Measurements:	10	MARSSIM default assumption
Minimum No. of Smear Measurements:	10	MARSSIM default assumption
Minimum No. of Exposure Rate Measurements:	1	MARSSIM default assumption

Instrumentation Information

Project No.: 2005006

Survey Unit No.: SU 3303 and 3307

Scans		*Notes*	
Meter Model No.:	2360		
Meter SN:	287562		
Probe Model No.:	43-93		
Probe SN:	FR283109		
Probe size (cm2):	100		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	250	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1402	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/30/15		
Data acquired by (initials):	BRT		
Stationary Measurements			
Meter Model No.:	2360		
Meter SN:	287562		
Probe Model No.:	43-93		
Probe SN:	FR283109		
Probe size (cm2):	100		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	250	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1402	Per annual instrument calibration doc - Tc99	
Date of Measurement:	3/302015		
Data acquired by (initials):	BRT		
Applicable gross alpha material background (dpm/100 cm2)	#DIV/0!	**Surface Description:**	
Applicable gross beta material background: (dpm/100 cm2)	0	**Surface Description:**	Background Included
Removable Activity Measurements			
Meter Model No.:	2929		
Meter SN:	126129		
Probe Model No.:	44-01		
Probe SN:	PR132239		
Probe size (cm2):	100	based on smear area coverage	
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	43	Start/End Shift Average	
Background Count time (min):	1	Columbia, MD office	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1383	Per annual instrument calibration doc - C14	
Date of Analysis:	04/02/15		
Data Acquired by (initials):	BRT		
Exposure Rate Measurements			
Meter Model No.:	19		
Meter SN:	300777		
Probe Model No.:	NA		
Probe SN:	NA		
Background (uR/hr @ 1m)	5	Elect/Furnace Room	
Date of Measurement:	04/01/15		
Data acquired by (initials):	BRT		

Scan Results

Project No.:	2005006
Survey Unit No.:	SU 3303 and 3307
MARSSIM Class:	2
SU Area (m2):	82.0
Date of Measurement:	03/30/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data		
Parameter	**Gross Alpha (dpm/100 cm2)**	**Gross Beta (dpm/100cm2)**
Mean		-1144
Standard Deviation		506
Minimum		-2596
Maximum		742
N		281

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
3303 - 1		131		-119		-1698		1705						
2		98		-152		-2168		1705						
3		134		-116		-1655		1705						
4		194		-56		-799		1705						
5		140		-110		-1569		1705						
6		112		-138		-1969		1705						
7		112		-138		-1969		1705						
8		103		-147		-2097		1705						
9		149		-101		-1441		1705						
10		127		-123		-1755		1705						
11		159		-91		-1298		1705						
12		190		-60		-856		1705						
13		119		-131		-1869		1705						
14		136		-114		-1626		1705						
15		179		-71		-1013		1705						
16		150		-100		-1427		1705						
17		187		-63		-899		1705						
18		68		-182		-2596		1705						
19		100		-150		-2140		1705						
20		207		-43		-613		1705						
21		183		-67		-956		1705						
22		115		-135		-1926		1705						
23		166		-84		-1198		1705						
24		171		-79		-1127		1705						
25		153		-97		-1384		1705						
26		165		-85		-1213		1705						
27		127		-123		-1755		1705						
28		95		-155		-2211		1705						
29		96		-154		-2197		1705						
30		136		-114		-1626		1705						
31		168		-82		-1170		1705						
32		135		-115		-1641		1705						
33		161		-89		-1270		1705						
34		148		-102		-1455		1705						
35		106		-144		-2054		1705						
36		120		-130		-1854		1705						
37		154		-96		-1369		1705						
38		177		-73		-1041		1705						
39		128		-122		-1740		1705						
40		138		-112		-1598		1705						
41		137		-113		-1612		1705						
42		165		-85		-1213		1705						
43		201		-49		-699		1705						
44		203		-47		-670		1705						
45		153		-97		-1384		1705						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
46		120		-130		-1854		1705						
47		156		-94		-1341		1705						
48		159		-91		-1298		1705						
49		137		-113		-1612		1705						
50		112		-138		-1969		1705						
51		107		-143		-2040		1705						
52		93		-157		-2240		1705						
53		96		-154		-2197		1705						
54		131		-119		-1698		1705						
55		161		-89		-1270		1705						
56		210		-40		-571		1705						
57		153		-97		-1384		1705						
58		150		-100		-1427		1705						
59		164		-86		-1227		1705						
60		152		-98		-1398		1705						
61		189		-61		-870		1705						
62		127		-123		-1755		1705						
63		115		-135		-1926		1705						
64		161		-89		-1270		1705						
65		168		-82		-1170		1705						
66		185		-65		-927		1705						
67		187		-63		-899		1705						
68		175		-75		-1070		1705						
69		208		-42		-599		1705						
70		121		-129		-1840		1705						
71		132		-118		-1683		1705						
3303 - 80		187		-63		-899		1705						
81		161		-89		-1270		1705						
82		209		-41		-585		1705						
83		202		-48		-685		1705						
84		182		-68		-970		1705						
85		166		-84		-1198		1705						
86		214		-36		-514		1705						
87		172		-78		-1113		1705						
88		136		-114		-1626		1705						
89		156		-94		-1341		1705						
90		110		-140		-1997		1705						
91		158		-92		-1312		1705						
92		131		-119		-1698		1705						
93		133		-117		-1669		1705						
94		172		-78		-1113		1705						
95		144		-106		-1512		1705						
96		173		-77		-1098		1705						
97		232		-18		-257		1705						
98		171		-79		-1127		1705						
99		152		-98		-1398		1705						
100		225		-25		-357		1705						
101		145		-105		-1498		1705						
102		161		-89		-1270		1705						
103		186		-64		-913		1705						
104		160		-90		-1284		1705						
105		187		-63		-899		1705						
106		160		-90		-1284		1705						
107		164		-86		-1227		1705						
108		150		-100		-1427		1705						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
109		167		-83		-1184		1705						
110		178		-72		-1027		1705						
111		172		-78		-1113		1705						
112		140		-110		-1569		1705						
113		130		-120		-1712		1705						
114		174		-76		-1084		1705						
115		141		-109		-1555		1705						
116		144		-106		-1512		1705						
117		109		-141		-2011		1705						
118		150		-100		-1427		1705						
119		175		-75		-1070		1705						
120		191		-59		-842		1705						
121		223		-27		-385		1705						
122		151		-99		-1412		1705						
123		118		-132		-1883		1705						
124		175		-75		-1070		1705						
125		148		-102		-1455		1705						
126		197		-53		-756		1705						
127		201		-49		-699		1705						
128		206		-44		-628		1705						
129		198		-52		-742		1705						
130		208		-42		-599		1705						
131		99		-151		-2154		1705						
132		125		-125		-1783		1705						
133		219		-31		-442		1705						
134		181		-69		-984		1705						
135		148		-102		-1455		1705						
136		188		-62		-884		1705						
137		131		-119		-1698		1705						
138		192		-58		-827		1705						
139		177		-73		-1041		1705						
140		131		-119		-1698		1705						
141		189		-61		-870		1705						
142		140		-110		-1569		1705						
143		156		-94		-1341		1705						
144		150		-100		-1427		1705						
145		160		-90		-1284		1705						
146		228		-22		-314		1705						
147		208		-42		-599		1705						
148		194		-56		-799		1705						
149		195		-55		-785		1705						
150		180		-70		-999		1705						
151		217		-33		-471		1705						
152		209		-41		-585		1705						
153		195		-55		-785		1705						
154		186		-64		-913		1705						
155		225		-25		-357		1705						
156		180		-70		-999		1705						
157		183		-67		-956		1705						
158		214		-36		-514		1705						
159		159		-91		-1298		1705						
160		181		-69		-984		1705						
161		209		-41		-585		1705						
162		177		-73		-1041		1705						
163		194		-56		-799		1705						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
164		203		-47		-670		1705						
165		173		-77		-1098		1705						
166		181		-69		-984		1705						
167		210		-40		-571		1705						
168		188		-62		-884		1705						
169		177		-73		-1041		1705						
170		193		-57		-813		1705						
171		205		-45		-642		1705						
172		226		-24		-342		1705						
173		142		-108		-1541		1705						
174		225		-25		-357		1705						
175		302		52		742		1705						
176		227		-23		-328		1705						
177		158		-92		-1312		1705						
178		189		-61		-870		1705						
179		226		-24		-342		1705						
180		241		-9		-128		1705						
181		168		-82		-1170		1705						
182		263		13		185		1705						
183		267		17		243		1705						
184		185		-65		-927		1705						
185		140		-110		-1569		1705						
186		180		-70		-999		1705						
187		171		-79		-1127		1705						
188		191		-59		-842		1705						
189		183		-67		-956		1705						
190		150		-100		-1427		1705						
191		117		-133		-1897		1705						
192		173		-77		-1098		1705						
193		179		-71		-1013		1705						
194		162		-88		-1255		1705						
195		170		-80		-1141		1705						
196		125		-125		-1783		1705						
197		165		-85		-1213		1705						
198		173		-77		-1098		1705						
199		201		-49		-699		1705						
200		206		-44		-628		1705						
201		171		-79		-1127		1705						
202		120		-130		-1854		1705						
203		162		-88		-1255		1705						
204		174		-76		-1084		1705						
205		163		-87		-1241		1705						
206		132		-118		-1683		1705						
207		212		-38		-542		1705						
208		176		-74		-1056		1705						
209		196		-54		-770		1705						
210		179		-71		-1013		1705						
211		164		-86		-1227		1705						
212		175		-75		-1070		1705						
213		184		-66		-942		1705						
214		148		-102		-1455		1705						
215		142		-108		-1541		1705						
216		165		-85		-1213		1705						
217		198		-52		-742		1705						
218		157		-93		-1327		1705						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
219		169		-81		-1155		1705						
220		136		-114		-1626		1705						
3307 - 1		108		-142		-2026		1705						
2		159		-91		-1298		1705						
3		144		-106		-1512		1705						
4		214		-36		-514		1705						
5		195		-55		-785		1705						
6		178		-72		-1027		1705						
7		164		-86		-1227		1705						
8		181		-69		-984		1705						
9		168		-82		-1170		1705						
10		221		-29		-414		1705						
11		162		-88		-1255		1705						
12		192		-58		-827		1705						
13		218		-32		-456		1705						
14		185		-65		-927		1705						
15		201		-49		-699		1705						
16		200		-50		-713		1705						
17		140		-110		-1569		1705						
18		171		-79		-1127		1705						
19		194		-56		-799		1705						
20		191		-59		-842		1705						
21		170		-80		-1141		1705						
22		237		-13		-185		1705						
23		186		-64		-913		1705						
24		211		-39		-556		1705						
25		126		-124		-1769		1705						
26		223		-27		-385		1705						
27		195		-55		-785		1705						
28		134		-116		-1655		1705						
29		126		-124		-1769		1705						
30		165		-85		-1213		1705						
31		200		-50		-713		1705						
32		172		-78		-1113		1705						
33		153		-97		-1384		1705						
34		178		-72		-1027		1705						
35		103		-147		-2097		1705						
36		174		-76		-1084		1705						
37		169		-81		-1155		1705						
38		159		-91		-1298		1705						
39		193		-57		-813		1705						
40		247		-3		-43		1705						
41		184		-66		-942		1705						
42		157		-93		-1327		1705						
43		201		-49		-699		1705						
44		186		-64		-913		1705						
45		146		-104		-1484		1705						
46		171		-79		-1127		1705						
47		169		-81		-1155		1705						
48		107		-143		-2040		1705						
49		194		-56		-799		1705						
50		161		-89		-1270		1705						
51		149		-101		-1441		1705						
52		189		-61		-870		1705						
53		165		-85		-1213		1705						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
54		125		-125		-1783		1705						
55		215		-35		-499		1705						
56		186		-64		-913		1705						
57		214		-36		-514		1705						
58		191		-59		-842		1705						
59		226		-24		-342		1705						
60		240		-10		-143		1705						
61		228		-22		-314		1705						
62		210		-40		-571		1705						
63		147		-103		-1469		1705						
64		208		-42		-599		1705						
65		188		-62		-884		1705						
66		209		-41		-585		1705						
67		236		-14		-200		1705						
68		182		-68		-970		1705						
69		189		-61		-870		1705						

Stationary Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3303 and 3307
MARSSIM Class:	2
SU Area (m2):	82.0
Date of Measurement:	3/302015
Data acquired by (initials):	BRT

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		2393
Standard Deviation		252
Minimum		1769
Maximum		2710
N		22

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Net Alpha (gross counts)	Net Beta (gross counts)	Shielded Alpha (gross counts)	Shielded Beta (gross counts)	Unshielded Alpha (gross counts)	Unshielded Beta (gross counts)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Flag	Beta Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
3303 - 72		162				162		162		2311		3						
73		152				152		152		2168		3						
74		153				153		153		2183		3						
75		139				139		139		1983		3						
76		150				150		150		2140		3						
77		145				145		145		2068		3						
78		124				124		124		1769		3						
79		170				170		170		2425		3						
3303 - 221		178				178		178		2539		3						
222		166				166		166		2368		3						
223		162				162		162		2311		3						
224		189				189		189		2696		3						

Removable Activity Results

Project No.:	2005006
Survey Unit No.:	SU 3303 and 3307
MARSSIM Class:	2
SU Area (m2):	82
Date of acquisition:	3/302015
Smears acquired by (initials):	BRT
Date of Measurement:	04/02/15
Smears analyzed by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		-14
Standard Deviation		59
Minimum		-101
Maximum		65
Median		-25
N		8

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Smear No.	Smear Gross Counts (alpha)	Smear Gross Counts (beta)	Smear Gross Count Rate (cpm alpha)	Smear Gross Count Rate (cpm beta)	Net Smear Count Rate (c/m alpha)	Net Smear Count Rate (c/m beta)	Alpha Activity (dpm/100 cm2 alpha)	Beta Activity (dpm/100 cm2 beta)	MDA Alpha (dpm)	MDA Beta (dpm)	DCGL Flag (alpha)	DCGL Flag (beta)
3303 - 79	1		48		48		5		36		240		
78	2		50		50		7		51		240		
77	3		37		37		-6		-43		240		
76	4		29		29		-14		-101		240		
75	5		52		52		9		65		240		
74	6		41		41		-2		-14		240		
73	7		34		34		-9		-65		240		
72	8		38		38		-5		-36		240		

Exposure Rate Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3303 and 3307
MARSSIM Class:	2
SU Area (m2):	82.0
Date of Measurement:	04/01/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data	
Parameter	**Exposure Rate (uR/hr)**
Mean	0
Standard Deviation	#DIV/0!
Minimum	0
Maximum	0
N	1

Duplicate Analysis					
S-Exp. Rate	**Dup-Exp. Rate**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Survey Location	**Gross Exposure Rate (uR/hr)**	**Net Exposure Rate (uR/hr)**	**MDA (uR/hr)**	**DCGL Flag**	**MDA Flag**
1	5	0	13		

Survey Unit Summary

Client Name:	NOAA - GLERL
Client No.:	2005006
Task No.:	5
Job Description:	FSS for the facility
Site Location (City,State):	Muskegon, Michigan
Building Name:	Building 3
Floor No:	NA
Room ID:	No/So. Walkway
Survey Unit No.:	SU 3304
Survey Unit MARSSIM Classification:	2
Survey Unit Dimensions (m2):	19.5
Gross Removable Alpha DCGLw (dpm/100 cm2):	0
Gross Removable Beta DCGLw (dpm/100 cm2):	370000
Gross Alpha DCGLw (dpm/100 cm2):	0
Gross Beta DCGLw (dpm/100 cm2):	3700000
Exposure Rate DCGLw (uR/hr @ 1m):	10
Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Gross Beta DCGL-EMC (dpm/100 cm2):	11000000
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	11000000

Measurement	Units	SU Mean	SU Max	$DCGL_W$ Flag	$DCGL_{EMC}$ Flag	No. Measurements	Flag
Gross alpha scan	dpm/100 cm^2	0	0			0	
Gross beta scan	dpm/100 cm^2	-827	174			69	
Stationary gross alpha	dpm/100 cm^2	0	0			0	
Stationary gross beta	dpm/100 cm^2	2070	2295			5	
Removable gross alpha	dpm/100 cm^2	0	0			0	
Removable gross beta	dpm/100 cm^2	14	80			5	
Exposure rate	MicroR/hr	0	0		N.A.	1	

Survey Design

		Notes
Client Name:	NOAA - GLERL	
Client No.:	2005006	
Task No.:	5	
Job Description:	FSS for the facility	
Site Location (City,State):	Muskegon, Michigan	
Building Name:	Building 3	
Floor No:	NA	
Room ID:	No/So. Walkway	
Survey Unit No.:	SU 3304	Two individual sets of survey data collected in this room
Survey Unit MARSSIM Classification:	2	Should be 1, 2, 3, "special", or leave blank
Survey Unit Dimensions (m2):	19.5	Approximated
Percent Unaccessible (%):	0%	
Gross Removable Alpha DCGLw (dpm/100 cm2):	0	This calc not used in project
Gross Removable Beta DCGLw (dpm/100 cm2):	3.7E+05	MARSSIM assumption
Gross Alpha DCGLw (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGLw (dpm/100 cm2):	3.70E+06	RSP-116, Section 5.2
Exposure Rate DCGLw (uR/hr @ 1m):	10	Not specified in RSP-116, but added as a supplemental su
Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
ROCs:	C14, H3	RSP-116, Section 5.2
Scan Speed (cm/sec):	2	RSP-116, Section 5.7
Stationary Count Time (min):	1	RSP-116, Section 5.8
Smear Count Time (min):	1	RSP-116, Section 5.9
Gross alpha surface efficiency:	0.25	MARSSIM default assumption
Gross beta surface efficiency:	0.5	MARSSIM default assumption
Surveyor detection efficiency:	0.5	MARSSIM default assumption
Minimum No. of Scan Measurements:	0	100% scans not performed
Minimum No. of Stationary Measurements:	10	MARSSIM default assumption
Minimum No. of Smear Measurements:	10	MARSSIM default assumption
Minimum No. of Exposure Rate Measurements:	1	MARSSIM default assumption

Instrumentation Information

Project No.: 2005006

Survey Unit No.: SU 3304

Scans		*Notes*	
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	219	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/30/15		
Data acquired by (initials):	SJB		
Stationary Measurements			
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	219	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/30/15		
Data acquired by (initials):	SJB		
Applicable gross alpha material background (dpm/100 cm2)	#DIV/0!	**Surface Description:**	
Applicable gross beta material background: (dpm/100 cm2)	0	**Surface Description:**	Background Included
Removable Activity Measurements			
Meter Model No.:	2929		
Meter SN:	126129		
Probe Model No.:	44-01		
Probe SN:	PR132239		
Probe size (cm2):	100	based on smear area coverage	
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	43	Start/End Shift Average	
Background Count time (min):	1	Columbia, MD office	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1383	Per annual instrument calibration doc - C14	
Date of Analysis:	04/02/15		
Data Acquired by (initials):	SJB		
Exposure Rate Measurements			
Meter Model No.:	19		
Meter SN:	300777		
Probe Model No.:	NA		
Probe SN:	NA		
Background (uR/hr @ 1m)	5	Elect/Furnace Room	
Date of Measurement:	04/01/15		
Data acquired by (initials):	BRT		

Scan Results

Project No.:	2005006
Survey Unit No.:	SU 3304
MARSSIM Class:	2
SU Area (m2):	19.5
Date of Measurement:	03/30/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	**Gross Alpha (dpm/100 cm2)**	**Gross Beta (dpm/100cm2)**
Mean		-827
Standard Deviation		431
Minimum		-1718
Maximum		174
N		69

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
1		150		-69		-926		1501						
2		203		-16		-215		1501						
3		168		-51		-685		1501						
4		232		13		174		1501						
5		182		-37		-497		1501						
6		140		-79		-1060		1501						
7		144		-75		-1007		1501						
8		138		-81		-1087		1501						
9		155		-64		-859		1501						
10		147		-72		-966		1501						
11		175		-44		-591		1501						
12		179		-40		-537		1501						
13		130		-89		-1195		1501						
14		209		-10		-134		1501						
15		200		-19		-255		1501						
16		133		-86		-1154		1501						
17		129		-90		-1208		1501						
18		187		-32		-430		1501						
19		147		-72		-966		1501						
20		207		-12		-161		1501						
21		143		-76		-1020		1501						
22		121		-98		-1315		1501						
23		154		-65		-872		1501						
24		202		-17		-228		1501						
25		219		0		0		1501						
26		190		-29		-389		1501						
27		144		-75		-1007		1501						
28		159		-60		-805		1501						
29		166		-53		-711		1501						
30		105		-114		-1530		1501						
31		135		-84		-1128		1501						
32		105		-114		-1530		1501						
33		155		-64		-859		1501						
34		171		-48		-644		1501						
35		99		-120		-1611		1501						
36		198		-21		-282		1501						
37		193		-26		-349		1501						
38		167		-52		-698		1501						
39		183		-36		-483		1501						
40		156		-63		-846		1501						
41		154		-65		-872		1501						
42		170		-49		-658		1501						
43		196		-23		-309		1501						
44		142		-77		-1034		1501						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
45		188		-31		-416		1501						
46		158		-61		-819		1501						
47		144		-75		-1007		1501						
48		155		-64		-859		1501						
49		199		-20		-268		1501						
50		182		-37		-497		1501						
51		124		-95		-1275		1501						
52		129		-90		-1208		1501						
53		91		-128		-1718		1501						
54		168		-51		-685		1501						
55		117		-102		-1369		1501						
56		160		-59		-792		1501						
57		165		-54		-725		1501						
58		111		-108		-1450		1501						
59		107		-112		-1503		1501						
60		98		-121		-1624		1501						
61		168		-51		-685		1501						
62		134		-85		-1141		1501						
63		165		-54		-725		1501						
64		188		-31		-416		1501						
65		154		-65		-872		1501						
66		127		-92		-1235		1501						
67		182		-37		-497		1501						
68		101		-118		-1584		1501						
69		161		-58		-779		1501						

Stationary Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3304
MARSSIM Class:	2
SU Area (m2):	19.5
Date of Measurement:	03/30/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		2070
Standard Deviation		133
Minimum		1946
Maximum		2295
N		5

Duplicate Analysis				
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)

Field ID	Net Alpha (gross counts)	Net Beta (gross counts)	Shielded Alpha (gross counts)	Shielded Beta (gross counts)	Unshielded Alpha (gross counts)	Unshielded Beta (gross counts)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Flag	Beta Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag
70		150				150		150		2013		3					
71		145				145		145		1946		3					
72		171				171		171		2295		3					
73		151				151		151		2027		3					
74		154				154		154		2067		3					

Removable Activity Results

Project No.:	2005006
Survey Unit No.:	SU 3304
MARSSIM Class:	2
SU Area (m2):	20
Date of acquisition:	3/30/15
Smears acquired by (initials):	SJB
Date of Measurement:	04/02/15
Smears analyzed by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		14
Standard Deviation		49
Minimum		-36
Maximum		80
Median		0
N		5

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Smear No.	Smear Gross Counts (alpha)	Smear Gross Counts (beta)	Smear Gross Count Rate (cpm alpha)	Smear Gross Count Rate (cpm beta)	Net Smear Count Rate (c/m alpha)	Net Smear Count Rate (c/m beta)	Alpha Activity (dpm/100 cm2 alpha)	Beta Activity (dpm/100 cm2 beta)	MDA Alpha (dpm)	MDA Beta (dpm)	DCGL Flag (alpha)	DCGL Flag (beta)
3304	1		38		38		-5		-36		240		
3304	2		54		54		11		80		240		
3304	3		40		40		-3		-22		240		
3304	4		43		43		0		0		240		
3304	5		50		50		7		51		240		

Exposure Rate Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3304
MARSSIM Class:	2
SU Area (m2):	19.5
Date of Measurement:	04/01/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data	
Parameter	**Exposure Rate (uR/hr)**
Mean	0
Standard Deviation	#DIV/0!
Minimum	0
Maximum	0
N	1

Duplicate Analysis					
S-Exp. Rate	**Dup-Exp. Rate**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Survey Location	**Gross Exposure Rate (uR/hr)**	**Net Exposure Rate (uR/hr)**	**MDA (uR/hr)**	**DCGL Flag**	**MDA Flag**
1	5	0	13		

Survey Unit Summary

Client Name:	NOAA - GLERL
Client No.:	2005006
Task No.:	5
Job Description:	FSS for the facility
Site Location (City,State):	Muskegon, Michigan
Building Name:	Research Vessel Laurentian
Floor No:	NA
Room ID:	Laboratory
Survey Unit No.:	SU 3305
Survey Unit MARSSIM Classification:	2
Survey Unit Dimensions (m2):	35
Gross Removable Alpha DCGLw (dpm/100 cm2):	0
Gross Removable Beta DCGLw (dpm/100 cm2):	370000
Gross Alpha DCGLw (dpm/100 cm2):	0
Gross Beta DCGLw (dpm/100 cm2):	3700000
Exposure Rate DCGLw (uR/hr @ 1m):	10
Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Gross Beta DCGL-EMC (dpm/100 cm2):	11000000
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	11000000

Measurement	Units	SU Mean	SU Max	$DCGL_W$ Flag	$DCGL_{EMC}$ Flag	No. Measurements	Flag
Gross alpha scan	dpm/100 cm^2	0	0			0	
Gross beta scan	dpm/100 cm^2	-1478	-456			248	
Stationary gross alpha	dpm/100 cm^2	0	0			0	
Stationary gross beta	dpm/100 cm^2	1428	1852			13	
Removable gross alpha	dpm/100 cm^2	0	0			0	
Removable gross beta	dpm/100 cm^2	15	116			13	
Exposure rate	MicroR/hr	0	0		N.A.	1	

Survey Design

		Notes
Client Name:	NOAA - GLERL	
Client No.:	2005006	
Task No.:	5	
Job Description:	FSS for the facility	
Site Location (City,State):	Muskegon, Michigan	
Building Name:	Research Vessel Laurentian	Shipboard laboratory and portions of open deck area
Floor No:	NA	
Room ID:	Laboratory	
Survey Unit No.:	SU 3305	Two individual sets of survey data collected in this room
Survey Unit MARSSIM Classification:	2	Should be 1, 2, 3, "special", or leave blank
Survey Unit Dimensions (m2):	35	Approximated
Percent Unaccessible (%):	20%	Under bench cabinetry
Gross Removable Alpha DCGLw (dpm/100 cm2):	0	This calc not used in project
Gross Removable Beta DCGLw (dpm/100 cm2):	3.7E+05	MARSSIM assumption
Gross Alpha DCGLw (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGLw (dpm/100 cm2):	3.70E+06	RSP-116, Section 5.2
Exposure Rate DCGLw (uR/hr @ 1m):	10	Not specified in RSP-116, but added as a supplemental su
Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
ROCs:	C14, H3	RSP-116, Section 5.2
Scan Speed (cm/sec):	2	RSP-116, Section 5.7
Stationary Count Time (min):	1	RSP-116, Section 5.8
Smear Count Time (min):	1	RSP-116, Section 5.9
Gross alpha surface efficiency:	0.25	MARSSIM default assumption
Gross beta surface efficiency:	0.5	MARSSIM default assumption
Surveyor detection efficiency:	0.5	MARSSIM default assumption
Minimum No. of Scan Measurements:	0	100% scans not performed
Minimum No. of Stationary Measurements:	10	MARSSIM default assumption
Minimum No. of Smear Measurements:	10	MARSSIM default assumption
Minimum No. of Exposure Rate Measurements:	1	MARSSIM default assumption

Instrumentation Information

Project No.: 2005006

Survey Unit No.: SU 3305

Scans		*Notes*	
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	212	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	SJB		
Stationary Measurements			
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	212	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	SJB		
Applicable gross alpha material background (dpm/100 cm2)	#DIV/0!	**Surface Description:**	
Applicable gross beta material background: (dpm/100 cm2)	0	**Surface Description:**	Background Included
Removable Activity Measurements			
Meter Model No.:	2929		
Meter SN:	126129		
Probe Model No.:	44-01		
Probe SN:	PR132239		
Probe size (cm2):	100	based on smear area coverage	
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	43	Start/End Shift Average	
Background Count time (min):	1	Columbia, MD office	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1383	Per annual instrument calibration doc - C14	
Date of Analysis:	04/02/15		
Data Acquired by (initials):	SJB		
Exposure Rate Measurements		***Not collected in this SU***	
Meter Model No.:			
Meter SN:			
Probe Model No.:			
Probe SN:			
Background (uR/hr @ 1m)		Elect/Furnace Room	
Date of Measurement:			
Data acquired by (initials):			

Scan Results

Project No.:	2005006
Survey Unit No.:	SU 3305
MARSSIM Class:	2
SU Area (m2):	35.0
Date of Measurement:	03/31/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		-1478
Standard Deviation		384
Minimum		-2456
Maximum		-456
N		248

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
1		50		-162		-2174		1477						
2		49		-163		-2188		1477						
3		97		-115		-1544		1477						
4		100		-112		-1503		1477						
5		106		-106		-1423		1477						
6		121		-91		-1221		1477						
7		113		-99		-1329		1477						
8		107		-105		-1409		1477						
9		49		-163		-2188		1477						
10		133		-79		-1060		1477						
11		150		-62		-832		1477						
12		104		-108		-1450		1477						
13		85		-127		-1705		1477						
14		104		-108		-1450		1477						
15		86		-126		-1691		1477						
16		142		-70		-940		1477						
17		94		-118		-1584		1477						
18		93		-119		-1597		1477						
19		103		-109		-1463		1477						
20		86		-126		-1691		1477						
21		72		-140		-1879		1477						
22		103		-109		-1463		1477						
23		74		-138		-1852		1477						
24		91		-121		-1624		1477						
25		78		-134		-1799		1477						
26		107		-105		-1409		1477						
27		80		-132		-1772		1477						
28		56		-156		-2094		1477						
29		54		-158		-2121		1477						
30		85		-127		-1705		1477						
31		62		-150		-2013		1477						
32		69		-143		-1919		1477						
33		60		-152		-2040		1477						
34		77		-135		-1812		1477						
35		83		-129		-1732		1477						
36		125		-87		-1168		1477						
37		84		-128		-1718		1477						
38		147		-65		-872		1477						
39		147		-65		-872		1477						
40		112		-100		-1342		1477						
41		97		-115		-1544		1477						
42		79		-133		-1785		1477						
43		97		-115		-1544		1477						
44		108		-104		-1396		1477						
45		93		-119		-1597		1477						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
46		147		-65		-872		1477						
47		170		-42		-564		1477						
48		144		-68		-913		1477						
49		86		-126		-1691		1477						
50		90		-122		-1638		1477						
51		88		-124		-1664		1477						
52		97		-115		-1544		1477						
53		116		-96		-1289		1477						
54		113		-99		-1329		1477						
55		117		-95		-1275		1477						
56		106		-106		-1423		1477						
57		50		-162		-2174		1477						
58		104		-108		-1450		1477						
59		135		-77		-1034		1477						
60		138		-74		-993		1477						
61		74		-138		-1852		1477						
62		29		-183		-2456		1477						
63		112		-100		-1342		1477						
64		144		-68		-913		1477						
65		124		-88		-1181		1477						
66		115		-97		-1302		1477						
67		102		-110		-1477		1477						
68		90		-122		-1638		1477						
69		129		-83		-1114		1477						
70		109		-103		-1383		1477						
71		104		-108		-1450		1477						
72		91		-121		-1624		1477						
73		137		-75		-1007		1477						
74		128		-84		-1128		1477						
75		136		-76		-1020		1477						
76		97		-115		-1544		1477						
77		74		-138		-1852		1477						
78		144		-68		-913		1477						
79		116		-96		-1289		1477						
80		117		-95		-1275		1477						
81		101		-111		-1490		1477						
82		87		-125		-1678		1477						
83		116		-96		-1289		1477						
84		47		-165		-2215		1477						
85		67		-145		-1946		1477						
86		99		-113		-1517		1477						
87		86		-126		-1691		1477						
88		72		-140		-1879		1477						
89		56		-156		-2094		1477						
90		108		-104		-1396		1477						
91		97		-115		-1544		1477						
92		40		-172		-2309		1477						
93		77		-135		-1812		1477						
94		143		-69		-926		1477						
95		138		-74		-993		1477						
96		109		-103		-1383		1477						
97		111		-101		-1356		1477						
98		99		-113		-1517		1477						
99		90		-122		-1638		1477						
100		119		-93		-1248		1477						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
101		78		-134		-1799		1477						
102		104		-108		-1450		1477						
103		129		-83		-1114		1477						
104		131		-81		-1087		1477						
105		82		-130		-1745		1477						
106		104		-108		-1450		1477						
107		124		-88		-1181		1477						
108		118		-94		-1262		1477						
109		77		-135		-1812		1477						
110		103		-109		-1463		1477						
111		117		-95		-1275		1477						
112		75		-137		-1839		1477						
113		68		-144		-1933		1477						
114		108		-104		-1396		1477						
115		123		-89		-1195		1477						
116		79		-133		-1785		1477						
117		81		-131		-1758		1477						
118		75		-137		-1839		1477						
119		101		-111		-1490		1477						
120		70		-142		-1906		1477						
121		98		-114		-1530		1477						
122		61		-151		-2027		1477						
123		48		-164		-2201		1477						
124		63		-149		-2000		1477						
125		65		-147		-1973		1477						
126		90		-122		-1638		1477						
127		64		-148		-1987		1477						
128		84		-128		-1718		1477						
129		162		-50		-671		1477						
130		105		-107		-1436		1477						
131		129		-83		-1114		1477						
132		62		-150		-2013		1477						
133		119		-93		-1248		1477						
134		84		-128		-1718		1477						
135		148		-64		-859		1477						
136		131		-81		-1087		1477						
137		139		-73		-980		1477						
138		110		-102		-1369		1477						
139		111		-101		-1356		1477						
140		63		-149		-2000		1477						
141		108		-104		-1396		1477						
142		147		-65		-872		1477						
143		143		-69		-926		1477						
144		84		-128		-1718		1477						
145		76		-136		-1826		1477						
146		104		-108		-1450		1477						
147		126		-86		-1154		1477						
148		134		-78		-1047		1477						
149		83		-129		-1732		1477						
150		178		-34		-456		1477						
151		116		-96		-1289		1477						
152		77		-135		-1812		1477						
153		103		-109		-1463		1477						
154		103		-109		-1463		1477						
155		114		-98		-1315		1477						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
156		159		-53		-711		1477						
157		145		-67		-899		1477						
158		112		-100		-1342		1477						
159		88		-124		-1664		1477						
160		99		-113		-1517		1477						
161		157		-55		-738		1477						
162		133		-79		-1060		1477						
163		170		-42		-564		1477						
164		163		-49		-658		1477						
165		79		-133		-1785		1477						
166		113		-99		-1329		1477						
167		120		-92		-1235		1477						
168		125		-87		-1168		1477						
169		70		-142		-1906		1477						
170		74		-138		-1852		1477						
171		82		-130		-1745		1477						
172		116		-96		-1289		1477						
173		154		-58		-779		1477						
174		130		-82		-1101		1477						
175		145		-67		-899		1477						
176		120		-92		-1235		1477						
177		98		-114		-1530		1477						
178		111		-101		-1356		1477						
179		95		-117		-1570		1477						
180		134		-78		-1047		1477						
181		111		-101		-1356		1477						
182		131		-81		-1087		1477						
183		103		-109		-1463		1477						
184		71		-141		-1893		1477						
185		110		-102		-1369		1477						
186		135		-77		-1034		1477						
187		71		-141		-1893		1477						
188		128		-84		-1128		1477						
189		125		-87		-1168		1477						
190		129		-83		-1114		1477						
191		90		-122		-1638		1477						
192		122		-90		-1208		1477						
193		69		-143		-1919		1477						
194		61		-151		-2027		1477						
195		89		-123		-1651		1477						
196		137		-75		-1007		1477						
197		138		-74		-993		1477						
198		93		-119		-1597		1477						
199		105		-107		-1436		1477						
200		71		-141		-1893		1477						
201		86		-126		-1691		1477						
202		121		-91		-1221		1477						
203		104		-108		-1450		1477						
204		130		-82		-1101		1477						
205		129		-83		-1114		1477						
206		114		-98		-1315		1477						
207		63		-149		-2000		1477						
208		96		-116		-1557		1477						
209		74		-138		-1852		1477						
210		84		-128		-1718		1477						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
211		48		-164		-2201		1477						
212		89		-123		-1651		1477						
213		66		-146		-1960		1477						
214		75		-137		-1839		1477						
215		119		-93		-1248		1477						
216		107		-105		-1409		1477						
217		93		-119		-1597		1477						
218		42		-170		-2282		1477						
219		59		-153		-2054		1477						
220		76		-136		-1826		1477						
221		62		-150		-2013		1477						
222		73		-139		-1866		1477						
223		85		-127		-1705		1477						
224		106		-106		-1423		1477						
225		161		-51		-685		1477						
226		78		-134		-1799		1477						
227		132		-80		-1074		1477						
228		121		-91		-1221		1477						
229		114		-98		-1315		1477						
230		153		-59		-792		1477						
231		131		-81		-1087		1477						
232		127		-85		-1141		1477						
233		138		-74		-993		1477						
234		86		-126		-1691		1477						
235		85		-127		-1705		1477						
236		79		-133		-1785		1477						
237		77		-135		-1812		1477						
238		128		-84		-1128		1477						
239		99		-113		-1517		1477						
240		62		-150		-2013		1477						
241		111		-101		-1356		1477						
242		113		-99		-1329		1477						
243		75		-137		-1839		1477						
244		80		-132		-1772		1477						
245		113		-99		-1329		1477						
246		112		-100		-1342		1477						
247		102		-110		-1477		1477						
248		84		-128		-1718		1477						

Stationary Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3305
MARSSIM Class:	2
SU Area (m2):	35.0
Date of Measurement:	03/31/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		1428
Standard Deviation		236
Minimum		1060
Maximum		1852
N		13

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Net Alpha (gross counts)	Net Beta (gross counts)	Shielded Alpha (gross counts)	Shielded Beta (gross counts)	Unshielded Alpha (gross counts)	Unshielded Beta (gross counts)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Flag	Beta Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
249		100				100		100		1342		3						
250		90				90		90		1208		3						
251		93				93		93		1248		3						
252		90				90		90		1208		3						
253		102				102		102		1369		3						
254		105				105		105		1409		3						
255		100				100		100		1342		3						
256		124				124		124		1664		3						
257		133				133		133		1785		3						
258		113				113		113		1517		3						
259		116				116		116		1557		3						
260		138				138		138		1852		3						

Removable Activity Results

Project No.:	2005006
Survey Unit No.:	SU 3305
MARSSIM Class:	2
SU Area (m2):	35
Date of acquisition:	3/31/15
Smears acquired by (initials):	SJB
Date of Measurement:	04/02/15
Smears analyzed by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		15
Standard Deviation		47
Minimum		-51
Maximum		116
Median		7
N		13

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Smear No.	Smear Gross Counts (alpha)	Smear Gross Counts (beta)	Smear Gross Count Rate (cpm alpha)	Smear Gross Count Rate (cpm beta)	Net Smear Count Rate (c/m alpha)	Net Smear Count Rate (c/m beta)	Alpha Activity (dpm/100 cm2 alpha)	Beta Activity (dpm/100 cm2 beta)	MDA Alpha (dpm)	MDA Beta (dpm)	DCGL Flag (alpha)	DCGL Flag (beta)
3305	1		40	NA	40		-3		-22		240		
3305	2		36	NA	36		-7		-51		240		
3305	3		45	NA	45		2		14		240		
3305	4		59	NA	59		16		116		240		
3305	5		53	NA	53		10		72		240		
3305	6		46	NA	46		3		22		240		
3305	7		36	NA	36		-7		-51		240		
3305	8		44	NA	44		1		7		240		
3305	9		42	NA	42		-1		-7		240		
3305	10		52	NA	52		9		65		240		
3305	11		44	0	44		1		7		240		
3305	12		46	0	46		3		22		240		

Exposure Rate Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3305
MARSSIM Class:	2
SU Area (m2):	35.0
Date of Measurement:	01/00/00
Data acquired by (initials):	

Statistical Evaluation of Data	
Parameter	**Exposure Rate (uR/hr)**
Mean	0
Standard Deviation	#DIV/0!
Minimum	0
Maximum	0
N	1

Duplicate Analysis					
S-Exp. Rate	**Dup-Exp. Rate**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Survey Location	**Gross Exposure Rate (uR/hr)**	**Net Exposure Rate (uR/hr)**	**MDA (uR/hr)**	**DCGL Flag**	**MDA Flag**
No exp rate collected		0	3		

Survey Unit Summary

Client Name:	NOAA - GLERL
Client No.:	2005006
Task No.:	5
Job Description:	FSS for the facility
Site Location (City,State):	Muskegon, Michigan
Building Name:	Building 3
Floor No:	NA
Room ID:	302
Survey Unit No.:	SU 3306
Survey Unit MARSSIM Classification:	2
Survey Unit Dimensions (m2):	30.1
Gross Removable Alpha DCGLw (dpm/100 cm2):	0
Gross Removable Beta DCGLw (dpm/100 cm2):	370000
Gross Alpha DCGLw (dpm/100 cm2):	0
Gross Beta DCGLw (dpm/100 cm2):	3700000
Exposure Rate DCGLw (uR/hr @ 1m):	10
Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Gross Beta DCGL-EMC (dpm/100 cm2):	11000000
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	11000000

Measurement	Units	SU Mean	SU Max	$DCGL_W$ Flag	$DCGL_{EMC}$ Flag	No. Measurements	Flag
Gross alpha scan	dpm/100 cm^2	0	0			0	
Gross beta scan	dpm/100 cm^2	-765	1436			200	
Stationary gross alpha	dpm/100 cm^2	0	0			0	
Stationary gross beta	dpm/100 cm^2	2001	2537			11	
Removable gross alpha	dpm/100 cm^2	0	0			0	
Removable gross beta	dpm/100 cm^2	12	65			10	
Exposure rate	MicroR/hr	0	0		N.A.	1	

Survey Design

		Notes
Client Name:	NOAA - GLERL	
Client No.:	2005006	
Task No.:	5	
Job Description:	FSS for the facility	
Site Location (City,State):	Muskegon, Michigan	
Building Name:	Building 3	
Floor No:	NA	
Room ID:	302	
Survey Unit No.:	SU 3306	Two individual sets of survey data collected in this room
Survey Unit MARSSIM Classification:	2	Should be 1, 2, 3, "special", or leave blank
Survey Unit Dimensions (m2):	30.1	Approximated
Percent Unaccessible (%):	0%	
Gross Removable Alpha DCGLw (dpm/100 cm2):	0	This calc not used in project
Gross Removable Beta DCGLw (dpm/100 cm2):	3.7E+05	MARSSIM assumption
Gross Alpha DCGLw (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGLw (dpm/100 cm2):	3.70E+06	RSP-116, Section 5.2
Exposure Rate DCGLw (uR/hr @ 1m):	10	Not specified in RSP-116, but added as a supplemental su
Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
ROCs:	C14, H3	RSP-116, Section 5.2
Scan Speed (cm/sec):	2	RSP-116, Section 5.7
Stationary Count Time (min):	1	RSP-116, Section 5.8
Smear Count Time (min):	1	RSP-116, Section 5.9
Gross alpha surface efficiency:	0.25	MARSSIM default assumption
Gross beta surface efficiency:	0.5	MARSSIM default assumption
Surveyor detection efficiency:	0.5	MARSSIM default assumption
Minimum No. of Scan Measurements:	0	100% scans not performed
Minimum No. of Stationary Measurements:	10	MARSSIM default assumption
Minimum No. of Smear Measurements:	10	MARSSIM default assumption
Minimum No. of Exposure Rate Measurements:	1	MARSSIM default assumption

Instrumentation Information

Project No.: 2005006

Survey Unit No.: SU 3306

Scans		*Notes*	
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	212	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	SJB		
Stationary Measurements			
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	212	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	SJB		
Applicable gross alpha material background (dpm/100 cm2)	#DIV/0!	**Surface Description:**	
Applicable gross beta material background: (dpm/100 cm2)	0	**Surface Description:**	Background Included
Removable Activity Measurements			
Meter Model No.:	2929		
Meter SN:	126129		
Probe Model No.:	44-01		
Probe SN:	PR132239		
Probe size (cm2):	100	based on smear area coverage	
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	43	Start/End Shift Average	
Background Count time (min):	1	Columbia, MD office	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1383	Per annual instrument calibration doc - C14	
Date of Analysis:	04/02/15		
Data Acquired by (initials):	SJB		
Exposure Rate Measurements			
Meter Model No.:	19		
Meter SN:	300777		
Probe Model No.:	NA		
Probe SN:	NA		
Background (uR/hr @ 1m)	5	Elect/Furnace Room	
Date of Measurement:	04/01/15		
Data acquired by (initials):	BRT		

Scan Results

Project No.:	2005006
Survey Unit No.:	SU 3306
MARSSIM Class:	2
SU Area (m2):	30.1
Date of Measurement:	03/31/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		-765
Standard Deviation		457
Minimum		-1839
Maximum		1436
N		200

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
1		142		-70		-940		1477						
2		137		-75		-1007		1477						
3		128		-84		-1128		1477						
4		185		-27		-362		1477						
5		116		-96		-1289		1477						
6		200		-12		-161		1477						
7		217		5		67		1477						
8		145		-67		-899		1477						
9		218		6		81		1477						
10		170		-42		-564		1477						
11		199		-13		-174		1477						
12		187		-25		-336		1477						
13		128		-84		-1128		1477						
14		98		-114		-1530		1477						
15		157		-55		-738		1477						
16		158		-54		-725		1477						
17		169		-43		-577		1477						
18		127		-85		-1141		1477						
19		114		-98		-1315		1477						
20		130		-82		-1101		1477						
21		174		-38		-510		1477						
22		187		-25		-336		1477						
23		183		-29		-389		1477						
24		148		-64		-859		1477						
25		208		-4		-54		1477						
26		169		-43		-577		1477						
27		178		-34		-456		1477						
28		190		-22		-295		1477						
29		144		-68		-913		1477						
30		157		-55		-738		1477						
31		119		-93		-1248		1477						
32		111		-101		-1356		1477						
33		158		-54		-725		1477						
34		188		-24		-322		1477						
35		232		20		268		1477						
36		173		-39		-523		1477						
37		158		-54		-725		1477						
38		157		-55		-738		1477						
39		210		-2		-27		1477						
40		190		-22		-295		1477						
41		116		-96		-1289		1477						
42		145		-67		-899		1477						
43		153		-59		-792		1477						
44		190		-22		-295		1477						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
45		146		-66		-886		1477						
46		169		-43		-577		1477						
47		183		-29		-389		1477						
48		170		-42		-564		1477						
49		111		-101		-1356		1477						
50		164		-48		-644		1477						
51		143		-69		-926		1477						
52		138		-74		-993		1477						
53		179		-33		-443		1477						
54		193		-19		-255		1477						
55		150		-62		-832		1477						
56		167		-45		-604		1477						
57		230		18		242		1477						
58		187		-25		-336		1477						
59		137		-75		-1007		1477						
60		110		-102		-1369		1477						
61		139		-73		-980		1477						
62		233		21		282		1477						
63		178		-34		-456		1477						
64		211		-1		-13		1477						
65		178		-34		-456		1477						
66		240		28		376		1477						
67		198		-14		-188		1477						
68		163		-49		-658		1477						
69		145		-67		-899		1477						
70		185		-27		-362		1477						
71		169		-43		-577		1477						
72		144		-68		-913		1477						
73		177		-35		-470		1477						
74		175		-37		-497		1477						
75		133		-79		-1060		1477						
76		144		-68		-913		1477						
77		178		-34		-456		1477						
78		213		1		13		1477						
79		192		-20		-268		1477						
80		195		-17		-228		1477						
81		199		-13		-174		1477						
82		198		-14		-188		1477						
83		167		-45		-604		1477						
84		141		-71		-953		1477						
85		152		-60		-805		1477						
86		148		-64		-859		1477						
87		126		-86		-1154		1477						
88		129		-83		-1114		1477						
89		147		-65		-872		1477						
90		153		-59		-792		1477						
91		178		-34		-456		1477						
92		152		-60		-805		1477						
93		167		-45		-604		1477						
94		175		-37		-497		1477						
95		171		-41		-550		1477						
96		152		-60		-805		1477						
97		150		-62		-832		1477						
98		243		31		416		1477						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
99		191		-21		-282		1477						
100		117		-95		-1275		1477						
101		161		-51		-685		1477						
102		143		-69		-926		1477						
103		199		-13		-174		1477						
104		165		-47		-631		1477						
105		159		-53		-711		1477						
106		129		-83		-1114		1477						
107		167		-45		-604		1477						
108		133		-79		-1060		1477						
109		92		-120		-1611		1477						
110		131		-81		-1087		1477						
111		117		-95		-1275		1477						
112		186		-26		-349		1477						
113		196		-16		-215		1477						
114		170		-42		-564		1477						
115		177		-35		-470		1477						
116		194		-18		-242		1477						
117		136		-76		-1020		1477						
118		168		-44		-591		1477						
119		204		-8		-107		1477						
120		163		-49		-658		1477						
121		167		-45		-604		1477						
122		181		-31		-416		1477						
123		138		-74		-993		1477						
124		208		-4		-54		1477						
125		162		-50		-671		1477						
126		135		-77		-1034		1477						
127		167		-45		-604		1477						
128		154		-58		-779		1477						
129		134		-78		-1047		1477						
130		162		-50		-671		1477						
131		128		-84		-1128		1477						
132		138		-74		-993		1477						
133		110		-102		-1369		1477						
134		176		-36		-483		1477						
135		136		-76		-1020		1477						
136		127		-85		-1141		1477						
137		143		-69		-926		1477						
138		116		-96		-1289		1477						
139		127		-85		-1141		1477						
140		168		-44		-591		1477						
141		174		-38		-510		1477						
142		126		-86		-1154		1477						
143		156		-56		-752		1477						
144		136		-76		-1020		1477						
145		109		-103		-1383		1477						
146		146		-66		-886		1477						
147		149		-63		-846		1477						
148		120		-92		-1235		1477						
149		127		-85		-1141		1477						
150		129		-83		-1114		1477						
151		129		-83		-1114		1477						
152		164		-48		-644		1477						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
153		135		-77		-1034		1477						
154		166		-46		-617		1477						
155		106		-106		-1423		1477						
156		105		-107		-1436		1477						
157		135		-77		-1034		1477						
158		80		-132		-1772		1477						
159		102		-110		-1477		1477						
160		135		-77		-1034		1477						
161		160		-52		-698		1477						
162		106		-106		-1423		1477						
163		319		107		1436		1477						
164		154		-58		-779		1477						
165		131		-81		-1087		1477						
166		154		-58		-779		1477						
167		187		-25		-336		1477						
168		151		-61		-819		1477						
169		102		-110		-1477		1477						
170		105		-107		-1436		1477						
171		100		-112		-1503		1477						
172		75		-137		-1839		1477						
173		175		-37		-497		1477						
174		157		-55		-738		1477						
175		195		-17		-228		1477						
176		138		-74		-993		1477						
177		111		-101		-1356		1477						
178		130		-82		-1101		1477						
179		105		-107		-1436		1477						
180		153		-59		-792		1477						
181		131		-81		-1087		1477						
182		104		-108		-1450		1477						
183		138		-74		-993		1477						
184		105		-107		-1436		1477						
185		145		-67		-899		1477						
186		150		-62		-832		1477						
187		128		-84		-1128		1477						
188		127		-85		-1141		1477						
189		116		-96		-1289		1477						
190		124		-88		-1181		1477						
191		137		-75		-1007		1477						
192		102		-110		-1477		1477						
193		156		-56		-752		1477						
194		174		-38		-510		1477						
195		153		-59		-792		1477						
196		137		-75		-1007		1477						
197		138		-74		-993		1477						
198		141		-71		-953		1477						
199		138		-74		-993		1477						
200		172		-40		-537		1477						

Stationary Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3306
MARSSIM Class:	2
SU Area (m2):	30.1
Date of Measurement:	03/31/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	**Gross Alpha (dpm/100 cm2)**	**Gross Beta (dpm/100cm2)**
Mean		2001
Standard Deviation		307
Minimum		1651
Maximum		2537
N		11

Duplicate Analysis				
S-alpha activity	**Dup-alpha activity**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**
S-beta activity	**Dup-beta activity**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**

Field ID	Net Alpha (gross counts)	Net Beta (gross counts)	Shielded Alpha (gross counts)	Shielded Beta (gross counts)	Unshielded Alpha (gross counts)	Unshielded Beta (gross counts)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Flag	Beta Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag
201		189				189		189		2537		3					
202		146				146		146		1960		3					
203		176				176		176		2362		3					
204		129				129		129		1732		3					
205		128				128		128		1718		3					
206		123				123		123		1651		3					
207		170				170		170		2282		3					
208		133				133		133		1785		3					
209		166				166		166		2228		3					
210		151				151		151		2027		3					
211		129				129		129		1732		3					

Removable Activity Results

Project No.:	2005006
Survey Unit No.:	SU 3306
MARSSIM Class:	2
SU Area (m2):	30
Date of acquisition:	3/31/15
Smears acquired by (initials):	SJB
Date of Measurement:	04/02/15
Smears analyzed by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		12
Standard Deviation		35
Minimum		-29
Maximum		65
Median		14
N		10

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Smear No.	Smear Gross Counts (alpha)	Smear Gross Counts (beta)	Smear Gross Count Rate (cpm alpha)	Smear Gross Count Rate (cpm beta)	Net Smear Count Rate (c/m alpha)	Net Smear Count Rate (c/m beta)	Alpha Activity (dpm/100 cm2 alpha)	Beta Activity (dpm/100 cm2 beta)	MDA Alpha (dpm)	MDA Beta (dpm)	DCGL Flag (alpha)	DCGL Flag (beta)
3306	1		44		44		1		7		240		
3306	2		42		42		-1		-7		240		
3306	3		39		39		-4		-29		240		
3306	4		52		52		9		65		240		
3306	5		46		46		3		22		240		
3306	6		46		46		3		22		240		
3306	7		39		39		-4		-29		240		
3306	8		49		49		6		43		240		
3306	9		50		50		7		51		240		
3306	10		39		39		-4		-29		240		

Exposure Rate Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3306
MARSSIM Class:	2
SU Area (m2):	30.1
Date of Measurement:	04/01/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data	
Parameter	**Exposure Rate (uR/hr)**
Mean	0
Standard Deviation	#DIV/0!
Minimum	0
Maximum	0
N	1

Duplicate Analysis					
S-Exp. Rate	**Dup-Exp. Rate**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Survey Location	**Gross Exposure Rate (uR/hr)**	**Net Exposure Rate (uR/hr)**	**MDA (uR/hr)**	**DCGL Flag**	**MDA Flag**
1	5	0	13		

Survey Unit Summary

Client Name:	NOAA - GLERL
Client No.:	2005006
Task No.:	5
Job Description:	FSS for the facility
Site Location (City,State):	Muskegon, Michigan
Building Name:	Building 3
Floor No:	NA
Room ID:	301
Survey Unit No.:	SU 3308
Survey Unit MARSSIM Classification:	2
Survey Unit Dimensions (m2):	46.8
Gross Removable Alpha DCGLw (dpm/100 cm2):	0
Gross Removable Beta DCGLw (dpm/100 cm2):	370000
Gross Alpha DCGLw (dpm/100 cm2):	0
Gross Beta DCGLw (dpm/100 cm2):	3700000
Exposure Rate DCGLw (uR/hr @ 1m):	10
Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Gross Beta DCGL-EMC (dpm/100 cm2):	11000000
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	11000000

Measurement	Units	SU Mean	SU Max	$DCGL_W$ Flag	$DCGL_{EMC}$ Flag	No. Measurements	Flag
Gross alpha scan	dpm/100 cm^2	0	0			0	
Gross beta scan	dpm/100 cm^2	-861	300			96	
Stationary gross alpha	dpm/100 cm^2	0	0			0	
Stationary gross beta	dpm/100 cm^2	2506	3024			12	
Removable gross alpha	dpm/100 cm^2	0	0			0	
Removable gross beta	dpm/100 cm^2	18	94			12	
Exposure rate	MicroR/hr	0	0		N.A.	1	

Survey Design

		Notes
Client Name:	NOAA - GLERL	
Client No.:	2005006	
Task No.:	5	
Job Description:	FSS for the facility	
Site Location (City,State):	Muskegon, Michigan	
Building Name:	Building 3	
Floor No:	NA	
Room ID:	301	
Survey Unit No.:	SU 3308	Two individual sets of survey data collected in this room
Survey Unit MARSSIM Classification:	2	Should be 1, 2, 3, "special", or leave blank
Survey Unit Dimensions (m2):	46.8	Approximated
Percent Unaccessible (%):	50%	Furniture and equipment on perimeter of room
Gross Removable Alpha DCGLw (dpm/100 cm2):	0	This calc not used in project
Gross Removable Beta DCGLw (dpm/100 cm2):	3.7E+05	MARSSIM assumption
Gross Alpha DCGLw (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGLw (dpm/100 cm2):	3.70E+06	RSP-116, Section 5.2
Exposure Rate DCGLw (uR/hr @ 1m):	10	Not specified in RSP-116, but added as a supplemental su
Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
ROCs:	C14, H3	RSP-116, Section 5.2
Scan Speed (cm/sec):	2	RSP-116, Section 5.7
Stationary Count Time (min):	1	RSP-116, Section 5.8
Smear Count Time (min):	1	RSP-116, Section 5.9
Gross alpha surface efficiency:	0.25	MARSSIM default assumption
Gross beta surface efficiency:	0.5	MARSSIM default assumption
Surveyor detection efficiency:	0.5	MARSSIM default assumption
Minimum No. of Scan Measurements:	0	100% scans not performed
Minimum No. of Stationary Measurements:	10	MARSSIM default assumption
Minimum No. of Smear Measurements:	10	MARSSIM default assumption
Minimum No. of Exposure Rate Measurements:	1	MARSSIM default assumption

Instrumentation Information

Project No.: 2005006

Survey Unit No.: SU 3308

Scans		*Notes*	
Meter Model No.:	2360		
Meter SN:	287562		
Probe Model No.:	43-93		
Probe SN:	FR283109		
Probe size (cm2):	100		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	239	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1402	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	BRT		
Stationary Measurements			
Meter Model No.:	2360		
Meter SN:	287562		
Probe Model No.:	43-93		
Probe SN:	FR283109		
Probe size (cm2):	100		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	239	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1402	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	BRT		
Applicable gross alpha material background (dpm/100 cm2)	#DIV/0!	**Surface Description:**	
Applicable gross beta material background: (dpm/100 cm2)	0	**Surface Description:**	Background Included
Removable Activity Measurements			
Meter Model No.:	2929		
Meter SN:	126129		
Probe Model No.:	44-01		
Probe SN:	PR132239		
Probe size (cm2):	100	based on smear area coverage	
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	43	Start/End Shift Average	
Background Count time (min):	1	Columbia, MD office	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1383	Per annual instrument calibration doc - C14	
Date of Analysis:	04/02/15		
Data Acquired by (initials):	SJB		
Exposure Rate Measurements			
Meter Model No.:	19		
Meter SN:	300777		
Probe Model No.:	NA		
Probe SN:	NA		
Background (uR/hr @ 1m)	5	Elect/Furnace Room	
Date of Measurement:	04/01/15		
Data acquired by (initials):	BRT		

Scan Results

Project No.:	2005006
Survey Unit No.:	SU 3308
MARSSIM Class:	2
SU Area (m2):	46.8
Date of Measurement:	03/31/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		-861
Standard Deviation		489
Minimum		-1669
Maximum		300
N		96

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
1		146		-93		-1327		1667						
2		177		-62		-884		1667						
3		206		-33		-471		1667						
4		196		-43		-613		1667						
5		254		15		214		1667						
6		228		-11		-157		1667						
7		180		-59		-842		1667						
8		163		-76		-1084		1667						
9		239		0		0		1667						
10		180		-59		-842		1667						
11		165		-74		-1056		1667						
12		134		-105		-1498		1667						
13		150		-89		-1270		1667						
14		129		-110		-1569		1667						
15		169		-70		-999		1667						
16		192		-47		-670		1667						
17		128		-111		-1583		1667						
18		126		-113		-1612		1667						
19		176		-63		-899		1667						
20		207		-32		-456		1667						
21		195		-44		-628		1667						
22		144		-95		-1355		1667						
23		172		-67		-956		1667						
24		166		-73		-1041		1667						
25		197		-42		-599		1667						
26		229		-10		-143		1667						
27		225		-14		-200		1667						
28		192		-47		-670		1667						
29		141		-98		-1398		1667						
30		202		-37		-528		1667						
31		169		-70		-999		1667						
32		165		-74		-1056		1667						
33		129		-110		-1569		1667						
34		244		5		71		1667						
35		236		-3		-43		1667						
36		260		21		300		1667						
37		221		-18		-257		1667						
38		149		-90		-1284		1667						
39		152		-87		-1241		1667						
40		204		-35		-499		1667						
41		154		-85		-1213		1667						
42		167		-72		-1027		1667						
43		163		-76		-1084		1667						
44		213		-26		-371		1667						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
45		175		-64		-913		1667						
46		132		-107		-1526		1667						
47		122		-117		-1669		1667						
48		138		-101		-1441		1667						
49		131		-108		-1541		1667						
50		160		-79		-1127		1667						
51		139		-100		-1427		1667						
52		166		-73		-1041		1667						
53		142		-97		-1384		1667						
54		200		-39		-556		1667						
55		142		-97		-1384		1667						
56		129		-110		-1569		1667						
57		150		-89		-1270		1667						
58		170		-69		-984		1667						
59		137		-102		-1455		1667						
60		249		10		143		1667						
61		129		-110		-1569		1667						
62		187		-52		-742		1667						
63		229		-10		-143		1667						
64		176		-63		-899		1667						
65		154		-85		-1213		1667						
66		166		-73		-1041		1667						
67		200		-39		-556		1667						
68		202		-37		-528		1667						
69		218		-21		-300		1667						
70		198		-41		-585		1667						
71		200		-39		-556		1667						
72		215		-24		-342		1667						
73		202		-37		-528		1667						
74		170		-69		-984		1667						
75		162		-77		-1098		1667						
76		148		-91		-1298		1667						
77		174		-65		-927		1667						
78		223		-16		-228		1667						
79		139		-100		-1427		1667						
80		184		-55		-785		1667						
81		153		-86		-1227		1667						
82		245		6		86		1667						
83		206		-33		-471		1667						
84		164		-75		-1070		1667						
85		171		-68		-970		1667						
86		231		-8		-114		1667						
87		178		-61		-870		1667						
88		202		-37		-528		1667						
89		222		-17		-243		1667						
90		176		-63		-899		1667						
91		157		-82		-1170		1667						
92		174		-65		-927		1667						
93		149		-90		-1284		1667						
94		159		-80		-1141		1667						
95		185		-54		-770		1667						
96		186		-53		-756		1667						

Stationary Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3308
MARSSIM Class:	2
SU Area (m2):	46.8
Date of Measurement:	03/31/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		2506
Standard Deviation		269
Minimum		2068
Maximum		3024
N		12

Duplicate Analysis				
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)

Field ID	Net Alpha (gross counts)	Net Beta (gross counts)	Shielded Alpha (gross counts)	Shielded Beta (gross counts)	Unshielded Alpha (gross counts)	Unshielded Beta (gross counts)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Flag	Beta Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag
97		163				163		163		2325		3					
98		185				185		185		2639		3					
99		178				178		178		2539		3					
100		176				176		176		2511		3					
101		180				180		180		2568		3					
102		190				190		190		2710		3					
103		164				164		164		2340		3					
104		186				186		186		2653		3					
105		183				183		183		2611		3					
106		212				212		212		3024		3					
107		145				145		145		2068		3					
108		146				146		146		2083		3					

Removable Activity Results

Project No.:	2005006
Survey Unit No.:	SU 3308
MARSSIM Class:	2
SU Area (m2):	47
Date of acquisition:	3/31/15
Smears acquired by (initials):	BRT
Date of Measurement:	04/02/15
Smears analyzed by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		18
Standard Deviation		52
Minimum		-65
Maximum		94
Median		29
N		12

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Smear No.	Smear Gross Counts (alpha)	Smear Gross Counts (beta)	Smear Gross Count Rate (cpm alpha)	Smear Gross Count Rate (cpm beta)	Net Smear Count Rate (c/m alpha)	Net Smear Count Rate (c/m beta)	Alpha Activity (dpm/100 cm2 alpha)	Beta Activity (dpm/100 cm2 beta)	MDA Alpha (dpm)	MDA Beta (dpm)	DCGL Flag (alpha)	DCGL Flag (beta)
97	1		43		43		0		0		240		
98	2		51		51		8		58		240		
99	3		52		52		9		65		240		
100	4		46		46		3		22		240		
101	5		47		47		4		29		240		
102	6		34		34		-9		-65		240		
103	7		47		47		4		29		240		
104	8		36		36		-7		-51		240		
105	9		35		35		-8		-58		240		
106	10		52		52		9		65		240		

Exposure Rate Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3308
MARSSIM Class:	2
SU Area (m2):	46.8
Date of Measurement:	04/01/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data	
Parameter	**Exposure Rate (uR/hr)**
Mean	0
Standard Deviation	#DIV/0!
Minimum	0
Maximum	0
N	1

Duplicate Analysis					
S-Exp. Rate	**Dup-Exp. Rate**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Survey Location	**Gross Exposure Rate (uR/hr)**	**Net Exposure Rate (uR/hr)**	**MDA (uR/hr)**	**DCGL Flag**	**MDA Flag**
1	5	0	13		

Survey Unit Summary

Client Name:	NOAA - GLERL
Client No.:	2005006
Task No.:	5
Job Description:	FSS for the facility
Site Location (City,State):	Muskegon, Michigan
Building Name:	Building 3
Floor No:	NA
Room ID:	E/W Hallway
Survey Unit No.:	SU 3309
Survey Unit MARSSIM Classification:	2
Survey Unit Dimensions (m2):	20
Gross Removable Alpha DCGLw (dpm/100 cm2):	0
Gross Removable Beta DCGLw (dpm/100 cm2):	370000
Gross Alpha DCGLw (dpm/100 cm2):	0
Gross Beta DCGLw (dpm/100 cm2):	3700000
Exposure Rate DCGLw (uR/hr @ 1m):	10
Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Gross Beta DCGL-EMC (dpm/100 cm2):	11000000
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	11000000

Measurement	Units	SU Mean	SU Max	$DCGL_W$ Flag	$DCGL_{EMC}$ Flag	No. Measurements	Flag
Gross alpha scan	dpm/100 cm^2	0	0			0	
Gross beta scan	dpm/100 cm^2	-228	1569			62	
Stationary gross alpha	dpm/100 cm^2	0	0			0	
Stationary gross beta	dpm/100 cm^2	3371	3623			6	
Removable gross alpha	dpm/100 cm^2	0	0			0	
Removable gross beta	dpm/100 cm^2	4	7			2	
Exposure rate	MicroR/hr	0	0		N.A.	1	

Survey Design

		Notes
Client Name:	NOAA - GLERL	
Client No.:	2005006	
Task No.:	5	
Job Description:	FSS for the facility	
Site Location (City,State):	Muskegon, Michigan	
Building Name:	Building 3	
Floor No:	NA	
Room ID:	E/W Hallway	
Survey Unit No.:	SU 3309	Two individual sets of survey data collected in this room
Survey Unit MARSSIM Classification:	2	Should be 1, 2, 3, "special", or leave blank
Survey Unit Dimensions (m2):	20	Approximated
Percent Unaccessible (%):	30%	Storage lockers on N side of hallway
Gross Removable Alpha DCGLw (dpm/100 cm2):	0	This calc not used in project
Gross Removable Beta DCGLw (dpm/100 cm2):	3.7E+05	MARSSIM assumption
Gross Alpha DCGLw (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGLw (dpm/100 cm2):	3.70E+06	RSP-116, Section 5.2
Exposure Rate DCGLw (uR/hr @ 1m):	10	Not specified in RSP-116, but added as a supplemental su
Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
ROCs:	C14, H3	RSP-116, Section 5.2
Scan Speed (cm/sec):	2	RSP-116, Section 5.7
Stationary Count Time (min):	1	RSP-116, Section 5.8
Smear Count Time (min):	1	RSP-116, Section 5.9
Gross alpha surface efficiency:	0.25	MARSSIM default assumption
Gross beta surface efficiency:	0.5	MARSSIM default assumption
Surveyor detection efficiency:	0.5	MARSSIM default assumption
Minimum No. of Scan Measurements:	0	100% scans not performed
Minimum No. of Stationary Measurements:	10	MARSSIM default assumption
Minimum No. of Smear Measurements:	10	MARSSIM default assumption
Minimum No. of Exposure Rate Measurements:	1	MARSSIM default assumption

Instrumentation Information

Project No.: 2005006

Survey Unit No.: SU 3309

Scans		*Notes*	
Meter Model No.:	2360		
Meter SN:	287562		
Probe Model No.:	43-93		
Probe SN:	FR283109		
Probe size (cm2):	100		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	239	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1402	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	BRT		
Stationary Measurements			
Meter Model No.:	2360		
Meter SN:	287562		
Probe Model No.:	43-93		
Probe SN:	FR283109		
Probe size (cm2):	100		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	239	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1402	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	BRT		
Applicable gross alpha material background (dpm/100 cm2)	#DIV/0!	**Surface Description:**	
Applicable gross beta material background: (dpm/100 cm2)	0	**Surface Description:**	Background Included
Removable Activity Measurements			
Meter Model No.:	2929		
Meter SN:	126129		
Probe Model No.:	44-01		
Probe SN:	PR132239		
Probe size (cm2):	100	based on smear area coverage	
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	43	Start/End Shift Average	
Background Count time (min):	1	Columbia, MD office	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1383	Per annual instrument calibration doc - C14	
Date of Analysis:	04/02/15		
Data Acquired by (initials):	BRT		
Exposure Rate Measurements			
Meter Model No.:	19		
Meter SN:	300777		
Probe Model No.:	NA		
Probe SN:	NA		
Background (uR/hr @ 1m)	5	Elect/Furnace Room	
Date of Measurement:	04/01/15		
Data acquired by (initials):	BRT		

Scan Results

Project No.:	2005006
Survey Unit No.:	SU 3309
MARSSIM Class:	2
SU Area (m2):	20.0
Date of Measurement:	03/31/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		-228
Standard Deviation		593
Minimum		-1912
Maximum		1569
N		62

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
1		105		-134		-1912		1667						
2		178		-61		-870		1667						
3		238		-1		-14		1667						
4		228		-11		-157		1667						
5		274		35		499		1667						
6		311		72		1027		1667						
7		239		0		0		1667						
8		237		-2		-29		1667						
9		230		-9		-128		1667						
10		263		24		342		1667						
11		221		-18		-257		1667						
12		202		-37		-528		1667						
13		235		-4		-57		1667						
14		194		-45		-642		1667						
15		198		-41		-585		1667						
16		185		-54		-770		1667						
17		223		-16		-228		1667						
18		200		-39		-556		1667						
19		228		-11		-157		1667						
20		231		-8		-114		1667						
21		226		-13		-185		1667						
22		191		-48		-685		1667						
23		187		-52		-742		1667						
24		240		1		14		1667						
25		259		20		285		1667						
26		232		-7		-100		1667						
27		151		-88		-1255		1667						
28		195		-44		-628		1667						
29		197		-42		-599		1667						
30		185		-54		-770		1667						
31		194		-45		-642		1667						
32		213		-26		-371		1667						
33		249		10		143		1667						
34		220		-19		-271		1667						
35		349		110		1569		1667						
36		248		9		128		1667						
37		143		-96		-1369		1667						
38		213		-26		-371		1667						
39		277		38		542		1667						
40		178		-61		-870		1667						
41		231		-8		-114		1667						
42		286		47		670		1667						
43		191		-48		-685		1667						
44		274		35		499		1667						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
45		215		-24		-342		1667						
46		203		-36		-514		1667						
47		293		54		770		1667						
48		212		-27		-385		1667						
49		218		-21		-300		1667						
50		236		-3		-43		1667						
51		200		-39		-556		1667						
52		209		-30		-428		1667						
53		265		26		371		1667						
54		263		24		342		1667						
55		240		1		14		1667						
56		229		-10		-143		1667						
57		203		-36		-514		1667						
58		243		4		57		1667						
59		304		65		927		1667						
60		199		-40		-571		1667						
61		172		-67		-956		1667						
62		172		-67		-956		1667						

Stationary Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3309
MARSSIM Class:	2
SU Area (m2):	20.0
Date of Measurement:	03/31/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		3371
Standard Deviation		213
Minimum		3010
Maximum		3623
N		6

Duplicate Analysis				
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)

Field ID	Net Alpha (gross counts)	Net Beta (gross counts)	Shielded Alpha (gross counts)	Shielded Beta (gross counts)	Unshielded Alpha (gross counts)	Unshielded Beta (gross counts)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Flag	Beta Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag
63		242				242		242		3452		3					
64		237				237		237		3381		3					
65		254				254		254		3623		3					
66		211				211		211		3010		3					
67		245				245		245		3495		3					
68		229				229		229		3267		3					

Removable Activity Results

Project No.:	2005006
Survey Unit No.:	SU 3309
MARSSIM Class:	2
SU Area (m2):	20
Date of acquisition:	3/31/15
Smears acquired by (initials):	BRT
Date of Measurement:	04/02/15
Smears analyzed by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		4
Standard Deviation		5
Minimum		0
Maximum		7
Median		4
N		2

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Smear No.	Smear Gross Counts (alpha)	Smear Gross Counts (beta)	Smear Gross Count Rate (cpm alpha)	Smear Gross Count Rate (cpm beta)	Net Smear Count Rate (c/m alpha)	Net Smear Count Rate (c/m beta)	Alpha Activity (dpm/100 cm2 alpha)	Beta Activity (dpm/100 cm2 beta)	MDA Alpha (dpm)	MDA Beta (dpm)	DCGL Flag (alpha)	DCGL Flag (beta)
64	1		43		43		0		0		240		
66	2		44		44		1		7		240		

Exposure Rate Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3309
MARSSIM Class:	2
SU Area (m2):	20.0
Date of Measurement:	04/01/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data	
Parameter	**Exposure Rate (uR/hr)**
Mean	0
Standard Deviation	#DIV/0!
Minimum	0
Maximum	0
N	1

Duplicate Analysis					
S-Exp. Rate	**Dup-Exp. Rate**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Survey Location	**Gross Exposure Rate (uR/hr)**	**Net Exposure Rate (uR/hr)**	**MDA (uR/hr)**	**DCGL Flag**	**MDA Flag**
1	5	0	13		

Survey Unit Summary

Client Name:	NOAA - GLERL
Client No.:	2005006
Task No.:	5
Job Description:	FSS for the facility
Site Location (City,State):	Muskegon, Michigan
Building Name:	Building 3
Floor No:	NA
Room ID:	Bay Area
Survey Unit No.:	SU 3310
Survey Unit MARSSIM Classification:	2
Survey Unit Dimensions (m2):	69.7
Gross Removable Alpha DCGLw (dpm/100 cm2):	0
Gross Removable Beta DCGLw (dpm/100 cm2):	370000
Gross Alpha DCGLw (dpm/100 cm2):	0
Gross Beta DCGLw (dpm/100 cm2):	3700000
Exposure Rate DCGLw (uR/hr @ 1m):	10
Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Gross Beta DCGL-EMC (dpm/100 cm2):	11000000
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	11000000

Measurement	Units	SU Mean	SU Max	$DCGL_W$ Flag	$DCGL_{EMC}$ Flag	No. Measurements	Flag
Gross alpha scan	dpm/100 cm^2	0	0			0	
Gross beta scan	dpm/100 cm^2	-9	1732			173	
Stationary gross alpha	dpm/100 cm^2	0	0			0	
Stationary gross beta	dpm/100 cm^2	2811	3154			7	
Removable gross alpha	dpm/100 cm^2	0	0			0	
Removable gross beta	dpm/100 cm^2	21	80			7	
Exposure rate	MicroR/hr	0	0		N.A.	1	

Survey Design

		Notes
Client Name:	NOAA - GLERL	
Client No.:	2005006	
Task No.:	5	
Job Description:	FSS for the facility	
Site Location (City,State):	Muskegon, Michigan	
Building Name:	Building 3	
Floor No:	NA	
Room ID:	Bay Area	
Survey Unit No.:	SU 3310	Two individual sets of survey data collected in this room
Survey Unit MARSSIM Classification:	2	Should be 1, 2, 3, "special", or leave blank
Survey Unit Dimensions (m2):	69.7	Approximated
Percent Unaccessible (%):	0%	
Gross Removable Alpha DCGLw (dpm/100 cm2):	0	This calc not used in project
Gross Removable Beta DCGLw (dpm/100 cm2):	3.7E+05	MARSSIM assumption
Gross Alpha DCGLw (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGLw (dpm/100 cm2):	3.70E+06	RSP-116, Section 5.2
Exposure Rate DCGLw (uR/hr @ 1m):	10	Not specified in RSP-116, but added as a supplemental su
Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
ROCs:	C14, H3	RSP-116, Section 5.2
Scan Speed (cm/sec):	2	RSP-116, Section 5.7
Stationary Count Time (min):	1	RSP-116, Section 5.8
Smear Count Time (min):	1	RSP-116, Section 5.9
Gross alpha surface efficiency:	0.25	MARSSIM default assumption
Gross beta surface efficiency:	0.5	MARSSIM default assumption
Surveyor detection efficiency:	0.5	MARSSIM default assumption
Minimum No. of Scan Measurements:	0	100% scans not performed
Minimum No. of Stationary Measurements:	10	MARSSIM default assumption
Minimum No. of Smear Measurements:	10	MARSSIM default assumption
Minimum No. of Exposure Rate Measurements:	1	MARSSIM default assumption

Instrumentation Information

Project No.: 2005006

Survey Unit No.: SU 3310

Scans		*Notes*	
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	212	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	SJB		
Stationary Measurements			
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	212	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	SJB		
Applicable gross alpha material background (dpm/100 cm2)	#DIV/0!	**Surface Description:**	
Applicable gross beta material background: (dpm/100 cm2)	0	**Surface Description:**	Background Included
Removable Activity Measurements			
Meter Model No.:	2929		
Meter SN:	126129		
Probe Model No.:	44-01		
Probe SN:	PR132239		
Probe size (cm2):	100	based on smear area coverage	
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	43	Start/End Shift Average	
Background Count time (min):	1	Columbia, MD office	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1383	Per annual instrument calibration doc - C14	
Date of Analysis:	04/02/15		
Data Acquired by (initials):	SJB		
Exposure Rate Measurements			
Meter Model No.:	19		
Meter SN:	300777		
Probe Model No.:	NA		
Probe SN:	NA		
Background (uR/hr @ 1m)	5	Elect/Furnace Room	
Date of Measurement:	04/01/15		
Data acquired by (initials):	BRT		

Scan Results

Project No.:	2005006
Survey Unit No.:	SU 3310
MARSSIM Class:	2
SU Area (m2):	69.7
Date of Measurement:	03/31/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		-9
Standard Deviation		486
Minimum		-1235
Maximum		1732
N		173

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
1		218		6		81		1477						
2		196		-16		-215		1477						
3		139		-73		-980		1477						
4		229		17		228		1477						
5		251		39		523		1477						
6		173		-39		-523		1477						
7		178		-34		-456		1477						
8		225		13		174		1477						
9		244		32		430		1477						
10		175		-37		-497		1477						
11		224		12		161		1477						
12		240		28		376		1477						
13		203		-9		-121		1477						
14		203		-9		-121		1477						
15		206		-6		-81		1477						
16		182		-30		-403		1477						
17		212		0		0		1477						
18		229		17		228		1477						
19		253		41		550		1477						
20		245		33		443		1477						
21		204		-8		-107		1477						
22		198		-14		-188		1477						
23		180		-32		-430		1477						
24		211		-1		-13		1477						
25		221		9		121		1477						
26		263		51		685		1477						
27		251		39		523		1477						
28		205		-7		-94		1477						
29		252		40		537		1477						
30		225		13		174		1477						
31		248		36		483		1477						
32		246		34		456		1477						
33		238		26		349		1477						
34		223		11		148		1477						
35		174		-38		-510		1477						
36		185		-27		-362		1477						
37		220		8		107		1477						
38		173		-39		-523		1477						
39		199		-13		-174		1477						
40		156		-56		-752		1477						
41		221		9		121		1477						
42		187		-25		-336		1477						
43		182		-30		-403		1477						
44		255		43		577		1477						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
45		252		40		537		1477						
46		307		95		1275		1477						
47		265		53		711		1477						
48		210		-2		-27		1477						
49		208		-4		-54		1477						
50		242		30		403		1477						
51		170		-42		-564		1477						
52		227		15		201		1477						
53		195		-17		-228		1477						
54		198		-14		-188		1477						
55		341		129		1732		1477						
56		247		35		470		1477						
57		295		83		1114		1477						
58		247		35		470		1477						
59		263		51		685		1477						
60		218		6		81		1477						
61		220		8		107		1477						
62		188		-24		-322		1477						
63		238		26		349		1477						
64		205		-7		-94		1477						
65		195		-17		-228		1477						
66		193		-19		-255		1477						
67		225		13		174		1477						
68		240		28		376		1477						
69		221		9		121		1477						
70		188		-24		-322		1477						
71		187		-25		-336		1477						
72		236		24		322		1477						
73		269		57		765		1477						
74		217		5		67		1477						
75		208		-4		-54		1477						
76		215		3		40		1477						
77		139		-73		-980		1477						
78		192		-20		-268		1477						
79		242		30		403		1477						
80		173		-39		-523		1477						
81		210		-2		-27		1477						
82		233		21		282		1477						
83		165		-47		-631		1477						
84		210		-2		-27		1477						
85		236		24		322		1477						
86		192		-20		-268		1477						
87		198		-14		-188		1477						
88		191		-21		-282		1477						
89		209		-3		-40		1477						
90		240		28		376		1477						
91		252		40		537		1477						
92		274		62		832		1477						
93		145		-67		-899		1477						
94		169		-43		-577		1477						
95		185		-27		-362		1477						
96		190		-22		-295		1477						
97		156		-56		-752		1477						
98		120		-92		-1235		1477						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
99		215		3		40		1477						
100		241		29		389		1477						
101		240		28		376		1477						
102		217		5		67		1477						
103		198		-14		-188		1477						
104		148		-64		-859		1477						
105		155		-57		-765		1477						
106		179		-33		-443		1477						
107		155		-57		-765		1477						
108		244		32		430		1477						
109		155		-57		-765		1477						
110		128		-84		-1128		1477						
111		189		-23		-309		1477						
112		268		56		752		1477						
113		195		-17		-228		1477						
114		204		-8		-107		1477						
115		175		-37		-497		1477						
116		180		-32		-430		1477						
117		198		-14		-188		1477						
118		226		14		188		1477						
119		235		23		309		1477						
120		184		-28		-376		1477						
121		181		-31		-416		1477						
122		161		-51		-685		1477						
123		183		-29		-389		1477						
124		228		16		215		1477						
125		221		9		121		1477						
126		237		25		336		1477						
127		197		-15		-201		1477						
128		245		33		443		1477						
129		171		-41		-550		1477						
130		143		-69		-926		1477						
131		199		-13		-174		1477						
132		242		30		403		1477						
133		241		29		389		1477						
134		231		19		255		1477						
135		237		25		336		1477						
136		240		28		376		1477						
137		198		-14		-188		1477						
138		203		-9		-121		1477						
139		271		59		792		1477						
140		238		26		349		1477						
141		277		65		872		1477						
142		203		-9		-121		1477						
143		231		19		255		1477						
144		209		-3		-40		1477						
145		206		-6		-81		1477						
146		203		-9		-121		1477						
147		260		48		644		1477						
148		227		15		201		1477						
149		234		22		295		1477						
150		197		-15		-201		1477						
151		221		9		121		1477						
152		252		40		537		1477						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
153		215		3		40		1477						
154		123		-89		-1195		1477						
155		244		32		430		1477						
156		246		34		456		1477						
157		226		14		188		1477						
158		240		28		376		1477						
159		190		-22		-295		1477						
160		172		-40		-537		1477						
161		153		-59		-792		1477						
162		199		-13		-174		1477						
163		258		46		617		1477						
164		237		25		336		1477						
165		164		-48		-644		1477						
166		166		-46		-617		1477						
167		188		-24		-322		1477						
168		215		3		40		1477						
169		269		57		765		1477						
170		202		-10		-134		1477						
171		162		-50		-671		1477						
172		189		-23		-309		1477						
173		187		-25		-336		1477						

Stationary Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3310
MARSSIM Class:	2
SU Area (m2):	69.7
Date of Measurement:	03/31/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		2811
Standard Deviation		252
Minimum		2403
Maximum		3154
N		7

Duplicate Analysis				
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)

Field ID	Net Alpha (gross counts)	Net Beta (gross counts)	Shielded Alpha (gross counts)	Shielded Beta (gross counts)	Unshielded Alpha (gross counts)	Unshielded Beta (gross counts)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Flag	Beta Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag
175		205				205		205		2752		3					
176		201				201		201		2698		3					
177		201				201		201		2698		3					
178		179				179		179		2403		3					
179		235				235		235		3154		3					
180		219				219		219		2940		3					
181		226				226		226		3034		3					

Removable Activity Results

Project No.:	2005006
Survey Unit No.:	SU 3310
MARSSIM Class:	2
SU Area (m2):	70
Date of acquisition:	3/31/15
Smears acquired by (initials):	SJB
Date of Measurement:	04/02/15
Smears analyzed by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		21
Standard Deviation		32
Minimum		-14
Maximum		80
Median		22
N		7

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Smear No.	Smear Gross Counts (alpha)	Smear Gross Counts (beta)	Smear Gross Count Rate (cpm alpha)	Smear Gross Count Rate (cpm beta)	Net Smear Count Rate (c/m alpha)	Net Smear Count Rate (c/m beta)	Alpha Activity (dpm/100 cm2 alpha)	Beta Activity (dpm/100 cm2 beta)	MDA Alpha (dpm)	MDA Beta (dpm)	DCGL Flag (alpha)	DCGL Flag (beta)
3310	1		42		42		-1		-7		240		
3310	2		46		46		3		22		240		
3310	3		41		41		-2		-14		240		
3310	4		43		43		0		0		240		
3310	5		47		47		4		29		240		
3310	6		48		48		5		36		240		
3310	7		54		54		11		80		240		

Exposure Rate Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3310
MARSSIM Class:	2
SU Area (m2):	69.7
Date of Measurement:	04/01/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data	
Parameter	**Exposure Rate (uR/hr)**
Mean	0
Standard Deviation	#DIV/0!
Minimum	0
Maximum	0
N	1

Duplicate Analysis					
S-Exp. Rate	**Dup-Exp. Rate**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Survey Location	***Gross* Exposure Rate (uR/hr)**	**Net Exposure Rate (uR/hr)**	**MDA (uR/hr)**	**DCGL Flag**	**MDA Flag**
1	5	0	13		

Survey Unit Summary

Client Name:	NOAA - GLERL
Client No.:	2005006
Task No.:	5
Job Description:	FSS for the facility
Site Location (City,State):	Muskegon, Michigan
Building Name:	Building 3
Floor No:	NA
Room ID:	303
Survey Unit No.:	SU 3311
Survey Unit MARSSIM Classification:	3
Survey Unit Dimensions (m2):	30.1
Gross Removable Alpha DCGLw (dpm/100 cm2):	0
Gross Removable Beta DCGLw (dpm/100 cm2):	370000
Gross Alpha DCGLw (dpm/100 cm2):	0
Gross Beta DCGLw (dpm/100 cm2):	3700000
Exposure Rate DCGLw (uR/hr @ 1m):	10
Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Gross Beta DCGL-EMC (dpm/100 cm2):	11000000
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	11000000

Measurement	Units	SU Mean	SU Max	$DCGL_W$ Flag	$DCGL_{EMC}$ Flag	No. Measurements	Flag
Gross alpha scan	dpm/100 cm^2	0	0			0	
Gross beta scan	dpm/100 cm^2	-831	499			42	
Stationary gross alpha	dpm/100 cm^2	0	0			0	
Stationary gross beta	dpm/100 cm^2	2746	3010			4	
Removable gross alpha	dpm/100 cm^2	0	0			0	
Removable gross beta	dpm/100 cm^2	-311	-311			1	
Exposure rate	MicroR/hr	0	0		N.A.	1	

Survey Design

		Notes
Client Name:	NOAA - GLERL	
Client No.:	2005006	
Task No.:	5	
Job Description:	FSS for the facility	
Site Location (City,State):	Muskegon, Michigan	
Building Name:	Building 3	
Floor No:	NA	
Room ID:	303	
Survey Unit No.:	SU 3311	Two individual sets of survey data collected in this room
Survey Unit MARSSIM Classification:	3	Should be 1, 2, 3, "special", or leave blank
Survey Unit Dimensions (m2):	30.1	Approximated
Percent Unaccessible (%):	0%	Carpeted walkway between Rm 304 and Rm 302.
Gross Removable Alpha DCGLw (dpm/100 cm2):	0	This calc not used in project
Gross Removable Beta DCGLw (dpm/100 cm2):	3.7E+05	MARSSIM assumption
Gross Alpha DCGLw (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGLw (dpm/100 cm2):	3.70E+06	RSP-116, Section 5.2
Exposure Rate DCGLw (uR/hr @ 1m):	10	Not specified in RSP-116, but added as a supplemental su
Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
ROCs:	C14, H3	RSP-116, Section 5.2
Scan Speed (cm/sec):	2	RSP-116, Section 5.7
Stationary Count Time (min):	1	RSP-116, Section 5.8
Smear Count Time (min):	1	RSP-116, Section 5.9
Gross alpha surface efficiency:	0.25	MARSSIM default assumption
Gross beta surface efficiency:	0.5	MARSSIM default assumption
Surveyor detection efficiency:	0.5	MARSSIM default assumption
Minimum No. of Scan Measurements:	0	100% scans not performed
Minimum No. of Stationary Measurements:	10	MARSSIM default assumption
Minimum No. of Smear Measurements:	10	MARSSIM default assumption
Minimum No. of Exposure Rate Measurements:	1	MARSSIM default assumption

Instrumentation Information

Project No.: 2005006

Survey Unit No.: SU 3311

Scans		*Notes*	
Meter Model No.:	2360		
Meter SN:	287562		
Probe Model No.:	43-93		
Probe SN:	FR283109		
Probe size (cm2):	100		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	239	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1402	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	BRT		
Stationary Measurements			
Meter Model No.:	2360		
Meter SN:	287562		
Probe Model No.:	43-93		
Probe SN:	FR283109		
Probe size (cm2):	100		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	239	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1402	Per annual instrument calibration doc - Tc99	
Date of Measurement:	03/31/15		
Data acquired by (initials):	BRT		
Applicable gross alpha material background (dpm/100 cm2)	#DIV/0!	**Surface Description:**	
Applicable gross beta material background: (dpm/100 cm2)	0	**Surface Description:**	Background included
Removable Activity Measurements			
Meter Model No.:	2929		
Meter SN:	126129		
Probe Model No.:	44-01		
Probe SN:	PR132239		
Probe size (cm2):	100	based on smear area coverage	
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	43	Start/End Shift Average	
Background Count time (min):	1	Columbia, MD office	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1383	Per annual instrument calibration doc - C14	
Date of Analysis:	04/02/15		
Data Acquired by (initials):	BRT		
Exposure Rate Measurements			
Meter Model No.:	19		
Meter SN:	300777		
Probe Model No.:	NA		
Probe SN:	NA		
Background (uR/hr @ 1m)	5	Elect/Furnace Room	
Date of Measurement:	04/01/15		
Data acquired by (initials):	BRT		

Scan Results

Project No.:	2005006
Survey Unit No.:	SU 3311
MARSSIM Class:	3
SU Area (m2):	30.1
Date of Measurement:	03/31/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		-831
Standard Deviation		475
Minimum		-1612
Maximum		499
N		42

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
1		158		-81		-1155		1667						
2		180		-59		-842		1667						
3		163		-76		-1084		1667						
4		163		-76		-1084		1667						
5		231		-8		-114		1667						
6		191		-48		-685		1667						
7		144		-95		-1355		1667						
8		238		-1		-14		1667						
9		180		-59		-842		1667						
10		171		-68		-970		1667						
11		132		-107		-1526		1667						
12		168		-71		-1013		1667						
13		199		-40		-571		1667						
14		259		20		285		1667						
15		166		-73		-1041		1667						
16		142		-97		-1384		1667						
17		176		-63		-899		1667						
18		203		-36		-514		1667						
19		179		-60		-856		1667						
20		214		-25		-357		1667						
21		189		-50		-713		1667						
22		161		-78		-1113		1667						
23		186		-53		-756		1667						
24		185		-54		-770		1667						
25		221		-18		-257		1667						
26		126		-113		-1612		1667						
27		172		-67		-956		1667						
28		168		-71		-1013		1667						
29		198		-41		-585		1667						
30		184		-55		-785		1667						
31		226		-13		-185		1667						
32		195		-44		-628		1667						
33		163		-76		-1084		1667						
34		139		-100		-1427		1667						
35		201		-38		-542		1667						
36		172		-67		-956		1667						
37		173		-66		-942		1667						
38		173		-66		-942		1667						
39		135		-104		-1484		1667						
40		126		-113		-1612		1667						
41		168		-71		-1013		1667						
42		274		35		499		1667						

Stationary Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3311
MARSSIM Class:	3
SU Area (m2):	30.1
Date of Measurement:	03/31/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data		
Parameter	**Gross Alpha (dpm/100 cm2)**	**Gross Beta (dpm/100cm2)**
Mean		2746
Standard Deviation		200
Minimum		2525
Maximum		3010
N		4

Duplicate Analysis				
S-alpha activity	**Dup-alpha activity**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**
S-beta activity	**Dup-beta activity**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**

Field ID	Net Alpha (gross counts)	Net Beta (gross counts)	Shielded Alpha (gross counts)	Shielded Beta (gross counts)	Unshielded Alpha (gross counts)	Unshielded Beta (gross counts)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Flag	Beta Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag
43		177				177		177		2525		3					
44		211				211		211		3010		3					
45		190				190		190		2710		3					
46		192				192		192		2739		3					

Removable Activity Results

Project No.:	2005006
Survey Unit No.:	SU 3311
MARSSIM Class:	3
SU Area (m2):	30
Date of acquisition:	
Smears acquired by (initials):	
Date of Measurement:	
Smears analyzed by (initials):	

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		-311
Standard Deviation		#DIV/0!
Minimum		-311
Maximum		-311
Median		-311
N		1

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Smear No.	Smear Gross Counts (alpha)	Smear Gross Counts (beta)	Smear Gross Count Rate (cpm alpha)	Smear Gross Count Rate (cpm beta)	Net Smear Count Rate (c/m alpha)	Net Smear Count Rate (c/m beta)	Alpha Activity (dpm/100 cm2 alpha)	Beta Activity (dpm/100 cm2 beta)	MDA Alpha (dpm)	MDA Beta (dpm)	DCGL Flag (alpha)	DCGL Flag (beta)
No Smears collected	in this SU				0		-43		-311		240		

Exposure Rate Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3311
MARSSIM Class:	3
SU Area (m2):	30.1
Date of Measurement:	04/01/15
Data acquired by (initials):	BRT

Statistical Evaluation of Data	
Parameter	**Exposure Rate (uR/hr)**
Mean	0
Standard Deviation	#DIV/0!
Minimum	0
Maximum	0
N	1

Duplicate Analysis					
S-Exp. Rate	**Dup-Exp. Rate**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Survey Location	**Gross Exposure Rate (uR/hr)**	**Net Exposure Rate (uR/hr)**	**MDA (uR/hr)**	**DCGL Flag**	**MDA Flag**
1	5	0	13		

Survey Unit Summary

Client Name:	NOAA - GLERL
Client No.:	2005006
Task No.:	5
Job Description:	FSS for the facility
Site Location (City,State):	Muskegon, Michigan
Building Name:	Hazmat Storage Building
Floor No:	NA
Room ID:	NA
Survey Unit No.:	SU 3313 and 3314
Survey Unit MARSSIM Classification:	2
Survey Unit Dimensions (m2):	22.9
Gross Removable Alpha DCGLw (dpm/100 cm2):	0
Gross Removable Beta DCGLw (dpm/100 cm2):	370000
Gross Alpha DCGLw (dpm/100 cm2):	0
Gross Beta DCGLw (dpm/100 cm2):	3700000
Exposure Rate DCGLw (uR/hr @ 1m):	10
Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Gross Beta DCGL-EMC (dpm/100 cm2):	11000000
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	11000000

Measurement	Units	SU Mean	SU Max	$DCGL_W$ Flag	$DCGL_{EMC}$ Flag	No. Measurements	Flag
Gross alpha scan	dpm/100 cm^2	0	0			0	
Gross beta scan	dpm/100 cm^2	-1293	295			422	
Stationary gross alpha	dpm/100 cm^2	0	0			0	
Stationary gross beta	dpm/100 cm^2	1757	2107			10	
Removable gross alpha	dpm/100 cm^2	0	0			0	
Removable gross beta	dpm/100 cm^2	22	94			10	
Exposure rate	MicroR/hr	#VALUE!	#VALUE!	#VALUE!	N.A.	1	

Survey Design

		Notes
Client Name:	NOAA - GLERL	
Client No.:	2005006	
Task No.:	5	
Job Description:	FSS for the facility	
Site Location (City,State):	Muskegon, Michigan	
Building Name:	Hazmat Storage Building	East of Building 3
Floor No:	NA	
Room ID:	NA	
Survey Unit No.:	SU 3313 and 3314	Two individual sets of survey data collected in this room
Survey Unit MARSSIM Classification:	2	Should be 1, 2, 3, "special", or leave blank
Survey Unit Dimensions (m2):	22.9	Approximated - 4 walls of shed and 3 shelves
Percent Unaccessible (%):	0%	
Gross Removable Alpha DCGLw (dpm/100 cm2):	0	This calc not used in project
Gross Removable Beta DCGLw (dpm/100 cm2):	3.7E+05	MARSSIM assumption
Gross Alpha DCGLw (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGLw (dpm/100 cm2):	3.70E+06	RSP-116, Section 5.2
Exposure Rate DCGLw (uR/hr @ 1m):	10	Not specified in RSP-116, but added as a supplemental su
Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
Scan Gross Alpha DCGL-EMC (dpm/100 cm2):	0	This value not used in this project
Scan Gross Beta DCGL-EMC (dpm/100 cm2):	1.10E+07	RSP-116, Section 5.2
ROCs:	C14, H3	RSP-116, Section 5.2
Scan Speed (cm/sec):	2	RSP-116, Section 5.7
Stationary Count Time (min):	1	RSP-116, Section 5.8
Smear Count Time (min):	1	RSP-116, Section 5.9
Gross alpha surface efficiency:	0.25	MARSSIM default assumption
Gross beta surface efficiency:	0.5	MARSSIM default assumption
Surveyor detection efficiency:	0.5	MARSSIM default assumption
Minimum No. of Scan Measurements:	0	100% scans not performed
Minimum No. of Stationary Measurements:	10	MARSSIM default assumption
Minimum No. of Smear Measurements:	10	MARSSIM default assumption
Minimum No. of Exposure Rate Measurements:	1	MARSSIM default assumption

Instrumentation Information

Project No.: 2005006

Survey Unit No.: SU 3313 and 3314

Scans		*Notes*	
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	222	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc - Tc99	
Date of Measurement:	04/01/15		
Data acquired by (initials):	SJB		
Stationary Measurements			
Meter Model No.:	2360		
Meter SN:	307127		
Probe Model No.:	43-89		
Probe SN:	RN014452		
Probe size (cm2):	125		
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	222	Start/End Shift Average	
Background count time (min):	1	Elect/Furnace Room	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.119	Per annual instrument calibration doc - Tc99	
Date of Measurement:	04/01/15		
Data acquired by (initials):	SJB		
Applicable gross alpha material background (dpm/100 cm2)	#DIV/0!	**Surface Description:**	
Applicable gross beta material background: (dpm/100 cm2)	0	**Surface Description:**	Background included
Removable Activity Measurements			
Meter Model No.:	2929		
Meter SN:	126129		
Probe Model No.:	44-01		
Probe SN:	PR132239		
Probe size (cm2):	100	based on smear area coverage	
Applicable gross alpha background (cpm):	NA		
Applicable gross beta background (cpm):	43	Start/End Shift Average	
Background Count time (min):	1	Columbia, MD office	
Gross alpha instrument efficiency (c/d):	NA		
Gross beta instrument efficiency (c/d):	0.1383	Per annual instrument calibration doc - C14	
Date of Analysis:	04/02/15		
Data Acquired by (initials):	SJB		
Exposure Rate Measurements		***Not Collected in this SU***	
Meter Model No.:			
Meter SN:			
Probe Model No.:			
Probe SN:			
Background (uR/hr @ 1m)		Elect/Furnace Room	
Date of Measurement:			
Data acquired by (initials):			

Scan Results

Project No.:	2005006
Survey Unit No.:	SU 3313 and 3314
MARSSIM Class:	2
SU Area (m2):	22.9
Date of Measurement:	04/01/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	**Gross Alpha (dpm/100 cm2)**	**Gross Beta (dpm/100cm2)**
Mean		-1293
Standard Deviation		381
Minimum		-2309
Maximum		295
N		422

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
3313 - 1		157		-65		-872		1512						
2		137		-85		-1141		1512						
3		107		-115		-1544		1512						
4		147		-75		-1007		1512						
5		129		-93		-1248		1512						
6		151		-71		-953		1512						
7		144		-78		-1047		1512						
8		107		-115		-1544		1512						
9		135		-87		-1168		1512						
10		109		-113		-1517		1512						
11		92		-130		-1745		1512						
12		118		-104		-1396		1512						
13		125		-97		-1302		1512						
14		125		-97		-1302		1512						
15		160		-62		-832		1512						
16		141		-81		-1087		1512						
17		129		-93		-1248		1512						
18		124		-98		-1315		1512						
19		131		-91		-1221		1512						
20		125		-97		-1302		1512						
21		133		-89		-1195		1512						
22		80		-142		-1906		1512						
23		164		-58		-779		1512						
24		112		-110		-1477		1512						
25		133		-89		-1195		1512						
26		117		-105		-1409		1512						
27		160		-62		-832		1512						
28		114		-108		-1450		1512						
29		95		-127		-1705		1512						
30		129		-93		-1248		1512						
31		96		-126		-1691		1512						
32		87		-135		-1812		1512						
33		92		-130		-1745		1512						
34		101		-121		-1624		1512						
35		105		-117		-1570		1512						
36		118		-104		-1396		1512						
37		152		-70		-940		1512						
38		133		-89		-1195		1512						
39		119		-103		-1383		1512						
40		131		-91		-1221		1512						
41		128		-94		-1262		1512						
42		140		-82		-1101		1512						
43		165		-57		-765		1512						
44		95		-127		-1705		1512						
45		144		-78		-1047		1512						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
46		150		-72		-966		1512						
47		138		-84		-1128		1512						
48		116		-106		-1423		1512						
49		88		-134		-1799		1512						
50		91		-131		-1758		1512						
51		163		-59		-792		1512						
52		155		-67		-899		1512						
53		167		-55		-738		1512						
54		139		-83		-1114		1512						
55		115		-107		-1436		1512						
56		113		-109		-1463		1512						
57		150		-72		-966		1512						
58		161		-61		-819		1512						
59		151		-71		-953		1512						
60		195		-27		-362		1512						
61		103		-119		-1597		1512						
62		65		-157		-2107		1512						
63		95		-127		-1705		1512						
64		165		-57		-765		1512						
65		157		-65		-872		1512						
66		153		-69		-926		1512						
67		137		-85		-1141		1512						
68		121		-101		-1356		1512						
69		126		-96		-1289		1512						
70		154		-68		-913		1512						
71		183		-39		-523		1512						
72		156		-66		-886		1512						
73		143		-79		-1060		1512						
74		150		-72		-966		1512						
75		116		-106		-1423		1512						
76		121		-101		-1356		1512						
77		128		-94		-1262		1512						
78		159		-63		-846		1512						
79		119		-103		-1383		1512						
80		93		-129		-1732		1512						
81		139		-83		-1114		1512						
82		134		-88		-1181		1512						
83		118		-104		-1396		1512						
84		129		-93		-1248		1512						
85		123		-99		-1329		1512						
86		102		-120		-1611		1512						
87		96		-126		-1691		1512						
88		82		-140		-1879		1512						
3314 - 1		101		-121		-1624		1512						
2		117		-105		-1409		1512						
3		81		-141		-1893		1512						
4		101		-121		-1624		1512						
5		158		-64		-859		1512						
6		126		-96		-1289		1512						
7		143		-79		-1060		1512						
8		81		-141		-1893		1512						
9		83		-139		-1866		1512						
10		137		-85		-1141		1512						
11		143		-79		-1060		1512						
12		105		-117		-1570		1512						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
13		138		-84		-1128		1512						
14		119		-103		-1383		1512						
15		112		-110		-1477		1512						
16		123		-99		-1329		1512						
17		77		-145		-1946		1512						
18		69		-153		-2054		1512						
19		100		-122		-1638		1512						
20		144		-78		-1047		1512						
21		79		-143		-1919		1512						
22		126		-96		-1289		1512						
23		119		-103		-1383		1512						
24		166		-56		-752		1512						
25		106		-116		-1557		1512						
26		179		-43		-577		1512						
27		120		-102		-1369		1512						
28		154		-68		-913		1512						
29		132		-90		-1208		1512						
30		120		-102		-1369		1512						
31		128		-94		-1262		1512						
32		158		-64		-859		1512						
33		189		-33		-443		1512						
34		119		-103		-1383		1512						
35		140		-82		-1101		1512						
36		112		-110		-1477		1512						
37		113		-109		-1463		1512						
38		142		-80		-1074		1512						
39		147		-75		-1007		1512						
40		131		-91		-1221		1512						
41		96		-126		-1691		1512						
42		106		-116		-1557		1512						
43		172		-50		-671		1512						
44		107		-115		-1544		1512						
45		105		-117		-1570		1512						
46		111		-111		-1490		1512						
47		187		-35		-470		1512						
48		107		-115		-1544		1512						
49		100		-122		-1638		1512						
50		110		-112		-1503		1512						
51		161		-61		-819		1512						
52		130		-92		-1235		1512						
53		191		-31		-416		1512						
54		119		-103		-1383		1512						
55		86		-136		-1826		1512						
56		95		-127		-1705		1512						
57		99		-123		-1651		1512						
58		124		-98		-1315		1512						
59		124		-98		-1315		1512						
60		70		-152		-2040		1512						
61		57		-165		-2215		1512						
62		50		-172		-2309		1512						
63		128		-94		-1262		1512						
64		124		-98		-1315		1512						
65		88		-134		-1799		1512						
66		130		-92		-1235		1512						
67		81		-141		-1893		1512						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
68		134		-88		-1181		1512						
69		119		-103		-1383		1512						
70		162		-60		-805		1512						
71		143		-79		-1060		1512						
72		119		-103		-1383		1512						
73		125		-97		-1302		1512						
74		121		-101		-1356		1512						
75		115		-107		-1436		1512						
76		87		-135		-1812		1512						
77		122		-100		-1342		1512						
78		130		-92		-1235		1512						
79		123		-99		-1329		1512						
80		131		-91		-1221		1512						
81		122		-100		-1342		1512						
82		139		-83		-1114		1512						
83		131		-91		-1221		1512						
84		121		-101		-1356		1512						
85		137		-85		-1141		1512						
86		112		-110		-1477		1512						
87		143		-79		-1060		1512						
88		113		-109		-1463		1512						
89		98		-124		-1664		1512						
90		121		-101		-1356		1512						
91		129		-93		-1248		1512						
92		136		-86		-1154		1512						
93		82		-140		-1879		1512						
94		78		-144		-1933		1512						
95		127		-95		-1275		1512						
96		103		-119		-1597		1512						
97		80		-142		-1906		1512						
98		138		-84		-1128		1512						
99		116		-106		-1423		1512						
100		180		-42		-564		1512						
101		156		-66		-886		1512						
102		135		-87		-1168		1512						
103		123		-99		-1329		1512						
104		119		-103		-1383		1512						
105		147		-75		-1007		1512						
106		140		-82		-1101		1512						
107		123		-99		-1329		1512						
108		170		-52		-698		1512						
109		125		-97		-1302		1512						
110		100		-122		-1638		1512						
111		147		-75		-1007		1512						
112		150		-72		-966		1512						
113		173		-49		-658		1512						
114		124		-98		-1315		1512						
115		116		-106		-1423		1512						
116		133		-89		-1195		1512						
117		159		-63		-846		1512						
118		126		-96		-1289		1512						
119		131		-91		-1221		1512						
120		138		-84		-1128		1512						
121		123		-99		-1329		1512						
122		110		-112		-1503		1512						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
123		125		-97		-1302		1512						
124		141		-81		-1087		1512						
125		112		-110		-1477		1512						
126		129		-93		-1248		1512						
127		191		-31		-416		1512						
128		199		-23		-309		1512						
129		178		-44		-591		1512						
130		103		-119		-1597		1512						
131		114		-108		-1450		1512						
132		144		-78		-1047		1512						
133		76		-146		-1960		1512						
134		168		-54		-725		1512						
135		149		-73		-980		1512						
136		110		-112		-1503		1512						
137		153		-69		-926		1512						
138		131		-91		-1221		1512						
139		136		-86		-1154		1512						
140		92		-130		-1745		1512						
141		86		-136		-1826		1512						
142		94		-128		-1718		1512						
143		134		-88		-1181		1512						
144		106		-116		-1557		1512						
145		136		-86		-1154		1512						
146		92		-130		-1745		1512						
147		150		-72		-966		1512						
148		134		-88		-1181		1512						
149		134		-88		-1181		1512						
150		93		-129		-1732		1512						
151		120		-102		-1369		1512						
152		182		-40		-537		1512						
153		177		-45		-604		1512						
154		138		-84		-1128		1512						
155		121		-101		-1356		1512						
156		85		-137		-1839		1512						
157		116		-106		-1423		1512						
158		80		-142		-1906		1512						
159		127		-95		-1275		1512						
160		244		22		295		1512						
161		170		-52		-698		1512						
162		150		-72		-966		1512						
163		127		-95		-1275		1512						
164		128		-94		-1262		1512						
165		125		-97		-1302		1512						
166		141		-81		-1087		1512						
167		116		-106		-1423		1512						
168		110		-112		-1503		1512						
169		128		-94		-1262		1512						
170		167		-55		-738		1512						
171		145		-77		-1034		1512						
172		112		-110		-1477		1512						
173		86		-136		-1826		1512						
174		138		-84		-1128		1512						
175		192		-30		-403		1512						
176		156		-66		-886		1512						
177		156		-66		-886		1512						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
178		153		-69		-926		1512						
179		116		-106		-1423		1512						
180		103		-119		-1597		1512						
181		103		-119		-1597		1512						
182		104		-118		-1584		1512						
183		154		-68		-913		1512						
184		144		-78		-1047		1512						
185		84		-138		-1852		1512						
186		125		-97		-1302		1512						
187		51		-171		-2295		1512						
188		129		-93		-1248		1512						
189		142		-80		-1074		1512						
190		116		-106		-1423		1512						
191		141		-81		-1087		1512						
192		134		-88		-1181		1512						
193		105		-117		-1570		1512						
194		127		-95		-1275		1512						
195		96		-126		-1691		1512						
196		82		-140		-1879		1512						
197		132		-90		-1208		1512						
198		143		-79		-1060		1512						
199		148		-74		-993		1512						
200		154		-68		-913		1512						
201		150		-72		-966		1512						
202		168		-54		-725		1512						
203		144		-78		-1047		1512						
204		128		-94		-1262		1512						
205		150		-72		-966		1512						
206		115		-107		-1436		1512						
207		164		-58		-779		1512						
208		176		-46		-617		1512						
209		172		-50		-671		1512						
210		106		-116		-1557		1512						
211		102		-120		-1611		1512						
212		83		-139		-1866		1512						
213		106		-116		-1557		1512						
214		102		-120		-1611		1512						
215		86		-136		-1826		1512						
216		106		-116		-1557		1512						
217		133		-89		-1195		1512						
218		128		-94		-1262		1512						
219		146		-76		-1020		1512						
220		192		-30		-403		1512						
221		183		-39		-523		1512						
222		159		-63		-846		1512						
223		116		-106		-1423		1512						
224		194		-28		-376		1512						
225		147		-75		-1007		1512						
226		108		-114		-1530		1512						
227		100		-122		-1638		1512						
228		116		-106		-1423		1512						
229		124		-98		-1315		1512						
230		133		-89		-1195		1512						
231		167		-55		-738		1512						
232		124		-98		-1315		1512						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
233		84		-138		-1852		1512						
234		106		-116		-1557		1512						
235		98		-124		-1664		1512						
236		187		-35		-470		1512						
237		154		-68		-913		1512						
238		156		-66		-886		1512						
239		130		-92		-1235		1512						
240		93		-129		-1732		1512						
241		137		-85		-1141		1512						
242		76		-146		-1960		1512						
243		103		-119		-1597		1512						
244		132		-90		-1208		1512						
245		121		-101		-1356		1512						
246		117		-105		-1409		1512						
247		98		-124		-1664		1512						
248		93		-129		-1732		1512						
249		98		-124		-1664		1512						
250		77		-145		-1946		1512						
251		158		-64		-859		1512						
252		122		-100		-1342		1512						
253		93		-129		-1732		1512						
254		129		-93		-1248		1512						
255		122		-100		-1342		1512						
256		107		-115		-1544		1512						
257		103		-119		-1597		1512						
258		154		-68		-913		1512						
259		178		-44		-591		1512						
260		150		-72		-966		1512						
261		97		-125		-1678		1512						
262		101		-121		-1624		1512						
263		124		-98		-1315		1512						
264		99		-123		-1651		1512						
265		105		-117		-1570		1512						
266		83		-139		-1866		1512						
267		89		-133		-1785		1512						
268		167		-55		-738		1512						
269		116		-106		-1423		1512						
270		84		-138		-1852		1512						
271		99		-123		-1651		1512						
272		124		-98		-1315		1512						
273		123		-99		-1329		1512						
274		115		-107		-1436		1512						
275		144		-78		-1047		1512						
276		148		-74		-993		1512						
277		114		-108		-1450		1512						
278		137		-85		-1141		1512						
279		143		-79		-1060		1512						
280		116		-106		-1423		1512						
281		117		-105		-1409		1512						
282		87		-135		-1812		1512						
283		150		-72		-966		1512						
284		130		-92		-1235		1512						
285		106		-116		-1557		1512						
286		102		-120		-1611		1512						
287		114		-108		-1450		1512						

Field ID	Alpha (cpm gross)	Beta (cpm gross)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Activity Flag	Beta Activity Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
288		86		-136		-1826		1512						
289		98		-124		-1664		1512						
290		95		-127		-1705		1512						
291		92		-130		-1745		1512						
292		120		-102		-1369		1512						
293		61		-161		-2161		1512						
294		81		-141		-1893		1512						
295		103		-119		-1597		1512						
296		143		-79		-1060		1512						
297		136		-86		-1154		1512						
298		98		-124		-1664		1512						
299		107		-115		-1544		1512						
300		128		-94		-1262		1512						
301		175		-47		-631		1512						
302		105		-117		-1570		1512						
303		180		-42		-564		1512						
304		145		-77		-1034		1512						
305		151		-71		-953		1512						
306		120		-102		-1369		1512						
307		96		-126		-1691		1512						
308		117		-105		-1409		1512						
309		95		-127		-1705		1512						
310		83		-139		-1866		1512						
311		123		-99		-1329		1512						
312		140		-82		-1101		1512						
313		139		-83		-1114		1512						
314		150		-72		-966		1512						
315		142		-80		-1074		1512						
316		117		-105		-1409		1512						
317		90		-132		-1772		1512						
318		93		-129		-1732		1512						
319		136		-86		-1154		1512						
320		184		-38		-510		1512						
321		127		-95		-1275		1512						
322		107		-115		-1544		1512						
323		123		-99		-1329		1512						
324		114		-108		-1450		1512						
325		118		-104		-1396		1512						
326		111		-111		-1490		1512						
327		120		-102		-1369		1512						
328		146		-76		-1020		1512						
329		124		-98		-1315		1512						
330		196		-26		-349		1512						
331		143		-79		-1060		1512						
332		174		-48		-644		1512						
333		106		-116		-1557		1512						
334		124		-98		-1315		1512						

Note: SU 3313 scan data cut short due to instrument manfunction. Instrument re-set and scanning continued under header SU 3314

Stationary Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3313 and 3314
MARSSIM Class:	2
SU Area (m2):	22.9
Date of Measurement:	04/01/15
Data acquired by (initials):	SJB

Statistical Evaluation of Data		
Parameter	**Gross Alpha (dpm/100 cm2)**	**Gross Beta (dpm/100cm2)**
Mean		1757
Standard Deviation		201
Minimum		1436
Maximum		2107
N		10

Duplicate Analysis					
S-alpha activity	**Dup-alpha activity**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**
S-beta activity	**Dup-beta activity**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Field ID	Net Alpha (gross counts)	Net Beta (gross counts)	Shielded Alpha (gross counts)	Shielded Beta (gross counts)	Unshielded Alpha (gross counts)	Unshielded Beta (gross counts)	Alpha (cpm net)	Beta (cpm net)	Alpha Activity (dpm/100 cm2)	Beta Activity (dpm/100 cm2)	Alpha MDA (dpm/100 cm2)	Beta MDA (dpm/100 cm2)	Alpha Flag	Beta Flag	Alpha EMC Flag	Beta EMC Flag	Alpha MDA Flag	Beta MDA Flag
3314 - 335		146				146		146		1960		3						
336		135				135		135		1812		3						
337		137				137		137		1839		3						
338		131				131		131		1758		3						
339		157				157		157		2107		3						
340		130				130		130		1745		3						
341		109				109		109		1463		3						
342		128				128		128		1718		3						
343		107				107		107		1436		3						
344		129				129		129		1732		3						

Removable Activity Results

Project No.:	2005006
Survey Unit No.:	SU 3313 and 3314
MARSSIM Class:	2
SU Area (m2):	23
Date of acquisition:	4/1/15
Smears acquired by (initials):	SJB
Date of Measurement:	04/02/15
Smears analyzed by (initials):	SJB

Statistical Evaluation of Data		
Parameter	Gross Alpha (dpm/100 cm2)	Gross Beta (dpm/100cm2)
Mean		22
Standard Deviation		58
Minimum		-58
Maximum		94
Median		18
N		10

Duplicate Analysis					
S-alpha activity	Dup-alpha activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis
S-beta activity	Dup-beta activity	RPD	RPD>100% (y=1)	Result>BKG (y=1)	Duplicate Analysis

Field ID	Smear No.	Smear Gross Counts (alpha)	Smear Gross Counts (beta)	Smear Gross Count Rate (cpm alpha)	Smear Gross Count Rate (cpm beta)	Net Smear Count Rate (c/m alpha)	Net Smear Count Rate (c/m beta)	Alpha Activity (dpm/100 cm2 alpha)	Beta Activity (dpm/100 cm2 beta)	MDA Alpha (dpm)	MDA Beta (dpm)	DCGL Flag (alpha)	DCGL Flag (beta)
3314	1		55		55		12		87		240		
3314	2		37		37		-6		-43		240		
3314	3		53		53		10		72		240		
3314	4		46		46		3		22		240		
3314	5		45		45		2		14		240		
3314	6		35		35		-8		-58		240		
3314	7		53		53		10		72		240		
3314	8		56		56		13		94		240		
3314	9		43		43		0		0		240		
3314	10		37		37		-6		-43		240		

Exposure Rate Measurement Results

Project No.:	2005006
Survey Unit No.:	SU 3313 and 3314
MARSSIM Class:	2
SU Area (m2):	22.9
Date of Measurement:	01/00/00
Data acquired by (initials):	

Statistical Evaluation of Data	
Parameter	**Exposure Rate (uR/hr)**
Mean	#VALUE!
Standard Deviation	#VALUE!
Minimum	#VALUE!
Maximum	#VALUE!
N	1

Duplicate Analysis					
S-Exp. Rate	**Dup-Exp. Rate**	**RPD**	**RPD>100% (y=1)**	**Result>BKG (y=1)**	**Duplicate Analysis**

Survey Location	**Gross Exposure Rate (uR/hr)**	**Net Exposure Rate (uR/hr)**	**MDA (uR/hr)**	**DCGL Flag**	**MDA Flag**
Not collected	NA	#VALUE!	3	#VALUE!	

Appendix 10.7 - Certificates of Analysis

RSO,Inc.

Radiation Service Organization

April 9, 2015

Carol Berger
IEM
975 Russell Ave Suite A
Gaitherburg, MD 20879

240-246-0694

Re: Sample Analysis Results

Dear Ms. Berger:

RSO, Inc. Analytical Laboratory received urine bioassay and wipe tests samples for radioactivity analysis as described in your letter of request or chain of custody.

Samples were analyzed using a Packard Tri-Carb Model 3100 S/N 424558 liquid scintillation counter that was calibrated using H-3 and C-14 NIST traceable standards.

Thank-you for the opportunity to be of service.

Sincerely,

Paul Madairy, HP
RSO, Inc.

RSO,Inc.

Radiation Service Organization

RSO, Inc.
Laboratory
5204 Minnick Road
Laurel, MD 20707
Phone - (301) 953-2482 Fax - (301) 498-3017

Client: IEM,Inc.
Address: 975 Russell Ave,Suite A
Gaithersburg,MD 20879

Contact: Carol Berger
Phone: 240-246-0694

Sample Radioanalytical Report

Lab Work Order # 2015-247

Date Received: 04/03/15 Analysis Date: 04/03/15 Report Date: 04/09/15

			Liquid Scintillation Counting					
			0 - 12 keV		12 - 156 keV		156 - 2000 keV	
	Background Sample Count-Rate		13 cpm		12 cpm		13 cpm	
	Nominal Efficiency (cpm/dpm)		H-3 45%		C-14 85%		HighE Beta 90%	
	Estimated MDA		50 dpm		50 dpm		50 dpm	
Sample #	Description	Sample Date	Net (cpm)	(dpm)	Net (cpm)	(dpm)	Net (cpm)	(dpm)
1	Wipe Test	03/31/15	3	3	7	8	0	0
2	Wipe Test	04/01/15	3	5	2	1	1	1
3	Wipe Test	04/01/15	10	19	2	1	2	2
4	Wipe Test	04/01/15	25	46	9	5	11	13
5	Wipe Test	04/01/15	16	29	3	0	6	7
6	Wipe Test	04/01/15	13	24	3	1	3	4
7	Wipe Test	04/01/15	9	15	9	9	5	6
8	Wipe Test	04/01/15	16	30	5	3	1	1
9	Wipe Test	04/01/15	25	46	8	5	7	8
10	Wipe Test	04/01/15	29	55	9	4	12	15
				<MDA		<MDA		<MDA

Prepared by: Paul Madairy

Signature: Paul Madairy
Senior Health Physicist

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Reference No. _____
Page 1/2 of 2

(1) Client Name: Integrated Environmental Management, Inc.	(7) Samples Shipment Date 4/1/2015	(5) Bill to: IEM
(2) Sample Team Leader Bill Thomas	(8) Lab Destination RSO, Inc	Cathryn Chang 443 319 8066 x 112
(3) Task No. 2005006.05	(9) Lab Contact Steve McDaniel	
(4) Project Manager Bill Thomas	(12) Technical Contact/Phone Bill Thomas	(10) Report to: IEM Bill Thomas
(6) Purchase Order No. IEM 14005002	(13) Carrier/Waybill No. Fedex	brthomas@iem-inc.com
(11) Required Report Date 4/30/2015		(419) 423 4701

ONE CONTAINER PER LINE

(14) Sample Number	(15) Sample Description/Type	(16) Date/Time Collected	(17) Container Type	(18) Sample Volume	(19) Preservative	(20) Requested Testing Program
01	RV Lauderdale	3/31/2015	VIAL	smear	None	LSC H3+C14
02	Rm 305	4/1/2015				H3+C14
03	Rm 305	4/1/2015				H3+C14
04	Rm 304	4/1/2015				H3+C14
05	Rm 304	4/1/2015				H3+C14
06	Hood	4/1/2015				

(23) Special Instructions

(24) Possible Hazard Identification (circle): Non-hazard Flammable Skin Irritant Poison B Unknown	(25) Sample Disposal (circle): Return to Client Disposal by Lab Archive _____ months
(26) Turnaround Time Required (circle): Normal Rush	(27) QC Level (circle): I II III Project Specific _____
(28) Relinquished by: (signature, date, time): BR Thomas 4/1/2015 1330 hrs	Received by: (signature, date, time) [signature] 4/3/2015 1100 hrs.
Relinquished by: (signature, date, time):	Received by: (signature, date, time)
Relinquished by: (signature, date, time):	Received by: (signature, date, time)

(See Reverse for Instructions)

INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.
ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Reference No. _____

Page 1 of 2

(1) Client Name: Integrated Environmental Management, Inc.	(7) Samples Shipment Date 4/1/2015	(5) Bill to: IEM
(2) Sample Team Leader Bill Thomas	(8) Lab Destination RSO, INC	Cathryn Chang 443 319 8066 x 112
(3) Task No. 2005006.05	(9) Lab Contact Steve McDaniel	
(4) Project Manager Bill Thomas	(12) Technical Contact/Phone Bill Thomas	(10) Report to: IEM Bill Thomas
(6) Purchase Order No. IEM 14005002	(13) Carrier/Waybill No. Fedex	br thomas @ iem-inc.com
(11) Required Report Date 4/30/2015		(419) 423 4701

ONE CONTAINER PER LINE

(14) Sample Number	(15) Sample Description/Type	(16) Date/Time Collected	(17) Container Type	(18) Sample Volume	(19) Preservative	(20) Requested Testing Program
07	Rm 302	4/1/2015	VIAL	Smear	None	LSC H3+C14
08	Rm 302	4/1/2015	↓	↓	↓	H3+C14
09	Bay Area	4/1/2015	↓	↓	↓	H3+C14
10	Waste Storage	4/1/2015	↓	↓	↓	H3+C14
/	/	/	/	/	/	/
/	/	/	/	/	/	/

(23) Special Instructions

(24) Possible Hazard Identification (circle):
Non-hazard Flammable Skin Irritant Poison B Unknown

(25) Sample Disposal (circle):
Return to Client Disposal by Lab Archive _____ months

(26) Turnaround Time Required (circle):
Normal Rush

(27) QC Level (circle):
I II III Project Specific _____

(28) Relinquished by: (signature, date, time): BR Thomas 4/1/2015 1330 hrs

Received by: (signature, date, time) [signature] 4/3/2015 1100 hrs

Relinquished by: (signature, date, time):

Received by: (signature, date, time)

Relinquished by: (signature, date, time):

Received by: (signature, date, time)

(See Reverse for Instructions)

Appendix 10.8 - Representative Photographs

REPRESENTATIVE PHOTOS

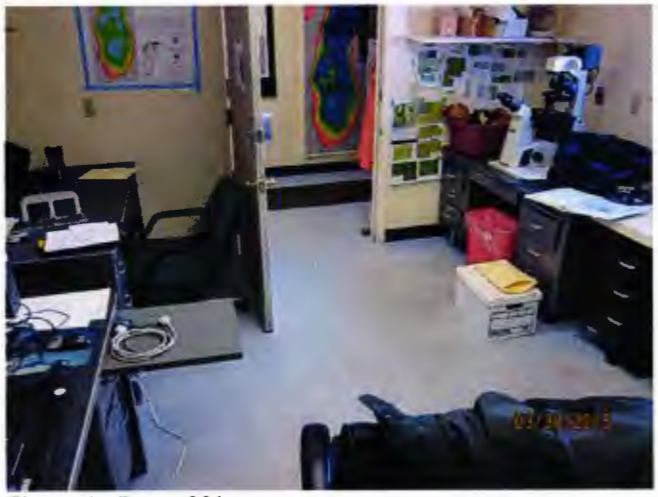


Figure 1 - Room 301

Figure 2 - Room 302

Figure 3 - Room 304 Hood

Figure 4 - Room 304

Figure 5 - Room 305

Figure 6 - Bay Area

Figure 7 - Building 3

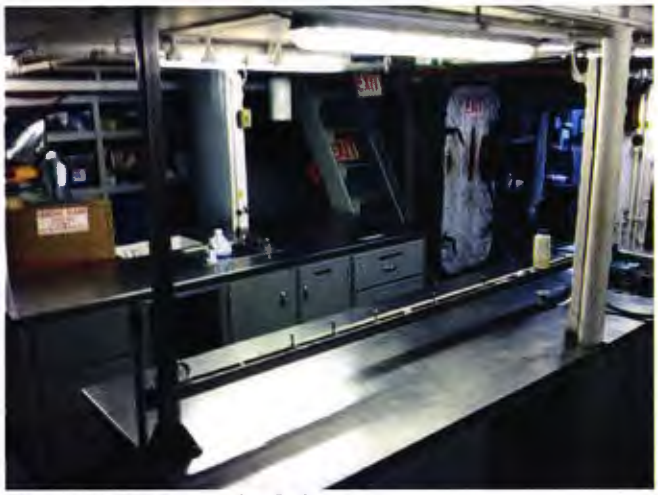


Figure 8 - RV Laurentian Laboratory

This report was prepared under the direction of the RSO for
Great Lakes Environmental Research Laboratory

by

David R. Kindig, P.E.
Senior Program Manager
BMT Designers & Planners Inc
4401 Ford Ave, Suite 1000
Alexandria, VA, 22302
(703) 920-7070 (x204)

Billy R. Thomas, CHP, CIH
Integrated Environmental Management, Inc., a Plexus Company
3124 Saddlebrook Drive, Suite 1508
Findlay, Ohio 45840
(419) 423-4701
BRThomas@IEM-Inc.com

http://www.iem-inc.com

UPS CampusShip: View/Print Label

1. **Ensure there are no other shipping or tracking labels attached to your package.** Select the Print button on the print dialog box that appears. Note: If your browser does not support this function select Print from the File menu to print the label.

2. **Fold the printed label at the solid line below.** Place the label in a UPS Shipping Pouch. If you do not have a pouch, affix the folded label using clear plastic shipping tape over the entire label.

3. **GETTING YOUR SHIPMENT TO UPS**
   UPS locations include the UPS Store®, UPS drop boxes, UPS customer centers, authorized retail outlets and UPS drivers.
   Schedule a same day or future day Pickup to have a UPS driver pickup all your CampusShip packages.
   Hand the package to any UPS driver in your area.
   Take your package to any location of The UPS Store®, UPS Drop Box, UPS Customer Center, UPS Alliances (Office Depot® or Staples®) or Authorized Shipping Outlet near you. Items sent via UPS Return Services(SM) (including via Ground) are also accepted at Drop Boxes. To find the location nearest you, please visit the Resources area of CampusShip and select UPS Locations.

   Customers with a Daily Pickup
   Your driver will pickup your shipment(s) as usual.

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