



GE Healthcare

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Princeton, NJ 08540  
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29 March 2010

Toye L. Simmons  
U.S. Nuclear Regulatory Commission – Region III  
Materials Licensing Branch  
2443 Warrenville Road, Suite 210  
Lisle, IL 60532-4352

RE: U.S. Nuclear Regulatory Commission Materials License No. 21-24828-01MD

Toye L. Simmons:

Please allow this letter to serve as notice that Medi-Physics, Inc., dba GE Healthcare has completed the Close Out surveys of the licensed address listed below.

Medi Physics, Inc.  
Dba GE Healthcare  
13321 Stark Road,  
Livonia, MI 48150

The address listed above has undergone a decommissioning process following the relocation and as stated in a previous letter to the department this document shall serve as a request to remove this address from the license referenced above.

Should you have any additional questions, please feel free to contact myself at 609-514-6647 or the Facility Manager, Jill Twehues, R.Ph at 734-425-0425.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Richard A. Hughes', written over a large, light blue circular scribble.

Richard A. Hughes  
Corporate Radiation Safety Officer

RECEIVED MAR 30 2010

# Radiological Decontamination and Decommissioning Report

Prepared for:



GE Healthcare

GE Healthcare-Medi-Physics Inc.  
13321 Stark Rd.  
Livonia, Michigan 48150

U.S Nuclear Regulatory Commission Radioactive Materials License  
Number 21-24828-01MD

Survey Dates: March 1, 2010 - March 3, 2010

Prepared by:




Philotechnics, Ltd.  
201 Renovare Blvd.  
Oak Ridge, Tn 37830

Written: \_\_\_\_\_

  
Tim Pratt

*Health Physics Operations Technical Manager  
Philotechnics, Ltd.*

Approved: \_\_\_\_\_

  
Rick Hughes

*Corporate Radiation Safety Officer  
GE Healthcare*

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## 1.0 Executive Summary

This report documents the final status survey of the GE Healthcare nuclear pharmacy facility located at 13321 Stark Road in Livonia, MI. GE Healthcare contracted Philotechnics Ltd. to perform final status surveys at the facility in support of the decommissioning. The final status surveys were designed and performed using the guidance provided in NUREG 1757, "Consolidated Nuclear Materials Safety and Safeguards (NMSS) Decommissioning Guidance" Volumes 1-3, NUREG 1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM) and NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions."

The project was performed from March 1st thru March 3rd, 2010 under Philotechnics Massachusetts Radioactive Materials License #56-0543 via reciprocity. Licensed radiopharmaceutical operations were discontinued at the Livonia facility on February 22, 2010.

The decontamination process and the utilization of these administrative limits also comply with the facility's radioactive material license conditions. A review of all data collection and analysis supports our professional opinion that building structural surfaces and associated facility systems included in the scope of this report meet the criteria for unrestricted release and removal of the specified areas from the Licensee's radioactive materials license pursuant to the U.S Nuclear Regulatory Commission guidelines for unrestricted release.

- *All final scanning and static measurements were below the release limits of  $3.25E5$  (Beta) and  $3.00E5$  (Gamma) dpm/100 cm<sup>2</sup>.*
- *All final beta and gamma removable surface contamination measurements for all areas were less than the administrative limit of 200 dpm/100cm<sup>2</sup>.*
- *External exposure rate measurements were below the reference background values of 8 – 10 microrem per hour ( $\mu\text{rem/hr}$ ) for all survey locations.*
- *The total effective exposure equivalent (TEDE) from any potential radioactive materials in the restricted and unrestricted areas is calculated to 0.28 mrem/year based upon the total maximum detectable concentrations of <sup>89</sup>Sr and <sup>131</sup>I uniformly dispersed*

### ***Exposure Modeling Results***

The resultant modeled exposure from residual activity was calculated utilizing the survey results and NRC-approved DandD Version 2.1 software. The Default Screening Values determined by DandD software for the most limiting nuclides of concern are presented in Table 4.1 of this report

The calculated maximum detectable activity for beta static activity based on survey results is 800 dpm/100 cm<sup>2</sup> and 12,274 dpm/100 cm<sup>2</sup> for gamma. The resultant exposure model from these maximum total activities for beta and gamma contributions is 0.28 mrem/year, detailed as follows:

Beta contribution:

$$800 \text{ dpm}/100 \text{ cm}^2 / 1.3\text{E}+06 \text{ dpm}/100 \text{ cm}^2 \times 25 \text{ mrem}/\text{year} = .02 \text{ mrem}/\text{year}$$

Gamma contribution:

$$12,274 \text{ dpm}/100\text{cm}^2 / 1.2\text{E}+06 \text{ dpm}/100\text{cm}^2 \times 25 \text{ mrem}/\text{year} = 0.26 \text{ mrem}/\text{year}$$

$$\text{Total} = 0.02 + 0.26 = 0.28 \text{ mrem}/\text{year}$$

Therefore, the maximum-modeled exposure due to exposure from residual activity associated with the facility's licensed operations is 0.28 mrem/year.

## **2.0 Project Scope, Findings and Summary**

In accordance with our agreement with GE Healthcare, Philotechnics performed a radiological decommissioning of the entire facility. This report provides pertinent information for the radiological decommissioning.

The U.S Nuclear Regulatory Commission requires that the licensee submit documentation of removal of all radioactive materials prior to the release of facilities for unrestricted use. This document provides the licensee with appropriate information to submit a request for removal of 13321 Stark Road Livonia, MI, 48150 from their current license with the U.S Nuclear Regulatory Commission Materials Program.

The Livonia facility consists of approximately 6,400 ft<sup>2</sup> of occupied space located in an industrial business park 18 miles west of Detroit. Processing activities involving the use of radioactive materials were performed in specific areas within the restricted area of the facility. Approximately 3,750 ft<sup>2</sup> comprise the restricted area of the facility.

The site had a variety of radioactive materials present prior to the final status survey in the form of dry active waste (DAW). Materials from the restricted area were surveyed for total and removable radioactive contamination prior to removal from the restricted area.

The DAW packages were inspected to ensure the containers were undamaged, packaged and labeled prior to shipment. All radioactive materials were removed from the Livonia facility prior to the decommissioning surveys begun on March 1, 2010.

After the DAW shipment was completed and materials removed from the facility, Philotechnics, Ltd. personnel performed a final status survey of the Livonia facility from March 1st – March 3rd, 2010. The purpose of the survey was to make certain residual radioactivity was not present above the release criteria, such that the facility is suitable for return to the building owner. The survey was performed by Tim Pratt and Justin Button under the general direction of Glenn Marshall, a Certified Health Physicist (CHP) of Philotechnics, Ltd. Oversight of the project was provided by Emile Poisson, Pharmacy Regulatory Assurance Specialist, and Rick Hughes, Corporate Radiation Safety Officer of Americas Nuclear Pharmacies for GE Healthcare.

The following summarizes the independent conclusions representing Philotechnics' best professional judgment based on information and data available to us during the course of this assignment. Factual information regarding operations, conditions and test data provided by GE Healthcare the owner or their representative have been assumed correct and complete based upon careful and diligent review of the safety program and past inspection records. Additionally, the conclusions presented are based on the conditions that existed at the time of the assessment. Note that on-site observation of the above referenced facilities consisted of readily visible, accessible areas only.

Table 2.1: Assessment Review

Assessment Component	Acceptable	Unacceptable	Section
License Review & Historical Use	X		3.0
<b><i>Radiation Surveys</i></b>			
A) Static Measurements – Hand-held instruments	X		5.0
B) Removable Contamination Measurements – Ludlum 2200 (gamma)& Protean ASC (beta)	X		5.0
C) Scanning Measurements – Hand-held instruments	X		5.0

***Conclusions and Recommendations***

Based upon the results of our survey, it is our professional opinion that the impacted facility meets the criteria for unrestricted release specified by 10 CFR 20.1402. During the survey, Philotechnics Ltd. verified that all labels, signs or other similar markings indicating the presence of radioactive materials had been removed or obliterated. All sealed sources have been transferred to GE Healthcare's new facility. Additionally, no concerns requiring further investigation exist at this time.

***Project Team***

The project team consisted of the following individuals:

Researched by:	Tim Pratt
Surveyed by:	Tim Pratt and Justin Button
Project Manager and Contact:	Tim Pratt
Written by:	Tim Pratt

***Closing***

We appreciate the opportunity to provide this radiological decommissioning and trust that the enclosed information is adequate for decision-making needs. Should you have any questions, please do not hesitate to call the undersigned.

*Glenn K. Marshall, CNP*

*for*

Tim Pratt  
*Health Physics Operations Technical Manager*  
Philotechnics, Ltd.

### 3.0 License Review and Historical Use

The Livonia facility is approximately 6,400 square feet and is located within an industrial area 18 Miles west of Detroit, Michigan. The building is concrete construction of floors, walls and ceiling and is equipped with an intrusion alarm system connected to all operating entrances/exits of the controlled area of the facility.

The restricted area of the pharmacy laboratory comprises approximately 3,750 square feet located toward the interior rear of the facility. The walls are constructed of painted drywall and concrete brick. The floors are poured concrete with 12-inch by 12-inch vinyl tile. The non-restricted area of the Liviona facility comprises approximately 2,650 square feet located in the interior front of the facility. The walls are constructed of painted drywall. The floors are comprised of carpet, vinyl tile and concrete.

Areas in the Livonia facility where radioactive materials were historically used are summarized in Table 3.1. Building and structures diagrams are identified in Appendix A.

*Table 3.1: Restricted and Non-Restricted Area Summary*

<b>Restricted and/or Affected Areas</b>	<b>Classification</b>	<b>Period of Use</b>
Main Laboratory, Shipping/Receiving Area (GEH-01)	1	2002-2010
<b>Non-Restricted Areas</b>	<b>Classification</b>	<b>Period of Use</b>
Hallway, Office Areas, Restrooms and Kitchen (GEH-02)	3	2002-2010

#### ***Historical Use of Radionuclides***

The nuclear pharmacy has been in operation at the site since late September 2002. GE Healthcare's U.S. Nuclear Regulatory Commission Materials License Number is 21-24828-01MD. Operations consisted of receiving, processing and dispensing radiopharmaceuticals for diagnostic imaging, therapy and distributing the radiopharmaceuticals to local hospitals and clinics licensed for material. Dispersible and non-dispersible (sealed) forms of radionuclides that were used are summarized in Table 3.2.



Table 3.2 – Radionuclides Used

Radionuclide	Half-life	Form	Decay Mode	Default Screening Value at 25 mrem/yr (dpm/100cm <sup>2</sup> )
Cobalt 57	270.9 days	Sealed	Electron capture	2.12E+05
Gallium 67	78.3 hrs	Liquid	Electron capture	Not Listed
Strontium 89	50.5 days	Liquid	Beta	1.26E+06
Yttrium 90	64 hours	Liquid	Beta	6.35E+07
Molybdenum 99	66 hours	Liquid	Beta/Photon	6.25E+06
Technetium 99m	6 hrs	Liquid	Isomeric transition	1.49E+08
Indium 111	2.8 days	Liquid	Electron capture	4.06E+06
Iodine 123	13.2 hrs	Capsule	Electron capture	Not Listed
Iodine 131	8 days	Capsule	Beta	1.20E+06
Barium 133*	10.8 yrs	Sealed	Electron capture	Not Listed
Xenon 133	5.25 days	Gas	Isomeric transition	Not Listed
Cesium 137*	30.17 yrs	Sealed	Beta/Photon	2.80E+04
Samarium 153	46.3 days	Liquid	Electron Capture/Beta	3.42E+07

\*Denotes Sealed Source. Copies of the last annual leak test records for the sealed sources used onsite are included in Appendix B. Sealed sources not selected are exempt from leak test requirements.

#### 4.0 Radiological Release Criteria

##### *Total Contamination Limit*

The nuclides of concern and their corresponding default screening values determined from DandD Version 2.1 exposure modeling software are presented in Table 4.1. The Default Screening Values are the individual radionuclide total surface activity limits resulting in exposures of 25 mrem/year under the modeling assumptions and conditions of NUREG/CR 5512 "Residual Radioactive Contamination from Decommissioning", Occupancy Scenario<sup>1</sup>.

Of the nuclides present or used at the Livonia facility, the radionuclides with the most limiting default screening values are Sr-89 (Beta) and I-131 (Gamma). Based on an analysis of their biokinetic and physical properties, the dispersible radionuclides not listed in the DandD software (i.e. Ga-67, I-123, and Xe-133)) would not result in higher exposure modeling results exposure or more limiting Default Screening Values than Sr-89 or I-131. In addition, it is not practical to establish fixed ratios of nuclides that may be present., as each nuclide was used discretely due to the nature of the radiopharmacy operation. Consequently, the most limiting DSVs (i.e., Sr-89 & I-131) were used for determining the Derived Concentration Guideline Values (DCGL) for total contamination. The DCGL was

<sup>1</sup> NOTE: One important assumption contained in NUREG 5512 is that 10% of the total surface contamination limit is due to removable contamination.

established using a suggested ALARA goal of 25% of the DSV of the limiting nuclides (25% of the DSVs are  $3.15E+05$  dpm/100 cm<sup>2</sup> for Sr-89 and  $3.00E+05$  dpm/100 cm<sup>2</sup> for I-131).

As stated previously, it is not practical to establish fixed ratios relating to the distribution of nuclides that may be present as they were used individually. Consequently, the most limiting Default Screening Value was used to determine the Derived Concentration Guideline Value (DCGL) for total contamination.

Table 4.1 Facility Total Activity Release Criteria

Radionuclide	Half-life	Form	Predominant Emissions	Default Screening Value <sup>Note 1</sup> (dpm/100cm <sup>2</sup> )	Project DCGL (dpm/100cm <sup>2</sup> )
Sr-89	50.5 Days	Liquid	Beta	1.26E+06	3.15E+05
I-131	8 Days	Capsule	Beta/Photon	1.20E+06	3.00E+05

<sup>1</sup> The default screening value is the 90% value obtained by running NRC-approved DandD, version 2.1 software under default conditions of the building occupancy scenario.

#### ***Removable Contamination Limit***

The radiological release criteria used is the GE Healthcare administrative criteria of less than 200 dpm/100cm<sup>2</sup> for removable beta and gamma surface contamination.

#### ***Exposure Rate Survey***

Although the site release criteria is based on the total activity DCGLs, exposure rate surveys were performed at a one meter distance from the building surfaces and structures as a verification that no residual contamination was present. No limit was determined for these measurements. The results of these measurements were compared to typical background values outside the restricted areas to determine if any areas needed further investigation. .

## **5.0 Radiation Surveys**

#### ***Description of Radiation Surveys***

During the period of March 1, 2010 – March 3, 2010, Philotechnics completed comprehensive final status surveys in all accessible impacted areas, which included floors and walls. Survey maps depicting these areas are included as Appendix A.

Scanning surveys and total surface contamination measurements for beta and gamma emissions were obtained using Ludlum 2350-1's coupled with Thermo Electron probes, Model IBP19DD and GP13A respectively. Removable contamination measurements for beta and gamma emissions were made in all occupied areas using a Protean ASC and a Ludlum 2200 Scaler Counter, respectively. Exposure rate measurements were taken with a Thermo-Micro Rem

exposure rate meter. The following instrumentation along with their respective calibrations was used to quantify radiation levels:

- Ludlum 2350-1 serial#201192, with the following
  - ✓ BP19DD (beta probe) serial# K110  
(Calibrated on 5/15/2009)
- Ludlum 2350-1 serial #203461, with the following
  - ✓ IBP19DD (beta probe) serial# K102  
(Calibrated on 5/16/2009)
- Ludlum 2350-1 serial# 203490, with the following
  - ✓ GP13A (gamma probe) serial# 335  
(Calibrated on 05/22/2009)
- Ludlum 2350-1 serial #212234, with the following
  - ✓ GP13A (gamma probe) serial# 360  
(Calibrated on 9/18/2009)
- Protean ASC serial# 251429  
(Calibrated on 6/19/2009)
- Ludlum 2200 Single Channel Analyzer with the following
  - ✓ 243 NaI 2" x 2" well  
(Calibrated 10/12/2009)
- Thermo Micro-Rem exposure rate meter, serial#1861  
(Calibrated 9/10/2009)

Instruments used for total activity measurements were calibrated using National Institute of Standards and Technology (NIST) traceable  $^{57}\text{Co}$  and  $^{99}\text{Tc}$  sources. The Certificates of Calibration for each instrument are included as Appendix C.

### ***Instrument Specifications***

The instrumentation used for final status surveys is summarized in the following tables. Table 5.1 lists the standard features of each instrument such as probe size and efficiency. Determinations of scan rate, count times and the associated minimum detectable concentration (MDC) values are addressed in Section 5.2 and presented in Table 5.2.

**Table 5.1 Instrumentation Specifications**

<b>Detector Model</b>	<b>Detector Type</b>	<b>Detector Area</b>	<b>Meter Model</b>	<b>Window Thickness</b>	<b>Typical Total Efficiency</b>
NE IBP19DD	Beta Scintillation	100 cm <sup>2</sup>	Ludlum 2350-1	0.9 mg/cm <sup>2</sup>	17% - <sup>99</sup> Tc
NE GP13A	Gamma Scintillation	100 cm <sup>2</sup>	Ludlum 2350-1	1.2 mg/cm <sup>2</sup>	14.9% - <sup>99</sup> Tc
Thermo Micro-Rem	Internal Tissue Equivalent Scintillation	N/A	Thermo Micro-Rem	N/A	N/A
Ludlum Model 243	Sodium Iodide Scintillation	N/A	Ludlum 2200	N/A	85% - <sup>57</sup> Co
Protean ASC	Beta Scintillation	20.3 cm <sup>2</sup>	N/A	N/A	25% - <sup>99</sup> Tc

**Table 5.2 Typical Instrument Operating Parameters and Sensitivities**

<b>Measurement Type</b>	<b>Detector Model</b>	<b>Meter Model</b>	<b>Scan Rate</b>	<b>Count Time</b>	<b>Background (cpm)</b>	<b>MDC (dpm/100 cm<sup>2</sup>)</b>
Surface Scans	IBP19DD	Ludlum 2350-1	2 in./sec.	N/A	616	2,194
Total Surface Activity	IBP19DD	Ludlum 2350-1	N/A	60 sec.	616	692
Surface Scans	GP13A	Ludlum 2350-1	2 in./sec.	N/A	5,047	7,356
Total Surface Activity	GP13A	Ludlum 2350-1	N/A	60 sec.	5,047	2,433
Photon Exposure Rate	Thermo Micro-Rem	N/A	N/A	N/A	8-10 μR/hr	N/A
Removable β	Protean ASC	N/A	N/A	60 sec.	89	189
Removable Photon	Ludlum Model 243	Ludlum Model 2200	N/A	60 sec.	172	75

#### **5.1. Determination of Counting Times and Minimum Detectable Concentrations**

Minimum counting times for background determinations and counting times for measurement of removable contamination are based on providing a minimum detectable concentration (MDC) that is 10 to 50% of the release criteria. Refer to Appendix D for MDC calculations. Count times and scanning rates were determined using the following equations:

### 5.2.1 Static Counting

Static counting Minimum Detectable Concentration at a 95% confidence level was calculated using the following equation, (Strom & Stansbury, 1992):

$$MDC_{static} = \frac{3 + 3.29 \sqrt{B_r \cdot t_s \cdot \left(1 + \frac{t_s}{t_b}\right)}}{t_s \cdot E_{tot} \cdot \frac{A}{100}}$$

Where:

- $MDC_{static}$  = minimum detectable concentration level in dpm/100 cm<sup>2</sup>
- $B_r$  = background count rate in counts per minute
- $t_b$  = background count time in minutes
- $t_s$  = sample count time in minutes
- $E_{tot}$  = total detector efficiency for radionuclide emission of interest (includes combination of instrument and surface efficiencies)
- $A$  = detector probe area in cm<sup>2</sup>

### 5.1.1. Ratemeter Scanning

Scanning Minimum Detectable Concentration at a 95% confidence level was calculated using the following equation:

$$MDC_{scan} = \frac{d' \sqrt{b_i} \left(\frac{60}{i}\right)}{\sqrt{P} \cdot E_{tot} \cdot \frac{A}{100 cm^2}}$$

Where:

- $MDC_{scan}$  = minimum detectable concentration level in dpm/100 cm<sup>2</sup>
- $d'$  = desired performance variable (1.38)
- $b_i$  = background counts during the residence interval
- $i$  = residence interval
- $P$  = surveyor efficiency (0.5)
- $E_{tot}$  = total detector efficiency for radionuclide emission of interest (includes combination of instrument and surface efficiencies)
- $A$  = detector probe area in cm<sup>2</sup>

### 5.1.2. Smear Counting

Smear counting Minimum Detectable Concentration at a 95% confidence level was calculated using the following equation, (Strom & Stansbury, 1992):

$$MDC_{static} = \frac{3 + 3.29 \sqrt{B_R \cdot t_s \cdot (1 + \frac{t_s}{t_b})}}{t_s \cdot E}$$

Where:

$MDC_{smear}$  = minimum detectable concentration level in dpm/smear  
 $B_R$  = background count rate in counts per minute  
 $t_B$  = background count time in minutes  
 $t_S$  = sample count time in minutes  
 $E$  = instrument efficiency for radionuclide emission of interest

### 5.2. Uncertainty

The counting uncertainty for each total and removable contamination measurement is calculated using the following equation:

$$\sigma = 1.96 \sqrt{\frac{C_{s+b}}{T_{s+b}^2} \frac{C_b}{T_b^2}}$$

Where:

$\sigma$  = uncertainty  
1.96 = multiplier to achieve 95% confidence level  
 $C_{s+b}$  = gross counts of the sample (cpm)  
 $T_{s+b}$  = Sample time (minutes)  
 $C_b$  = Gross background counts (cpm)  
 $T_b$  = Background count time (minutes)

## 6.0 Design and Performance of Final Status Surveys

A final status survey was performed to demonstrate that residual radioactivity was not present above the predetermined criteria for release for unrestricted use. The restricted area and support areas were treated as different survey units. The

restricted area had the highest potential for contamination due to the routine use of unsealed radioactive materials. Radioactive contamination was considered less likely in the remaining administrative support area of the facility.

A final status survey was conducted by performing scanning surveys, total surface contamination measurements (static measurements), removable contamination measurements, and photon exposure rate measurements. The final status survey was performed by establishing a 1 x 1 meter reference grid for the restricted area and 2 x 2 meter reference grid for the unrestricted area of the Livonia facility. Wipe samples were collected at the center of each reference grid and at judgmental locations (door knobs, remaining furnishings, sinks, drains, vents, light switches, etc.). Gamma exposure measurements were taken at a one-meter height above each reference grid.

#### **6.1. Area Classifications**

Based on the results of the historical site assessment, facility areas were classified as impacted or non-impacted areas. Non-impacted areas are areas with no potential residual radioactivity from licensed activities. These include non-laboratory areas adjacent to the restricted area. Impacted areas are those areas that may have some level of potential residual radioactivity from licensed activities.

Impacted areas are typically divided into Class 1, 2, or 3 areas. Class 1 areas have the greatest potential for contamination and therefore receive the highest degree of survey effort for the final status survey, followed by Class 2 and then Class 3. Definitions of area classifications are provided below:

- Class 1 Areas – Areas with the highest potential for contamination, and meet the following criterion: (1) impacted; (2) potential for delivering an exposure above the release criterion; (3) potential for small areas of elevated activity; and (4) insufficient evidence to support classification as Class 2 or Class 3.
- Class 2 Areas – Areas that meet the following criterion: (1) impacted; (2) low potential for delivering an exposure above the release criterion; and (3) little or no potential for small areas of elevated activity.
- Class 3 Areas – Areas that meet the following criterion: (1) impacted; (2) little or no potential for delivering an exposure above the release criterion; and (3) little or no potential for small areas of elevated activity.

Non-impacted Areas: Indoor areas other than those identified as restricted areas by the RAM license.

Impacted Class 1 Areas: Main Laboratory, Waste Storage, Iodine Storage and After Hours Receiving Area

Impacted Class 2 Areas: None

Impacted Class 3 Areas: Office, Hallway and Kitchen Areas

### 6.2. Establishing Survey Units

Survey Units were assigned for areas that were homogeneous in construction, contamination potential, and contamination distribution. Survey units were not chosen to meet the size recommendations provided in MARSSIM. However, additional survey locations were plotted to compensate for the additional area.

Table 5.3 lists the recommended maximum survey unit sizes based on floor area. It should be noted that these limits are recommended and are not absolute.

*Table 5.3: Recommended Maximum Survey Unit Size Limits*

Type of Survey Unit	Class 1	Class 2	Class 3
Surfaces and Structures	Up to 100 m <sup>2</sup>	100 m <sup>2</sup> to 1,000 m <sup>2</sup>	No limit

### 6.3. Removable Activity

Removable gamma contamination measurements were performed by wiping a wet swab over approximately 100 cm<sup>2</sup> of the surface to be measured using moderate hand pressure. The samples were counted for one minute in the Ludlum 2200 sodium iodide (NaI(Tl)) scintillation counting system.

Removable beta contamination measurements were performed by wiping a dry filter disc smear over approximately 100 cm<sup>2</sup> of the surface to be measured using moderate hand pressure and counted for one minute in the Protean ASC beta scintillation counting system.

### 6.4. Total Beta Activity

Surveys for total beta were performed by scanning accessible surfaces at a rate of two inches per second with a plastic scintillation probe (Ludlum 2350-1 with BP19DD probe). One-minute static measurements were performed at a frequency of one per square meter in the applicable restricted areas.



### 6.5. Total Gamma Activity

Surveys for total gamma and beta were performed by scanning accessible surfaces at a rate of two inches per second with a plastic scintillation probe (Ludlum 2350-1 with GP13A probe). One-minute static measurements were performed at a frequency of one per square meter in the applicable restricted areas.

It should be noted that background determination for total surface activity measurements, ambient background levels are generally determined for each survey unit by performing a one minute count with the probe at waist level and away from survey unit surfaces. However, due to the highly variable gamma background as the instrument was move closer to or farther away from the building outer walls, surface material background measurements were taken for each type of material in areas of the unrestricted area that were not expected to contain residual contamination from recent operations. Background values were determined for each instrument and material surveyed for both beta and gamma measurements

### 6.6. Exposure Rate Surveys

Exposure rate surveys were performed by walking through the areas to be measured with a Thermo Electron-Micro Rem exposure rate meter held at a one-meter height. The survey instrument was held at a one meter height from each sample location for at least 15-seconds allowing the instrument to stabilize. The average exposure rate was recorded for each location and compared to a reference background collected in the non-restricted area (at the northwest end of the facility – office area). The reference backgrounds were approximately 8-10 uR/hr using the Micro Rem instrument.

## 7.0 Survey Results

Prior to the performance of the Final Status Survey, an inspection of the facility was performed to verify that all radioactive material had been removed from the facility. No radioactive material remained at the facility at the time of the survey. All removable contamination measurements were less than GE Healthcare's administrative limit of 200 dpm/100cm<sup>2</sup>. Analyses of these measurements indicate they are within normal statistical and background variability for the survey instrument. All the total beta and gamma measurements were less than each established DCGL, respectively. All photon exposure rates were at or below the reference background value of 8-10 uR/hr. All survey results are presented in Appendices E- F.

### *Surveys of Other Building Components*

Surveys of various building components were performed in restricted areas and the vertical stack on the roof. The survey design for these systems is out of the

scope of MARSSIM. For purposes of identifying potential residual contamination within these components, a gross survey was performed on light switches, door handles, sink and floor drains in restricted and non-restrictive areas. The survey results for the building components can be found at the end of Appendices E and F.

## 8.0 Data Analysis

Contamination measurements were analyzed using the descriptive statistics function in Microsoft Excel. The survey unit was analyzed as a population, as well as all measurements together as a population. The statistical analysis indicates that the measurements fit an approximate normal distribution around the background level indicating that significant residual surface contamination does not exist in the areas surveyed. The results of statistical analyses for restricted and non-restricted areas are presented in Table 8.1 and Table 8.2 respectively. The statistical analysis is also referenced in Appendix G.

<b>Table 8.1 Data Analysis Results</b>				
<i>Restricted Area</i>				
<b>Parameter</b>	<b>Removable Beta</b>	<b>Removable Photon</b>	<b>Total Beta Activity</b>	<b>Total Gamma Activity</b>
Mean	-27	0	34	-1947
Standard Error	2	1	11	199
Median	-28	0	32	-1987
Mode	-28	-1	-94	-1494
Standard Deviation	36	13	209	3769
Minimum	-117	-37	-714	-15261
Maximum	77	46	800	9047
Count	359	359	359	359
Confidence Level (95.0%)	4	1	22	391

\*\*All results are in dpm/100 cm<sup>2</sup> unless otherwise noted. \*\*

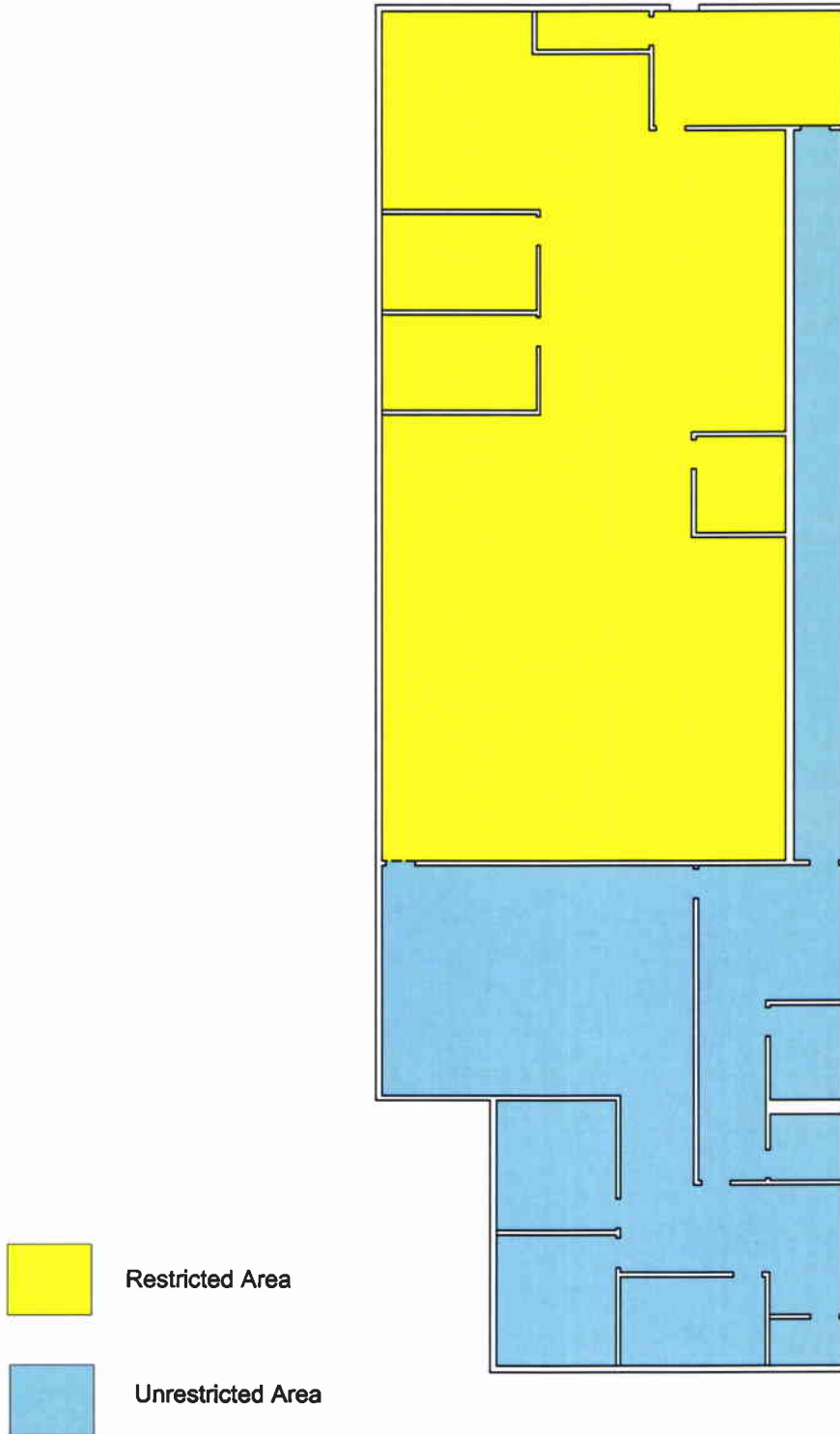
<b>Table 8.2 Data Analysis Results</b>				
<i>Unrestricted Area</i>				
<b>Parameter</b>	<b>Removable Beta</b>	<b>Removable Photon</b>	<b>Total Beta Activity</b>	<b>Total Gamma Activity</b>
Mean	-26	-1	40	-499
Standard Error	4	1	25	411
Median	-28	-3	35	-347
Mode	-24	-9	243	0
Standard Deviation	32	13	218	3629
Minimum	-85	-32	-435	-7907
Maximum	48	29	570	12274
Count	78	78	78	78
Confidence Level (95.0%)	7	3	49	818

\*\*All results are in dpm/100 cm<sup>2</sup> unless otherwise noted. \*\*

## 9.0 Records

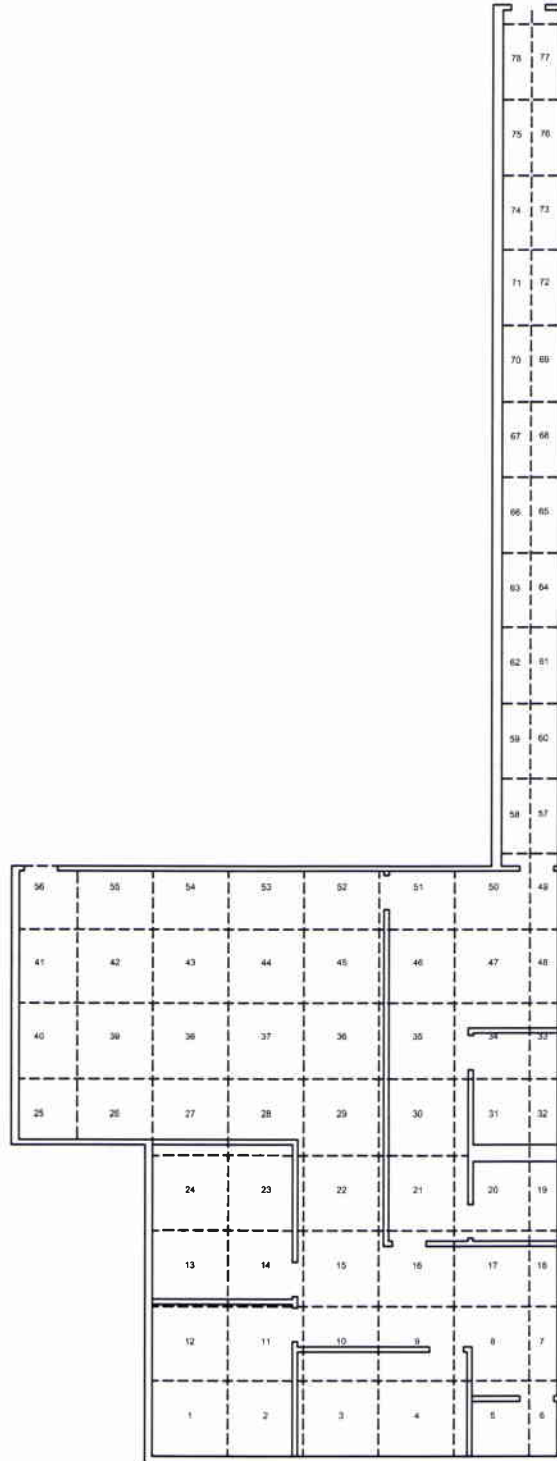
GE Healthcare maintains the original project report including survey data sheets and maps. Copies of project records are maintained at the Philotechnics, Ltd. office at 201 Renovare Blvd. in Oak Ridge, Tennessee.

Our services have been performed, our findings obtained and our recommendations prepared in accordance with customary principles and practices in the field of environmental science. This survey and any data, recommendations, reports and similar information provided by Philotechnics, Ltd. to GE Healthcare are provided for the exclusive use of GE Healthcare and are not to be used or relied upon in connection with other purpose or by third parties.

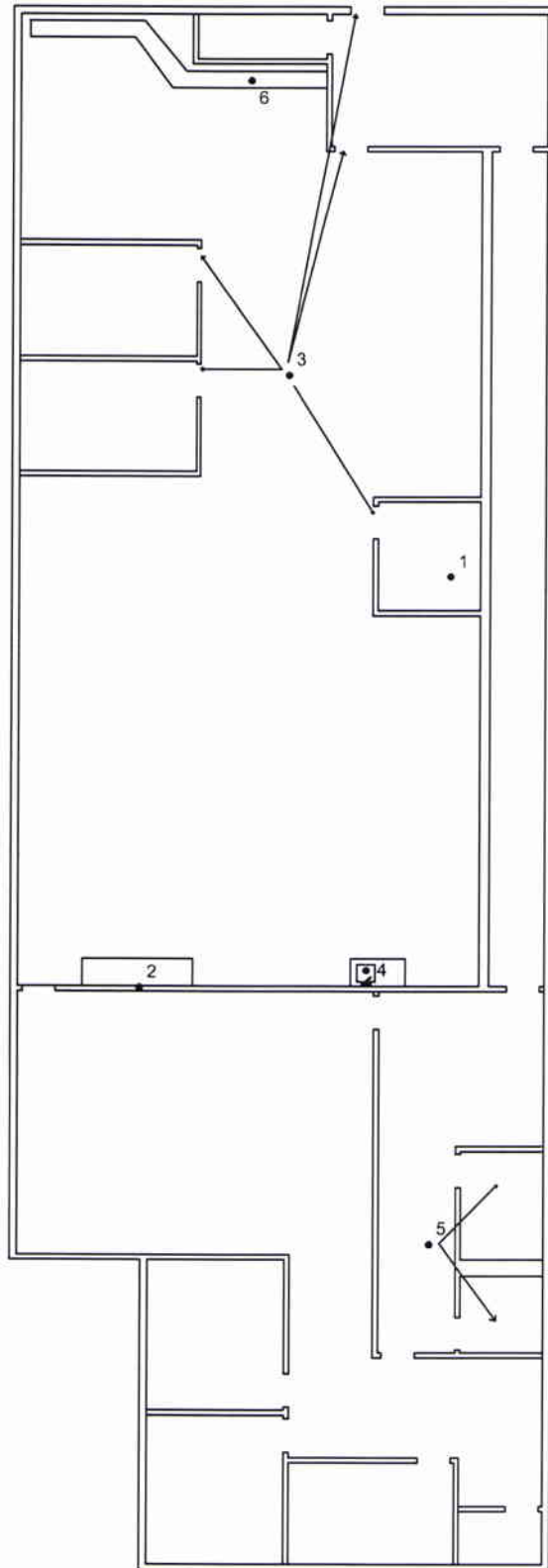


Appendix A – Building & Structures Survey Diagrams

345	346	347	348	349	350	351	352	353	354	355	356	357	358	359
344	343	342	341	340	339	338	337	336	335	334	333	332	331	330
315	316	317	318	319	320	321	322	323	324	325	326	327	328	329
314	313	312	311	310	309	308	307	306	305	304	303	302	301	300
287	288	289	290	291	292	293	294	295	296	297	298	299		
286	285	284	283	282	281	280	279	278	277	276	275	274		
261	262	263	264	265	266	267	268	269	270	271	272	273		
260	259	258	257	256	255	254	253	252	251	250	249	248		
235	236	237	238	239	240	241	242	243	244	245	246	247		
234	233	232	231	230	229	228	227	226	225	224	223	222		
209	210	211	212	213	214	215	216	217	218	219	220	221		
208	207	206	205	204	203	202	201	200	199	198	197	196		
183	184	185	186	187	188	189	190	191	192	193	194	195		
182	181	180	179	178	177	176	175	174	173	172	171	170		
157	158	159	160	161	162	163	164	165	166	167	168	169		
156	155	154	153	152	151	150	149	148	147	146	145	144		
131	132	133	134	135	136	137	138	139	140	141	142	143		
130	129	128	127	126	125	124	123	122	121	120	119	118		
105	106	107	108	109	110	111	112	113	114	115	116	117		
104	103	102	101	100	99	98	97	96	95	94	93	92		
79	80	81	82	83	84	85	86	87	88	89	90	91		
78	77	76	75	74	73	72	71	70	69	68	67	66		
53	54	55	56	57	58	59	60	61	62	63	64	65		
52	51	50	49	48	47	46	45	44	43	42	41	40		
27	28	29	30	31	32	33	34	35	36	37	38	39		
26	25	24	23	22	21	20	19	18	17	16	15	14		
1	2	3	4	5	6	7	8	9	10	11	12	13		



Appendix A – Building & Structures Survey Diagrams



**Sealed Source Leak Test**

GE Healthcare DETROIT - MI1-1000  
 13321 Stark Road  
 Tested on 9/30/2009 15:00:00

**Standard Source**

Nuclide:	Cs-137	Serial Number:	ET459
Configuration:	Rod Source	Manufacturer:	AMERSHAM
Activity:	0.00010840 mCi on 10/31/1995 12:00:00	Current Activity:	0.00007865 mCi

**Counting Instrument**

Instrument Type:	Scaler	Model Number:	727
Manufacturer:	Canberra	Serial Number:	02018312
		Descriptive Name:	MCA

**Sealed Source Tested**

Model:	MLD-01	Serial Number:	228714B
Nuclide:	Cs-137	Manufacturer:	ICN C&R
Configuration:	Vial Reference Source	Current Activity:	0.15292395 mCi
Activity:	0.26200000 mCi on 5/23/1986		

**Counting Data**

Reference Standard Counts(Cstd):	238,144	Reference Standard Counting Time(Tstd):	10.0 min
Background Counts(Cb):	90	Background Counting Time(Tb):	10.0 min
Net Standard Count Rate(Rstd):	23,805 Cpm		
Leak Test Source Counts(Csam):	102	Leak Test Source Counting Time(Tsam):	10.0 min
Net Sample Count Rate(Rsam):	1 Cpm		

**Calculation Format**

Instrument Efficiency:	13.63 %
MDA(cpm):	5
Measured Activity (uCi):	0.00000000 <= Detection Limit

**Comments and Recommendations**

The Removable contamination on this sealed source is within the maximum limit of 0.005 uCi  
 Removable activity is <= Detection Limit.

Sealed Source Leak testing must be performed periodically in accordance with Applicable Facility License Conditions-  
 Consult Facility License. This source is due for its next Leak test by: Tuesday 3/30/2010.

Sample Taken By: K. Anson Sample Analyzed By: \_\_\_\_\_

Radiation Safety Officer: K. Anson (Signature Required: 10CFR35)

Report Provided By:  
 GE Healthcare  
 13321 Stark Road  
 Livonia, MI 48150  
 IN EMERGENCY CALL: 734-425-0425  
 RSO: Kris Anson



**Sealed Source Leak Test**

GE Healthcare DETROIT - MI1-1000  
13321 Stark Road  
Tested on 9/30/2009 14:45:00

**Standard Source**

Nuclide:	Ba-133	Serial Number:	ES658
Configuration:	Rod Source	Manufacturer:	AMERSHAM
Activity:	0.00009140 mCi on 10/2/1995 12:00:00	Current Activity:	0.00003702 mCi

**Counting Instrument**

Instrument Type:	Scaler	Model Number:	727
Manufacturer:	Canberra	Serial Number:	02018312
		Decriptive Name:	MCA

**Sealed Source Tested**

Model:	BDR562	Serial Number:	HB 723
Nuclide:	Ba-133	Manufacturer:	AEA Technology
Configuration:	Vial Reference Source	Current Activity:	0.14701814 mCi
Activity:	0.25100000 mCi on 6/19/2001		

**Counting Data**

Reference Standard Counts(Cstd):	352,476	Reference Standard Counting Time(Tstd):	10.0 min
Background Counts(Cb):	408	Background Counting Time(Tb):	10.0 min
Net Standard Count Rate(Rstd):	35,207 Cpm	Leak Test Source Counting Time(Tsam):	10.0 min
Leak Test Source Counts(Csam):	426		
Net Sample Count Rate(Rsam):	2 Cpm		

**Calculation Format**

Instrument Efficiency:	42.84 %
MDA(cpm):	10
Measured Activity (uCi):	0.00000000 <= Detection Limit

**Comments and Recommendations**

The Removable contamination on this sealed source is within the maximum limit of 0.005 uCi  
Removable activity is <= Detection Limit.

Sealed Source Leak testing must be performed periodically in accordance with Applicable Facility License Conditions-  
Consult Facility License. This source is due for its next Leak test by: Monday 3/29/2010.

Sample Taken By: K. Anson Sample Analyzed By: \_\_\_\_\_

Radiation Safety Officer: K. Anson (Signature Required: 10CFR35)

Report Provided By:

GE Healthcare  
13321 Stark Road  
Livonia, MI 48150  
IN EMERGENCY CALL: 734-425-0425  
RSO: Kris Anson

### Multichannel Analyzer and Scaler Calibration

GE Healthcare DETROIT - MII-1000  
13321 Stark Road  
Tested on 10/12/2009 14:00:00

*P Repair*

#### Standard Source

Nuclide: Co-57 Rod Source 0.00004185 mCi on 10/12/2009 - M11  
Manufacturer: International Isotopes of Idaho Inc. Serial Number: BM0805708210107

#### Counting Instrument Calibrated

Instrument Type: Scaler Serial Number: 97765  
Manufacturer: LUDLUM Model Number: L-2200  
Descriptive Name: QC-SCA

#### Counting Data

Instrument Settings: LLD - 100.0000 ULD - 1,000.0000 WIN - 900.0000  
Geometry: 4 pi  
Source Counts(Cstd): 793,017 Source Count Time(Tstd): 10.0 min  
Source Background(Cbkg): 1,540 Background Count Time(Tbkg): 10.0 min

#### Calculations

Reference Standard Activity = 92,914 dpm

Net Standard Count Rate = 79,148 cpm

MDA = 19 cpm

Efficiency% = 85.18 %

Sample Taken By: *KMA* Sample Analyzed By: \_\_\_\_\_

Radiation Safety Officer: *K. Anson* (Signature Required: 10CFR35)

Report Provided By:

GE Healthcare  
13321 Stark Road  
Livonia, MI 48150

IN EMERGENCY CALL: 734-425-0425  
RSO: Kris Anson



GRIFFIN INSTRUMENTS



CALIBRATION CERTIFICATE FOR

MICRO REM SERIAL# 1861

Owner: PHILOTECHNICS

DATE: 09/10/09 LOCATION: Griffin Inst  
 TECH: Joanne Glenn DATE LAST CAL EXPIRES: 09/12/09  
 REASON FOR CALIBRATION: Due for Calibration

NIST TRACEABLE EQUIPMENT AND SOURCES USED DURING CALIBRATION

PULSER MODEL: MP-2 PULSER SERIAL: 1000 PULSER CAL DUE: 07/13/10  
 SOURCE NUMBE 10250 ISOTOPE: Cs137 ASSAY DATE: 08/30/07

Geotropism TEMP 72.3 F BARO PRESS: 30.12" HUMIDITY 52%

**A.F.Data A.F. % ERROR A.L.Data A.L. % ERROR**

uR/hr

<b>x0.1 Scale*</b>	3.75	6.3%	A.F.	<b>*Pulsed Scale</b>
<b>x0.1 Scale*</b>	16.5	3.1%	A.F.	
<b>x1 Scale*</b>	40	0.0%	A.F.	
<b>x1 Scale*</b>	160	0.0%	A.F.	

mR/hr

<b>x10 Scale</b>	0.35	12.5%	0.4
<b>x10 Scale</b>	0.95	5.0%	1.0
<b>x10 Scale</b>	1.5	6.3%	1.6
<b>x100 Scale</b>	4	0.0%	A.F.
<b>x100 Scale</b>	10.5	5.0%	A.F.
<b>x100 Scale</b>	16	0.0%	A.F.
<b>x1000 Scale</b>	40	0.0%	A.F.
<b>x1000 Scale</b>	107	7.0%	A.F.
<b>x1000 Scale</b>	165	3.1%	A.F.

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

Yes  No, See Remarks

REMARKS:

Does Instrument Meet Final Acceptance Criteria?:  Yes  No

Calibration Sticker Attached?:  Yes  No

Date Instrument is Due For Next Calibration: 09/10/10

Performed/Reviewed by:

*Joanne Glenn*

Date: 9/10/2009

Entered by: *[Signature]* Initials



GRIFFIN INSTRUMENTS



CALIBRATION CERTIFICATE FOR

2350-1

SERIAL#

201192

Owner: PHILOTECHNICS

DATE: 05/15/09

LOCATION:

Griffin Inst

TECH: E.M. Glenn

DATE LAST CAL EXPIRES:

05/14/09

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 #: 42386

CAL. DUE: 04/15/10

MODEL:

SERIAL #:

CAL DUE:

Audio Response

CABLE LENGTH 5'

CONDITION: Sat

NEW BATTERIES:  Yes  No

BATTERY CHECK: 6.4

HV (+/-10%)

AS FOUND HV

AS LEFT HV

500 V:

490

500

1250 V:

1225

1250

2000 V:

1950

2000

AF Threshold: 340

AL Threshold): 350

RATE CPM AS FOUND % ERROR AS LEFT % ERROR

RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
250			250	0.0%
2500			2495	0.2%
25K	K		24.95K	0.2%
250K	K		249.5	0.2%

Is the As Found Data Within 2% of the Set Point?:

Yes  No

Detector #:  AF  AL  00

Detector Serial #:  K110

Model #:  IBP19DD

U:  7

M:  0

TB:  1

HV:  AF  AL  725

Window:  OFF

Count Time (sec):  60

Threshold:  350

Correction Constant:  1

Dead Time (uSec):  0

REMARKS: Dead batteries. Initialized Cold Start.

Does Instrument Meet Final Acceptance Criteria?:  Yes  No

Calibration Sticker Attached?:  Yes  No

Date Instrument is Due For Next Calibration: 05/15/10

INSTRUMENT MARRIED WITH IBP19DD # K110

Performed/Reviewed by:

*E.G. Glenn*

Date: 5/15/2009

Entered by: *[Signature]* Initials



GRIFFIN INSTRUMENTS



CALIBRATION CERTIFICATE FOR IBP19DD PROBE # K110

Owner: PHILOTECHNICS

DATE: 05/16/09

LOCATION: Griffin Inst

TECH: Joanne Glenn

DATE LAST CAL EXPIRES: 05/14/09

REASON FOR CALIBRATION:

- Due For Calibration, Repair (See Remarks), Other (See Remarks), Due and Repair

CABLE LENGTH: 5'

INPUT SENSITIVITY: 35 mV

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2350-1 SERIAL #: 201192 CAL. DUE: 05/15/10

NIST TRACEABLE SOURCES USED

Table with 5 columns: Source Number, Isotope, 4 pi Activity, Assay Date, 2 pi Activity. Rows include 99TC470-1814, 2697-00, and PX 726.

Efficiencies from last cal.:

Condition: Sat Unsat Pu: Th: Sr: 34.51% Tc ss: 15.12% C14: 5.77% Tc Ni:

As Found (AF) Efficiencies:

Table with columns for HV/Vernier, Tc-99 Source Response Nickel (CPM), Pu-239 Source Response (CPM), Background (CPM), and Tc-99 Source Response Stainless Steel (CPM). Includes sub-columns for A ch, B ch, and Net Eff.

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

Table with columns for Pu239, Tc99 Ni, Tc99 ss, Th-230, Sr90, C-14. Rows include AF CPM, AF 4 pi eff, and AF 2 pi eff.

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 #: K110

Date: 05/16/09

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		160	0.3%					38		
650		2397	6.0%					149		
700		5297	13.3%					332		
725		6513	16.2%					452		
750								601		
770								734		

HV / Vernier	Alpha / Beta Bkg (cpm)		452		C-14	Sr-90
	Pu-239	Tc-99 Ni	Tc-99 SS	Th-230		
725 / N/a	CPM:		6513		3114	4237
	<i>4 pi AL Efficiencies:</i>		16.25%		5.46%	38.69%
	<i>2 pi AL Efficiencies:</i>		26.01%		14.27%	55.33%

REMARKS: Replaced mylar 2 times due to high backgrounds. Plateau taken on 5/22/09. Cal due 5/15/10 to match meter.

Does Instrument Meet Final Acceptance Criteria?:  Yes  No

Calibration Sticker Attached?:  Yes  No

Date Instrument is Due For Next Calibration: 05/15/10

INSTRUMENT MARRIED WITH 2350-1 # 201192

Performed/Reviewed by:

*Joseph Chinn*

Date: 5/16/2009

Entered by: *[Signature]* Initials

2 pi efficiencies denoted in italics.

Calibrations performed to ANSI N323A-1997 standards.



GRIFFIN INSTRUMENTS



CALIBRATION CERTIFICATE FOR 2350-1 SERIAL# 203461

Owner: PHILOTECHNICS

DATE: 05/15/09 LOCATION: Griffin Inst

TECH: E.M. Glenn DATE LAST CAL EXPIRES: 05/08/09

Reason For Calibration: [X] Due For Calibration [ ] Repair (See Remarks) [ ] Other (See Remarks) [ ] Due and Repair (See Remarks)

NIST TRACEABLE EQUIPMENT USED DURING CALIBRATION

MODEL: M-500 SERIAL #: 42386 CAL. DUE: 04/15/10
MODEL: SERIAL #: CAL DUE:

[X] Audio Response CABLE LENGTH 5'

CONDITION: Sat

NEW BATTERIES: [X] Yes [ ] No BATTERY CHECK: 6.4

Table with 3 columns: HV (+/-10%), AS FOUND HV, AS LEFT HV. Rows for 500 V, 1250 V, 2000 V.

AF Threshold: 370 AL Threshold: 350

RATE CPM AS FOUND % ERROR AS LEFT % ERROR

Table with 5 columns: RATE CPM, AS FOUND, % ERROR, AS LEFT, % ERROR. Rows for 250, 2500, 25K, 250K.

Is the As Found Data Within 2% of the Set Point?:

[X] Yes [ ] No

Table with 5 columns: Detector #, AF, AL, HV, Window, Count Time (sec), Threshold, Correction Constant, Dead Time (uSec).

REMARKS: Replaced missing power knob.

Does Instrument Meet Final Acceptance Criteria?: [X] Yes [ ] No

Calibration Sticker Attached?: [X] Yes [ ] No

Date Instrument is Due For Next Calibration: 05/15/10

INSTRUMENT MARRIED WITH IBP19DD # K102

Performed/Reviewed by: [Signature]

Date: 5/15/2009

Entered by [Signature] Initials



GRIFFIN INSTRUMENTS



CALIBRATION CERTIFICATE FOR IBP19DD PROBE # K102

Owner: PHILOTECHNICS

DATE: 05/16/09

LOCATION:

Griffin Inst

TECH: Joanne Glenn

DATE LAST CAL EXPIRES:

05/08/09

REASON FOR CALIBRATION:

- Due For Calibration, Repair (See Remarks), Other (See Remarks), Due and Repair

CABLE LENGTH: 5'

INPUT SENSITIVITY: 35 mV

NIST TRACEABLE EQUIPMENT AND STANDARDS USED DURING CALIBRATION

MODEL: 2350-1 SERIAL #: 203461 CAL. DUE: 05/15/10

NIST TRACEABLE SOURCES USED

Table with 5 columns: Source Number, Isotope, 4 pi Activity, Assay Date, 2 pi Activity. Rows include 99TC470-1814, 2697-00, PX 726 with various isotopes and activities.

Efficiencies from last cal.:

Condition: Sat Unsat

Pu: Th: Sr: 40.95% Tc ss: 20.18% C14: 9.11% Tc Ni:

As Found (AF) Efficiencies:

Table with columns for HV/Vernier, Tc-99 Source Response Nickel (CPM), Pu-239 Source Response (CPM), Background (CPM), and Tc-99 Source Response Stainless Steel (CPM). Includes sub-columns for A ch., B ch., and Net Eff.

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

Table with columns for Pu239, Tc99 Ni, Tc99 ss, Th-230, Sr90, C-14. Rows include AF CPM, AF 4 pi eff, and AF 2 pi eff.

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 #: K102

Date: 05/16/09

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)		627							
HV / Vernier	Pu-239	Tc-99 Ni	Tc-99 SS	Th-230	C-14	Sr-90			
750 / N/A	CPM:		8603		5808	4864			
	<i>4 pi AL Efficiencies:</i>		21.38%		10.62%	43.31%			
	<i>2 pi AL Efficiencies:</i>		34.23%		27.77%	61.94%			

REMARKS: Cal due 5/15/10 to match meter.

Does Instrument Meet Final Acceptance Criteria?:  Yes  No

Calibration Sticker Attached?:  Yes  No

Date Instrument is Due For Next Calibration: 05/15/10

INSTRUMENT MARRIED WITH 2350-1 # 203461

Performed/Reviewed by:

*Joanne Glenn*

Date: 5/16/2009

Entered by: *JP* Initials

2 pi efficiencies denoted in italics.

Calibrations performed to ANSI N323A-1997 standards.



# CALIBRATION CERTIFICATE

Duratek Instrument Services  
628 Gallaher Road  
Kingston, TN 37763  
Phone: (865) 376-8337  
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
Customer Name: Griffin Instruments		Manufacturer: Ludlum	
Address: 977 Hamilton Lane Kingston, TN 37763		Model: 2350-1	Serial Number: 212234
Contact Name: JoAnne Glenn		Probe: N/A	Serial Number: N/A
Customer Purchase Order Number: Credit Card	Work Order Number: 2009-10344	Calibration Method: Electronic and Source	

## INSTRUMENT CALIBRATION INFORMATION

Instrument Range (CPM)	Calibration Standard Value (CPM)	Instrument Response (±10% of Calibration Standard)		Comments
		Before Calibration	After Calibration	
400	400	399	399	Pulser: 120935 Cal Due: 08/30/10
4,000	4,000	3,993	3,993	DVM: 88020324 Cal Due: 10/31/09
40,000	40,000	39,931	39,931	D-814: 2525 Cal Due: 12/10/09
400,000	400,000	399,303	399,303	Humidity: 992290 Cal Due: 02/03/10
HV Cal Values (M2350 HV Entry)	Desired HV (Voltmeter) (VDC)	As Found (VDC)	As Left (VDC)	EPPROM Version: 37122N28
600 (540-660)	600	601	601	Temp: 25.0 °C Pressure: 742 mmHg Humidity: 51%
1,200 (1,080-1,320)	1,200	1,191	1,191	
1,800 (1,620-1,980)	1,800	1,779	1,779	
Parameter	Tolerance (±10%)	As Found	As Left	
Threshold T = 100	10 ± (9 to 11) mVDC	10.5	10.5	Geotropism: SAT ACK/Scroll: SAT
Threshold T = 500	50 ± (45 to 55) mVDC	50.2	50.2	BAT>4.5: SAT Volume: SAT
Threshold T =1000	100 ± (90 to 110) mVDC	100	100	Count: SAT Audio Divide: SAT
Window Width W = 100	10 ± ( 9 to 11 ) mVDC	10	10	Alarms: SAT Lamp: SAT
Display-to-mV ratio:	100 to 10 mV			Overload Test: SAT

## STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument		
Calibrated By: <i>M. Paul</i>	Reviewed By: <i>[Signature]</i>	Date: <i>9/21/09</i>
Calibration Date: 09/18/2009	Calibration Due: 09/18/2010	

*9/21/09*



**CALIBRATION  
CERTIFICATE**

Duratek Instrument Services  
628 Gallaher Road  
Kingston, TN 37763  
Phone: (865) 376-8337  
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION			DETECTOR INFORMATION			
Customer Name: Griffin Instruments			Manufacturer: NE Technology			
Address: 977 Hamilton Lane Kingston, TN 37763			Model: GP13A		Serial Number: 360	
Contact Name: JoAnne Glenn			Calibration Method: Electronic and Source			
Contract Purchase Order Number: ES-137		Work Order Number: 2009-10344				
DETECTOR PARAMETER SETUPS						
Parameter	As Found	As Left	Parameter	As Found	As Left	Comments
Model	N/A	GP13A	CC	N/A	1.0	DVM: 88020324 Cal Due: 10/31/09
S/N	N/A	360	DT	N/A	4uSec	D-814: 2525 Cal Due: 12/10/09
Units	N/A	7=counts	Threshold	N/A	350=35mv	Humidity: 992290 Cal Due: 02/03/10
multiplier	N/A	0=auto				
Time base	N/A	1=minutes				Temp: 23.6 °C Pressure: 742 mmHg
HV	N/A	860V				Humidity: 77%
Count time	N/A	60sec				**Detector specific parameters must be entered into instrument manually to be used with another 2350-1**
Saved as Detector #3						
INSTRUMENT INFORMATION						
<u>Model</u>		<u>Serial Number</u>			<u>Calibration Due Date</u>	
2350-1		212234			09/18/2010	
USED FOR EFFICIENCY DETERMINATION AND HV PLATEAUIING						
I <sup>129</sup> #040202 at 95,682 DPM Certification Date: 04/13/99						
<u>Background (CPM)</u>	<u>Gross Source Counts (CPM)</u>	<u>Net Source Counts (CPM)</u>		<u>Efficiency in % (Determined on contact)</u>		
7,158	21,099	13,941		14.6% for I <sup>129</sup>		
**Gross source counts taken from an average of three one minute counts from the Heel, Middle, and Toe of Detector**						
COMMENTS						
Calibration due date shortened by from actual calibration date to match due date of instrument						
STATEMENT OF CERTIFICATION						
We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).						
Instrument						
Calibrated By: <i>M. Pauli</i>		Reviewed By: <i>[Signature]</i>		Date: <i>9/21/09</i>		
Calibration Date: 09/21/2009				Calibration Due: 09/21/2010		

*9/24/09*





# CALIBRATION CERTIFICATE

Duratek Instrument Services  
628 Gallaher Road  
Kingston, TN 37763  
Phone: (865) 376-8337  
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
Customer Name: Griffin Instruments		Manufacturer: Ludlum	
Address: 977 Hamilton Lane Kingston, TN 37763		Model: 2350-1	Serial Number: 203490
Contact Name: JoAnne Glenn		Probe: N/A	Serial Number: N/A
Customer Purchase Order Number: Es-137	Work Order Number: 2009-10160	Calibration Method: Electronic and Source	

## INSTRUMENT CALIBRATION INFORMATION

Instrument Range (CPM)	Calibration Standard Value (CPM)	Instrument Response (±10% of Calibration Standard)		Comments
		Before Calibration	After Calibration	
400	400	399	399	Pulser: 120935 Cal Due: 09/11/09
4,000	4,000	3,985	3,985	DVM: 88020324 Cal Due: 10/31/09
40,000	40,000	40,024	40,024	CD550: 3076 Cal Due: 08/28/09
400,000	400,000	399,736	399,736	Humidity: 992290 Cal Due: 02/03/10
<b>HV Cal Values (M2350 HV Entry)</b>	<b>Desired HV (Voltmeter) (VDC)</b>	<b>As Found (VDC)</b>	<b>As Left (VDC)</b>	<b>EPPROM Version: 37122N28</b>
600 (540-660)	600	602	602	Temp: 22.5 °C
1,200 (1,080-1,320)	1,200	1,191	1,191	Pressure: 747 mmHg
1,800 (1,620-1,980)	1,800	1,778	1,778	Humidity: 43%
<b>Parameter</b>	<b>Tolerance (±10%)</b>	<b>As Found</b>	<b>As Left</b>	
Threshold T = 100	10 ± (9 to 11) mVDC	10.6	10.6	Geotropism: SAT ACK/Scroll: SAT
Threshold T = 500	50 ± (45 to 55) mVDC	49.9	49.9	BAT>4.5: SAT Volume: SAT
Threshold T = 1000	100 ± (90 to 110) mVDC	99	99	Count: SAT Audio Divide: SAT
Window Width W = 100	10 ± (9 to 11) mVDC	10	10	Alarms: SAT Lamp: SAT
Display-to-mV ratio:	100 to 10 mV			Overload Test: SAT

## STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument			
Calibrated By: <i>Mike Paul</i>	Reviewed By: <i>J. Ruberson</i>	Date: 5/22/09	
Calibration Date: 05/22/2009	Calibration Due: 05/22/2010		



# CALIBRATION CERTIFICATE

Duratek Instrument Services  
628 Gallaher Road  
Kingston, TN 37763  
Phone: (865) 376-8337  
Fax: (865) 376-8331

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION			DETECTOR INFORMATION			
Customer Name: Griffin Instruments			Manufacturer: NE Technology			
Address: 977 Hamilton Lane Kingston, TN 37763			Model: GP13A	Serial Number: 335		
Contact Name: JoAnne Glenn			Calibration Method:			
Contract Purchase Order Number: ES-137		Work Order Number: 2009-10160	Electronic and Source			
DETECTOR PARAMETER SETUPS						
Parameter	As Found	As Left	Parameter	As Found	As Left	Comments
Model	N/A	GP13A	CC	N/A	1.0	DVM: 88020324 Cal Due: 10/31/09
S/N	N/A	335	DT	N/A	4uSec	CD-550: 3076 Cal Due: 08/28/09
Units	N/A	7=counts	Threshold	N/A	350=35mv	Humidity: 992290 Cal Due: 02/03/10
multiplier	N/A	0=auto				
Time base	N/A	1=minutes				Temp: 20.8 °C Pressure: 737 mmHg
HV	N/A	860V				Humidity: 45%
Count time	N/A	60sec				**Detector specific parameters must be entered into instrument manually to be used with another 2350-1**
Saved as Detector #3						
INSTRUMENT INFORMATION						
<u>Model</u>		<u>Serial Number</u>			<u>Calibration Due Date</u>	
2350-1		203490			05/22/2010	
USED FOR EFFICIENCY DETERMINATION AND HV PLATEAUIING						
I <sup>129</sup> #040202 at 95,682 DPM Certification Date: 04/13/99						
<u>Background (CPM)</u>	<u>Gross Source Counts (CPM)</u>		<u>Net Source Counts (CPM)</u>		<u>Efficiency in % (Determined on contact)</u>	
5,889	20,139		14,250		14.9% for I <sup>129</sup>	
**Gross source counts taken from an average of three one minute counts from the Heel, Middle, and Toe of Detector**						
COMMENTS						
Calibration due date shortened by from actual calibration date to match due date of instrument						
STATEMENT OF CERTIFICATION						
We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology. (We are not responsible for damage incurred during shipment or use of this instrument).						
Instrument		Reviewed By: <i>Jeff McKenzie</i>			Date: 5/27/09	
Calibrated By: <i>M. Pauli</i>		Calibration Date: 05/27/2009			Calibration Due: 05/27/2010	



DETECTOR SETUP CHECK LIST REPORT

The following list is stored as detector setup D3 in the Model 2350.  
Today's date is 05/27/2009.  
The current time of day is: 10:23:50.

I have verified the list below  
has NO discrepancies with the DETECTOR SETTINGS TABLE: mf

Comments:

Model 2350 Serial # =	203490.
User I.D. =	
High Voltage =	860 volts.
Threshold =	350.
Window =	1000,Off.
Overload Current =	40.0 micro amperes.
Scaler Count Time =	60 seconds.
Readout Units =	counts.
Readout Time Base =	min.
Readout Range Multiplier =	auto.
Detector Dead Time =	4.000000E-06.
Detector Calibration Constant =	1.000000E+00.
Detector Model =	GP13A.
Detector Serial # =	335.
Ratemeter Alarm Setting =	1.000000E+09.
Scaler Alarm Setting =	1000000.
Integrated Dose Alarm Setting =	1.000000E+09.
Low Count Alarm Setting =	X.
Operating Battery Voltage =	5.3 volts.



det3

Generated: 05/27/2009 10:24:26.

Model 2350 Serial #203490



\*H860\$R\*

Set High Voltage: 860



\*T350\$X\*

Set Threshold: 350



\*W1000\$WOFF\$P\*

Set Window: 1000,OFF



\*O400\$OOFF\$C\*

Set Overload: 400,OFF



\*F60\$H\*

Set Scaler Count Time: 60



\*SU7\$I\*

Set Readout Units = counts



\*SB1\$-\*

Set Readout Time Base = min



\*SM0\$3\*

Set Readout Range Multiplier = auto



\*SL4.000000E-06\$D\*

Set Dead Time: 4.000000E-06



\*SC1.000000E+00\$0\*

Set Calibration Constant: 1.000000E+00



\*MGP13A\$U\*

Set Detector Model: GP13A



\*N335\$U\*

Set Detector Serial #: 335



\*J1.000000E+09\$V\*

Set Ratemeter Alarm: 1.000000E+09



\*K1000000\$H\*

Set Scaler Alarm: 1000000



\*P1.000000E+09\$.\*

Set Dose Alarm: 1.000000E+09



\*SP3\$9\*

SAVE PARAMETERS AS D3

PIC ASC #0713821  
6/16/2009 10:50:18 AM  
QC 1 BACKGROUND

TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM
10.00	2	521	0.2 ✓	52.1 ✓

$\alpha$  HV = 705V  
 $\alpha/\beta$  HV = 1290V

calibration date: 6/16/09  
calibration due date: 6/16/10

Performed by: Jesse Glen  
Griffin Instruments

PIC ASC #0713821  
6/16/2009 9:50:27 AM  
QC 2 TH ALPHA SOURCE

PB 642  
5/4/07

TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	GAMMA COUNTS	ALPHA NET CPM	ALPHA dpm/Sample	ALPHA EFF.
5.00	18640	3143	0	3728.00	1.1760E+04	0.3170 ✓

PIC ASC #0713821  
6/16/2009 9:55:33 AM  
QC 3 Tc99 BETA SOURCE

PB 640  
5/4/07

TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	GAMMA COUNTS	BETA NET CPM	BETA dpm/Sample	BETA EFF.
5.00	1	11099	0	2171.70	8.8000E+03	0.2468 ✓

PIC ASC #0713821  
6/16/2009 10:13:12 AM  
QC 3 C14 BETA SOURCE

PB639  
5/4/07

ROUTINE # 2

TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	GAMMA COUNTS	BETA NET CPM	BETA dpm/Sample	BETA EFF.
5.00	2	45164	0	8984.70	7.8000E+04	0.1152 ✓
*****	WARNING BETA EFF. NOT WITHIN SPECIFICATIONS					*****

OKAY  
Compared to THE 24.68% TC99  
BETA USED DURING CAL.  
6/16/09

PIC ASC #0713821  
6/16/2009 10:05:36 AM  
QC 3 Sr90 BETA SOURCE

PB 641  
5/3/07

ROUTINE # 3

TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	GAMMA COUNTS	BETA NET CPM	BETA dpm/sample	BETA EFF.
5.00	8	35413	0	7034.50	1.7421E+04	0.4038
*****	WARNING BETA EFF. NOT WITHIN SPECIFICATIONS					*****

OKAY  
COMPARED TO THE 24.68% TC 99  
BETA USED DURING CAL.  
J 6/16/09

## Background Documentation

### Fail Levels

L<sub>d</sub>, system detection limit is the net count having 95% probability of being detected when a survey sample point contains activity at L<sub>d</sub>, which translates to a 5% probability of falsely interpreting sample activity as activity due to background (MARSSIM Section 6.7.1)

$$L_d (cpm) = 3 + 4.65\sqrt{B} \quad (\text{Eq. 7})$$

Fail Level CPM = Bkg cpm + Ld cpm

Fail Level Calculations				
Probe	Surface	Bkg	Ld (cpm)	Fail Level (cpm)
IBP19DD #K102	Ambient	588	116	704
	Tile over Concrete	616	118	735
	Carpet over Concrete	632	120	752
IBP19DD #K110	Tile over Concrete	770	132	902
	Bare Concrete	856	139	995
GP13A #360	Ambient	4,442	313	4,755
	Tile over Concrete	5,047	333	5,380
	Carpet over Concrete	5,729	355	6,084
GP13A #335	Tile over Concrete	6,093	366	6,459
	Bare Concrete	7,815	414	8,229

### Beta Instrument Background Data

Ludlum 2350-1 with a IBP19DD probe #K102					
Surface	Counts (cpm)				
Ambient	573	589	599	590	625
	557	578	579	594	597
Average:		588 cpm			

Ludlum 2350-1 with a IBP19DD probe #K102					
Surface	Counts (cpm)				
Tile Over Concrete	656	586	624	562	613
	618	571	627	674	630
Average:		616 cpm			

Ludlum 2350-1 with a IBP19DD probe #K102					
Surface	Counts (cpm)				
Carpet Over Concrete	616	619	603	669	625
	691	607	668	637	589
Average:		632 cpm			

Appendix D – MARSSIM Analytical Calculation Sheets

Ludlum 2350-1 with a IBP19DD probe #K110					
Surface	Counts (cpm)				
Tile Over Concrete	789	773	767	758	745
	738	773	782	755	816
Average: 770 cpm					

Ludlum 2350-1 with a IBP19DD probe #K110					
Surface	Counts (cpm)				
Bare Concrete	832	858	907	871	866
	849	874	859	832	810
Average: 856 cpm					

**Gamma Instrument Background Data**

Ludlum 2350-1 with a GP13A probe #360					
Surface	Counts (cpm)				
Ambient	4423	4327	4456	4468	4453
	4505	4443	4431	4412	4502
Average: 4442 cpm					

Ludlum 2350-1 with a GP13A probe #360					
Surface	Counts (cpm)				
Tile Over Concrete	4836	5225	5280	5087	4456
	4891	4431	5436	5227	5602
Average: 5047 cpm					

Ludlum 2350-1 with a GP13A probe #360					
Surface	Counts (cpm)				
Carpet Over Concrete	5989	5833	5893	5762	5869
	5916	5399	5567	5504	5562
Average: 5729 cpm					

Ludlum 2350-1 with a GP13A probe #335					
Surface	Counts (cpm)				
Tile over Concrete	5754	5631	5759	6498	6416
	6398	5592	6498	6478	5906
Average: 6093 cpm					

Ludlum 2350-1 with a GP13A probe #335					
Surface	Counts (cpm)				
Bare Concrete	7976	7804	7852	7818	7774
	7873	7744	7868	7739	7701
Average: 7815 cpm					



**Minimum Detectable Concentration (MDC) Static Count  
Calculations for Beta & Gamma Counters**

(95% confidence level via MARSSIM method)

$$MDC (dpm/100cm^2) = \frac{3 + 3.29\sqrt{(R_b)(T_{s+b})(1 + T_{s+b}/T_b)}}{(Eff.)(T_{s+b})}$$

Where:

- Eff. = Counter total efficiency, Counter cpm/NIST Standard dpm
- R<sub>b</sub> = Counter background rate (cpm)
- T<sub>s+b</sub> = Sample count time (minutes)
- T<sub>b</sub> = Background count time (minutes)

Static Count MDC Calculations						
Isotope	Eff.*	R <sub>b</sub>	T <sub>s+b</sub>	T <sub>b</sub>	MDC (Static)	
Ludlum 2200 Co-57	85%	172	1	1	75	dpm/100 cm <sup>2</sup>
Protean ASC Tc-99	25%	89	1	1	189	dpm/100 cm <sup>2</sup>

Ludlum 2200  
Protean ASC

**Minimum Detectable Activity (MDA) Static Count  
Calculations for Hand-Held Monitors**

(95% confidence level via MARSSIM method)

$$MDA(dpm/100cm^2) = \frac{3 + 3.29\sqrt{(R_b)(T_{s+b})(1 + T_{s+b}/T_b)}}{(Eff.)(T_{s+b})(probe\ area\ cm^2/100cm^2)} \quad (Eq. 2)$$

Where:

- Eff. = Probe efficiency (2π geometry)
- R<sub>b</sub> = Average background rate (cpm)
- T<sub>s+b</sub> = Sample count time (minutes)
- T<sub>b</sub> = Background count time (minutes)
- P = Probe area (cm<sup>2</sup>)

Static Count MDA Calculations						
Detector	Eff.	R <sub>b</sub>	T <sub>s+tb</sub>	T <sub>b</sub>	P	MDC (Static)
<b>Beta Probe: IBP19DD</b>						
<b>Meter #K102</b>						
Ambient	17.1%	588	1	1	100	677 dpm/100 cm <sup>2</sup>
Tile over Concrete	17.1%	616	1	1	100	692 dpm/100 cm <sup>2</sup>
Carpet over Concrete	17.1%	632	1	1	100	701 dpm/100 cm <sup>2</sup>
<b>Meter #K110</b>						
Tile over Concrete	13.0%	770	1	1	100	1,016 dpm/100 cm <sup>2</sup>
Bare Concrete	13.0%	856	1	1	100	1,070 dpm/100 cm <sup>2</sup>
<b>Probe: GP13A</b>						
<b>Gamma #360</b>						
Ambient	14.6%	4442	1	1	100	2,145 dpm/100 cm <sup>2</sup>
Tile over Concrete	14.6%	5047	1	1	100	2,285 dpm/100 cm <sup>2</sup>
Carpet over Concrete	14.6%	5729	1	1	100	2,433 dpm/100 cm <sup>2</sup>
<b>Gamma #335</b>						
Tile over Concrete	14.9%	6093	1	1	100	2,458 dpm/100 cm <sup>2</sup>
Bare Concrete	14.9%	7815	1	1	100	2,781 dpm/100 cm <sup>2</sup>

**Scan Minimum Detectable Concentration (MDC)**

**Calculations for Hand-Held Monitors**

(Scan MDC per MARSSIM/NUREG-1575, NUREG-1507 methodology)

$$\text{Scan MDA} = \frac{\text{MDCR}}{\sqrt{p} (\epsilon_i)(\epsilon_s) \left( \frac{A}{100 \text{ cm}^2} \right)} \quad (\text{Eq. 3})$$

Where:

- p = surveyor efficiency, per MARISSIM (0.5)
- $\epsilon_i$  = instrument efficiency ( $2\pi$  geometry)
- $\epsilon_s$  = surface efficiency, 1 for gammas and high energy betas  $>1 \text{ Mev } E_{\text{max}}$  (e.g. P-32, Cl-36, S/Y-90, etc.), 0.5 for low energy betas (e.g. C-14, P-33, S-35, Tc-99, Ca-45, etc.)
- A = probe active area ( $\text{cm}^2$ )

And,

$$\text{MDCR} = S_i (60 \text{ sec / min}) / i \text{ sec} \quad (\text{Eq. 4})$$

Where:

- MDCR = Minimum detectable count rate (cpm)
- $S_i$  = source counts in time interval, i. Use 2 seconds observation count interval per MARISM, Table 6.6

And,

$$S_i = d' \sqrt{B_i} \quad (\text{Eq. 5})$$

Where:

- $d'$  = 1.38 for 95% true positive scan detection rate, per, MARRISM, Table 6.5
- $B_i$  = Background counts in interval, i

And,

$$B_i = (P_b)(i)(1 \text{ min} / 60 \text{ sec}) \quad (\text{Eq. 6})$$

Where:

- $P_b$  = probe background count rate (cpm)
- i = observation interval

**Scan Minimum Detectable Concentration (MDC)**

**Calculations for Hand-Held Monitors**

(Scan MDC per MARSSIM/NUREG-1575, NUREG-1507 methodology)

**Specific Scan MDCR calculation results:**

**Beta Detectors**

	<b>K102 Ambient</b>	<b>K102 Tile/Concrete</b>	<b>K102 Carpet/Concrete</b>	<b>K110 Tile/Concrete</b>
$P_b =$	588 cpm	616 cpm	632 cpm	770 cpm
$i =$	1 sec	1 sec	1 sec	1 sec
$B_i =$	10 counts	10 counts	11 counts	13 counts
$d' =$	1.38	1.38	1.38	1.38
$S_i =$	4.32 counts	4.42 counts	4.48 counts	4.94 counts
MDCR =	259 cpm	265 cpm	269 cpm	297 cpm

**Beta Detectors (cont.)**

	<b>K110 Bare Concrete</b>
$P_b =$	856 cpm
$i =$	1 sec
$B_i =$	14 counts
$d' =$	1.38
$S_i =$	5.21 counts
MDCR =	313 cpm

**Gamma Detectors**

	<b>360 Ambient</b>	<b>360 Tile/Concrete</b>
	4,442 cpm	5,047 cpm
	1 sec	1 sec
	74 counts	84 counts
	1.38	1.38
	11.87 counts	12.66 counts
	712 cpm	759 cpm

**Gamma Detectors (cont.)**

	<b>360 Carpet/Concrete</b>	<b>335 Tile/Concrete</b>	<b>335 Bare Concrete</b>
$P_b =$	5,729 cpm	6,093 cpm	7,815 cpm
$i =$	1 sec	1 sec	1 sec
$B_i =$	95 counts	102 counts	130 counts
$d' =$	1.38	1.38	1.38
$S_i =$	13.49 counts	13.91 counts	15.75 counts
MDCR =	809 cpm	834 cpm	945 cpm

<b>Scan MDC Calculations</b>					
<b>Detector</b>	<b>Surface</b>	$\epsilon_i$	$\epsilon_s$	<b>A</b>	<b>MDA (Scan)</b>
<b>Probe: BP19DD</b>					
K102 Beta	Ambient	34.2%	0.50	100	2,144 dpm/100 cm <sup>2</sup>
	Tile over Concrete	34.2%	0.50	100	2,194 dpm/100 cm <sup>2</sup>
	Carpet over Concrete	34.2%	0.50	100	2,223 dpm/100 cm <sup>2</sup>
K110 Beta	Tile over Concrete	26.0%	0.50	100	3,225 dpm/100 cm <sup>2</sup>
	Bare Concrete	26.0%	0.50	100	3,401 dpm/100 cm <sup>2</sup>
<b>Probe: GP13A</b>					
360 Gamma	Ambient	14.6%	1.00	100	6,901 dpm/100 cm <sup>2</sup>
	Tile over Concrete	14.6%	1.00	100	7,356 dpm/100 cm <sup>2</sup>
	Carpet over Concrete	14.6%	1.00	100	7,837 dpm/100 cm <sup>2</sup>
335 Gamma	Tile over Concrete	14.9%	1.00	100	7,920 dpm/100 cm <sup>2</sup>
	Bare Concrete	14.9%	1.00	100	8,969 dpm/100 cm <sup>2</sup>

Appendix E – Building and Structures Static Measurements

Static Contamination Measurements

Facility Areas

Instruments Used		Surface Material	Beta				Background Dose Rate	Gamma				
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All					8-10 uR/hr					
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05	692		5047	14.60%	3.00E+05	2285	
		Carpet Over Concrete	632			701		5729			2433	
		Ambient	588			677		4442			2145	
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%		1016		6093	14.90%		2458	
		Bare Concrete	856			1070		7815			2781	
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
<b>GEH-Restricted Area</b>												
1	Beta K102/Gamma-360	Tile Over Concrete	676	616	350	<MDC	≤BKG	5451	5047	2766	<DCGL	None
2	Beta K102/Gamma-360	Tile Over Concrete	624	616	46	<MDC	≤BKG	5441	5047	2698	<DCGL	None
3	Beta K102/Gamma-360	Tile Over Concrete	612	616	-24	<MDC	≤BKG	5079	5047	218	<MDC	None
4	Beta K102/Gamma-360	Tile Over Concrete	661	616	262	<MDC	≤BKG	5072	5047	171	<MDC	None
5	Beta K102/Gamma-360	Tile Over Concrete	600	616	-94	<MDC	≤BKG	4868	5047	-1227	<MDC	None
6	Beta K102/Gamma-360	Tile Over Concrete	610	616	-36	<MDC	≤BKG	4842	5047	-1405	<MDC	None
7	Beta K102/Gamma-360	Tile Over Concrete	622	616	34	<MDC	≤BKG	4659	5047	-2658	<MDC	None
8	Beta K102/Gamma-360	Tile Over Concrete	646	616	175	<MDC	≤BKG	4812	5047	-1610	<MDC	None
9	Beta K102/Gamma-360	Tile Over Concrete	645	616	169	<MDC	≤BKG	4621	5047	-2918	<MDC	None
10	Beta K102/Gamma-360	Tile Over Concrete	610	616	-36	<MDC	≤BKG	4679	5047	-2521	<MDC	None
11	Beta K102/Gamma-360	Tile Over Concrete	599	616	-100	<MDC	≤BKG	4912	5047	-925	<MDC	None
12	Beta K102/Gamma-360	Tile Over Concrete	596	616	-117	<MDC	≤BKG	4902	5047	-994	<MDC	None
13	Beta K102/Gamma-360	Tile Over Concrete	646	616	175	<MDC	≤BKG	5003	5047	-302	<MDC	None
14	Beta K102/Gamma-360	Tile Over Concrete	577	616	-228	<MDC	≤BKG	4898	5047	-1021	<MDC	None
15	Beta K102/Gamma-360	Tile Over Concrete	656	616	233	<MDC	≤BKG	4960	5047	-597	<MDC	None
16	Beta K102/Gamma-360	Tile Over Concrete	641	616	145	<MDC	≤BKG	4716	5047	-2268	<MDC	None
17	Beta K102/Gamma-360	Tile Over Concrete	589	616	-158	<MDC	≤BKG	4777	5047	-1850	<MDC	None
18	Beta K102/Gamma-360	Tile Over Concrete	660	616	257	<MDC	≤BKG	4581	5047	-3192	<MDC	None
19	Beta K102/Gamma-360	Tile Over Concrete	652	616	210	<MDC	≤BKG	4579	5047	-3206	<MDC	None
20	Beta K102/Gamma-360	Tile Over Concrete	600	616	-94	<MDC	≤BKG	4838	5047	-1432	<MDC	None
21	Beta K102/Gamma-360	Tile Over Concrete	613	616	-18	<MDC	≤BKG	4721	5047	-2234	<MDC	None
22	Beta K102/Gamma-360	Tile Over Concrete	643	616	157	<MDC	≤BKG	4829	5047	-1494	<MDC	None
23	Beta K102/Gamma-360	Tile Over Concrete	691	616	438	<MDC	≤BKG	5040	5047	-49	<MDC	None
24	Beta K102/Gamma-360	Tile Over Concrete	641	616	145	<MDC	≤BKG	5138	5047	623	<MDC	None
25	Beta K102/Gamma-360	Tile Over Concrete	606	616	-59	<MDC	≤BKG	5503	5047	3123	<DCGL	None
26	Beta K102/Gamma-360	Tile Over Concrete	645	616	169	<MDC	≤BKG	5651	5047	4136	<DCGL	None
27	Beta K102/Gamma-360	Tile Over Concrete	680	616	373	<MDC	≤BKG	5814	5047	5253	<DCGL	None
28	Beta K102/Gamma-360	Tile Over Concrete	635	616	110	<MDC	≤BKG	5245	5047	1355	<MDC	None
29	Beta K102/Gamma-360	Tile Over Concrete	675	616	344	<MDC	≤BKG	5320	5047	1869	<MDC	None
30	Beta K102/Gamma-360	Tile Over Concrete	599	616	-100	<MDC	≤BKG	4943	5047	-713	<MDC	None
31	Beta K102/Gamma-360	Tile Over Concrete	645	616	169	<MDC	≤BKG	4889	5047	-1083	<MDC	None
32	Beta K102/Gamma-360	Tile Over Concrete	610	616	-36	<MDC	≤BKG	4860	5047	-1282	<MDC	None
33	Beta K102/Gamma-360	Tile Over Concrete	577	616	-228	<MDC	≤BKG	4775	5047	-1864	<MDC	None
34	Beta K102/Gamma-360	Tile Over Concrete	623	616	40	<MDC	≤BKG	4658	5047	-2665	<MDC	None
35	Beta K102/Gamma-360	Tile Over Concrete	586	616	-176	<MDC	≤BKG	4660	5047	-2651	<MDC	None
36	Beta K102/Gamma-360	Tile Over Concrete	582	616	-199	<MDC	≤BKG	4638	5047	-2802	<MDC	None
37	Beta K102/Gamma-360	Tile Over Concrete	582	616	-199	<MDC	≤BKG	4861	5047	-1275	<MDC	None
38	Beta K102/Gamma-360	Tile Over Concrete	574	616	-246	<MDC	≤BKG	4991	5047	-384	<MDC	None

Appendix E – Building and Structures Static Measurements

Static Contamination Measurements

Facility Areas

Instruments Used		Surface Material	Beta				Background Dose Rate	Gamma				
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All					8-10 uR/hr					
Beta-K102/Gamma-360	Tile Over Concrete		616	17.12%	3.25E+05			5047	14.60%	3.00E+05		2285
	Carpet Over Concrete		632					701			5729	2433
	Ambient		588					677			4442	2145
Beta-K110/Gamma-335	Tile Over Concrete		770	13.01%				6093	14.90%			2458
	Bare Concrete		856			1016		7815		2781		
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
39	Beta K102/Gamma-360	Tile Over Concrete	651	616	204	<MDC	≤BKG	4969	5047	-535	<MDC	None
40	Beta K102/Gamma-360	Tile Over Concrete	590	616	-152	<MDC	≤BKG	5007	5047	-275	<MDC	None
41	Beta K102/Gamma-360	Tile Over Concrete	607	616	-53	<MDC	≤BKG	4829	5047	-1494	<MDC	None
42	Beta K102/Gamma-360	Tile Over Concrete	621	616	29	<MDC	≤BKG	4764	5047	-1939	<MDC	None
43	Beta K102/Gamma-360	Tile Over Concrete	594	616	-129	<MDC	≤BKG	4757	5047	-1987	<MDC	None
44	Beta K102/Gamma-360	Tile Over Concrete	597	616	-112	<MDC	≤BKG	4671	5047	-2576	<MDC	None
45	Beta K102/Gamma-360	Tile Over Concrete	621	616	29	<MDC	≤BKG	4651	5047	-2713	<MDC	None
46	Beta K102/Gamma-360	Tile Over Concrete	617	616	5	<MDC	≤BKG	4793	5047	-1740	<MDC	None
47	Beta K102/Gamma-360	Tile Over Concrete	594	616	-129	<MDC	≤BKG	4678	5047	-2528	<MDC	None
48	Beta K102/Gamma-360	Tile Over Concrete	602	616	-82	<MDC	≤BKG	4746	5047	-2062	<MDC	None
49	Beta K102/Gamma-360	Tile Over Concrete	654	616	221	<MDC	≤BKG	4932	5047	-788	<MDC	None
50	Beta K102/Gamma-360	Tile Over Concrete	648	616	186	<MDC	≤BKG	4990	5047	-391	<MDC	None
51	Beta K102/Gamma-360	Tile Over Concrete	645	616	169	<MDC	≤BKG	5263	5047	1479	<MDC	None
52	Beta K102/Gamma-360	Tile Over Concrete	650	616	198	<MDC	≤BKG	5664	5047	4225	<DCGL	None
53	Beta K102/Gamma-360	Tile Over Concrete	620	616	23	<MDC	≤BKG	5724	5047	4636	<DCGL	None
54	Beta K102/Gamma-360	Tile Over Concrete	646	616	175	<MDC	≤BKG	5386	5047	2321	<DCGL	None
55	Beta K102/Gamma-360	Tile Over Concrete	631	616	87	<MDC	≤BKG	5084	5047	253	<MDC	None
56	Beta K102/Gamma-360	Tile Over Concrete	634	616	105	<MDC	≤BKG	4896	5047	-1035	<MDC	None
57	Beta K102/Gamma-360	Tile Over Concrete	612	616	-24	<MDC	≤BKG	4797	5047	-1713	<MDC	None
58	Beta K102/Gamma-360	Tile Over Concrete	597	616	-112	<MDC	≤BKG	4735	5047	-2138	<MDC	None
59	Beta K102/Gamma-360	Tile Over Concrete	630	616	81	<MDC	≤BKG	4602	5047	-3049	<MDC	None
60	Beta K102/Gamma-360	Tile Over Concrete	576	616	-234	<MDC	≤BKG	4647	5047	-2740	<MDC	None
61	Beta K102/Gamma-360	Tile Over Concrete	613	616	-18	<MDC	≤BKG	4593	5047	-3110	<MDC	None
62	Beta K102/Gamma-360	Tile Over Concrete	616	616	-1	<MDC	≤BKG	4675	5047	-2549	<MDC	None
63	Beta K102/Gamma-360	Tile Over Concrete	654	616	221	<MDC	≤BKG	4556	5047	-3364	<MDC	None
64	Beta K102/Gamma-360	Tile Over Concrete	607	616	-53	<MDC	≤BKG	4804	5047	-1665	<MDC	None
65	Beta K102/Gamma-360	Tile Over Concrete	608	616	-47	<MDC	≤BKG	5012	5047	-240	<MDC	None
66	Beta K102/Gamma-360	Tile Over Concrete	601	616	-88	<MDC	≤BKG	5128	5047	554	<MDC	None
67	Beta K102/Gamma-360	Tile Over Concrete	629	616	75	<MDC	≤BKG	4933	5047	-782	<MDC	None
68	Beta K102/Gamma-360	Tile Over Concrete	631	616	87	<MDC	≤BKG	4600	5047	-3062	<MDC	None
69	Beta K102/Gamma-360	Tile Over Concrete	585	616	-182	<MDC	≤BKG	4683	5047	-2494	<MDC	None
70	Beta K102/Gamma-360	Tile Over Concrete	631	616	87	<MDC	≤BKG	4651	5047	-2713	<MDC	None
71	Beta K102/Gamma-360	Tile Over Concrete	600	616	-94	<MDC	≤BKG	4615	5047	-2960	<MDC	None
72	Beta K102/Gamma-360	Tile Over Concrete	617	616	5	<MDC	≤BKG	4916	5047	-898	<MDC	None
73	Beta K102/Gamma-360	Tile Over Concrete	663	616	274	<MDC	≤BKG	4668	5047	-2597	<MDC	None
74	Beta K102/Gamma-360	Tile Over Concrete	601	616	-88	<MDC	≤BKG	4832	5047	-1473	<MDC	None
75	Beta K102/Gamma-360	Tile Over Concrete	630	616	81	<MDC	≤BKG	4972	5047	-514	<MDC	None
76	Beta K102/Gamma-360	Tile Over Concrete	679	616	368	<MDC	≤BKG	5109	5047	424	<MDC	None
77	Beta K102/Gamma-360	Tile Over Concrete	673	616	332	<MDC	≤BKG	5336	5047	1979	<MDC	None

Static Contamination Measurements

Facility Areas

Instruments Used		Surface Material	Beta				Background Dose Rate	Gamma				
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All					8-10 uR/hr					
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05	692		5047	14.60%	3.00E+05	2285	
		Carpet Over Concrete	632			701		5729			2433	
		Ambient	588			677		4442			2145	
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%		1016		6093	14.90%		2458	
		Bare Concrete	856			1070		7815			2781	
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
78	Beta K102/Gamma-360	Tile Over Concrete	655	616	227	<MDC	SBKG	5520	5047	3239	<DCGL	None
79	Beta K102/Gamma-360	Tile Over Concrete	624	616	46	<MDC	SBKG	5501	5047	3109	<DCGL	None
80	Beta K102/Gamma-360	Tile Over Concrete	629	616	75	<MDC	SBKG	5386	5047	2321	<DCGL	None
81	Beta K102/Gamma-360	Tile Over Concrete	607	616	-53	<MDC	SBKG	5242	5047	1335	<MDC	None
82	Beta K102/Gamma-360	Tile Over Concrete	592	616	-141	<MDC	SBKG	4821	5047	-1549	<MDC	None
83	Beta K102/Gamma-360	Tile Over Concrete	603	616	-77	<MDC	SBKG	4890	5047	-1076	<MDC	None
84	Beta K102/Gamma-360	Tile Over Concrete	634	616	105	<MDC	SBKG	4668	5047	-2597	<MDC	None
85	Beta K102/Gamma-360	Tile Over Concrete	627	616	64	<MDC	SBKG	4696	5047	-2405	<MDC	None
86	Beta K102/Gamma-360	Tile Over Concrete	611	616	-30	<MDC	SBKG	4550	5047	-3405	<MDC	None
87	Beta K102/Gamma-360	Tile Over Concrete	581	616	-205	<MDC	SBKG	4644	5047	-2761	<MDC	None
88	Beta K102/Gamma-360	Tile Over Concrete	615	616	-6	<MDC	SBKG	4479	5047	-3891	<MDC	None
89	Beta K102/Gamma-360	Tile Over Concrete	600	616	-94	<MDC	SBKG	4741	5047	-2097	<MDC	None
90	Beta K102/Gamma-360	Tile Over Concrete	652	616	210	<MDC	SBKG	4821	5047	-1549	<MDC	None
91	Beta K102/Gamma-360	Tile Over Concrete	653	616	216	<MDC	SBKG	5052	5047	34	<MDC	None
92	Beta K102/Gamma-360	Tile Over Concrete	600	616	-94	<MDC	SBKG	4963	5047	-576	<MDC	None
93	Beta K102/Gamma-360	Tile Over Concrete	593	616	-135	<MDC	SBKG	4876	5047	-1172	<MDC	None
94	Beta K102/Gamma-360	Tile Over Concrete	584	616	-188	<MDC	SBKG	4647	5047	-2740	<MDC	None
95	Beta K102/Gamma-360	Tile Over Concrete	573	616	-252	<MDC	SBKG	4310	5047	-5049	<MDC	None
96	Beta K102/Gamma-360	Tile Over Concrete	615	616	-6	<MDC	SBKG	4546	5047	-3432	<MDC	None
97	Beta K102/Gamma-360	Tile Over Concrete	590	616	-152	<MDC	SBKG	4417	5047	-4316	<MDC	None
98	Beta K102/Gamma-360	Tile Over Concrete	619	616	17	<MDC	SBKG	4483	5047	-3864	<MDC	None
99	Beta K102/Gamma-360	Tile Over Concrete	640	616	140	<MDC	SBKG	4634	5047	-2829	<MDC	None
100	Beta K102/Gamma-360	Tile Over Concrete	649	616	192	<MDC	SBKG	4740	5047	-2103	<MDC	None
101	Beta K102/Gamma-360	Tile Over Concrete	614	616	-12	<MDC	SBKG	4979	5047	-466	<MDC	None
102	Beta K102/Gamma-360	Tile Over Concrete	652	616	210	<MDC	SBKG	5212	5047	1129	<MDC	None
103	Beta K102/Gamma-360	Tile Over Concrete	607	616	-53	<MDC	SBKG	5232	5047	1266	<MDC	None
104	Beta K102/Gamma-360	Tile Over Concrete	651	616	204	<MDC	SBKG	5493	5047	3054	<DCGL	None
105	Beta K102/Gamma-360	Tile Over Concrete	669	616	309	<MDC	SBKG	5405	5047	2451	<DCGL	None
106	Beta K102/Gamma-360	Tile Over Concrete	616	616	-1	<MDC	SBKG	5144	5047	664	<MDC	None
107	Beta K102/Gamma-360	Tile Over Concrete	668	616	303	<MDC	SBKG	5152	5047	718	<MDC	None
108	Beta K102/Gamma-360	Tile Over Concrete	620	616	23	<MDC	SBKG	4889	5047	-1083	<MDC	None
109	Beta K102/Gamma-360	Tile Over Concrete	600	616	-94	<MDC	SBKG	4739	5047	-2110	<MDC	None
110	Beta K102/Gamma-360	Tile Over Concrete	606	616	-59	<MDC	SBKG	4728	5047	-2186	<MDC	None
111	Beta K102/Gamma-360	Tile Over Concrete	613	616	-18	<MDC	SBKG	4529	5047	-3549	<MDC	None
112	Beta K102/Gamma-360	Tile Over Concrete	606	616	-59	<MDC	SBKG	4472	5047	-3939	<MDC	None
113	Beta K102/Gamma-360	Tile Over Concrete	592	616	-141	<MDC	SBKG	4309	5047	-5055	<MDC	None
114	Beta K102/Gamma-360	Tile Over Concrete	495	616	-708	<MDC	SBKG	4462	5047	-4008	<MDC	None
115	Beta K102/Gamma-360	Tile Over Concrete	630	616	81	<MDC	SBKG	4628	5047	-2871	<MDC	None
116	Beta K102/Gamma-360	Tile Over Concrete	646	616	175	<MDC	SBKG	4723	5047	-2220	<MDC	None

Static Contamination Measurements  
Facility Areas

Instruments Used		Surface Material	Beta				Background Dose Rate	Gamma				
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All					8-10 uR/hr					
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05	692		5047	14.60%	3.00E+05	2285	
		Carpet Over Concrete	632			701		5729			2433	
		Ambient	588			677		4442			2145	
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%		1016		6093	14.90%		2458	
		Bare Concrete	856			1070		7815			2781	
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
117	Beta K102/Gamma-360	Tile Over Concrete	579	616	-217	<MDC	≤BKG	5112	5047	445	<MDC	None
118	Beta K102/Gamma-360	Tile Over Concrete	632	616	93	<MDC	≤BKG	5001	5047	-316	<MDC	None
119	Beta K102/Gamma-360	Tile Over Concrete	614	616	-12	<MDC	≤BKG	5126	5047	540	<MDC	None
120	Beta K102/Gamma-360	Tile Over Concrete	588	616	-164	<MDC	≤BKG	4856	5047	-1309	<MDC	None
121	Beta K102/Gamma-360	Tile Over Concrete	619	616	17	<MDC	≤BKG	4619	5047	-2932	<MDC	None
122	Beta K102/Gamma-360	Tile Over Concrete	607	616	-53	<MDC	≤BKG	4482	5047	-3871	<MDC	None
123	Beta K102/Gamma-360	Tile Over Concrete	594	616	-129	<MDC	≤BKG	4462	5047	-4008	<MDC	None
124	Beta K102/Gamma-360	Tile Over Concrete	625	616	52	<MDC	≤BKG	4490	5047	-3816	<MDC	None
125	Beta K102/Gamma-360	Tile Over Concrete	574	616	-246	<MDC	≤BKG	4616	5047	-2953	<MDC	None
126	Beta K102/Gamma-360	Tile Over Concrete	603	616	-77	<MDC	≤BKG	4778	5047	-1843	<MDC	None
127	Beta K102/Gamma-360	Tile Over Concrete	620	616	23	<MDC	≤BKG	4857	5047	-1302	<MDC	None
128	Beta K102/Gamma-360	Tile Over Concrete	631	616	87	<MDC	≤BKG	5179	5047	903	<MDC	None
129	Beta K102/Gamma-360	Tile Over Concrete	610	616	-36	<MDC	≤BKG	5231	5047	1260	<MDC	None
130	Beta K102/Gamma-360	Tile Over Concrete	625	616	52	<MDC	≤BKG	5436	5047	2664	<DCGL	None
131	Beta K102/Gamma-360	Tile Over Concrete	623	616	40	<MDC	≤BKG	5551	5047	3451	<DCGL	None
132	Beta K102/Gamma-360	Tile Over Concrete	630	616	81	<MDC	≤BKG	5131	5047	575	<MDC	None
133	Beta K102/Gamma-360	Tile Over Concrete	613	616	-18	<MDC	≤BKG	5024	5047	-158	<MDC	None
134	Beta K102/Gamma-360	Tile Over Concrete	612	616	-24	<MDC	≤BKG	4930	5047	-802	<MDC	None
135	Beta K102/Gamma-360	Tile Over Concrete	670	616	315	<MDC	≤BKG	4701	5047	-2371	<MDC	None
136	Beta K102/Gamma-360	Tile Over Concrete	607	616	-53	<MDC	≤BKG	4300	5047	-5117	<MDC	None
137	Beta K102/Gamma-360	Tile Over Concrete	597	616	-112	<MDC	≤BKG	4432	5047	-4213	<MDC	None
138	Beta K102/Gamma-360	Tile Over Concrete	642	616	151	<MDC	≤BKG	4507	5047	-3699	<MDC	None
139	Beta K102/Gamma-360	Tile Over Concrete	596	616	-117	<MDC	≤BKG	4536	5047	-3501	<MDC	None
140	Beta K102/Gamma-360	Tile Over Concrete	559	616	-334	<MDC	≤BKG	4550	5047	-3405	<MDC	None
141	Beta K102/Gamma-360	Tile Over Concrete	614	616	-12	<MDC	≤BKG	4660	5047	-2651	<MDC	None
142	Beta K102/Gamma-360	Tile Over Concrete	632	616	93	<MDC	≤BKG	4949	5047	-672	<MDC	None
143	Beta K102/Gamma-360	Tile Over Concrete	639	616	134	<MDC	≤BKG	5117	5047	479	<MDC	None
144	Beta K102/Gamma-360	Tile Over Concrete	662	616	268	<MDC	≤BKG	5222	5047	1198	<MDC	None
145	Beta K102/Gamma-360	Tile Over Concrete	656	616	233	<MDC	≤BKG	4878	5047	-1158	<MDC	None
146	Beta K102/Gamma-360	Tile Over Concrete	655	616	227	<MDC	≤BKG	4801	5047	-1686	<MDC	None
147	Beta K102/Gamma-360	Tile Over Concrete	557	616	-345	<MDC	≤BKG	4830	5047	-1487	<MDC	None
148	Beta K102/Gamma-360	Tile Over Concrete	623	616	40	<MDC	≤BKG	4545	5047	-3439	<MDC	None
149	Beta K102/Gamma-360	Tile Over Concrete	651	616	204	<MDC	≤BKG	4569	5047	-3275	<MDC	None
150	Beta K102/Gamma-360	Tile Over Concrete	658	616	245	<MDC	≤BKG	4493	5047	-3795	<MDC	None
151	Beta K102/Gamma-360	Tile Over Concrete	623	616	40	<MDC	≤BKG	4660	5047	-2651	<MDC	None
152	Beta K102/Gamma-360	Tile Over Concrete	654	616	221	<MDC	≤BKG	4739	5047	-2110	<MDC	None
153	Beta K102/Gamma-360	Tile Over Concrete	623	616	40	<MDC	≤BKG	5007	5047	-275	<MDC	None
154	Beta K102/Gamma-360	Tile Over Concrete	643	616	157	<MDC	≤BKG	4908	5047	-953	<MDC	None
155	Beta K102/Gamma-360	Tile Over Concrete	671	616	321	<MDC	≤BKG	5162	5047	787	<MDC	None



Static Contamination Measurements  
Facility Areas

Instruments Used		Surface Material	Beta				Background Dose Rate	Gamma				
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All					8-10 uR/hr					
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05	692		5047	14.60%	3.00E+05	2285	
		Carpet Over Concrete	632			701		5729			2433	
		Ambient	588			677		4442			2145	
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%		1016		6093	14.90%		2458	
		Bare Concrete	856			1070		7815			2781	
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
156	Beta K102/Gamma-360	Tile Over Concrete	656	616	233	<MDC	≤BKG	5468	5047	2883	<DCGL	None
157	Beta K102/Gamma-360	Tile Over Concrete	668	616	303	<MDC	≤BKG	5448	5047	2746	<DCGL	None
158	Beta K102/Gamma-360	Tile Over Concrete	629	616	75	<MDC	≤BKG	5134	5047	595	<MDC	None
159	Beta K102/Gamma-360	Tile Over Concrete	645	616	169	<MDC	≤BKG	4963	5047	-576	<MDC	None
160	Beta K102/Gamma-360	Tile Over Concrete	672	616	327	<MDC	≤BKG	4829	5047	-1494	<MDC	None
161	Beta K102/Gamma-360	Tile Over Concrete	638	616	128	<MDC	≤BKG	4813	5047	-1603	<MDC	None
162	Beta K102/Gamma-360	Tile Over Concrete	600	616	-94	<MDC	≤BKG	4462	5047	-4008	<MDC	None
163	Beta K102/Gamma-360	Tile Over Concrete	584	616	-188	<MDC	≤BKG	4631	5047	-2850	<MDC	None
164	Beta K102/Gamma-360	Tile Over Concrete	593	616	-135	<MDC	≤BKG	4406	5047	-4391	<MDC	None
165	Beta K102/Gamma-360	Tile Over Concrete	656	616	233	<MDC	≤BKG	4666	5047	-2610	<MDC	None
166	Beta K102/Gamma-360	Tile Over Concrete	643	616	157	<MDC	≤BKG	4426	5047	-4254	<MDC	None
167	Beta K102/Gamma-360	Tile Over Concrete	645	616	169	<MDC	≤BKG	4667	5047	-2603	<MDC	None
168	Beta K102/Gamma-360	Tile Over Concrete	638	616	128	<MDC	≤BKG	4829	5047	-1494	<MDC	None
169	Beta K102/Gamma-360	Tile Over Concrete	596	616	-117	<MDC	≤BKG	4982	5047	-446	<MDC	None
170	Beta K102/Gamma-360	Tile Over Concrete	621	616	29	<MDC	≤BKG	4903	5047	-987	<MDC	None
171	Beta K102/Gamma-360	Tile Over Concrete	672	616	327	<MDC	≤BKG	4746	5047	-2062	<MDC	None
172	Beta K102/Gamma-360	Tile Over Concrete	603	616	-77	<MDC	≤BKG	4642	5047	-2775	<MDC	None
173	Beta K102/Gamma-360	Tile Over Concrete	599	616	-100	<MDC	≤BKG	4531	5047	-3535	<MDC	None
174	Beta K102/Gamma-360	Tile Over Concrete	645	616	169	<MDC	≤BKG	4520	5047	-3610	<MDC	None
175	Beta K102/Gamma-360	Tile Over Concrete	601	616	-88	<MDC	≤BKG	4440	5047	-4158	<MDC	None
176	Beta K102/Gamma-360	Tile Over Concrete	620	616	23	<MDC	≤BKG	4512	5047	-3665	<MDC	None
177	Beta K102/Gamma-360	Tile Over Concrete	629	616	75	<MDC	≤BKG	4626	5047	-2884	<MDC	None
178	Beta K102/Gamma-360	Tile Over Concrete	605	616	-65	<MDC	≤BKG	4687	5047	-2466	<MDC	None
179	Beta K102/Gamma-360	Tile Over Concrete	620	616	23	<MDC	≤BKG	4728	5047	-2186	<MDC	None
180	Beta K102/Gamma-360	Tile Over Concrete	630	616	81	<MDC	≤BKG	4736	5047	-2131	<MDC	None
181	Beta K102/Gamma-360	Tile Over Concrete	628	616	70	<MDC	≤BKG	5082	5047	239	<MDC	None
182	Beta K102/Gamma-360	Tile Over Concrete	653	616	216	<MDC	≤BKG	5374	5047	2239	<MDC	None
183	Beta K102/Gamma-360	Tile Over Concrete	667	616	297	<MDC	≤BKG	5425	5047	2588	<DCGL	None
184	Beta K102/Gamma-360	Tile Over Concrete	630	616	81	<MDC	≤BKG	4830	5047	-1487	<MDC	None
185	Beta K102/Gamma-360	Tile Over Concrete	612	616	-24	<MDC	≤BKG	4893	5047	-1055	<MDC	None
186	Beta K102/Gamma-360	Tile Over Concrete	629	616	75	<MDC	≤BKG	4747	5047	-2055	<MDC	None
187	Beta K102/Gamma-360	Tile Over Concrete	651	616	204	<MDC	≤BKG	4606	5047	-3021	<MDC	None
188	Beta K102/Gamma-360	Tile Over Concrete	604	616	-71	<MDC	≤BKG	4494	5047	-3788	<MDC	None
189	Beta K102/Gamma-360	Tile Over Concrete	586	616	-176	<MDC	≤BKG	4388	5047	-4514	<MDC	None
190	Beta K102/Gamma-360	Tile Over Concrete	606	616	-59	<MDC	≤BKG	4610	5047	-2994	<MDC	None
191	Beta K102/Gamma-360	Tile Over Concrete	598	616	-106	<MDC	≤BKG	4470	5047	-3953	<MDC	None
192	Beta K102/Gamma-360	Tile Over Concrete	596	616	-117	<MDC	≤BKG	4735	5047	-2138	<MDC	None
193	Beta K102/Gamma-360	Tile Over Concrete	593	616	-135	<MDC	≤BKG	4794	5047	-1734	<MDC	None
194	Beta K102/Gamma-360	Tile Over Concrete	654	616	221	<MDC	≤BKG	5024	5047	-158	<MDC	None

Static Contamination Measurements  
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Instruments Used		Surface Material	Beta				Background Dose Rate 8-10 uR/hr	Gamma				
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All										
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05	692		5047	14.60%	3.00E+05	2285	
		Carpet Over Concrete	632			701		5729			2433	
		Ambient	588			677		4442			2145	
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%		1016		6093	14.90%		2458	
		Bare Concrete	856			1070		7815			2781	
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
195	Beta K102/Gamma-360	Tile Over Concrete	619	616	17	<MDC	≤BKG	5126	5047	540	<MDC	None
196	Beta K102/Gamma-360	Tile Over Concrete	626	616	58	<MDC	≤BKG	5103	5047	383	<MDC	None
197	Beta K102/Gamma-360	Tile Over Concrete	650	616	198	<MDC	≤BKG	4984	5047	-432	<MDC	None
198	Beta K102/Gamma-360	Tile Over Concrete	665	616	286	<MDC	≤BKG	4837	5047	-1439	<MDC	None
199	Beta K102/Gamma-360	Tile Over Concrete	618	616	11	<MDC	≤BKG	4610	5047	-2994	<MDC	None
200	Beta K102/Gamma-360	Tile Over Concrete	584	616	-188	<MDC	≤BKG	4627	5047	-2877	<MDC	None
201	Beta K102/Gamma-360	Tile Over Concrete	601	616	-88	<MDC	≤BKG	4336	5047	-4871	<MDC	None
202	Beta K102/Gamma-360	Tile Over Concrete	620	616	23	<MDC	≤BKG	4309	5047	-5055	<MDC	None
203	Beta K102/Gamma-360	Tile Over Concrete	601	616	-88	<MDC	≤BKG	4513	5047	-3658	<MDC	None
204	Beta K102/Gamma-360	Tile Over Concrete	587	616	-170	<MDC	≤BKG	4697	5047	-2398	<MDC	None
205	Beta K102/Gamma-360	Tile Over Concrete	645	616	169	<MDC	≤BKG	4735	5047	-2138	<MDC	None
206	Beta K102/Gamma-360	Tile Over Concrete	611	616	-30	<MDC	≤BKG	4882	5047	-1131	<MDC	None
207	Beta K102/Gamma-360	Tile Over Concrete	595	616	-123	<MDC	≤BKG	5180	5047	910	<MDC	None
208	Beta K102/Gamma-360	Tile Over Concrete	615	616	-6	<MDC	≤BKG	5653	5047	4150	<DCGL	None
209	Beta K102/Gamma-360	Tile Over Concrete	646	616	175	<MDC	≤BKG	5574	5047	3609	<DCGL	None
210	Beta K102/Gamma-360	Tile Over Concrete	625	616	52	<MDC	≤BKG	5252	5047	1403	<MDC	None
211	Beta K102/Gamma-360	Tile Over Concrete	653	616	216	<MDC	≤BKG	4912	5047	-925	<MDC	None
212	Beta K102/Gamma-360	Tile Over Concrete	571	616	-264	<MDC	≤BKG	4664	5047	-2624	<MDC	None
213	Beta K102/Gamma-360	Tile Over Concrete	658	616	245	<MDC	≤BKG	4622	5047	-2912	<MDC	None
214	Beta K102/Gamma-360	Tile Over Concrete	647	616	181	<MDC	≤BKG	4484	5047	-3857	<MDC	None
215	Beta K102/Gamma-360	Tile Over Concrete	584	616	-188	<MDC	≤BKG	4327	5047	-4932	<MDC	None
216	Beta K102/Gamma-360	Tile Over Concrete	609	616	-41	<MDC	≤BKG	4427	5047	-4247	<MDC	None
217	Beta K102/Gamma-360	Tile Over Concrete	619	616	17	<MDC	≤BKG	4590	5047	-3131	<MDC	None
218	Beta K102/Gamma-360	Tile Over Concrete	662	616	268	<MDC	≤BKG	4671	5047	-2576	<MDC	None
219	Beta K102/Gamma-360	Tile Over Concrete	572	616	-258	<MDC	≤BKG	4798	5047	-1706	<MDC	None
220	Beta K102/Gamma-360	Tile Over Concrete	668	616	303	<MDC	≤BKG	4997	5047	-343	<MDC	None
221	Beta K102/Gamma-360	Tile Over Concrete	643	616	157	<MDC	≤BKG	5049	5047	13	<MDC	None
222	Beta K102/Gamma-360	Tile Over Concrete	653	616	216	<MDC	≤BKG	5117	5047	479	<MDC	None
223	Beta K102/Gamma-360	Tile Over Concrete	636	616	116	<MDC	≤BKG	4880	5047	-1145	<MDC	None
224	Beta K102/Gamma-360	Tile Over Concrete	596	616	-117	<MDC	≤BKG	4797	5047	-1713	<MDC	None
225	Beta K102/Gamma-360	Tile Over Concrete	648	616	186	<MDC	≤BKG	4661	5047	-2645	<MDC	None
226	Beta K102/Gamma-360	Tile Over Concrete	639	616	134	<MDC	≤BKG	4641	5047	-2782	<MDC	None
227	Beta K102/Gamma-360	Tile Over Concrete	636	616	116	<MDC	≤BKG	4456	5047	-4049	<MDC	None
228	Beta K102/Gamma-360	Tile Over Concrete	634	616	105	<MDC	≤BKG	4386	5047	-4528	<MDC	None
229	Beta K102/Gamma-360	Tile Over Concrete	595	616	-123	<MDC	≤BKG	4402	5047	-4418	<MDC	None
230	Beta K102/Gamma-360	Tile Over Concrete	584	616	-188	<MDC	≤BKG	4765	5047	-1932	<MDC	None
231	Beta K102/Gamma-360	Tile Over Concrete	590	616	-152	<MDC	≤BKG	4865	5047	-1247	<MDC	None
232	Beta K102/Gamma-360	Tile Over Concrete	662	616	268	<MDC	≤BKG	4930	5047	-802	<MDC	None
233	Beta K102/Gamma-360	Tile Over Concrete	622	616	34	<MDC	≤BKG	5299	5047	1725	<MDC	None

Static Contamination Measurements  
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Instruments Used		Surface Material	Beta				Background Dose Rate	Gamma				
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All					8-10 uR/hr					
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05	692		5047	14.60%	3.00E+05	2285	
		Carpet Over Concrete	632			701		5729			2433	
		Ambient	588			677		4442			2145	
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%		1016		6093	14.90%		2458	
		Bare Concrete	856			1070		7815			2781	
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
234	Beta K102/Gamma-360	Tile Over Concrete	639	616	134	<MDC	≤BKG	5568	5047	3568	<DCGL	None
235	Beta K102/Gamma-360	Tile Over Concrete	615	616	-6	<MDC	≤BKG	5699	5047	4465	<DCGL	None
236	Beta K102/Gamma-360	Tile Over Concrete	626	616	58	<MDC	≤BKG	5288	5047	1650	<MDC	None
237	Beta K102/Gamma-360	Tile Over Concrete	642	616	151	<MDC	≤BKG	5054	5047	47	<MDC	None
238	Beta K102/Gamma-360	Tile Over Concrete	629	616	75	<MDC	≤BKG	4922	5047	-857	<MDC	None
239	Beta K102/Gamma-360	Tile Over Concrete	635	616	110	<MDC	≤BKG	4723	5047	-2220	<MDC	None
240	Beta K102/Gamma-360	Tile Over Concrete	614	616	-12	<MDC	≤BKG	4482	5047	-3871	<MDC	None
241	Beta K102/Gamma-360	Tile Over Concrete	585	616	-182	<MDC	≤BKG	4442	5047	-4145	<MDC	None
242	Beta K102/Gamma-360	Tile Over Concrete	597	616	-112	<MDC	≤BKG	4688	5047	-2460	<MDC	None
243	Beta K102/Gamma-360	Tile Over Concrete	651	616	204	<MDC	≤BKG	4644	5047	-2761	<MDC	None
244	Beta K102/Gamma-360	Tile Over Concrete	637	616	122	<MDC	≤BKG	4614	5047	-2966	<MDC	None
245	Beta K102/Gamma-360	Tile Over Concrete	564	616	-304	<MDC	≤BKG	4681	5047	-2508	<MDC	None
246	Beta K102/Gamma-360	Tile Over Concrete	600	616	-94	<MDC	≤BKG	4807	5047	-1645	<MDC	None
247	Beta K102/Gamma-360	Tile Over Concrete	597	616	-112	<MDC	≤BKG	5032	5047	-103	<MDC	None
248	Beta K102/Gamma-360	Tile Over Concrete	632	616	93	<MDC	≤BKG	5010	5047	-254	<MDC	None
249	Beta K102/Gamma-360	Tile Over Concrete	632	616	93	<MDC	≤BKG	4888	5047	-1090	<MDC	None
250	Beta K102/Gamma-360	Tile Over Concrete	629	616	75	<MDC	≤BKG	4748	5047	-2049	<MDC	None
251	Beta K102/Gamma-360	Tile Over Concrete	639	616	134	<MDC	≤BKG	4691	5047	-2439	<MDC	None
252	Beta K102/Gamma-360	Tile Over Concrete	613	616	-18	<MDC	≤BKG	4814	5047	-1597	<MDC	None
253	Beta K102/Gamma-360	Tile Over Concrete	651	616	204	<MDC	≤BKG	4599	5047	-3069	<MDC	None
254	Beta K102/Gamma-360	Tile Over Concrete	572	616	-258	<MDC	≤BKG	4659	5047	-2658	<MDC	None
255	Beta K102/Gamma-360	Tile Over Concrete	648	616	186	<MDC	≤BKG	4531	5047	-3535	<MDC	None
256	Beta K102/Gamma-360	Tile Over Concrete	619	616	17	<MDC	≤BKG	4586	5047	-3158	<MDC	None
257	Beta K102/Gamma-360	Tile Over Concrete	611	616	-30	<MDC	≤BKG	4643	5047	-2768	<MDC	None
258	Beta K102/Gamma-360	Tile Over Concrete	644	616	163	<MDC	≤BKG	5069	5047	150	<MDC	None
259	Beta K102/Gamma-360	Tile Over Concrete	634	616	105	<MDC	≤BKG	5404	5047	2445	<DCGL	None
260	Beta K102/Gamma-360	Tile Over Concrete	674	616	338	<MDC	≤BKG	5602	5047	3801	<DCGL	None
261	Beta K102/Gamma-360	Tile Over Concrete	654	616	221	<MDC	≤BKG	5680	5047	4335	<DCGL	None
262	Beta K102/Gamma-360	Tile Over Concrete	630	616	81	<MDC	≤BKG	5430	5047	2623	<DCGL	None
263	Beta K102/Gamma-360	Tile Over Concrete	598	616	-106	<MDC	≤BKG	5329	5047	1931	<MDC	None
264	Beta K102/Gamma-360	Tile Over Concrete	620	616	23	<MDC	≤BKG	4989	5047	-398	<MDC	None
265	Beta K102/Gamma-360	Tile Over Concrete	613	616	-18	<MDC	≤BKG	4985	5047	-425	<MDC	None
266	Beta K102/Gamma-360	Tile Over Concrete	618	616	11	<MDC	≤BKG	4638	5047	-2802	<MDC	None
267	Beta K102/Gamma-360	Tile Over Concrete	637	616	122	<MDC	≤BKG	4807	5047	-1645	<MDC	None
268	Beta K102/Gamma-360	Tile Over Concrete	601	616	-88	<MDC	≤BKG	4600	5047	-3062	<MDC	None
269	Beta K102/Gamma-360	Tile Over Concrete	619	616	17	<MDC	≤BKG	4737	5047	-2124	<MDC	None
270	Beta K102/Gamma-360	Tile Over Concrete	619	616	17	<MDC	≤BKG	4705	5047	-2343	<MDC	None
271	Beta K102/Gamma-360	Tile Over Concrete	647	616	181	<MDC	≤BKG	4557	5047	-3357	<MDC	None
272	Beta K102/Gamma-360	Tile Over Concrete	617	616	5	<MDC	≤BKG	4430	5047	-4227	<MDC	None

Static Contamination Measurements  
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Instruments Used		Surface Material	Beta				Background Dose Rate 8-10 uR/hr	Gamma				
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All										
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05	692		5047	14.60%	3.00E+05	2285	
		Carpet Over Concrete	832			701		5729			2433	
		Ambient	588			677		4442			2145	
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%		1016		6093	14.90%		2458	
		Bare Concrete	856			1070		7815			2781	
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
273	Beta K102/Gamma-360	Tile Over Concrete	570	616	-269	<MDC	≤BKG	4754	5047	-2008	<MDC	None
274	Beta K102/Gamma-360	Tile Over Concrete	583	616	-193	<MDC	≤BKG	4134	5047	-6254	<MDC	None
275	Beta K102/Gamma-360	Tile Over Concrete	588	616	-164	<MDC	≤BKG	3522	5047	-10446	<MDC	None
276	Beta K102/Gamma-360	Tile Over Concrete	584	616	-188	<MDC	≤BKG	4453	5047	-4069	<MDC	None
277	Beta K102/Gamma-360	Tile Over Concrete	627	616	64	<MDC	≤BKG	4688	5047	-2460	<MDC	None
278	Beta K102/Gamma-360	Tile Over Concrete	606	616	-59	<MDC	≤BKG	4809	5047	-1631	<MDC	None
279	Beta K102/Gamma-360	Tile Over Concrete	617	616	5	<MDC	≤BKG	4748	5047	-2049	<MDC	None
280	Beta K102/Gamma-360	Tile Over Concrete	628	616	70	<MDC	≤BKG	4954	5047	-639	<MDC	None
281	Beta K102/Gamma-360	Tile Over Concrete	650	616	198	<MDC	≤BKG	4998	5047	-336	<MDC	None
282	Beta K102/Gamma-360	Tile Over Concrete	753	616	800	<DCGL	≤BKG	5366	5047	2184	<MDC	None
283	Beta-K110/Gamma-335	Tile Over Concrete	729	770	-312	<MDC	≤BKG	5606	6093	-3268	<MDC	None
284	Beta-K110/Gamma-335	Tile Over Concrete	778	770	65	<MDC	≤BKG	6396	6093	2034	<MDC	None
285	Beta-K110/Gamma-335	Tile Over Concrete	827	770	441	<MDC	≤BKG	6526	6093	2906	<DCGL	None
286	Beta-K110/Gamma-335	Tile Over Concrete	791	770	165	<MDC	≤BKG	6825	6093	4913	<DCGL	None
287	Beta-K110/Gamma-335	Tile Over Concrete	771	770	11	<MDC	≤BKG	6882	6093	5295	<DCGL	None
288	Beta-K110/Gamma-335	Tile Over Concrete	810	770	311	<MDC	≤BKG	6323	6093	1544	<MDC	None
289	Beta-K110/Gamma-335	Tile Over Concrete	749	770	-158	<MDC	≤BKG	6155	6093	416	<MDC	None
290	Beta-K110/Gamma-335	Tile Over Concrete	757	770	-97	<MDC	≤BKG	5785	6093	-2067	<MDC	None
291	Beta-K110/Gamma-335	Tile Over Concrete	761	770	-66	<MDC	≤BKG	5538	6093	-3725	<MDC	None
292	Beta-K110/Gamma-335	Tile Over Concrete	765	770	-35	<MDC	≤BKG	5548	6093	-3658	<MDC	None
293	Beta-K110/Gamma-335	Tile Over Concrete	731	770	-297	<MDC	≤BKG	5338	6093	-5067	<MDC	None
294	Beta-K110/Gamma-335	Tile Over Concrete	760	770	-74	<MDC	≤BKG	5322	6093	-5174	<MDC	None
295	Beta-K110/Gamma-335	Tile Over Concrete	774	770	34	<MDC	≤BKG	5149	6093	-6336	<MDC	None
296	Beta-K110/Gamma-335	Tile Over Concrete	758	770	-89	<MDC	≤BKG	5266	6093	-5550	<MDC	None
297	Beta-K110/Gamma-335	Tile Over Concrete	758	770	-89	<MDC	≤BKG	5234	6093	-5765	<MDC	None
298	Beta-K110/Gamma-335	Tile Over Concrete	791	770	165	<MDC	≤BKG	4809	6093	-8617	<MDC	None
299	Beta-K110/Gamma-335	Tile Over Concrete	748	770	-166	<MDC	≤BKG	4811	6093	-8604	<MDC	None
300	Beta-K110/Gamma-335	Bare Concrete	904	856	371	<MDC	≤BKG	7347	7815	-3140	<MDC	None
301	Beta-K110/Gamma-335	Bare Concrete	901	856	348	<MDC	≤BKG	6735	7815	-7248	<MDC	None
302	Beta-K110/Gamma-335	Bare Concrete	833	856	-175	<MDC	≤BKG	6842	7815	-6530	<MDC	None
303	Beta-K110/Gamma-335	Bare Concrete	868	856	94	<MDC	≤BKG	6289	7815	-10241	<MDC	None
304	Beta-K110/Gamma-335	Bare Concrete	871	856	117	<MDC	≤BKG	5836	7815	-13281	<MDC	None
305	Beta-K110/Gamma-335	Bare Concrete	849	856	-52	<MDC	≤BKG	5940	7815	-12583	<MDC	None
306	Beta-K110/Gamma-335	Bare Concrete	889	856	255	<MDC	≤BKG	6048	7815	-11858	<MDC	None
307	Beta-K110/Gamma-335	Tile Over Concrete	730	770	-304	<MDC	≤BKG	5317	6093	-5208	<MDC	None
308	Beta-K110/Gamma-335	Tile Over Concrete	753	770	-128	<MDC	≤BKG	5396	6093	-4678	<MDC	None
309	Beta-K110/Gamma-335	Tile Over Concrete	813	770	334	<MDC	≤BKG	5766	6093	-2195	<MDC	None
310	Beta-K110/Gamma-335	Tile Over Concrete	790	770	157	<MDC	≤BKG	5907	6093	-1248	<MDC	None
311	Beta-K110/Gamma-335	Tile Over Concrete	779	770	72	<MDC	≤BKG	6139	6093	309	<MDC	None

Appendix E – Building and Structures Static Measurements

Static Contamination Measurements  
Facility Areas

Instruments Used		Surface Material	Beta				Background Dose Rate	Gamma				Comments
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All					8-10 uR/hr					
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05	692		5047	14.60%	3.00E+05	2285	
		Carpet Over Concrete	632			701		5729			2433	
		Ambient	588			677		4442			2145	
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%		1016		6093	14.90%		2458	
		Bare Concrete	856			1070		7815			2781	
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
312	Beta-K110/Gamma-335	Tile Over Concrete	808	770	295	<MDC	≤BKG	5966	6093	-852	<MDC	None
313	Beta-K110/Gamma-335	Tile Over Concrete	821	770	395	<MDC	≤BKG	6814	6093	4839	<DCGL	None
314	Beta-K110/Gamma-335	Tile Over Concrete	819	770	380	<MDC	≤BKG	6882	6093	5295	<DCGL	None
315	Beta-K110/Gamma-335	Tile Over Concrete	826	770	434	<MDC	≤BKG	7441	6093	9047	<DCGL	None
316	Beta-K110/Gamma-335	Tile Over Concrete	809	770	303	<MDC	≤BKG	7332	6093	8315	<DCGL	None
317	Beta-K110/Gamma-335	Tile Over Concrete	794	770	188	<MDC	≤BKG	6340	6093	1658	<MDC	None
318	Beta-K110/Gamma-335	Tile Over Concrete	821	770	395	<MDC	≤BKG	6196	6093	691	<MDC	None
319	Beta-K110/Gamma-335	Tile Over Concrete	796	770	203	<MDC	≤BKG	5417	6093	-4537	<MDC	None
320	Beta-K110/Gamma-335	Tile Over Concrete	790	770	157	<MDC	≤BKG	6107	6093	94	<MDC	None
321	Beta-K110/Gamma-335	Tile Over Concrete	758	770	-89	<MDC	≤BKG	5937	6093	-1047	<MDC	None
322	Beta-K110/Gamma-335	Tile Over Concrete	736	770	-258	<MDC	≤BKG	5615	6093	-3208	<MDC	None
323	Beta-K110/Gamma-335	Bare Concrete	856	856	2	<MDC	≤BKG	5902	7815	-12838	<MDC	None
324	Beta-K110/Gamma-335	Bare Concrete	894	856	294	<MDC	≤BKG	5929	7815	-12657	<MDC	None
325	Beta-K110/Gamma-335	Bare Concrete	849	856	-52	<MDC	≤BKG	6147	7815	-11194	<MDC	None
326	Beta-K110/Gamma-335	Bare Concrete	877	856	163	<MDC	≤BKG	5988	7815	-12261	<MDC	None
327	Beta-K110/Gamma-335	Bare Concrete	879	856	178	<MDC	≤BKG	6708	7815	-7429	<MDC	None
328	Beta-K110/Gamma-335	Bare Concrete	884	856	217	<MDC	≤BKG	6784	7815	-6919	<MDC	None
329	Beta-K110/Gamma-335	Tile Over Concrete	829	770	457	<MDC	≤BKG	7113	6093	6846	<DCGL	None
330	Beta-K110/Gamma-335	Tile Over Concrete	782	770	95	<MDC	≤BKG	7177	6093	7275	<DCGL	None
331	Beta-K110/Gamma-335	Bare Concrete	864	856	63	<MDC	≤BKG	6445	7815	-9194	<MDC	None
332	Beta-K110/Gamma-335	Bare Concrete	819	856	-283	<MDC	≤BKG	6169	7815	-11046	<MDC	None
333	Beta-K110/Gamma-335	Bare Concrete	893	856	286	<MDC	≤BKG	6248	7815	-10516	<MDC	None
334	Beta-K110/Gamma-335	Bare Concrete	788	856	-521	<MDC	≤BKG	6094	7815	-11550	<MDC	None
335	Beta-K110/Gamma-335	Bare Concrete	851	856	-37	<MDC	≤BKG	6011	7815	-12107	<MDC	None
336	Beta-K110/Gamma-335	Bare Concrete	903	856	363	<MDC	≤BKG	6290	7815	-10234	<MDC	None
337	Beta-K110/Gamma-335	Bare Concrete	776	856	-614	<MDC	≤BKG	6192	7815	-10892	<MDC	None
338	Beta-K110/Gamma-335	Bare Concrete	787	856	-529	<MDC	≤BKG	6311	7815	-10093	<MDC	None
339	Beta-K110/Gamma-335	Bare Concrete	832	856	-183	<MDC	≤BKG	6375	7815	-9664	<MDC	None
340	Beta-K110/Gamma-335	Bare Concrete	828	856	-214	<MDC	≤BKG	6492	7815	-8879	<MDC	None
341	Beta-K110/Gamma-335	Tile Over Concrete	828	770	449	<MDC	≤BKG	6473	6093	2550	<DCGL	None
342	Beta-K110/Gamma-335	Tile Over Concrete	864	770	726	<MDC	≤BKG	6293	6093	1342	<MDC	None
343	Beta-K110/Gamma-335	Tile Over Concrete	802	770	249	<MDC	≤BKG	6426	6093	2235	<MDC	None
344	Beta-K110/Gamma-335	Tile Over Concrete	819	770	380	<MDC	≤BKG	7127	6093	6940	<DCGL	None
345	Beta-K110/Gamma-335	Tile Over Concrete	806	770	280	<MDC	≤BKG	6719	6093	4201	<DCGL	None
346	Beta-K110/Gamma-335	Tile Over Concrete	836	770	511	<MDC	≤BKG	7046	6093	6396	<DCGL	None
347	Beta-K110/Gamma-335	Tile Over Concrete	841	770	549	<MDC	≤BKG	6670	6093	3872	<DCGL	None
348	Beta-K110/Gamma-335	Tile Over Concrete	781	770	88	<MDC	≤BKG	6545	6093	3034	<DCGL	None
349	Beta-K110/Gamma-335	Tile Over Concrete	780	770	80	<MDC	≤BKG	6480	6093	2597	<DCGL	None
350	Beta-K110/Gamma-335	Bare Concrete	786	856	-537	<MDC	≤BKG	6844	7815	-6516	<MDC	None

Static Contamination Measurements  
Facility Areas

Instruments Used		Surface Material	Beta				Background Dose Rate 8-10 uR/hr	Gamma				Comments
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All										
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05			5047	14.60%	3.00E+05		2285
		Carpet Over Concrete	632					5729				2433
		Ambient	588					4442				2145
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%				6093	14.90%			2458
		Bare Concrete	856					7815				2781
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
351	Beta-K110/Gamma-335	Bare Concrete	780	856	-583	<MDC	≤BKG	6528	7815	-8637	<MDC	None
352	Beta-K110/Gamma-335	Bare Concrete	797	856	-452	<MDC	≤BKG	6773	7815	-6993	<MDC	None
353	Beta-K110/Gamma-335	Bare Concrete	818	856	-291	<MDC	≤BKG	6526	7815	-8650	<MDC	None
354	Beta-K110/Gamma-335	Bare Concrete	789	856	-514	<MDC	≤BKG	5541	7815	-15261	<MDC	None
355	Beta-K110/Gamma-335	Bare Concrete	829	856	-206	<MDC	≤BKG	6530	7815	-8623	<MDC	None
356	Beta-K110/Gamma-335	Bare Concrete	781	856	-575	<MDC	≤BKG	5606	7815	-14825	<MDC	None
357	Beta-K110/Gamma-335	Bare Concrete	763	856	-714	<MDC	≤BKG	5742	7815	-13912	<MDC	None
358	Beta-K110/Gamma-335	Bare Concrete	815	856	-314	<MDC	≤BKG	6401	7815	-9489	<MDC	None
359	Beta-K110/Gamma-335	Bare Concrete	860	856	32	<MDC	≤BKG	7846	7815	209	<MDC	None
GEH: Non-Restricted Area												
1	Beta K102/Gamma-360	Carpet Over Concrete	713	632	471	<MDC	≤BKG	5841	5729	764	<MDC	None
2	Beta K102/Gamma-360	Carpet Over Concrete	577	632	-324	<MDC	≤BKG	5351	5729	-2592	<MDC	None
3	Beta K102/Gamma-360	Carpet Over Concrete	611	632	-125	<MDC	≤BKG	5312	5729	-2859	<MDC	None
4	Beta K102/Gamma-360	Carpet Over Concrete	661	632	167	<MDC	≤BKG	5655	5729	-510	<MDC	None
5	Beta K102/Gamma-360	Carpet Over Concrete	609	632	-137	<MDC	≤BKG	5762	5729	223	<MDC	None
6	Beta K102/Gamma-360	Carpet Over Concrete	641	632	50	<MDC	≤BKG	6434	5729	4826	<DCGL	None
7	Beta K102/Gamma-360	Carpet Over Concrete	683	632	296	<MDC	≤BKG	6367	5729	4367	<DCGL	None
8	Beta K102/Gamma-360	Carpet Over Concrete	665	632	190	<MDC	≤BKG	5803	5729	504	<MDC	None
9	Beta K102/Gamma-360	Carpet Over Concrete	657	632	144	<MDC	≤BKG	5127	5729	-4126	<MDC	None
10	Beta K102/Gamma-360	Carpet Over Concrete	610	632	-131	<MDC	≤BKG	5021	5729	-4852	<MDC	None
11	Beta K102/Gamma-360	Carpet Over Concrete	730	632	570	<MDC	≤BKG	5413	5729	-2167	<MDC	None
12	Beta K102/Gamma-360	Carpet Over Concrete	658	632	150	<MDC	≤BKG	6096	5729	2511	<DCGL	None
13	Beta K102/Gamma-360	Carpet Over Concrete	653	632	120	<MDC	≤BKG	6183	5729	3107	<DCGL	None
14	Beta K102/Gamma-360	Carpet Over Concrete	624	632	-49	<MDC	≤BKG	5455	5729	-1879	<MDC	None
15	Beta K102/Gamma-360	Carpet Over Concrete	634	632	9	<MDC	≤BKG	4989	5729	-5071	<MDC	None
16	Beta K102/Gamma-360	Carpet Over Concrete	674	632	243	<MDC	≤BKG	5174	5729	-3804	<MDC	None
17	Beta K102/Gamma-360	Carpet Over Concrete	619	632	-78	<MDC	≤BKG	5558	5729	-1174	<MDC	None
18	Beta K102/Gamma-360	Carpet Over Concrete	669	632	214	<MDC	≤BKG	6618	5729	6086	<DCGL	None
19	Beta-K110/Gamma-335	Tile Over Concrete	794	770	188	<MDC	≤BKG	7885	6093	12274	<DCGL	None
20	Beta-K110/Gamma-335	Tile Over Concrete	734	770	-274	<MDC	≤BKG	7029	6093	6411	<DCGL	None
21	Beta-K110/Gamma-335	Tile Over Concrete	757	770	-97	<MDC	≤BKG	5419	6093	-4616	<MDC	None
22	Beta K102/Gamma-360	Carpet Over Concrete	599	632	-195	<MDC	≤BKG	5125	5729	-4140	<MDC	None
23	Beta K102/Gamma-360	Carpet Over Concrete	686	632	313	<MDC	≤BKG	5928	5729	1360	<MDC	None
24	Beta K102/Gamma-360	Carpet Over Concrete	697	632	377	<MDC	≤BKG	6647	5729	6285	<DCGL	None
25	Beta K102/Gamma-360	Carpet Over Concrete	670	632	220	<MDC	≤BKG	5934	5729	1401	<MDC	None
26	Beta K102/Gamma-360	Carpet Over Concrete	632	632	-2	<MDC	≤BKG	5376	5729	-2421	<MDC	None
27	Beta K102/Gamma-360	Carpet Over Concrete	640	632	44	<MDC	≤BKG	5810	5729	552	<MDC	None
28	Beta K102/Gamma-360	Carpet Over Concrete	623	632	-55	<MDC	≤BKG	5538	5729	-1311	<MDC	None
29	Beta K102/Gamma-360	Carpet Over Concrete	601	632	-183	<MDC	≤BKG	4575	5729	-7907	<MDC	None

Appendix E – Building and Structures Static Measurements

Static Contamination Measurements  
Facility Areas

Instruments Used		Surface Material	Beta				Background Dose Rate 8-10 uR/hr	Gamma				
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All										
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05	692		5047	14.60%	3.00E+05	2285	
		Carpet Over Concrete	632			701		5729			2433	
		Ambient	588			677		4442			2145	
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%		1016		6093	14.90%		2458	
		Bare Concrete	856			1070		7815			2781	
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
30	Beta-K110/Gamma-335	Tile Over Concrete	757	770	-97	<MDC	≤BKG	5653	6093	-3014	<MDC	None
31	Beta-K110/Gamma-335	Tile Over Concrete	820	770	388	<MDC	≤BKG	6478	6093	2637	<DCGL	None
32	Beta-K110/Gamma-335	Tile Over Concrete	840	770	541	<MDC	≤BKG	7305	6093	8301	<DCGL	None
33	Beta-K110/Gamma-335	Tile Over Concrete	758	770	-89	<MDC	≤BKG	6589	6093	3397	<DCGL	None
34	Beta-K110/Gamma-335	Tile Over Concrete	713	770	-435	<MDC	≤BKG	5981	6093	-767	<MDC	None
35	Beta-K110/Gamma-335	Tile Over Concrete	784	770	111	<MDC	≤BKG	5563	6093	-3630	<MDC	None
36	Beta K102/Gamma-360	Carpet Over Concrete	666	632	196	<MDC	≤BKG	4753	5729	-6688	<MDC	None
37	Beta K102/Gamma-360	Carpet Over Concrete	592	632	-236	<MDC	≤BKG	4996	5729	-5023	<MDC	None
38	Beta K102/Gamma-360	Carpet Over Concrete	674	632	243	<MDC	≤BKG	5434	5729	-2023	<MDC	None
39	Beta K102/Gamma-360	Carpet Over Concrete	613	632	-113	<MDC	≤BKG	5483	5729	-1688	<MDC	None
40	Beta K102/Gamma-360	Carpet Over Concrete	693	632	354	<MDC	≤BKG	5983	5729	1737	<MDC	None
41	Beta K102/Gamma-360	Carpet Over Concrete	689	632	331	<MDC	≤BKG	5600	5729	-886	<MDC	None
42	Beta K102/Gamma-360	Carpet Over Concrete	642	632	56	<MDC	≤BKG	5217	5729	-3510	<MDC	None
43	Beta K102/Gamma-360	Carpet Over Concrete	649	632	97	<MDC	≤BKG	4915	5729	-5578	<MDC	None
44	Beta K102/Gamma-360	Carpet Over Concrete	620	632	-72	<MDC	≤BKG	4971	5729	-5195	<MDC	None
45	Beta K102/Gamma-360	Carpet Over Concrete	630	632	-14	<MDC	≤BKG	4791	5729	-6427	<MDC	None
46	Beta-K110/Gamma-335	Tile Over Concrete	758	770	-89	<MDC	≤BKG	5106	6093	-6760	<MDC	None
47	Beta-K110/Gamma-335	Tile Over Concrete	783	770	103	<MDC	≤BKG	5786	6093	-2103	<MDC	None
48	Beta-K110/Gamma-335	Tile Over Concrete	749	770	-158	<MDC	≤BKG	6111	6093	123	<MDC	None
49	Beta-K110/Gamma-335	Tile Over Concrete	738	770	-243	<MDC	≤BKG	6104	6093	75	<MDC	None
50	Beta-K110/Gamma-335	Tile Over Concrete	766	770	-28	<MDC	≤BKG	5836	6093	-1760	<MDC	None
51	Beta-K110/Gamma-335	Tile Over Concrete	808	770	295	<MDC	≤BKG	5234	6093	-5884	<MDC	None
52	Beta K102/Gamma-360	Carpet Over Concrete	579	632	-312	<MDC	≤BKG	4755	5729	-6674	<MDC	None
53	Beta K102/Gamma-360	Carpet Over Concrete	695	632	366	<MDC	≤BKG	5683	5729	-318	<MDC	None
54	Beta K102/Gamma-360	Carpet Over Concrete	642	632	56	<MDC	≤BKG	5893	5729	1121	<MDC	None
55	Beta K102/Gamma-360	Carpet Over Concrete	630	632	-14	<MDC	≤BKG	5404	5729	-2229	<MDC	None
56	Beta K102/Gamma-360	Carpet Over Concrete	696	632	372	<MDC	≤BKG	5719	5729	-71	<MDC	None
57	Beta-K110/Gamma-335	Tile Over Concrete	755	770	-112	<MDC	≤BKG	6107	6093	96	<MDC	None
58	Beta-K110/Gamma-335	Tile Over Concrete	728	770	-320	<MDC	≤BKG	6083	6093	-68	<MDC	None
59	Beta-K110/Gamma-335	Tile Over Concrete	786	770	126	<MDC	≤BKG	6377	6093	1945	<MDC	None
60	Beta-K110/Gamma-335	Tile Over Concrete	755	770	-112	<MDC	≤BKG	5863	6093	-1575	<MDC	None
61	Beta-K110/Gamma-335	Tile Over Concrete	780	770	80	<MDC	≤BKG	6307	6093	1466	<MDC	None
62	Beta-K110/Gamma-335	Tile Over Concrete	728	770	-320	<MDC	≤BKG	5879	6093	-1466	<MDC	None
63	Beta-K110/Gamma-335	Tile Over Concrete	724	770	-351	<MDC	≤BKG	6180	6093	596	<MDC	None
64	Beta-K110/Gamma-335	Tile Over Concrete	778	770	65	<MDC	≤BKG	6131	6093	260	<MDC	None
65	Beta-K110/Gamma-335	Tile Over Concrete	756	770	-105	<MDC	≤BKG	6127	6093	233	<MDC	None
66	Beta-K110/Gamma-335	Tile Over Concrete	787	770	134	<MDC	≤BKG	5987	6093	-726	<MDC	None
67	Beta-K110/Gamma-335	Tile Over Concrete	765	770	-35	<MDC	≤BKG	6157	6093	438	<MDC	None
68	Beta-K110/Gamma-335	Tile Over Concrete	778	770	65	<MDC	≤BKG	5975	6093	-808	<MDC	None

Static Contamination Measurements  
Facility Areas

Instruments Used		Surface Material	Beta				Background Dose Rate 8-10 uR/hr	Gamma				
			BKG	Efficiency	DCGL	MDC		BKG	Efficiency	DCGL	MDC	
Thermo Miro-Rem		All										
Beta-K102/Gamma-360		Tile Over Concrete	616	17.12%	3.25E+05	692		5047	14.60%	3.00E+05	2285	
		Carpet Over Concrete	632			701		5729			2433	
		Ambient	588			677		4442			2145	
Beta-K110/Gamma-335		Tile Over Concrete	770	13.01%		1016		6093	14.90%		2458	
		Bare Concrete	856			1070		7815			2781	
Sample	Instruments	Surface Material	Gross Beta (cpm)	Background (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result	Dose Rate	Gross Gamma (cpm)	Background (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comments
69	Beta-K110/Gamma-335	Tile Over Concrete	777	770	57	<MDC	≤BKG	6337	6093	1671	<MDC	None
70	Beta-K110/Gamma-335	Tile Over Concrete	768	770	-12	<MDC	≤BKG	6038	6093	-377	<MDC	None
71	Beta-K110/Gamma-335	Tile Over Concrete	769	770	-5	<MDC	≤BKG	6240	6093	1007	<MDC	None
72	Beta-K110/Gamma-335	Tile Over Concrete	791	770	165	<MDC	≤BKG	6507	6093	2836	<DCGL	None
73	Beta-K110/Gamma-335	Tile Over Concrete	782	770	95	<MDC	≤BKG	6462	6093	2527	<DCGL	None
74	Beta-K110/Gamma-335	Tile Over Concrete	771	770	11	<MDC	≤BKG	6326	6093	1596	<MDC	None
75	Beta-K110/Gamma-335	Tile Over Concrete	733	770	-281	<MDC	≤BKG	6117	6093	164	<MDC	None
76	Beta-K110/Gamma-335	Tile Over Concrete	805	770	272	<MDC	≤BKG	6469	6093	2575	<DCGL	None
77	Beta-K110/Gamma-335	Tile Over Concrete	773	770	26	<MDC	≤BKG	6376	6093	1938	<MDC	None
78	Beta-K110/Gamma-335	Tile Over Concrete	763	770	-51	<MDC	≤BKG	5850	6093	-1664	<MDC	None
Miscellaneous Equipment												
1-Iodine Hood Exhaust Stack	Beta-K102/Gamma-360	Miscellaneous	547	588	-316	<DCGL	≤BKG	4536	4442	644	<DCGL	None
2-Pass Thru	Beta-K102/Gamma-360	Miscellaneous	654	588	507	<DCGL	≤BKG	4420	4442	-151	<MDC	None
3-Door Knobs	Beta-K102/Gamma-360	Miscellaneous	562	588	-201	<DCGL	≤BKG	4358	4442	-575	<MDC	None
4-Sink	Beta-K102/Gamma-360	Miscellaneous	563	588	-193	<DCGL	≤BKG	3808	4442	-4342	<MDC	None
5-Bathroom Drains	Beta-K102/Gamma-360	Miscellaneous	625	588	284	<DCGL	≤BKG	5815	4442	9404	<DCGL	None
6-Package Conveyors	Beta-K102/Gamma-360	Miscellaneous	577	588	-85	<DCGL	≤BKG	3714	4442	-4986	<MDC	None



Appendix F – Building and Structures Removable Measurements

Removable Contamination Measurements

Facility Areas

Protean ASC # 251429			
Efficiency	BKG	DCGL	MDC
24.81%	89	3.25E+04	189
	Gross Beta (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result

GEH: Restricted Area

1	82	-28	<MDC
2	96	28	<MDC
3	94	20	<MDC
4	91	8	<MDC
5	78	-44	<MDC
6	70	-77	<MDC
7	75	-56	<MDC
8	76	-52	<MDC
9	104	60	<MDC
10	89	0	<MDC
11	101	48	<MDC
12	82	-28	<MDC
13	81	-32	<MDC
14	70	-77	<MDC
15	80	-36	<MDC
16	84	-20	<MDC
17	84	-20	<MDC
18	99	40	<MDC
19	95	24	<MDC
20	75	-56	<MDC
21	86	-12	<MDC
22	88	-4	<MDC
23	93	16	<MDC
24	80	-36	<MDC
25	65	-97	<MDC
26	94	20	<MDC
27	88	-4	<MDC
28	70	-77	<MDC
29	79	-40	<MDC
30	82	-28	<MDC
31	87	-8	<MDC
32	69	-81	<MDC
33	89	0	<MDC
34	93	16	<MDC
35	84	-20	<MDC
36	82	-28	<MDC
37	83	-24	<MDC
38	95	24	<MDC
39	73	-64	<MDC
40	82	-28	<MDC
41	87	-8	<MDC
42	74	-60	<MDC
43	86	-12	<MDC
44	84	-20	<MDC
45	67	-89	<MDC
46	77	-48	<MDC
47	72	-69	<MDC
48	82	-28	<MDC
49	88	-4	<MDC
50	75	-56	<MDC

Ludlum 2200/NaI 2" x 2" Well Counter			
Efficiency	BKG	DCGL	MDC
90.77%	172	3.00E+04	71
Gross Gamma (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comment

184	13	<MDC	None
162	-11	<MDC	None
157	-17	<MDC	None
170	-2	<MDC	None
181	10	<MDC	None
180	9	<MDC	None
173	1	<MDC	None
181	10	<MDC	None
163	-10	<MDC	None
188	18	<MDC	None
188	18	<MDC	None
167	-6	<MDC	None
165	-8	<MDC	None
171	-1	<MDC	None
180	9	<MDC	None
177	6	<MDC	None
175	3	<MDC	None
138	-37	<MDC	None
177	6	<MDC	None
176	4	<MDC	None
162	-11	<MDC	None
176	4	<MDC	None
195	25	<MDC	None
164	-9	<MDC	None
180	9	<MDC	None
172	0	<MDC	None
169	-3	<MDC	None
181	10	<MDC	None
166	-7	<MDC	None
166	-7	<MDC	None
184	13	<MDC	None
163	-10	<MDC	None
211	43	<MDC	None
167	-6	<MDC	None
152	-22	<MDC	None
159	-14	<MDC	None
207	39	<MDC	None
178	7	<MDC	None
156	-18	<MDC	None
178	7	<MDC	None
159	-14	<MDC	None
183	12	<MDC	None
200	31	<MDC	None
186	15	<MDC	None
189	19	<MDC	None
191	21	<MDC	None
179	8	<MDC	None
163	-10	<MDC	None
151	-23	<MDC	None
169	-3	<MDC	None

Appendix F – Building and Structures Removable Measurements

Removable Contamination Measurements

Facility Areas

Protean ASC # 251429			
Efficiency	BKG	DCGL	MDC
24.81%	89	3.25E+04	189
	Gross Beta (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result
51	97	32	<MDC
52	73	-64	<MDC
53	79	-40	<MDC
54	77	-48	<MDC
55	74	-60	<MDC
56	80	-36	<MDC
57	78	-44	<MDC
58	108	77	<MDC
59	78	-44	<MDC
60	70	-77	<MDC
61	86	-12	<MDC
62	80	-36	<MDC
63	69	-81	<MDC
64	96	28	<MDC
65	76	-52	<MDC
66	73	-64	<MDC
67	82	-28	<MDC
68	78	-44	<MDC
69	81	-32	<MDC
70	93	16	<MDC
71	77	-48	<MDC
72	76	-52	<MDC
73	83	-24	<MDC
74	80	-36	<MDC
75	63	-105	<MDC
76	77	-48	<MDC
77	97	32	<MDC
78	81	-32	<MDC
79	75	-56	<MDC
80	68	-85	<MDC
81	87	-8	<MDC
82	73	-64	<MDC
83	96	28	<MDC
84	79	-40	<MDC
85	84	-20	<MDC
86	88	-4	<MDC
87	72	-69	<MDC
88	80	-36	<MDC
89	82	-28	<MDC
90	86	-12	<MDC
91	85	-16	<MDC
92	83	-24	<MDC
93	84	-20	<MDC
94	87	-8	<MDC
95	98	36	<MDC
96	77	-48	<MDC
97	83	-24	<MDC
98	92	12	<MDC
99	78	-44	<MDC
100	95	24	<MDC
101	87	-8	<MDC

Ludlum 2200/NaI 2" x 2" Well Counter			
Efficiency	BKG	DCGL	MDC
90.77%	172	3.00E+04	71
Gross Gamma (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comment
161	-12	<MDC	None
191	21	<MDC	None
169	-3	<MDC	None
173	1	<MDC	None
181	10	<MDC	None
157	-17	<MDC	None
179	8	<MDC	None
174	2	<MDC	None
172	0	<MDC	None
181	10	<MDC	None
173	1	<MDC	None
172	0	<MDC	None
180	9	<MDC	None
160	-13	<MDC	None
179	8	<MDC	None
189	19	<MDC	None
184	13	<MDC	None
180	9	<MDC	None
182	11	<MDC	None
162	-11	<MDC	None
178	7	<MDC	None
168	-4	<MDC	None
175	3	<MDC	None
159	-14	<MDC	None
156	-18	<MDC	None
156	-18	<MDC	None
183	12	<MDC	None
178	7	<MDC	None
156	-18	<MDC	None
166	-7	<MDC	None
156	-18	<MDC	None
168	-4	<MDC	None
197	28	<MDC	None
179	8	<MDC	None
190	20	<MDC	None
184	13	<MDC	None
147	-28	<MDC	None
166	-7	<MDC	None
160	-13	<MDC	None
169	-3	<MDC	None
168	-4	<MDC	None
167	-6	<MDC	None
159	-14	<MDC	None
178	7	<MDC	None
170	-2	<MDC	None
170	-2	<MDC	None
178	7	<MDC	None
153	-21	<MDC	None
198	29	<MDC	None
174	2	<MDC	None
187	17	<MDC	None

Appendix F – Building and Structures Removable Measurements

Removable Contamination Measurements

Facility Areas

Protean ASC # 251429			
Efficiency	BKG	DCGL	MDC
24.81%	89	3.25E+04	189
	Gross Beta (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result
102	81	-32	<MDC
103	84	-20	<MDC
104	85	-16	<MDC
105	73	-64	<MDC
106	69	-81	<MDC
107	66	-93	<MDC
108	83	-24	<MDC
109	88	-4	<MDC
110	93	16	<MDC
111	81	-32	<MDC
112	99	40	<MDC
113	80	-36	<MDC
114	64	-101	<MDC
115	89	0	<MDC
116	71	-73	<MDC
117	79	-40	<MDC
118	88	-4	<MDC
119	75	-56	<MDC
120	81	-32	<MDC
121	93	16	<MDC
122	78	-44	<MDC
123	83	-24	<MDC
124	79	-40	<MDC
125	73	-64	<MDC
126	62	-109	<MDC
127	79	-40	<MDC
128	69	-81	<MDC
129	84	-20	<MDC
130	87	-8	<MDC
131	72	-69	<MDC
132	86	-12	<MDC
133	88	-4	<MDC
134	74	-60	<MDC
135	93	16	<MDC
136	67	-89	<MDC
137	93	16	<MDC
138	77	-48	<MDC
139	87	-8	<MDC
140	70	-77	<MDC
141	83	-24	<MDC
142	107	73	<MDC
143	87	-8	<MDC
144	68	-85	<MDC
145	85	-16	<MDC
146	68	-85	<MDC
147	98	36	<MDC
148	63	-105	<MDC
149	79	-40	<MDC
150	92	12	<MDC
151	73	-64	<MDC
152	94	20	<MDC

Ludlum 2200/NaI 2" x 2" Well Counter			
Efficiency	BKG	DCGL	MDC
90.77%	172	3.00E+04	71
Gross Gamma (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comment
171	-1	<MDC	None
164	-9	<MDC	None
163	-10	<MDC	None
175	3	<MDC	None
172	0	<MDC	None
160	-13	<MDC	None
177	6	<MDC	None
183	12	<MDC	None
187	17	<MDC	None
170	-2	<MDC	None
169	-3	<MDC	None
179	8	<MDC	None
162	-11	<MDC	None
166	-7	<MDC	None
151	-23	<MDC	None
166	-7	<MDC	None
194	24	<MDC	None
162	-11	<MDC	None
180	9	<MDC	None
148	-26	<MDC	None
179	8	<MDC	None
176	4	<MDC	None
173	1	<MDC	None
159	-14	<MDC	None
174	2	<MDC	None
159	-14	<MDC	None
152	-22	<MDC	None
175	3	<MDC	None
165	-8	<MDC	None
165	-8	<MDC	None
173	1	<MDC	None
158	-15	<MDC	None
176	4	<MDC	None
168	-4	<MDC	None
177	6	<MDC	None
160	-13	<MDC	None
183	12	<MDC	None
177	6	<MDC	None
159	-14	<MDC	None
178	7	<MDC	None
171	-1	<MDC	None
183	12	<MDC	None
177	6	<MDC	None
177	6	<MDC	None
170	-2	<MDC	None
175	3	<MDC	None
165	-8	<MDC	None
166	-7	<MDC	None
164	-9	<MDC	None
171	-1	<MDC	None
159	-14	<MDC	None

Appendix F – Building and Structures Removable Measurements

Removable Contamination Measurements

Facility Areas

Protean ASC # 251429			
Efficiency	BKG	DCGL	MDC
24.81%	89	3.25E+04	189
	Gross Beta (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result
153	95	24	<MDC
154	101	48	<MDC
155	73	-64	<MDC
156	66	-93	<MDC
157	76	-52	<MDC
158	78	-44	<MDC
159	75	-56	<MDC
160	100	44	<MDC
161	76	-52	<MDC
162	72	-69	<MDC
163	74	-60	<MDC
164	82	-28	<MDC
165	74	-60	<MDC
166	76	-52	<MDC
167	92	12	<MDC
168	83	-24	<MDC
169	86	-12	<MDC
170	78	-44	<MDC
171	85	-16	<MDC
172	82	-28	<MDC
173	77	-48	<MDC
174	78	-44	<MDC
175	71	-73	<MDC
176	90	4	<MDC
177	83	-24	<MDC
178	84	-20	<MDC
179	88	-4	<MDC
180	94	20	<MDC
181	84	-20	<MDC
182	76	-52	<MDC
183	76	-52	<MDC
184	97	32	<MDC
185	86	-12	<MDC
186	72	-69	<MDC
187	90	4	<MDC
188	82	-28	<MDC
189	78	-44	<MDC
190	82	-28	<MDC
191	70	-77	<MDC
192	104	60	<MDC
193	97	32	<MDC
194	86	-12	<MDC
195	65	-97	<MDC
196	91	8	<MDC
197	74	-60	<MDC
198	85	-16	<MDC
199	81	-32	<MDC
200	80	-36	<MDC
201	82	-28	<MDC
202	78	-44	<MDC
203	82	-28	<MDC

Ludlum 2200/NaI 2" x 2" Well Counter			
Efficiency	BKG	DCGL	MDC
90.77%	172	3.00E+04	71
Gross Gamma (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comment
171	-1	<MDC	None
191	21	<MDC	None
172	0	<MDC	None
176	4	<MDC	None
172	0	<MDC	None
179	8	<MDC	None
197	28	<MDC	None
174	2	<MDC	None
178	7	<MDC	None
188	18	<MDC	None
182	11	<MDC	None
160	-13	<MDC	None
165	-8	<MDC	None
169	-3	<MDC	None
166	-7	<MDC	None
167	-6	<MDC	None
156	-18	<MDC	None
174	2	<MDC	None
149	-25	<MDC	None
171	-1	<MDC	None
184	13	<MDC	None
172	0	<MDC	None
178	7	<MDC	None
158	-15	<MDC	None
165	-8	<MDC	None
180	9	<MDC	None
165	-8	<MDC	None
176	4	<MDC	None
176	4	<MDC	None
141	-34	<MDC	None
166	-7	<MDC	None
185	14	<MDC	None
175	3	<MDC	None
157	-17	<MDC	None
157	-17	<MDC	None
166	-7	<MDC	None
183	12	<MDC	None
183	12	<MDC	None
181	10	<MDC	None
172	0	<MDC	None
172	0	<MDC	None
165	-8	<MDC	None
178	7	<MDC	None
177	6	<MDC	None
164	-9	<MDC	None
171	-1	<MDC	None
157	-17	<MDC	None
177	6	<MDC	None
161	-12	<MDC	None
176	4	<MDC	None
171	-1	<MDC	None

Appendix F – Building and Structures Removable Measurements

Removable Contamination Measurements

Facility Areas

Protean ASC # 251429			
Efficiency	BKG	DCGL	MDC
24.81%	89	3.25E+04	189
	Gross Beta (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result
204	79	-40	<MDC
205	99	40	<MDC
206	101	48	<MDC
207	78	-44	<MDC
208	93	16	<MDC
209	69	-81	<MDC
210	77	-48	<MDC
211	95	24	<MDC
212	86	-12	<MDC
213	88	-4	<MDC
214	80	-36	<MDC
215	79	-40	<MDC
216	75	-56	<MDC
217	79	-40	<MDC
218	85	-16	<MDC
219	90	4	<MDC
220	73	-64	<MDC
221	85	-16	<MDC
222	86	-12	<MDC
223	74	-60	<MDC
224	91	8	<MDC
225	87	-8	<MDC
226	80	-36	<MDC
227	85	-16	<MDC
228	99	40	<MDC
229	83	-24	<MDC
230	79	-40	<MDC
231	69	-81	<MDC
232	86	-12	<MDC
233	89	0	<MDC
234	78	-44	<MDC
235	80	-36	<MDC
236	80	-36	<MDC
237	101	48	<MDC
238	100	44	<MDC
239	78	-44	<MDC
240	82	-28	<MDC
241	88	-4	<MDC
242	91	8	<MDC
243	99	40	<MDC
244	91	8	<MDC
245	84	-20	<MDC
246	70	-77	<MDC
247	84	-20	<MDC
248	75	-56	<MDC
249	94	20	<MDC
250	73	-64	<MDC
251	80	-36	<MDC
252	98	36	<MDC
253	94	20	<MDC
254	78	-44	<MDC

Ludlum 2200/NaI 2" x 2" Well Counter			
Efficiency	BKG	DCGL	MDC
90.77%	172	3.00E+04	71
Gross Gamma (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comment
177	6	<MDC	None
146	-29	<MDC	None
196	26	<MDC	None
154	-20	<MDC	None
160	-13	<MDC	None
165	-8	<MDC	None
154	-20	<MDC	None
171	-1	<MDC	None
173	1	<MDC	None
156	-18	<MDC	None
166	-7	<MDC	None
182	11	<MDC	None
172	0	<MDC	None
174	2	<MDC	None
176	4	<MDC	None
181	10	<MDC	None
164	-9	<MDC	None
165	-8	<MDC	None
187	17	<MDC	None
181	10	<MDC	None
160	-13	<MDC	None
175	3	<MDC	None
184	13	<MDC	None
151	-23	<MDC	None
172	0	<MDC	None
151	-23	<MDC	None
151	-23	<MDC	None
165	-8	<MDC	None
164	-9	<MDC	None
199	30	<MDC	None
183	12	<MDC	None
195	25	<MDC	None
191	21	<MDC	None
186	15	<MDC	None
168	-4	<MDC	None
174	2	<MDC	None
173	1	<MDC	None
173	1	<MDC	None
158	-15	<MDC	None
168	-4	<MDC	None
155	-19	<MDC	None
156	-18	<MDC	None
190	20	<MDC	None
186	15	<MDC	None
168	-4	<MDC	None
172	0	<MDC	None
186	15	<MDC	None
158	-15	<MDC	None
182	11	<MDC	None
155	-19	<MDC	None
158	-15	<MDC	None

Appendix F – Building and Structures Removable Measurements

Removable Contamination Measurements

Facility Areas

Protean ASC # 251429			
Efficiency	BKG	DCGL	MDC
24.81%	89	3.25E+04	189
	Gross Beta (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result
255	73	-64	<MDC
256	79	-40	<MDC
257	91	8	<MDC
258	80	-36	<MDC
259	84	-20	<MDC
260	84	-20	<MDC
261	89	0	<MDC
262	83	-24	<MDC
263	102	52	<MDC
264	65	-97	<MDC
265	60	-117	<MDC
266	71	-73	<MDC
267	85	-16	<MDC
268	82	-28	<MDC
269	83	-24	<MDC
270	82	-28	<MDC
271	91	8	<MDC
272	70	-77	<MDC
273	75	-56	<MDC
274	80	-36	<MDC
275	78	-44	<MDC
276	76	-52	<MDC
277	88	-4	<MDC
278	80	-36	<MDC
279	89	0	<MDC
280	90	4	<MDC
281	77	-48	<MDC
282	76	-52	<MDC
283	83	-24	<MDC
284	73	-64	<MDC
285	83	-24	<MDC
286	94	20	<MDC
287	80	-36	<MDC
288	82	-28	<MDC
289	93	16	<MDC
290	73	-64	<MDC
291	102	52	<MDC
292	87	-8	<MDC
293	69	-81	<MDC
294	89	0	<MDC
295	79	-40	<MDC
296	81	-32	<MDC
297	68	-85	<MDC
298	85	-16	<MDC
299	82	-28	<MDC
300	66	-93	<MDC
301	94	20	<MDC
302	97	32	<MDC
303	98	36	<MDC
304	72	-69	<MDC
305	70	-77	<MDC

Ludlum 2200/NaI 2" x 2" Well Counter			
Efficiency	BKG	DCGL	MDC
90.77%	172	3.00E+04	71
Gross Gamma (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comment
152	-22	<MDC	None
189	19	<MDC	None
155	-19	<MDC	None
156	-18	<MDC	None
171	-1	<MDC	None
176	4	<MDC	None
165	-8	<MDC	None
186	15	<MDC	None
183	12	<MDC	None
155	-19	<MDC	None
171	-1	<MDC	None
160	-13	<MDC	None
156	-18	<MDC	None
154	-20	<MDC	None
170	-2	<MDC	None
170	-2	<MDC	None
179	8	<MDC	None
166	-7	<MDC	None
189	19	<MDC	None
162	-11	<MDC	None
186	15	<MDC	None
163	-10	<MDC	None
170	-2	<MDC	None
163	-10	<MDC	None
179	8	<MDC	None
170	-2	<MDC	None
158	-15	<MDC	None
165	-8	<MDC	None
185	14	<MDC	None
172	0	<MDC	None
166	-7	<MDC	None
182	11	<MDC	None
167	-6	<MDC	None
174	2	<MDC	None
151	-23	<MDC	None
198	29	<MDC	None
150	-24	<MDC	None
171	-1	<MDC	None
167	-6	<MDC	None
170	-2	<MDC	None
192	22	<MDC	None
189	19	<MDC	None
179	8	<MDC	None
162	-11	<MDC	None
184	13	<MDC	None
192	22	<MDC	None
214	46	<MDC	None
176	4	<MDC	None
164	-9	<MDC	None
174	2	<MDC	None
179	8	<MDC	None

Appendix F – Building and Structures Removable Measurements

Removable Contamination Measurements

Facility Areas

Protean ASC # 251429			
Efficiency	BKG	DCGL	MDC
24.81%	89	3.25E+04	189
	Gross Beta (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result
306	78	-44	<MDC
307	90	4	<MDC
308	93	16	<MDC
309	80	-36	<MDC
310	83	-24	<MDC
311	81	-32	<MDC
312	93	16	<MDC
313	78	-44	<MDC
314	78	-44	<MDC
315	85	-16	<MDC
316	70	-77	<MDC
317	82	-28	<MDC
318	83	-24	<MDC
319	75	-56	<MDC
320	74	-60	<MDC
321	84	-20	<MDC
322	83	-24	<MDC
323	98	36	<MDC
324	81	-32	<MDC
325	98	36	<MDC
326	83	-24	<MDC
327	81	-32	<MDC
328	73	-64	<MDC
329	69	-81	<MDC
330	84	-20	<MDC
331	80	-36	<MDC
332	82	-28	<MDC
333	80	-36	<MDC
334	75	-56	<MDC
335	90	4	<MDC
336	81	-32	<MDC
337	80	-36	<MDC
338	88	-4	<MDC
339	90	4	<MDC
340	89	0	<MDC
341	86	-12	<MDC
342	74	-60	<MDC
343	91	8	<MDC
344	79	-40	<MDC
345	92	12	<MDC
346	84	-20	<MDC
347	85	-16	<MDC
348	78	-44	<MDC
349	68	-85	<MDC
350	82	-28	<MDC
351	73	-64	<MDC
352	76	-52	<MDC
353	98	36	<MDC
354	80	-36	<MDC
355	77	-48	<MDC
356	70	-77	<MDC

Ludlum 2200/NaI 2" x 2" Well Counter			
Efficiency	BKG	DCGL	MDC
90.77%	172	3.00E+04	71
Gross Gamma (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comment
160	-13	<MDC	None
167	-6	<MDC	None
174	2	<MDC	None
189	19	<MDC	None
186	15	<MDC	None
173	1	<MDC	None
201	32	<MDC	None
164	-9	<MDC	None
160	-13	<MDC	None
179	8	<MDC	None
181	10	<MDC	None
161	-12	<MDC	None
175	3	<MDC	None
172	0	<MDC	None
174	2	<MDC	None
164	-9	<MDC	None
174	2	<MDC	None
188	18	<MDC	None
158	-15	<MDC	None
179	8	<MDC	None
177	6	<MDC	None
179	8	<MDC	None
178	7	<MDC	None
186	15	<MDC	None
159	-14	<MDC	None
158	-15	<MDC	None
176	4	<MDC	None
168	-4	<MDC	None
159	-14	<MDC	None
191	21	<MDC	None
163	-10	<MDC	None
177	6	<MDC	None
171	-1	<MDC	None
159	-14	<MDC	None
193	23	<MDC	None
172	0	<MDC	None
171	-1	<MDC	None
164	-9	<MDC	None
157	-17	<MDC	None
173	1	<MDC	None
178	7	<MDC	None
169	-3	<MDC	None
147	-28	<MDC	None
177	6	<MDC	None
182	11	<MDC	None
197	28	<MDC	None
171	-1	<MDC	None
175	3	<MDC	None
161	-12	<MDC	None
174	2	<MDC	None
166	-7	<MDC	None

Appendix F – Building and Structures Removable Measurements

Removable Contamination Measurements

Facility Areas

Protean ASC # 251429			
Efficiency	BKG	DCGL	MDC
24.81%	89	3.25E+04	189
	Gross Beta (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result
357	83	-24	<MDC
358	90	4	<MDC
359	72	-69	<MDC

GEH: Non-Restricted Area

1	68	-85	<MDC
2	83	-24	<MDC
3	81	-32	<MDC
4	81	-32	<MDC
5	75	-56	<MDC
6	70	-77	<MDC
7	101	48	<MDC
8	73	-64	<MDC
9	90	4	<MDC
10	86	-12	<MDC
11	86	-12	<MDC
12	85	-16	<MDC
13	85	-16	<MDC
14	100	44	<MDC
15	91	8	<MDC
16	94	20	<MDC
17	89	0	<MDC
18	83	-24	<MDC
19	72	-69	<MDC
20	83	-24	<MDC
21	82	-28	<MDC
22	88	-4	<MDC
23	93	16	<MDC
24	93	16	<MDC
25	89	0	<MDC
26	70	-77	<MDC
27	77	-48	<MDC
28	93	16	<MDC
29	90	4	<MDC
30	75	-56	<MDC
31	95	24	<MDC
32	76	-52	<MDC
33	76	-52	<MDC
34	87	-8	<MDC
35	76	-52	<MDC
36	88	-4	<MDC
37	80	-36	<MDC
38	74	-60	<MDC
39	80	-36	<MDC
40	85	-16	<MDC
41	76	-52	<MDC
42	89	0	<MDC
43	79	-40	<MDC
44	70	-77	<MDC
45	76	-52	<MDC
46	96	28	<MDC
47	77	-48	<MDC

Ludlum 2200/NaI 2" x 2" Well Counter			
Efficiency	BKG	DCGL	MDC
90.77%	172	3.00E+04	71
Gross Gamma (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comment
177	6	<MDC	None
181	10	<MDC	None
184	13	<MDC	None

164	-9	<MDC	None
164	-9	<MDC	None
165	-8	<MDC	None
178	7	<MDC	None
159	-14	<MDC	None
162	-11	<MDC	None
151	-23	<MDC	None
176	4	<MDC	None
143	-32	<MDC	None
166	-7	<MDC	None
180	9	<MDC	None
167	-6	<MDC	None
171	-1	<MDC	None
161	-12	<MDC	None
163	-10	<MDC	None
159	-14	<MDC	None
154	-20	<MDC	None
164	-9	<MDC	None
192	22	<MDC	None
157	-17	<MDC	None
192	22	<MDC	None
185	14	<MDC	None
190	20	<MDC	None
167	-6	<MDC	None
182	11	<MDC	None
181	10	<MDC	None
184	13	<MDC	None
156	-18	<MDC	None
196	26	<MDC	None
175	3	<MDC	None
175	3	<MDC	None
177	6	<MDC	None
159	-14	<MDC	None
161	-12	<MDC	None
160	-13	<MDC	None
163	-10	<MDC	None
163	-10	<MDC	None
161	-12	<MDC	None
166	-7	<MDC	None
169	-3	<MDC	None
172	0	<MDC	None
198	29	<MDC	None
178	7	<MDC	None
164	-9	<MDC	None
188	18	<MDC	None
167	-6	<MDC	None
159	-14	<MDC	None



Appendix F – Building and Structures Removable Measurements

Removable Contamination Measurements

Facility Areas

Protean ASC # 251429			
Efficiency	BKG	DCGL	MDC
24.81%	89	3.25E+04	189
	Gross Beta (cpm)	Net Beta (dpm/100cm <sup>2</sup> )	Result
48	84	-20	<MDC
49	92	12	<MDC
50	82	-28	<MDC
51	87	-8	<MDC
52	73	-64	<MDC
53	74	-60	<MDC
54	77	-48	<MDC
55	86	-12	<MDC
56	87	-8	<MDC
57	75	-56	<MDC
58	83	-24	<MDC
59	96	28	<MDC
60	77	-48	<MDC
61	75	-56	<MDC
62	94	20	<MDC
63	83	-24	<MDC
64	85	-16	<MDC
65	74	-60	<MDC
66	78	-44	<MDC
67	82	-28	<MDC
68	94	20	<MDC
69	79	-40	<MDC
70	89	0	<MDC
71	91	8	<MDC
72	80	-36	<MDC
73	81	-32	<MDC
74	69	-81	<MDC
75	82	-28	<MDC
76	74	-60	<MDC
77	73	-64	<MDC
78	77	-48	<MDC

Ludlum 2200/NaI 2" x 2" Well Counter			
Efficiency	BKG	DCGL	MDC
90.77%	172	3.00E+04	71
Gross Gamma (cpm)	Net Gamma (dpm/100cm <sup>2</sup> )	Result	Comment
172	0	<MDC	None
159	-14	<MDC	None
177	6	<MDC	None
177	6	<MDC	None
184	13	<MDC	None
157	-17	<MDC	None
171	-1	<MDC	None
189	19	<MDC	None
179	8	<MDC	None
181	10	<MDC	None
173	1	<MDC	None
170	-2	<MDC	None
192	22	<MDC	None
164	-9	<MDC	None
183	12	<MDC	None
170	-2	<MDC	None
167	-6	<MDC	None
165	-8	<MDC	None
150	-24	<MDC	None
173	1	<MDC	None
177	6	<MDC	None
168	-4	<MDC	None
172	0	<MDC	None
151	-23	<MDC	None
172	0	<MDC	None
165	-8	<MDC	None
163	-10	<MDC	None
182	11	<MDC	None
177	6	<MDC	None
179	8	<MDC	None
167	-6	<MDC	None

Miscellaneous Equipment

1-Iodine Hood Exhaust Stack	86	-12	<MDC
2-Pass Thru	78	-44	<MDC
3-Door Knobs	92	12	<MDC
4-Sink	76	-52	<MDC
5-Bathroom Drains	71	-73	<MDC
6-Package Conveyors	91	8	<MDC

172	0	<MDC	None
169	-3	<MDC	None
188	18	<MDC	None
186	15	<MDC	None
203	34	<MDC	None
180	9	<MDC	None

Appendix G – Building Surfaces and Structures Statistical Data

*Restricted Area Statistical Data*

<b>GE Healthcare-Livonia, Michigan Beta Static Measurements Statistics Net Activity (dpm/100cm<sup>2</sup>)</b>	
Mean	34
Standard Error	11
Median	32
Mode	-94
Standard Deviation	209
Minimum	-714
Maximum	800
Count	359
Confidence Level (95.0%)	22

<b>GE Healthcare-Livonia Michigan Gamma Static Measurements Statistics Net Activity (dpm/100cm<sup>2</sup>)</b>	
Mean	-1947
Standard Error	199
Median	-1987
Mode	-1494
Standard Deviation	3769
Minimum	-15261
Maximum	9047
Count	359
Confidence Level (95.0%)	391

<b>GE Healthcare-Livonia, Michigan Beta Removable Measurements Statistics Net Activity (dpm/100cm<sup>2</sup>)</b>	
Mean	-27
Standard Error	2
Median	-28
Mode	-28
Standard Deviation	36
Minimum	-117
Maximum	77
Count	359
Confidence Level (95.0%)	4

<b>GE Healthcare-Livonia, Michigan Gamma Removable Measurements Statistics Net Activity (dpm/100cm<sup>2</sup>)</b>	
Mean	0
Standard Error	1
Median	0
Mode	-1
Standard Deviation	13
Minimum	-37
Maximum	46
Count	359
Confidence Level (95.0%)	1

Appendix G – Building Surfaces and Structures Statistical Data

Unrestricted Area Statistical Data

<b>GE Healthcare-Livonia, Michigan Beta Static Measurements Statistics Net Activity (dpm/100cm<sup>2</sup>)</b>	
Mean	40
Standard Error	25
Median	35
Mode	243
Standard Deviation	218
Minimum	-435
Maximum	570
Count	78
Confidence Level (95.0%)	49

<b>GE Healthcare-Livonia, Michigan Gamma Static Measurements Statistics Net Activity (dpm/100cm<sup>2</sup>)</b>	
Mean	-499
Standard Error	411
Median	-347
Mode	0
Standard Deviation	3629
Minimum	-7907
Maximum	12274
Count	78
Confidence Level (95.0%)	818

<b>GE Healthcare-Livonia, Michigan Beta Removable Measurements Statistics Net Activity (dpm/100cm<sup>2</sup>)</b>	
Mean	-26
Standard Error	4
Median	-28
Mode	-24
Standard Deviation	32
Minimum	-85
Maximum	48
Count	78
Confidence Level (95.0%)	7

<b>GE Healthcare-Livonia, Michigan Gamma Removable Measurements Statistics Net Activity (dpm/100cm<sup>2</sup>)</b>	
Mean	-1
Standard Error	1
Median	-3
Mode	-9
Standard Deviation	13
Minimum	-32
Maximum	29
Count	78
Confidence Level (95.0%)	3

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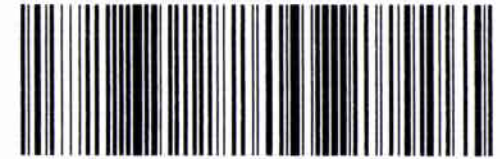


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