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Radiation Safety

February 16, 2017

Br. 1

03035409

ATTN: Ms. Tara Weidner
Senior Health Physicist
Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission
2100 Renaissance Blvd, Suite 100
King of Prussia, PA 19406-2713

Request for Amendment to NRC License No. 08-30577-01

Please amend subject license by removing the facility designated in License Condition 10 (3750 Reservoir Rd, NW. Washington, DC). At attachment please find the results of our Final Status Survey of the facility indicating it meets the requirements for unrestricted release. The facility is planned for demolition as part of an expansion plan of the hospital.

I can be reached at (202) 444-4637 or by email at: david.a.smith@gunet.georgetown.edu if there are any questions regarding this action.

Thank you.

David A. Smith, PhD
Director, Radiation Safety
Radiation Safety Officer
Medstar Georgetown University Hospital

Attachment
Final Status Survey

593070

NMSS/RGN1 MATERIALS-002

REC'D IN LAT 2-16-17

KOBER COGAN BUILDING

RADIOLOGICAL
FINAL SURVEY REPORT

Prepared For:

MedStar Georgetown University Medical Center, Inc.

February 2017

Prepared By:

RSO, Inc.

Laurel, MD

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1.0 INTRODUCTION AND RADIOLOGICAL DECOMMISSIONING ACTIONS

1.1 Introduction

Medstar Georgetown University Medical Center, Inc., maintains a Nuclear Regulatory Commission license (License number 08-30577-01), for use of byproduct radioactive materials for medical diagnosis, therapy and research in humans and R&D including animal studies, instrument calibration student instruction, and in-vitro studies.

The above referenced license identifies 3750 Reservoir Road, NW Washington DC as an authorized place of use or storage. The Kober Cogan Building (KCB) is the recognized building for this street address.

Licensed material was authorized for use in KCB in the past. This building has been unoccupied since May 2010 and is to undergo demolition in the near future.

1.2 Purpose

This report is to provide the results of a radiological final survey to demonstrate the building is in a condition for suitable release from radiological controls and to support a request to removal of the specified address from the above referenced license.

1.3 Facility Background

Facility:

MedStar Georgetown University Medical Center, Inc.

3800 Reservoir Road, NW, Washington, DC 20007

Kober-Cogan Building (KCB)

3750 Reservoir Road, NW, Washington DC

Basic Description:

KCB has 6 above ground floors plus a basement level and a roof-top penthouse above the 6th floor.

A visual inspection was made of the rooms in KCB in December 2016 and January 2017 by the survey team. The majority of use of the building appears to have been for offices, doctor's offices, patient exam rooms, (e.g.: audiology testing) and waiting rooms. Most of the floors of the rooms were carpeted and only a few of the rooms were used as laboratory rooms. There were no chemical fume hoods, laboratory sinks, eye wash stations etc. There were no visual indications of use of radioactive materials such as room signage, postings, notices, caution "radioactive" labels or stickers.

History:

KCB was dedicated in 1959 (see MedStar GUH internet web site) and was closed in May 2010. The closure in 2010 was caused by building wide mold problems (news article at web site: "mold caused by steam leak").

There has been no occupancy since closure.

Licensing History

Georgetown University Hospital became part of MedStar Health in 2000 and it is assumed that KCB transferred from the Georgetown University license to the GUMC, Inc. license at this time.

1.4 Historical Site Assessment

The authorizations for use of un-sealed radioactive material in KCB appears to have started in the early 1970s and likely ended by 2002 (the exact date is uncertain) and was limited to rooms in the basement level and the 3rd floor level.

Decommissioning Information

Records of past use of license material indicate: past authorizations for use in 6 rooms in the basement level: B02, B04, B005C, B07, B08, B100 under 1 authorized user and 5 rooms on the 3rd floor level: 304A, 305, 306, 322, and 327 (for use by the GUH Radiation Safety Office and 2 other Authorized Users). There were no known areas of residual contamination identified.

The authorized radionuclides in the available records were H-3, C-14, Cr-51, I-125 and Cs-137. The Cs-137 was for use as a "cal" source (calibration source) by the Radiation Safety Office. The radionuclides authorized for use in KCB and pertinent data are listed in Table 1.

Table 1. List of unsealed radionuclides authorized for use in KCB and radionuclide data.

Authorized Radionuclides	Half Life	Decay Mode	Principle Emission	Energy	Use within 10 years of the on-site survey
H-3	12.3 yrs	Beta	beta	18.6 keV (max)	No
C-14	5730 yrs	Beta	beta	156 keV (max)	No
Cr-51	27.7 days	Electron Capture	gamma	0.320 keV (9.8%)	No[1]
I-125	59.4 days	Electron Capture	gamma and x-rays	27.5-36 keV (144%)	No[2]

Note 1 assume last use was 5/2010, elapsed time is 2,400 days, over 86 half-lives, decay factor is >1E+26, effectively 100% radioactive decay

Note 2 assume last use was 5/2010, elapsed time is 2,400 days, over 40 half-lives, decay factor is >1.5E+12, effectively 100% radioactive decay

Radionuclides of Concern

Using the list from Table 1 above and the elimination of the short half-life radionuclides, Cr-51 and I-125, and Cs-137 (assumed to be a sealed source with no known reported failed Leak Tests) the potential contaminant radionuclides identified as the Radionuclides of Concern were H-3 and C-14.

2.0 RADIOLOGICAL SURVEY APPROACH

2.1 Survey Design Basis

This radiological survey was designed in consideration of the guidance provided by the Nuclear Regulatory Commission (NRC) regarding Final Radiological Surveys. In particular the guidance provided by the NRC in NUREG 1757 for what is termed Group 2 facilities (see following excerpt) was used. Group 2 includes facilities that "would not have contaminated work areas at the levels above the decommissioning screening criteria".

From NUREG 1757 v1 Chapter 7:

> Group 2 facilities may have residual radiological contamination present in building surfaces and soils. However, licensees are able to demonstrate that their facilities meet the provisions

of 10 CFR 20.1402 ("Radiological Criteria for Unrestricted Use") by applying the screening approach dose analysis described in Chapter 6.

Additionally, licensees in Group 2 typically possess historical records of material receipt, use, and disposal, such that quantifying past radiological material possession and use may be developed with a high degree of confidence. Furthermore, these licensees have radiological survey records that characterize the residual radiological contamination levels present within the facilities and at their sites. That is, they are able to demonstrate residual radiological contamination levels without more sophisticated survey procedures (greater than those used for operational surveys) or dose modeling. These licensees do not need to use site-specific parameters or establish site-specific DCGLs in order to demonstrate acceptability for release of their sites."

Derived Concentration Guideline Levels (DCGLs) are radionuclide-specific concentration limits used by the licensee during decommissioning to achieve the regulatory dose standard that permits the release of the property and termination of the license. The DCGL applicable to the average concentration over a survey unit is called the $DCGL_W$. The DCGL applicable to limited areas of elevated concentrations within a survey unit is called the $DCGL_{EMC}$.

2.2 Decommissioning Criteria

The specific requirements for release of sites licensed under NRC regulations are the Radiological Criteria for Unrestricted Use in NRC regulations 10 CFR Part 20.1402 (complete text is shown below).

§ 20.1402 Radiological criteria for unrestricted use. A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA).

2.3 Potential Radionuclide Contaminants and Screening Values

The NRC has established Screening Values derived using scenarios and default values for assumptions that result in a Derived Concentration Guideline Limit (DCGL). These values have been derived for common beta-gamma emitting radionuclides for building surface contamination as published in the Federal Register (63 FR 64132, November 18, 1998) and also shown in Appendix B Table B.1 of NUREG 1757 and by definition is the $DCGL_W$. These are values, which can also be derived using the default parameters and the computer code DandD, for the concentration (dpm/100 cm^2) equivalent to 25 mrem per year.

It is noted that for beta-gamma emitters the $DCGL_W$ is typically higher than the facility operational contamination limits. The $DCGL_W$ for the radionuclides of concern are shown in Table 2.

Table 2. $DCGL_W$ for radionuclides of concern.

Radionuclide	Surface Contamination (dpm/100 cm^2)
H-3	*1.2×10^8
C-14	*3.7×10^6

* from NUREG 1757

2.4 Performance of Radiological Surveys

The radiological surveys were conducted using guidance provided by the NRC in NUREG-1575, EPA 402-R-97-016, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM): Revision 1, August 2000.2.5 Survey Design: Area Classification.

Impacted Areas

- Impacted areas are areas that may have residual radioactivity from the licensed activities.
- Non-impacted areas are areas without residual radioactivity from licensed activities.
- NRC guidance provides that Final Status Survey (FSS) radiation surveys do not need to be conducted in non-impacted areas.

The impacted area for this license was considered to be the identified laboratory rooms where radioactive material was authorized for use, the radioactive waste storage area, and the connecting corridors.

Classes

Impacted areas can be classified into one of the three classes, listed below, based on expected levels of residual radioactivity.

- Class 1 Areas are impacted areas that, prior to remediation, are expected to have concentrations of residual radioactivity that exceed the $DCGL_W$ ($DCGL_W$ is defined in Section 2.2 of MARSSIM);
- Class 2 Areas are impacted areas that, prior to remediation, are not likely to have concentrations of residual radioactivity that exceed the $DCGL_W$.;
- Class 3 Areas are impacted areas that have a low probability of containing residual radioactivity.

All areas were treated as Class 3 with no or very limited areas of residual contamination expected.

2.5 Decommissioning Guideline Levels

The decommissioning guideline levels used for the survey were the DCGLs as shown in Tabless 2 and 3. Also shown are a survey specific Action Levels also shown in Table 3. Action Levels were chosen to bring attention to survey results that were unexpected and to ensure areas were properly classified and surveyed.

Table 3. Surface contamination guidelines used for the Final Survey.

Radionuclide	DCGL (dpm/100 cm^2)	Action Level	Action Level
		Removable Contamination (dry wipe method) Action Level	Static and Scans Action Level
H-3	1.2×10^8 assumed to be a factor of 10 lower, ie 1.2×10^7, when only removable contamination is measured	200	N/A Not detectable
C-14	3.7×10^6	200	MDCR of 130 cpm (equivalent to a point source of about 4400 dpm/100 cm^2)

2.6 Survey Units (Areas)

KCB was divided into 2 survey units, basement rooms and 3rd Floor rooms. Table 4. lists the survey unit, rooms or areas where radioactive material were authorized for use (or storage), and the radionuclide(s) authorized for use.

Table 4. KCB Authorized Room listing.

Survey Unit	KCB	Room	Area (ft^2)	C-14	H-3	Cr-51	I-125
1	Basement	B02	250	x	x	x	
1	Basement	B04	540	x	x		x
1	Basement	B05C	250	x	x		
1	Basement	B07	500	x	x		
1	Basement	B08	240	x	x		
1	Basement	B100	120	x	x		
2	3rd Floor	304A	100	x	x		x
2	3rd Floor	305	200	x	x		
2	3rd Floor	306	200	x	x		
2	3rd Floor	322	340	x	x		
2	3rd Floor	327	300	x	x		

Floor plans of each KCB floor showing the locations of the rooms/areas (shaded border) are shown in Figure 1 and Figure 2.

2.7 Survey Number of Samples and Locations

Using MARSSIM's guidance for determination of the number of samples needed for a survey unit when the DCGL is large (as is the case for this survey), the relative shift is also large (>2.5), and using equal values of 0.05 for Type I and Type II errors, results in a number of data points needed of 14.

For the survey, 14 randomly selected survey locations per survey unit, and an additional 33 biased sample locations evenly divided between the 2 survey units were identified by the survey team. A scan (hand-held survey meter), static (direct) measurement, and wipe test, and gamma dose rate measurement was performed at each survey location except where noted.

When a sample location was on a carpeted floor, a scan, static measurement and wipe test was performed, and then a 1 m^2 section of carpet removed and 2nd scan, static measurement and wipe test was performed on the surface revealed by the removal of the carpet.

2.8 Survey Methods

The survey methods for each potential radionuclide

Radionu-clide	Static/Direct	Scan	Wipe Test for Removable Contamination
H-3	No - Not practical with survey meters	No - Not practical with survey meters	Yes liquid scintillation Analysis
C-14	Yes – thin window scintillation detector	Yes – thin window scintillation detector	Yes liquid scintillation Analysis

Fig 1. Floor plan diagram of the 3rd floor level of KCB. Authorized use areas outlined with dark grey lines.

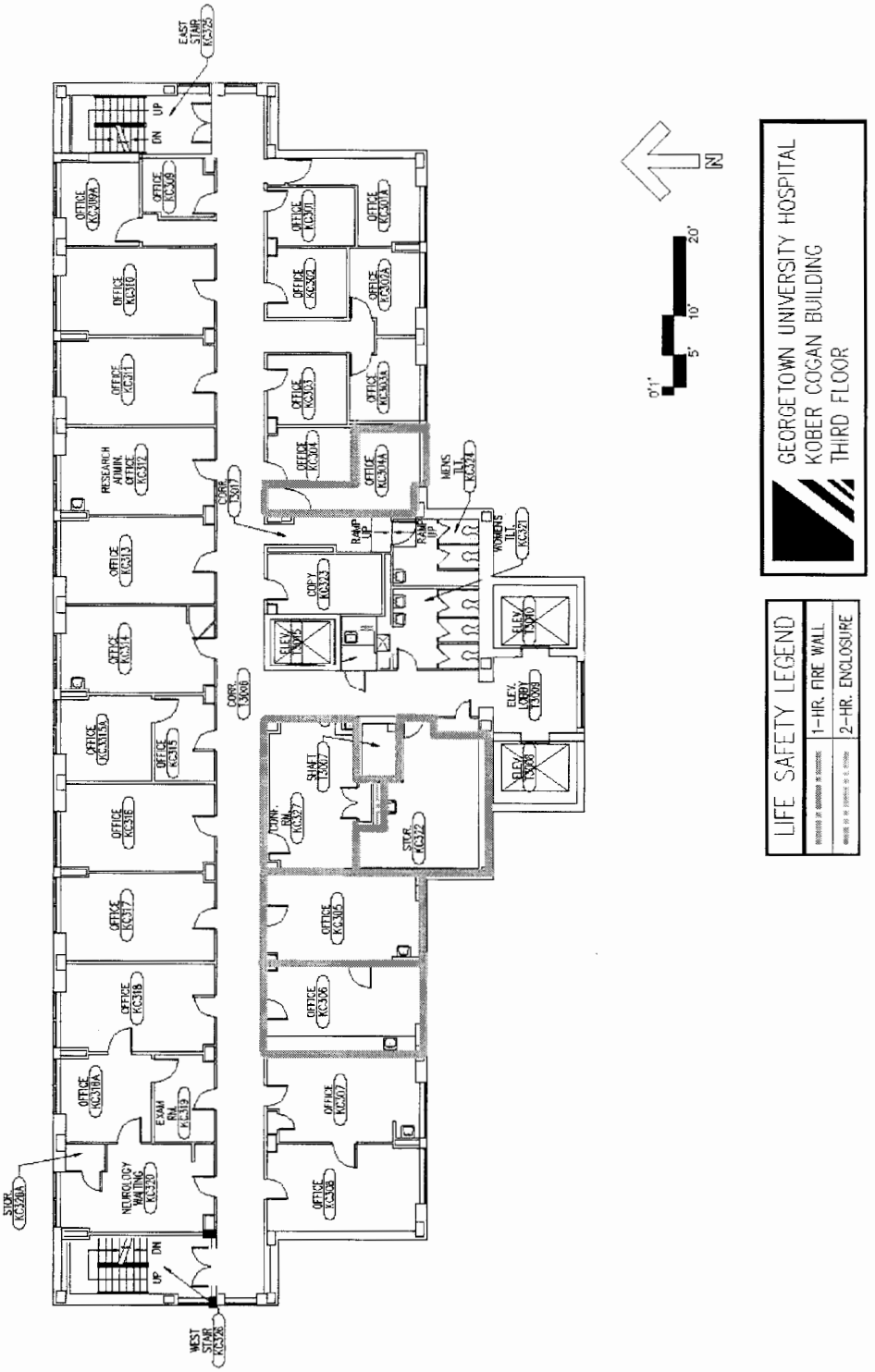
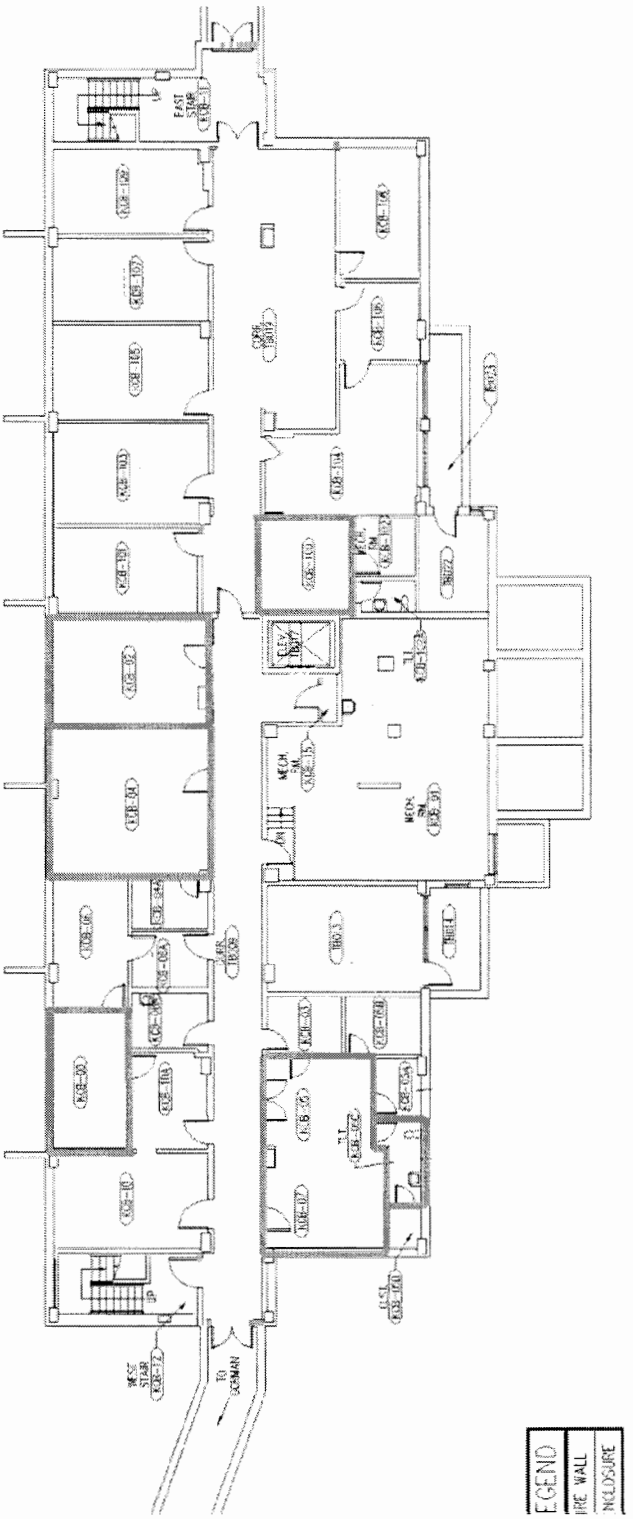


Fig 2. Floor plan diagram of the basement level of KCB. Authorized use areas outlined with dark grey lines.



Beta Scan Survey

Surface scanning speeds were 1/2 detector width per second. To optimize detection of elevated radiation levels during scanning, audible speakers were used in addition to noting the fluctuations in the analog meter reading. Scan surveys were conducted on 5 to 10% of the floors.

Static (Direct) Measurements of Surfaces

Static radiation measurements for beta/gamma surface contamination were performed at random and biased (e.g.: additional areas and sink basins) locations. Measurements were conducted by integrating a 1-minute count time with the probe in direct contact with the surface.

Removable Contamination

A wipe test for removable contamination was performed at each survey location. The wipe test consisted of wiping a minimum of 100 cm^2 of the surface with a dry paper, using moderate pressure and measuring the amount of radioactive material on the test material using liquid scintillation counting.

Dose Rate (Gamma Only)

A measurement of the gamma dose rate was made at each survey location using a hand held survey meter sensitive to low radiation levels. Either an instrument with a plastic scintillation detector or a pressurized ion chamber suitable for assessments of radiation levels near background.

Quality Assurance

Survey meters used to perform the Final Survey had been calibrated within 12 months of their use using radioactive standards traceable to NIST. Also, performance checks were completed on each survey meter at the beginning of the survey.

The laboratory instruments used by RSO, Inc. to analyze the wipe tests were maintained under RSO's laboratory quality assurance program which includes a service agreement with the manufacturer, daily quality control performance charts and background and standard samples counted daily.

Personnel Qualifications

All personnel had levels of training and experience commensurate with their assigned tasks. For those individuals involved in taking radiological measurements and samples, special instruction was provided when necessary on equipment, special techniques, and practices relating to survey activities.

Laboratory Services

Wipes or swabs were screened for gross gamma activity and further were analyzed for gross beta/gamma activity. All wipes for the final survey were analyzed by RSO, Inc. personnel.

2.9 Data Quality Objectives (MARSSIM)

The survey planning used the *Data Quality Objectives (DQO) Process* to ensure that the survey results are of sufficient quality and quantity to support the final decision. The use of the DQO Process assures that the type, quantity, and quality of environmental data used in decision making will be appropriate for the intended application. The DQO Process consists of seven steps, as shown below. The output from each step influences the choices that will be made later in the Process.

1. State the problem: Radioactive materials (H-3 and C-14) primarily in the form of liquids was used in this facility. The use of these materials was strictly limited to work benches and chemical fume hoods in the impacted rooms. It is unlikely that the use of radioactive materials caused residual contamination at levels exceeding the activity DCGL (Derived Concentration Guideline) for H-3 and C-14. The amounts of radioactivity used at any 1 time was relatively small (millicurie or sub-millicurie amounts) and there were no spills or incidents resulting in widespread contamination.
2. Identify the decision: Determine if residual radioactivity on structure surfaces of the laboratories and other areas where H-3 and C-14 were used with site-specific surface activity DCGLs derived as unrestricted release criteria to comply with dose limits prescribed in 10 CFR 20, Subpart E.
3. Identify inputs to the decision: Radiological survey data was collected for impacted structure surfaces.
4. Define the study boundaries: Historical analysis had identified in Table 4 as the impacted use areas.
5. Develop a decision rule: Given that sufficient data has been collected, if the mean concentration in the facility is less than the DCGL, then the facility is determined to be in compliance with the release criterion. Compliance with applicable DCGLs is demonstrated using the Sign and/or Wilcoxon Rank Sum (WRS) Tests to disprove the null hypothesis that the survey unit being evaluated exhibits contamination at concentrations exceeding the applicable DCGL.
6. Specify limits on decision errors: MARSSIM's guidance for determination of the number of samples needed for a survey unit when the DCGL is large, the relative shift is large (>2.5), using equal values of 0.05 for Type I and Type II errors, results in a number of data points needed of 14.
7. Optimize the design for collecting data: H-3 and C-14 are low energy beta emitters. Survey equipment and sampling techniques were chosen that were appropriate and sensitive for the detection of the potential contaminants.

3.0 SURVEY INSTRUMENTATION

3.1 Description of Field and Laboratory Instrumentation and Sensitivity (also see Survey Data Sheets)

Field Instrument Used –

Ludlum Model 2360 with a Ludlum 43-93 detector.

Laboratory Instrument Used –

Packard Tricarb Liquid Scintillation Counter for analysis of wipe tests.

3.2 Description of Instrumentation

Table 5. Survey meters used to conduct radiological surveys.

Survey Meter	Detector Model	Detector Type	Probe Area/Size	Use
Ludlum Model 2360 Scaler/Rate meter	Ludlum 43-93	Alpha/Beta Scintillation Detector	100 cm^2	Scans of Surfaces Direct/Static Measurements

3.3 Instrument Calibration and Efficiency Data

The calibration and efficiency data for the survey meters that were used during the Final Survey are summarized in Table 6.

Table 6. Survey meter/instrument calibration and efficiency data.

Meter w/ Probe	Detector Model	Radionuclide	Efficiency (4π)
Ludlum Model 2360	Ludlum 43-93	C-14	6% cpm per dpm
Packard TriCarb 31000	Liquid Scintillation	3H	~40% cpm per dpm
		14C	~85% cpm per dpm

3.3 Minimum Detectable Concentration for Scanning Technique

The minimum detectable concentration for the beta scans was calculated using the suggested method in NUREG-1507 and in Abelquist 2001 (See Equation 9.11).

Beta Scans:

Equation 1

$$\text{Scan MDC} = \frac{MDCR}{\sqrt{p} * e_i * e_s * A}$$

Where:

Scan MDC = estimated minimum activity (dpm/100 cm^2) that can be detected during a scan,

MDCR = Minimum detectable count rate, as defined in MARSSIM

MDCR = s_i *(60/i)

d' = desired performance variable = 1.38

i = counting interval (function of scan speed and detector width)

b_i = number of background counts in the interval

s_i = d' * $\sqrt{b_i}$

p = surveyor efficiency (E_{hf}) considered to be 0.5

e_i = 2π efficiency (c/d) = 4π efficiency * 2

e_s = source efficiency (low energy beta)

A = (Probe Area cm^2) / 100 cm^2

Note: E_i estimated determining the 2π efficiency as 2 times the 4π efficiency

Note: E_s is 0.25 for low energy beta

Example of calculation of the MDC for Scanning (scan MDC).

Scan MDC for a Ludlum 2360 with a 43-93 detector (100 cm2) and background of 151 cpm.

Calculation of the Minimum Detectable Count Rate:
MDCR = si *(60/i) and si = d' x square root of b_i

d'	i	b_i	s_i
1.38	2	5.04	3.10

MDCR = 3.10 x (60\2) = 93

The Minimum Detectable Count Rate (MDCR) was calculated to be 93 (cpm).

Calculation of the Scan MDC:
Scan MDC = MDCR ÷ (square root of E_{hf} x e_i x e_s A)

p (E_{hf})	Source Efficiency	2π Efficiency	e_i	e_s
0.5	0.25	0.12	0.03	1

$$\text{Scan MDC} = \frac{93}{\sqrt{0.5} * 0.03 * 1 * (100cm2 / 100cm\ 2)}$$

The Scan MDC is calculated to be 4381 dpm per 100 cm^2.

3.4 Static and Wipe Test Data Reduction

Determinations of the total surface activity were based on static measurements with the detector in direct contact with the surface. For each analysis gross counts were converted into area activity concentration using the following method of data reduction:

Equation 2

$$A_s = \frac{\left(\frac{C}{T}\right) - R_B}{e_i * \left(\frac{A}{100\ \text{cm}^2}\right)}$$

Where:

A_S = total surface activity (dpm/100 cm^2),
C = integrated gross counts (counts),
T = count time (min),
R_B = background count rate (cpm),
e_i = total efficiency (c/d) * source efficiency
A = detector area (normalized to 100 cm^2).

3.5 Minimum Detectable Concentration for Static and Wipe Test Analysis

Using the equation shown below the minimum detectable activity for the static measurements was calculated using the following equation for instances in which the background and sample are counted for the same time intervals:

Equation 3

$$\text{Static MDC} = \frac{3 + 4.65\sqrt{R_B}}{K * \left(\frac{\text{detector area}}{100cm^2}\right) * T_{S+B}}$$

Using the equation shown below the minimum detectable activity for the static measurements was calculated using the following equation for instances in which the background and sample are counted for different time intervals:

Equation 4

$$\text{Static MDC} = \frac{3 + 3.29\sqrt{R_B * T_{S+B}(1 + {}^{T_{S+B}}/_{T_B})}}{K * \left(\frac{\text{detector area}}{100cm^2}\right) * T_{S+B}}$$

Where:

Static MDC = activity (dpm/100 cm^2),
C = integrated gross counts (counts),
T_{S+B} = sample count time
T_B = background count time
R_B = background count rate (cpm)
K = proportionality constants e.g.: to obtain total efficiency

Table 7. Example of calculation of the MDC for Static Measurements.

Survey Meter	Detector Model	Probe Area/Size	K (4π Eff. X modifying factors) (cpm/dpm)	Background Count Rate (cpm)	Background and Sample Count Time	Static MDC (dpm/100 cm^2)
Ludlum 2360 Scaler/ Ratemeter	Ludlum 43-93	100 cm^2	0.03	151	10 minute (bkg) 1 minute (sample	1514

3.6 Laboratory Instrumentation Sensitivity

Laboratory Instrument Used – Packard Tricarb 3100 liquid scintillation counter.

The minimum detectable activity for H-3 on a wipe test was estimated to be less than 40 dpm for a 1-minute count time, 1-minute background count time, efficiency of 0.4 cpm/dpm and a background count-rate of 6 cpm.

The minimum detectable activity for C-14 on a wipe test was estimated to be less than 30 dpm for a 1-minute count time, 1-minute background count time, efficiency of 0.8 cpm/dpm and a background count-rate of <15 cpm.

4.0 SURVEY RESULTS

The radiological final survey showed residual contamination was less the DCGLs for the survey. Further, all measurement results were less than the Action Levels for the survey method.

4.1 Survey Results

Attachment A contains the survey results by survey unit. Results include: survey unit drawing annotated with survey locations for wipe tests and direct measurements, and instrument scan results (raw data shown). Direct (static) measurement results above the Direct MDC are shown with yellow highlight.

Attachment B contains the LSC analysis data print-outs reports.

Attachment C contains the survey meter calibration reports.

4.2 Beta Scans and Direct Measurements-Summary

No activity above the DCGLs was detected. No activity above the Action Level was detected. Performance of the Sign test was not required since all results were less than the DCGL. The null hypothesis is therefore rejected, and all survey units meet the release criteria and are in a condition for unrestricted use or release.

4.3 Removable Contamination-Summary

All wipe test results were less than 10% of the respective DCGL and were less than the Action Level of 200 dpm per wipe test.

Performance of the Sign test was not required since all results were less than the DCGL. The null hypothesis is therefore rejected, and all survey units meet the release criteria and are in a condition for unrestricted use or release.

5.0 CONCLUSIONS

The Radiological Final Survey of the affected areas demonstrates that the surfaces were less than the $DCGL_W$ (25 mrem) for surface contamination and no contamination was detected that was greater than the assigned action limits.

The subject rooms/areas meet the requirements for unrestricted release.

6.0 REFERENCES

6.1 USNRC, Regulatory Guide 1.86., Termination of Operating Licenses for Nuclear Reactors, June 1974.

6.2 USNRC, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unaffected Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material", May 1987.

6.3 NUREG 1757, USNRC, "Decommissioning Process for Materials Licensees", Final September 2003.

6.4 NUREG-1575, EPA 402-R-97-016, and Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM): Final, August 2000.

6.5 10CFR Part 20 § 20.1402 Radiological criteria for unrestricted use.

6.6 Abelquist, Decommissioning Health Physics, A Handbook for MARSSIM Users, IOP Publishing Ltd 2001, Philadelphia PA.

7.0 ATTACHMENTS

Attachment A	Radiological Survey Results
Attachment B	Wipe Test LSC Analysis Report Print-Out
Attachment C	Survey Meter Calibration Report

Attachment A Radiological Survey Results

Site: Georgetown | Building: Kober Cogan | Lab/Room: Kober Cogan

Start Date: 01/13/17 | Finish Date: 01/30/17

Surveyor: Paul Madairy | Surveyor: Greg Smith

Area Survey Results			Wipe Tests		Direct Measurements			Dose Rate		β Scan Measurements; See Maps For Zones				
Sample Or Area Number	Surface	Location		Beta (dpm/100 cm^2)	Survey Meter #	Gross (cpm)	C-14 dpm/100 cm^2	Survey Meter #	Gross (μrem/hr)	Area	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	C-14 dpm/100 cm^2
	Basement	**Carpets Only**												
2	Carpet	Floor		<100	*1*	122	-973			2	*1*	160	110	-1373
4	Carpet	Floor		<100	*1*	108	-1440			4	*1*	160	100	-1707
5	Carpet	Floor		<100	*1*	151	-7			5	*1*	200	150	-40
6	Carpet	Floor		<100	*1*	128	-773			6	*1*	1060	120	-1040
7	Carpet	Floor		<100	*1*	118	-1107			7	*1*	180	160	293
8	Carpet	Floor		<100	*1*	128	-773			8	*1*	150	130	-707
9	Carpet	Floor		<100	*1*	103	-1607			9	*1*	150	130	-707
11	Carpet	Floor		<100	*1*	121	-1007			11	*1*	150	120	-1040
12	Carpet	Floor		<100	*1*	95	-1873			12	*1*	100	160	293
13	Carpet	Floor		<100	*1*	157	193			13	*1*	200	150	-40
15	Carpet	Floor		<100	*1*	103	-1607			15	*1*	180	110	-1373
16	Carpet	Floor		<100	*1*	125	-873			16	*1*	150	110	-1373
17	Carpet	Floor		<100	*1*	103	-1607			17	*1*	160	100	-1707
19	Carpet	Floor		<100	*1*	106	-1507			19	*1*	160	100	-1707
20	Carpet	Floor		<100	*1*	113	-1273			20	*1*	160	110	-1373
26	Carpet	Floor		<100	*1*	115	-1207			26	*1*	150	120	-1040
27	Carpet	Floor		<100	*1*	130	-707			27	*1*	200	140	-373
	Third Fl	**Carpets Only**												
1	Carpet	Floor		<100	*1*	133	-607			1	*1*	180	140	-373
2	Carpet	Floor		<100	*1*	164	427			2	*1*	180	170	627
4	Carpet	Floor		<100	*1*	135	-540			4	*1*	180	150	-40
5	Carpet	Floor		<100	*1*	133	-607			5	*1*	150	140	-373
8	Carpet	Floor		<100	*1*	151	-7			8	*1*	180	150	-40
9	Carpet	Floor		<100	*1*	138	-440			9	*1*	150	140	-373
11	Carpet	Floor		<100	*1*	140	-373			11	*1*	150	140	-373
12	Carpet	Floor		<100	*1*	126	-840			12	*1*	150	140	-373
14	Carpet	Floor		<100	*1*	167	527			14	*1*	180	170	627
15	Carpet	Floor		<100	*1*	111	-1340			15	*1*	140	120	-1040
18	Carpet	Floor		<100	*1*	135	-540			18	*1*	150	140	-373
19	Carpet	Floor		<100	*1*	145	-207			19	*1*	150	140	-373
20	Carpet	Floor		<100	*1*	125	-873			20	*1*	150	140	-373
26	Carpet	Floor		<100	*1*	172	693			26	*1*	175	15	-4540
27	Carpet	Floor		<100	*1*	149	-73			27	*1*	160	140	-373

Site: Georgetown | Building: Kober Cogan | Lab/Room: Kober Cogan

Start Date: 01/13/17 | Finish Date: 01/30/17

Surveyor: Paul Madairy | Surveyor: Greg Smith

Area Survey Results			Wipe Tests		Direct Measurements			Dose Rate		β Scan Measurements; See Maps For Zones				
Sample Or Area Number	Surface	Location		Beta (dpm/100 cm^2)	Survey Meter #	Gross (cpm)	C-14 dpm/100 cm^2	Survey Meter #	Gross (μrem/hr)	Area	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	C-14 dpm/100 cm^2
28	Carpet	Floor		<100	1	139	-407			28	1	150	140	-373
29	Carpet	Floor		<100	1	145	-207			29	1	180	150	-40
30	Carpet	Floor		<100	1	130	-707			30	1	160	130	-707
	Final Status	**Basement**												
1	Floor	Vinyl Tile		<100	2	111	-1350	5	3	1	2	160	100	-1717
2	Floor	Vinyl Tile		<100	2	128	-783	5	5	2	2	180	150	-50
3	Floor	Vinyl Tile		<100	2	139	-417	5	5	3	2	190	130	-717
4	Floor	Vinyl Tile		<100	2	150	-50	5	5	4	2	180	150	-50
5	Floor	Vinyl Tile		<100	2	171	650	5	5	5	2	180	160	283
6	Floor	Vinyl Tile		<100	2	150	-50	5	5	6	2	180	160	283
7	Floor	Vinyl Tile		<100	2	166	483	5	5	7	2	180	160	283
8	Floor	Vinyl Tile		<100	2	107	-1483	5	3	8	2	160	100	-1717
9	Floor	Vinyl Tile		<100	2	123	-950	5	5	9	2	160	130	-717
10	Floor	Vinyl Tile		<100	2	98	-1783	5	3	10	2	160	100	-1717
11	Floor	Vinyl Tile		<100	2	165	450	5	5	11	2	180	150	-50
12	Floor	Vinyl Tile		<100	2	148	-117	5	5	12	2	180	150	-50
13	Floor	Vinyl Tile		<100	2	138	-450	5	5	13	2	180	150	-50
14	Floor	Vinyl Tile		<100	2	154	83	5	5	14	2	160	130	-717
15	Floor	Vinyl Tile		<100	2	101	-1683	5	5	15	2	160	140	-383
16	Floor	Vinyl Tile		<100	2	170	617	5	5	16	2	180	150	-50
17	Floor	Vinyl Tile		<100	2	137	-483	5	5	17	2	180	150	-50
18	Floor	Vinyl Tile		<100	2	164	417	5	5	18	2	160	130	-717
19	Floor	Vinyl Tile		<100	2	152	17	5	5	19	2	160	130	-717
20	Floor	Vinyl Tile		<100	2	118	-1117	5	5	20	2	180	160	283
21	Floor	Vinyl Tile		<100	2	144	-250	5	5	21	2	180	150	-50
22	Sink	Porcelain		<100	3	370	687	5	5	22	3	400	350	20
23	Floor	Bath Tile		<100	2	157	183	5	5	23	2	180	150	-50
24	Floor	Vinyl Tile		<100	3	248	-3380	5	5	24	2	300	220	2283
25	Floor	Vinyl Tile		<100	2	150	-50	5	5	25	2	180	150	-50
26	Floor	Vinyl Tile		<100	2	171	650	5	5	26	2	180	160	283
27	Floor	Vinyl Tile		<100	2	154	83	5	5	27	2	180	160	283
28	Floor	Vinyl Tile		<100	2	169	583	5	5	28	2	160	130	-717
29	Floor	Vinyl Tile		<100	2	106	-1517	5	3	29	2	160	100	-1717
30	Floor	Vinyl Tile		<100	2	151	-17	5	4	30	2	180	160	283

Site: Georgetown | Building: Kober Cogan | Lab/Room: Kober Cogan

Start Date: 01/13/17 | Finish Date: 01/30/17

Surveyor: Paul Madairy | Surveyor: Greg Smith

Area Survey Results			Wipe Tests		Direct Measurements			Dose Rate		β Scan Measurements; See Maps For Zones				
Sample Or Area Number	Surface	Location		Beta (dpm/100 cm^2)	Survey Meter #	Gross (cpm)	C-14 dpm/100 cm^2	Survey Meter #	Gross (μrem/hr)	Area	Survey Meter #	Gross High (cpm)	Gross Average (cpm)	C-14 dpm/100 cm^2
31	Benchtop	Steel		<100	2	109	-1417	5	3	31	2	160	100	-1717
	Final Status	**Third Floor**												
1	Floor	Vinyl Tile		<100	2	174	750	5	5	1	3	440	350	20
2	Floor	Vinyl Tile		<100	2	202	1683	5	4	2	2	240	170	617
3	Floor	Bath Tile		<100	3	326	-780	5	5	3	3	440	350	20
4	Floor	Vinyl Tile		<100	2	166	483	5	5	4	2	240	160	283
5	Floor	Vinyl Tile		<100	2	186	1150	5	3	5	2	190	140	-383
6	Floor	Vinyl Tile		<100	2	134	-583	5	3	6	2	180	150	-50
7	Floor	Bath Tile		<100	3	330	-647	5	5	7	3	440	350	20
8	Floor	Vinyl Tile		<100	2	113	-1283	5	5	8	2	150	130	-717
9	Floor	Vinyl Tile		<100	2	150	-50	5	4	9	2	170	140	-383
10	Floor	Bath Tile		<100	3	372	753	5	5	10	3	440	350	20
11	Floor	Vinyl Tile		<100	2	126	-850	5	3	11	2	180	150	-50
12	Floor	Vinyl Tile		<100	2	144	-250	5	5	12	2	180	150	-50
13	Floor	Vinyl Tile		<100	2	121	-1017	5	3	13	2	180	150	-50
14	Floor	Vinyl Tile		<100	2	196	1483	5	5	14	2	240	170	617
15	Floor	Vinyl Tile		<100	2	206	1817	5	5	15	2	200	160	283
16	Bathtub	Porcelain		<100	2	153	50	5	5	16	2	250	170	617
17	Sink	Porcelain		<100	3	294	-1847	5	5	17	3	440	350	20
18	Floor	Vinyl Tile		<100	2	191	1317	5	4	18	2	220	160	283
19	Floor	Vinyl Tile		<100	2	196	1483	5	5	19	2	220	160	283
20	Floor	Vinyl Tile		<100	2	149	-83	5	5	20	2	170	140	-383
21	Floor	Vinyl Tile		<100	2	152	17	5	3	21	2	180	150	-50
22	Floor	Vinyl Tile		<100	2	131	-683	5	3	22	2	180	150	-50
23	Floor	Vinyl Tile		<100	2	151	-17	5	3	23	2	180	150	-50
24	Floor	Vinyl Tile		<100	2	138	-450	5	3	24	2	180	150	-50
25	Floor	Vinyl Tile		<100	2	149	-83	5	3	25	2	180	150	-50
26	Floor	Vinyl Tile		<100	2	155	117	5	3	26	2	180	150	-50
27	Floor	Vinyl Tile		<100	2	176	817	5	5	27	2	180	150	-50
28	Floor	Vinyl Tile		<100	2	155	117	5	5	28	2	240	170	617
29	Floor	Vinyl Tile		<100	2	172	683	5	5	29	2	180	150	-50
30	Floor	Vinyl Tile		<100	2	148	-117	5	5	30	2	150	130	-717

Survey Meter Information

Site: Georgetown Building: Kober Cogan Lab/Room: Kober Cogan

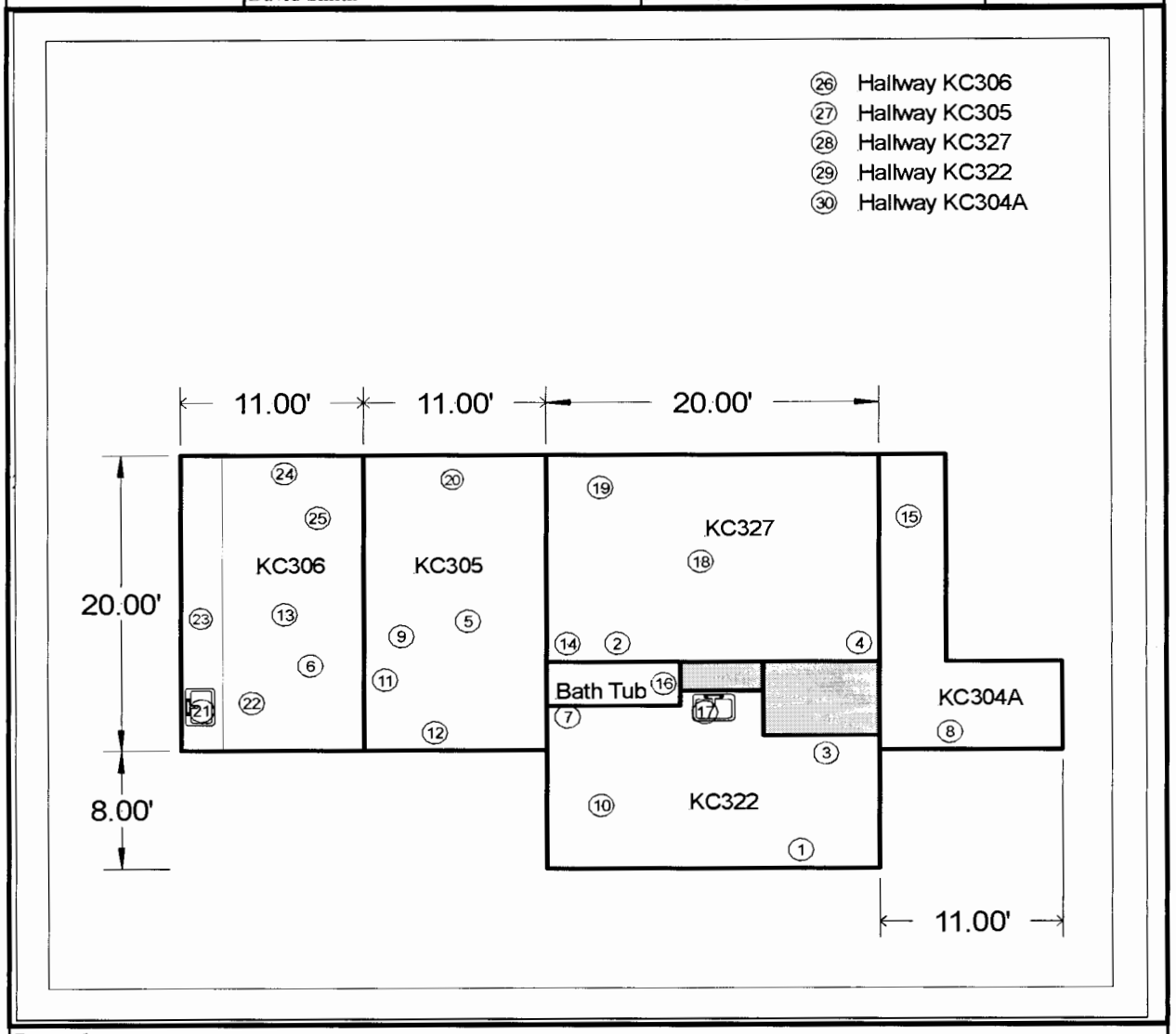
	Meter 1		Meter 2		Meter 3		Meter 4	Meter 5	
Date:	1/13/2017		1/30/2017		1/30/2017		Not In Service	1/13/2017	
Make:	Ludlum		Ludlum		Ludlum			Bicron	
Model:	2360		2360		2360			Micro Rem	
SN:	16707		16707		16707			C139F	
Probe Make:	Ludlum		Ludlum		Ludlum			N/A	
Probe Model:	43-93		43-93		43-93			N/A	
Probe SN:	359841		359841		359841			N/A	
Probe Area (cm^2):	100		100		100			N/A	
Next Cal. Date:	11/14/2017		11/14/2017		11/14/2017			8/31/2017	
Background Surface Material	Carpet		Vinyl Tile		Bath Tile			Air	
Background(c) - Time(Min)):	1512	10	1515	10	3494	10		5	mRem/hr
CS Isotope - Activity(μCi):	C-14	0.159	C-14	0.159	C-14	0.159		Cs-137	
CS Source(cpm)	2146		3371		3371			OK	
Total Efficiency 2Pi, Isotope:	12.0%	C-14	12.0%	C-14	12.0%	C-14		N/A	N/A
Source Efficiency/Surveyor Efficiency	0.25	0.50	0.25	0.50	0.25	0.50		N/A	N/A
Surface Efficiency/Scan Interval	1.00	2.0	1.00	2.0	1.00	2.0		N/A	N/A
Sample Count Time(min)	1.0		1.0		1.0			N/A	
L_c, L_d (Counts)	29	60	29	60	44	90		N/A	N/A
Direct MDC, Scan MDC (dpm/100cm^2)	**1514**	**4381**	**1516**	**4386**	**2250**	**6660**		N/A	N/A
MDCR , MDC Count Rate	**93**	530	**93**	530	**141**	912		N/A	N/A

Example of Survey Meter Calculations of MDCR, Scan MDC, and Direct MDC

	Meter 1	
Date:	1/13/2017	
Make:	Ludlum	
Model:	2360	
SN:	16707	
Probe Make:	Ludlum	
Probe Model:	43-93	
Probe SN:	359841	
Probe Area (cm^2):	100	
Next Cal. Date:	11/14/2017	
Background Surface Material	Carpet	
Background(c) - Time(Min)):	1512	10
CS Isotope - Activity(μCi):	C-14	0.159
CS Source(cpm)	2146	
Total Efficiency 2Pi, Isotope:	12.0%	C-14
Source Efficiency/Surveyor Efficiency	0.25	0.50
Surface Efficiency/Scan Interval	1.00	2.0
Sample Count Time(min)	1.0	
L_c, L_d (Counts)	29	60
Direct MDC, Scan MDC (dpm/100cm^2)	1514	4381
MDCR , MDC Count Rate	93	530

Scanning Sensitivity		
MARSSIM	**Value**	**Description**
MDCR Calculation		
d'	1.38	detectability value associated with the desired performance
i	2.0	interval
b_i	5.04	bi=background counts in interval=B*(1/60)
s_i	3.10	si=d'*SQRT(bi)
MDCR (net)	93	MDCR(net)=si*(60/i)
MDCR (gross)	244	MDCR(gross)=Si*(60/i)+B
Scan MDC Calculation		
p	0.50	Surveyor Efficiency (Ehf or Efficiency human factor)
Source Efficiency	0.25	
2π Efficiency	0.12	
e_i	0.030	ei=2π Efficiency * Source Efficiency
e_s	1.00	Surface Efficiency (decreases for porous surfaces)
Scan MDC	4381	Scan MDC= $\frac{MDCR(net)}{SQRT(E_{hf})*e_i*e_s*A*C}$
Direct MDC Calculation		
B	151	B = Background Counts
T	1	T = Counting Time In Minutes
Direct MDC	1514	Direct MDC= $\frac{3+3.29*(SQRT((B*T_s*(1+(T_s/T_b))))}{T*e_t*A*C}$

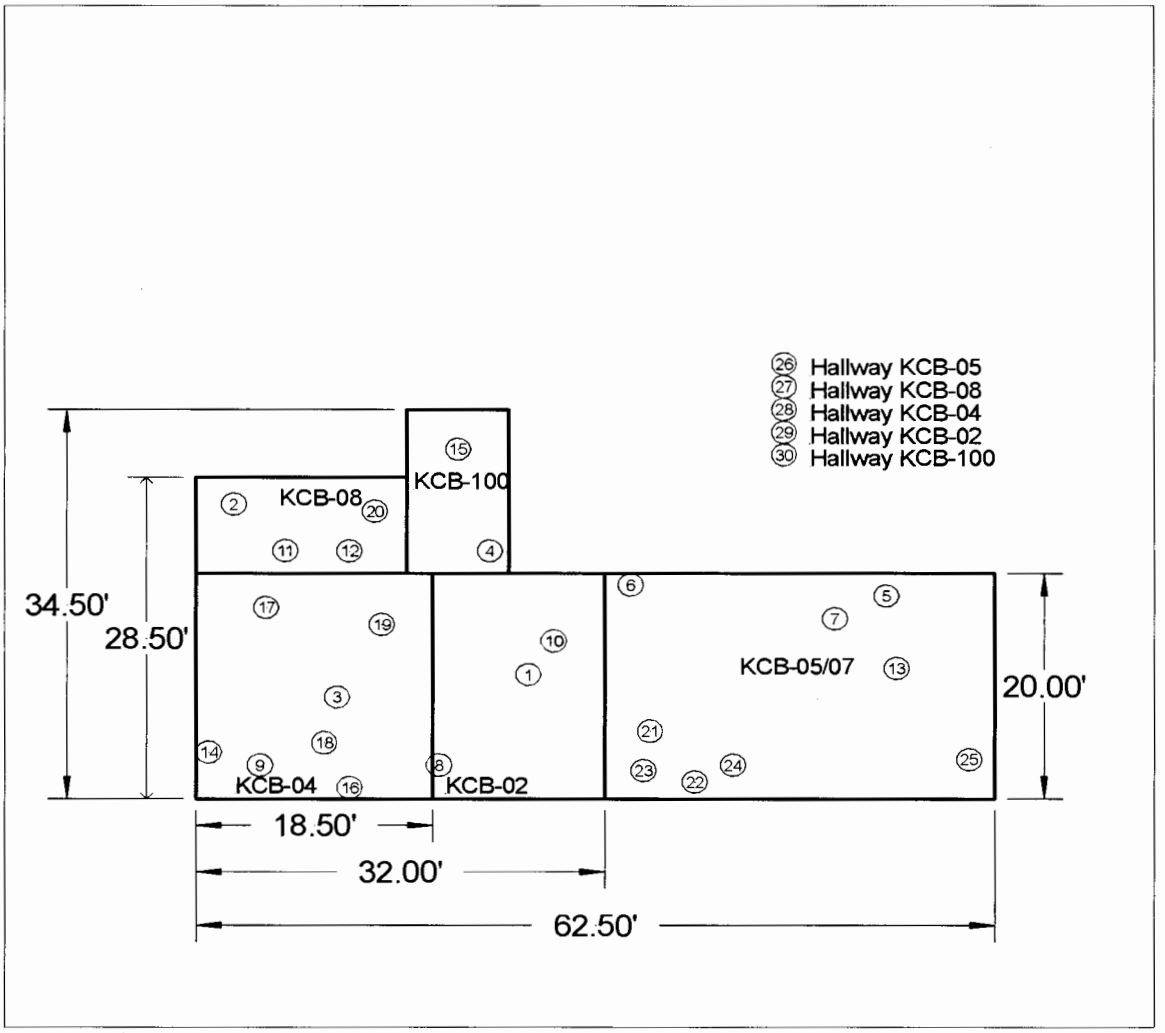
Radiological Survey	Georgetown	RSO, Inc.		
		Building: Kober Cogan	Room: 3rd Fl	Lab Type:
Surveyors	Name: Paul Madairy	Name: Greg Smith	Date: 1/13/2017	
Contact	Name: David Smith	Phone No.: 202.444.4637		



Remarks:

Radiological Survey	Georgetown	RSO, Inc.		
		Building: Kober Cogan	Room: Basement	Lab Type:

Surveyors	Name: Paul Madairy	Name: Greg Smith	Date: 1/13/2017
Contact	Name: David Smith	Phone No.: 202.444.4637	



Remarks:

Attachment B Wipe Test LSC Analysis Report Print-Out

Rev. 07/20/10

RSO, Inc.

Analytical Lab Work Order

Work Order # 2017-035

Page 25 of 35

Invoice #: _____ By: _____

Date Received: _____

RSO Contact: P. MADAIRY Project #: 370 Reviewed By: _____

Customer Information:		**Billing Address:**	
Name:	GEORGETOWN	Name:	
Address:	CARPETS	Address:	
Contact Name:		Contact Name:	
Phone:		Phone:	
Contract/PO #:		Contract/PO #:	

Job Description: _____ Analytical Date: _____

Analysis Request and Sample Information/Description :

☑ - Alpha ☑ - Beta ☑ - Gamma Required MDA: _____

# of Samples 37 #'s 1 - 37 ☐ - ID Method on Container

Sample Description (Matrix)

☐ - Air: ☐ - Water: ☐ - Soil/Ash: ☐ - Bioassay: ☐ - Wipe: ☐ - Leak Test: ☐ - Waste: ☐ - Other:

Disposition:

☐ - Return: _____ Date ☐ - Hold: _____ Date ☑ - Discard: _____ Date

Chain of Custody (if Required):

Delivered By: _____ Time: _____ Date: _____

Received By: _____ Time; _____ Date: _____

Analytical Request:

LSC/Gamma Counter: Isotope(s) - SCREENING

Type of Analys LSC - ☑ - Triple Label ☐ - Dual Label ☐ - Single Label ☑ - Gamma Counter

Report in Units of: ☐ - cpm ☐ - dpm ☐ - pCi/l ☐ - pCi/ml Other: _____

Gamma Spectroscopy:

Isotope(s) - _____ ☐ - Th - _____ ☐ - U - _____ ☐ - DU

Report in Units of: ☐ - pCi/g ☐ - pCi/l ☐ - pCi/ml ☐ - uCi/ml Other: _____

Analytical Report: ☐ - LSC Print Out ☐ - Gamma Counter Print Out: ☐ - Gamma Spec Print Out: *Electronic:* ☐ - Disk Type: EMAIL/BOX ☐ - Other _____

Analysis Report via: *(If sending report other than RSO Contact or US Mail add cost and shipping information below)*

☐ - Return to RSO Contact ☐ - US Mail ☐ - Fax ☐ - e-mail ☐ - UPS ☐ - FedEx

Comments _____

Laboratory Services/Supplies: Qty X Cost

_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ _____

Job Complete: ☐ - Yes ☐ - No

Sub Total : _____

Invoice Amount: _____

Protocol# 1 - Triple Lable DPM.lsa **User: RSO INC**

2017.035

Assay Definition-

Assay Description:
RSO SWIPES

Assay Type: DPM (Triple)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\RSO INC\Triple Lable DPM
Raw Results Path: C:\Packard\Tricarb\Results\RSO INC\Triple Lable DPM\20170119_1625.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\RSO INC\Triple Lable DPM\1410.csv
Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label
   Quench Indicator: tSIE/AEC
   External Std Terminator (sec): 0.5 2s%
   Pre-Count Delay (min): 0.00
Quench Sets:
   Low Energy: 3H-UG-01162017
   Mid Energy: 14C-UG-01162017
   High Energy: 32P-UG-02-28-05
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On Luminescence Correction: Off
Colored Samples: Off Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
A				
B				
C				

Cycle 1 Results

S#	PID	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	tSIE	LUM	DATE
1	35	10.00	6	8	5	0	0	0	708	2	1/19/17
2	35	1.00	-3	-3	-2	-6	-2	-3	617	0	1/19/17
3	35	1.00	3	2	4	5	1	5	641	0	1/19/17
4	35	1.00	2	0	-3	3	1	-4	670	0	1/19/17
5	35	1.00	-3	-2	3	-6	-2	3	678	0	1/19/17
6	35	1.00	-0	-4	3	1	-5	3	684	0	1/19/17
7	35	1.00	2	4	-0	4	4	-0	693	0	1/19/17

2-17-035

8	35	1.00	1	-1	-0	2	-1	-0	629	0	1/19/17
9	35	1.00	-4	-1	-1	-8	-0	-1	672	0	1/19/17
10	35	1.00	-2	2	-3	-4	3	-4	688	0	1/19/17
11	35	1.00	2	-1	-2	4	-1	-3	674	0	1/19/17
12	35	1.00	-3	4	-0	-7	5	-0	685	0	1/19/17
13	35	1.00	-1	-1	-2	-2	-0	-3	637	0	1/19/17
14	35	1.00	4	7	1	6	8	1	679	0	1/19/17
15	35	1.00	-1	-1	-1	-2	-1	-1	662	0	1/19/17
16	35	1.00	-0	-3	-4	-0	-2	-5	670	0	1/19/17
17	35	1.00	-2	8	-0	-7	11	-0	666	0	1/19/17
18	35	1.00	4	-3	-0	9	-4	-0	673	0	1/19/17
19	37	1.00	-1	-2	-3	-1	-2	-4	648	0	1/19/17
20	37	1.00	-0	2	-1	-1	3	-1	657	0	1/19/17
Missing vial 21.											
Missing vial 22.											
Missing vial 23.											
24	37	1.00	-0	2	-0	-1	3	-0	695	0	1/19/17
25	37	1.00	2	-4	5	5	-6	6	699	0	1/19/17
26	37	1.00	-4	3	-1	-9	5	-1	674	0	1/19/17
27	37	1.00	-3	0	-3	-7	1	-4	694	0	1/19/17
28	37	1.00	-3	1	-2	-8	3	-3	627	0	1/19/17
29	37	1.00	-1	-2	-1	-2	-2	-1	697	0	1/19/17
30	37	1.00	1	0	-3	2	1	-4	602	0	1/19/17
31	37	1.00	-2	2	1	-4	2	1	652	0	1/19/17
32	37	1.00	-2	2	2	-5	3	2	691	0	1/19/17
33	37	1.00	-2	5	-1	-6	7	-1	664	0	1/19/17
34	37	1.00	-1	1	4	-3	1	5	672	0	1/19/17
35	37	1.00	3	-3	-0	7	-4	-0	668	0	1/19/17
36	37	1.00	-1	-1	2	-2	-1	2	688	0	1/19/17
37	14	1.00	4	-3	-1	9	-4	-1	622	0	1/19/17
38	14	1.00	-1	6	-2	-4	8	-3	668	0	1/19/17
39	14	1.00	-2	-5	-3	-3	-5	-4	677	0	1/19/17
40	14	1.00	-1	5	2	-4	6	2	620	0	1/19/17
41	14	1.00	-2	1	-4	-5	3	-5	656	0	1/19/17

Rev. 07/20/10

RSO, Inc.

Analytical Lab Work Order

Work Order #: 2017.047

Invoice #: ____ By: ____

Date Received: ____

RSO Contact: P Mandairy

Project #: 370

Reviewed By: 1-31-17

Customer Information:		**Billing Address:**	
Name:	Georgetown Hosp	Name:	
Address:	KC Building	Address:	
Contact Name:		Contact Name:	
Phone:		Phone:	
Contract/PO #:		Contract/PO #:	

Job Description: ____ Analytical Date: ____

Analysis Request and Sample Information/Description :

[✓] Alpha [✓] - Beta [✓] - Gamma Required MDA: ____

# of Samples 61 #'s 1 - 61 [ ] - ID Method on Container

Sample Description (Matrix)

[ ] - Air: [✓] - Wipe:
[ ] - Water: [ ] - Leak Test:
[ ] - Soil/Ash: [ ] - Waste:
[ ] - Bioassay: [ ] - Other:

Disposition:

[ ] - Return: ____ Date
[ ] - Hold: ____ Date
[ ] - Discard: ____ Date

Chain of Custody (if Required):

Delivered By: ____ Time: ____ Date: ____

Received By: ____ Time; ____ Date: ____

Analytical Request:

LSC/Gamma Counter: Isotope(s) - ____

Type of Analys LSC - [✓] - Triple Label [ ] - Dual Label [ ] - Single Label [✓] - Gamma Counter

Report in Units of: [ ] - cpm [ ] - dpm [ ] - pCi/l [ ] - pCi/ml Other: ____

Gamma Spectroscopy:

Isotope(s) - ____ [ ] - Th - ____ [ ] - U - ____ [ ] - DU

Report in Units of: [ ] - pCi/g [ ] - pCi/l [ ] - pCi/ml [ ] - uCi/ml Other: ____

Analytical Report: [✓] - Gamma Counter Print Out: *Electronic:* [ ] - Disk Type: ____

[✓] - LSC Print Out [ ] - Gamma Spec Print Out: [ ] - Other ____

Analysis Report via: *(If sending report other than RSO Contact or US Mail add cost and shipping information below)*

[ ] - Return to RSO Contact [ ] - US Mail [ ] - Fax [ ] - e-mail [ ] - UPS [ ] - FedEx

Comments ____

Laboratory Services/Supplies: Qty X Cost

Job Complete:

[ ] - Yes [ ] - No

Sub Total : ____

Invoice Amount: ____

2017-047

Assay Definition-

Assay Description:
RSO SWIPES

Assay Type: DPM (Triple)
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM
Raw Results Path: C:\Packard\Tricarb\Results\Default\Triple Lable DPM\20170203_1128.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Default\Triple Lable DPM\1410.csv
Assay File Name: C:\Packard\TriCarb\Assays\Triple Lable DPM.lsa

Count Conditions-

Nuclide: Triple Label
  Quench Indicator: tSIE/AEC
  External Std Terminator (sec): 0.5 2s%
  Pre-Count Delay (min): 0.00
Quench Sets:
  Low Energy: 3H-UG-01162017
  Mid Energy: 14C-UG-01162017
  High Energy: 32P-UG-02-28-05
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
A	0.0	12.0	1st Vial	0.00
B	12.0	156.0	1st Vial	0.00
C	156.0	2000.0	1st Vial	0.00

Count Corrections-

Static Controller: On Luminescence Correction: Off
Colored Samples: Off Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
A				
B				
C				

Cycle 1 Results

S#	PID	Time	CPMA	CPMB	CPMC	DPM1	DPM2	DPM3	tSIE	LUM	DATE
1	17	10.00	6	8	6	0	0	0	778	2	2/3/17
2	17	1.00	5	1	-4	9	2	-4	743	15	2/3/17
3	17	1.00	0	-1	1	1	-2	1	760	23	2/3/17
4	17	1.00	4	-6	-1	11	-8	-1	630	42	2/3/17
5	17	1.00	9	-1	1	16	-2	1	774	14	2/3/17
6	17	1.00	-1	3	4	-2	2	4	670	25	2/3/17
7	17	1.00	4	-4	-1	10	-6	-1	733	21	2/3/17

2017-047

8	17	1.00	9	-6	-2	20	-9	-2	718	24	2/3/17
9	17	1.00	19	4	6	36	1	7	743	38	2/3/17
10	17	1.00	3	-2	-4	6	-2	-4	744	33	2/3/17
11	17	1.00	1	2	-1	2	2	-1	741	24	2/3/17
12	17	1.00	4	6	-1	7	6	-1	730	13	2/3/17
13	17	1.00	4	-0	-1	9	-1	-1	704	22	2/3/17
14	17	1.00	1	-0	-1	3	-1	-1	760	27	2/3/17
15	17	1.00	0	-4	-4	2	-5	-4	770	30	2/3/17
16	17	1.00	9	1	-2	18	0	-2	707	42	2/3/17
17	17	1.00	6	1	3	12	-1	3	720	14	2/3/17
18	17	1.00	2	-2	1	6	-3	1	680	29	2/3/17
19	10	1.00	1	1	7	3	-1	8	742	25	2/3/17
20	10	1.00	0	7	2	-1	8	2	759	14	2/3/17
21	10	1.00	7	2	2	15	1	2	669	26	2/3/17
22	10	1.00	-3	7	2	-6	8	2	755	17	2/3/17
23	10	1.00	3	2	-4	7	2	-4	659	16	2/3/17
24	10	1.00	4	-3	-1	10	-5	-1	696	20	2/3/17
25	10	1.00	7	-3	-3	15	-4	-3	746	22	2/3/17
26	10	1.00	6	-0	1	13	-1	1	714	20	2/3/17
27	10	1.00	4	-0	-2	12	-1	-2	444	44	2/3/17
28	10	1.00	-2	5	-2	-9	7	-2	412	35	2/3/17
29	10	1.00	4	-4	4	10	-7	4	751	43	2/3/17
30	10	1.00	0	-5	-1	2	-6	-1	751	56	2/3/17
31	10	1.00	5	5	1	10	5	1	709	17	2/3/17
Missing vial 32.											
Missing vial 33.											
Missing vial 34.											
Missing vial 35.											
36	10	1.00	3	1	2	7	-0	2	712	22	2/3/17
37	11	1.00	13	1	-1	26	-1	-1	705	18	2/3/17
38	11	1.00	3	-1	-1	6	-2	-1	756	25	2/3/17
39	11	1.00	9	-3	-1	19	-5	-1	731	20	2/3/17
40	11	1.00	3	1	5	7	-1	5	713	22	2/3/17
41	11	1.00	-1	-3	2	-1	-3	2	742	50	2/3/17
42	11	1.00	10	2	5	19	-0	5	775	15	2/3/17
43	11	1.00	5	4	1	10	4	1	698	13	2/3/17
44	11	1.00	6	-0	1	12	-1	1	745	25	2/3/17
45	11	1.00	7	3	-4	13	3	-4	740	17	2/3/17
46	11	1.00	-4	-3	-1	-6	-3	-1	702	57	2/3/17
47	11	1.00	7	-5	-1	15	-7	-1	750	25	2/3/17
48	11	1.00	3	4	-2	4	5	-2	741	14	2/3/17
49	11	1.00	2	-3	2	6	-5	2	724	31	2/3/17
50	11	1.00	-1	3	3	-2	3	3	728	13	2/3/17
51	11	1.00	1	-3	1	4	-4	1	733	25	2/3/17
52	11	1.00	7	-1	-5	14	-1	-5	762	20	2/3/17
53	11	1.00	3	-0	-2	7	-1	-2	754	18	2/3/17
54	11	1.00	1	2	-1	2	2	-1	692	18	2/3/17
55	1	1.00	4	-1	2	7	-2	2	737	24	2/3/17
56	1	1.00	-2	-2	-3	-2	-2	-3	721	30	2/3/17
57	1	1.00	0	-0	2	1	-1	2	476	21	2/3/17
58	1	1.00	7	1	2	14	0	2	646	14	2/3/17
59	1	1.00	-0	4	1	-1	5	1	741	17	2/3/17
60	1	1.00	4	3	1	8	3	1	740	24	2/3/17
61	1	1.00	3	1	-2	6	1	-2	744	22	2/3/17
62	1	1.00	6	4	-1	12	4	-1	708	13	2/3/17
63	1	1.00	-1	-3	1	-0	-4	1	741	30	2/3/17
64	1	1.00	8	-3	-2	18	-5	-2	702	21	2/3/17
65	1	1.00	6	0	2	11	-0	2	732	10	2/3/17
66	1	1.00	5	2	1	11	1	1	638	10	2/3/17

Attachment C Survey Meter Calibration Report

RSO, Inc.
P.O. Box 1450
Laurel, MD 20725
(301) 953-2482

RSO Job No. 12197

Certificate of Calibration

ISSUED TO: **RSO, Inc.**
5206 Minnick Road
Laurel, MD 20707

INSTRUMENT: LUDLUM
MODEL: 2360
TYPE: DATA LOGGER
SN: 167707

CONTACT: Greg Smith
PHONE: (301) 953-2482

PO NO: TOTE-SAVANNAH

RSO, Inc. certifies that on 11/14/2016 the above described instrument was calibrated using a radioactive source to determine the efficiency for a specific radionuclide(s) and using electronically generated pulse for the linearity. Pulsed using Ludlum 500-2, S/N 159110.

The results are tabulated below. Calibration is traceable to NIST.

Calibration Data

	RANGE	EXPECTED	OBSERVED		C.F.	NOTE
X	1	100	100	cpm	1.00	
		400	399	cpm	1.00	
X	10	1000	994	cpm	1.01	
		4000	3987	cpm	1.00	
X	100	10000	9942	cpm	1.01	
		40000	39871	cpm	1.00	
X	1000	100000	99418	cpm	1.01	
		400000	398653	cpm	1.00	
				C.F. AVERAGE	1.00	

Notes

Probe type(s) Probe1: SCINTILATOR Probe2: Probe3:

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF.(%)	ISOTOPE 2	EFF.(%)	ISOTOPE 3	EFF.(%)	ISOTOPE 4	EFF.(%)
43-93	PR359841	FIXED	CONTACT	729	C14	6	Ni63	.4	Sr90	17		

Note: "As Found" condition +/- 10% of Expected values unless indicated.

INSTRUMENT CHECKS

BATTERY CHECK: NORMAL
CHECK SOURCE 1: N/A READING:
CHECK SOURCE 2: N/A READING:

ENVIRONMENTAL

TEMP: 20°C
PRESS: 532 mmHg
HUMID: 32 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS 11/14/2017

Calibrated By: Herb Evans Reviewed By: Cal Date: 11/14/2016

Maryland License MD-33-021-01

19598

RSO, Inc.
P.O. Box 1450
Laurel, MD 20725
(301) 953-2482

RSO Job No. 12197

Certificate of Calibration

ISSUED TO: RSO, Inc.
5206 Minnick Road
Laurel, MD 20707

CONTACT: Greg Smith
PHONE: (301) 953-2482

INSTRUMENT: LUDLUM
MODEL: 2360
TYPE: DATA LOGGER
SN: 167707

PO NO: TOTE-SAVANNAH

RSO, Inc. certifies that on 11/14/2016 the above described instrument was calibrated using a radioactive source to determine the efficiency for a specific radionuclide(s) and using electronically generated pulse for the linearity. Pulsed using Ludlum 500-2, S/N 159110.

The results are tabulated below. Calibration is traceable to NIST.

Calibration Data

	RANGE	EXPECTED	OBSERVED		C.F.	NOTE
X	1	100	100	cpm	1.00	
		400	399	cpm	1.00	
X	10	1000	994	cpm	1.01	
		4000	3987	cpm	1.00	
X	100	10000	9942	cpm	1.01	
		40000	39871	cpm	1.00	
X	1000	100000	99418	cpm	1.01	
		400000	398653	cpm	1.00	
				C.F. AVERAGE	1.00	

Notes

Probe type(s) Probe1: SCINTILATOR Probe2: Probe3:

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF.(%)	ISOTOPE 2	EFF.(%)	ISOTOPE 3	EFF.(%)	ISOTOPE 4	EFF.(%)
43-93	PR359841	FIXED	CONTACT	729	Th230	19	Am241	21	Pu239	20	Tc99	10

Note: As found data for this instrument is +/- 20%.

Note: "As Found" condition +/- 10% of Expected values unless indicated.

INSTRUMENT CHECKS

BATTERY CHECK: NORMAL
CHECK SOURCE 1: N/A READING:
CHECK SOURCE 2: N/A READING:

ENVIRONMENTAL

TEMP: 20°C
PRESS: 532 mmHg
HUMID: 32 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS 11/14/2017

Calibrated By: Herb Evans Reviewed By: Cal Date: 11/14/2016

Maryland License MD-33-021-01

19408

RSO, Inc.
P.O. Box 1450
Laurel, MD 20725
(301) 953-2482

RSO Job No. 12106

Certificate of Calibration

ISSUED TO: RSO, Inc.
5206 Minnick Road
Laurel, MD 20707

CONTACT: Greg Smith
PHONE: (301) 953-2482

PO NO:

INSTRUMENT: BICRON
MODEL: MICRO REM
TYPE: RATEMETER
SN: C139F

RSO, Inc. certifies that on 08/31/2016 the above described instrument was calibrated in a known radiation field using Cs-137 (662 keV) beam calibrator (J.L. Shepherd Model 28-6A, S/N 10056), RSO # 363 Certified Cs137 check source.

The results are tabulated below. Calibration is traceable to NIST.

Calibration Data

	RANGE	EXPECTED	OBSERVED		C.F.	NOTE
X	0.1	10	10	uR/hr	1.00	
		16	16	uR/hr	1.00	
X	1	60	55	uR/hr	1.09	
		150	140	uR/hr	1.07	
X	10	500	480	uR/hr	1.04	
		1500	1550	uR/hr	0.97	
X	100	5000	5200	uR/hr	0.96	
		15000	15000	uR/hr	1.00	
X	1000	50000	50000	uR/hr	1.00	
		150000	155000	uR/hr	0.97	
			C.F. AVERAGE		1.01	

Notes

Probe type(s) Probe1: SCINTILLATOR Probe2: Probe3:

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF.(%)	ISOTOPE 2	EFF.(%)	ISOTOPE 3	EFF.(%)	ISOTOPE 4	EFF.(%)
INTERNAL		FIXED	FRONT									

Note: "As Found" condition +/- 10% of Expected values unless indicated.

INSTRUMENT CHECKS

BATTERY CHECK: NORMAL
CHECK SOURCE 1: N/A READING:
CHECK SOURCE 2: N/A READING:

ENVIRONMENTAL

TEMP: 25°C
PRESS: 766 mmHg
HUMID: 49 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS 08/31/2017

Calibrated By: Korressa Williams Reviewed By: Cal Date: 08/31/2016

Maryland License MD-33-021-01

19136

NRC FORM 532
(05-2016)

U.S. NUCLEAR REGULATORY COMMISSION

ACKNOWLEDGEMENT - RECEIPT OF CORRESPONDENCE

Name and Address of Applicant and/or Licensee	Date
MedStar Georgetown University Hospital Attn: David A. Smith, PhD 3800 Reservoir Road Washington, DC 20007	02/27/2017
	License Number(s) 08-30577-01
	Mail Control Number(s) 593070
	Licensing and/or Technical Reviewer or Branch Medical Branch

This is to acknowledge receipt of your: ☑ **Letter and/or** ☐ **Application** **Dated:** 02/16/2017

The initial processing, which included an administrative review, has been performed.

☑ **Amendment** ☐ **Termination** ☐ **New License** ☐ **Renewal**

☑ **There were no administrative omissions identified during our initial review.**

☐ **This is to acknowledge receipt of your application for renewal of the material(s) license identified above. Your application is deemed timely filed, and accordingly, the license will not expire until final action has been taken by this office.**

☐ **Your application for a new NRC license did not include your taxpayer identification number. Please complete and submit NRC Form 531, Request for Taxpayer Identification Number, located at the following link: http://www.nrc.gov/reading-rm/doc-collections/forms/nrc531.pdf**

Follow the instructions on the form for submission.

☐ **The following administrative omissions have been identified:**

Your application has been assigned the above listed MAIL CONTROL NUMBER. When calling to inquire about this action, please refer to this control number. Your application has been forwarded to a technical reviewer. Please note that the technical review, which is normally completed within 180 days for a renewal application (90 days for all other requests), may identify additional omissions or require additional information. If you have any questions concerning the processing of your application, our contact information is listed below:

Region I
U. S. Nuclear Regulatory Commission
Division of Nuclear Materials Safety
2100 Renaissance Boulevard, Suite 100
King of Prussia, PA 19406-2713
(610) 337-5260, (610) 337-5313,
(610) 337-5398, or (610) 337-5239