APPENDIX FIVE

Characterization Report

MC-40 Cyclotron Vault at the University of Texas Health Science Center

1132-REP-001 Rev. 0

October 2017

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Review and Approval

Timothy Pratt **10/30/2017**
Date

Review and Approval

UT Health **Date**

Contents

Attachments

Abbreviations and Acronyms

ALARA	As Low As Reasonably Achievable
Ameriphysics	Ameriphysics, LLC
cpm	counts per minute
CHP	Certified Health Physicist
DCGL	Derived Concentration Guideline Level
dpm	disintegration per minute
DQO	Data Quality Objective
DSHS	Texas Department of State Health Services
EH&S	Environmental Health & Safety
LSC	Liquid Scintillation Counter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
NaI	Sodium Iodide
NIST	National Institute of Standards and Technology
QAPP	Quality Assurance Project Plan
RPD	Relative Percent Difference
TEDE	Total Effective Dose Equivalent
UTHealth	University of Texas Health Science Center at Houston

1. INTRODUCTION

The purpose of this Characterization Report is to provide the data necessary to aid in the decision-making process for decommissioning of University of Texas Health Science Center at Houston (UTHealth) MC-40 Cyclotron Vault located at 6431 Fannin St, Houston, TX, 77030. UTHealth contracted Ameriphysics, LLC (Ameriphysics) to perform the characterization activities described in this report. All work was performed under UTHealth's Texas Department of State Health Services (DSHS) radioactive material license.

The characterization plan used to develop this report was developed using the guidance provided in NUREG-1757, "Consolidated NMSS Decommissioning Guidance" and NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM) and provided the approach, methods, and techniques for the radiological characterization of UTHealth's MC-40 Cyclotron Vault. These methods ensured technically defensible data were generated to aid in the decommissioning decision-making process.

Radiological requirements for license termination are described in 25 Texas Administrative Code §289.202(ddd)(1)(D)(2), *Radiological requirements for unrestricted use*. The release criterion is dose-based and cannot be measured directly. MARSSIM uses the term derived concentration guideline level (DCGL) to describe radionuclide-specific surface or volume residual radioactivity levels that correspond to the release criterion. The release criterion cannot be translated into radionuclide-specific DCGLs without characterization data. Consequently, obtaining high quality data for translation was a major focus of this project.

2. RADIONUCLIDES OF CONCERN

While the cyclotron was operated, neutrons were freed as a result of collisions with energized protons. In turn, these neutrons collided with surrounding nuclei and caused activation. As a result, induced radioactivity is expected in the cyclotron and any apparatus or building material near the cyclotron or along the beam travel path.

Studies pertaining to induced radioactivity in cyclotrons are published in a number of papers. The radionuclide distribution is material specific, and the concentration varies according to proximity to the beam and interferences that cause losses. Radiation emitted is beta and gamma; however, it is important to consider that atoms undergoing decay are trapped within the volume of the materials and surfaces. According to the Radiological Health Handbook, the maximum range of a 1 MeV beta particle is less than 1/10th of an inch in lead, copper, iron, aluminum, and concrete. At 0.1 MeV, the maximum range is less than 1/100th of an inch.

Unlike betas and other charged particles that exhibit finite ranges, gammas cannot be completely attenuated. Rather, the intensity of this radiation is reduced by increasingly thicker

absorbers. Consequently, gamma radiation is the radiation of concern except in instances where surface contamination is suspected or identified.

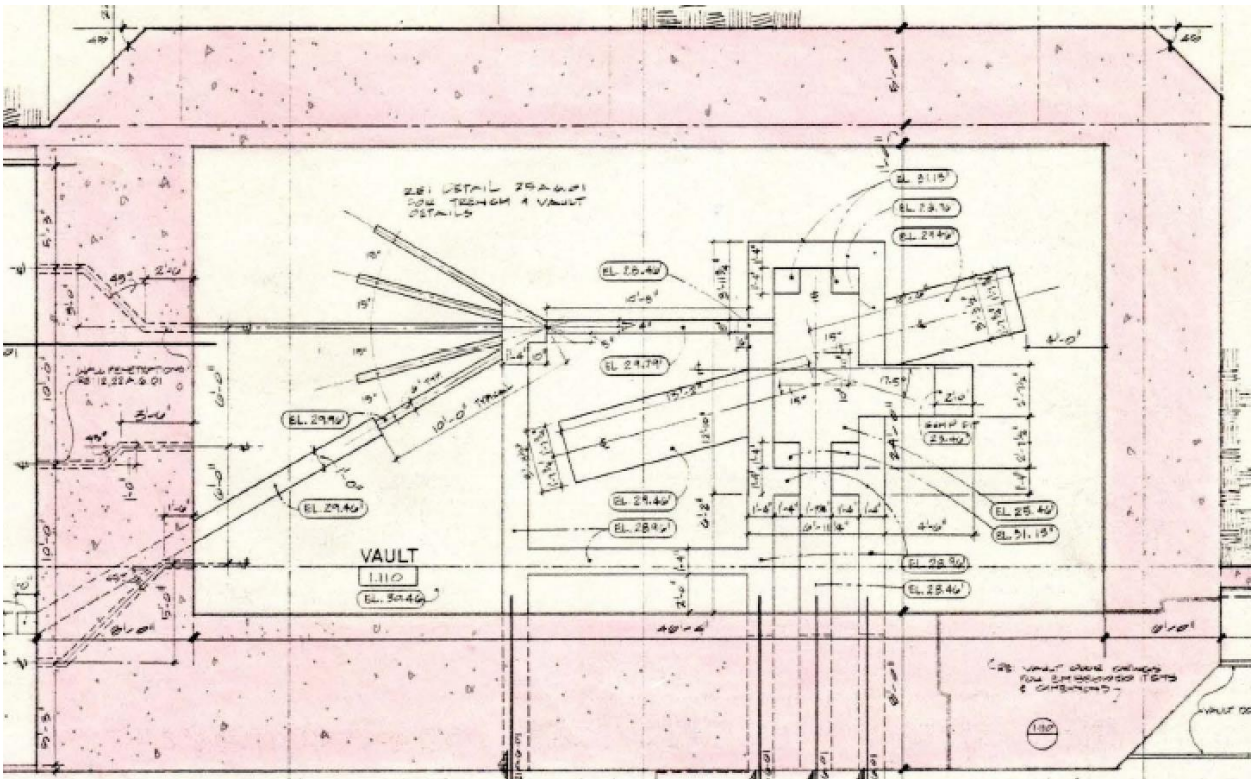
Based on experience on other cyclotron decommissioning projects, induced residual radioactivity in vault structures is almost exclusively attributed to Co-60 and Eu-152 after a few months of decay. However, there are a couple more radionuclides that routinely have positive results, these are Cs-134 and Eu-154. Small amounts of H-3 and Fe-55 have also been present at cyclotron sites and have been investigated in conjunction with this characterization. Since this site has not operated for more than 16 years, a significant amount of decay has occurred. However, samples sent for gamma spectroscopy were analyzed for all radionuclides of concern typically associated with neutron activation in the cyclotron equipment and building materials.

3. FACILITY DESCRIPTION

UTHealth operated a Scanditronix MC-40 cyclotron to produce radioisotopes for positron emission tomography from 1984 to 2001 under DSHS License L03685. On June 8, 2001, the facility was inundated by water from Tropical Storm Allison which rendered the cyclotron permanently inoperable. Since 2001, the facility and supporting rooms have been repurposed for use by UTHealth Environmental Health & Safety (EH&S). The cyclotron line, associated materials, and activated components have remained in storage. EH&S has utilized available space within the facility for sealed source storage, other radioactive waste processing and storage under the UTHealth broad license, and chemical waste processing. On June 15, 2015, UTHealth was notified by DSHS that the renewed license would have a license condition imposed to complete the decommissioning process.

The cyclotron vault has a footprint of approximately 1,080 ft^2. The floor, walls and ceiling are constructed of rebar reinforced concrete. The north and east walls are 6-feet thick and the south and west walls are 8-feet thick. Access to the vault is through a movable door at the southeast corner. An overview of the cyclotron vault is provided in Figure 1.

Figure 1: Cyclotron Vault Floorplan



4. RELEASE CRITERION

Radiological requirements for license termination are described in 25 Texas Administrative Code §289.202(ddd)(1)(D)(2), *Radiological requirements for unrestricted use*, which states that a site will be considered acceptable for unrestricted release if the residual radioactivity that is distinguishable from background radiation results in a total effective dose equivalent (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). Determination of the levels that are ALARA shall take into account consideration of any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.

5. CHARACTERIZATION SURVEY PROCEDURES

To aid in remediation planning and development of a Decommissioning Plan, radiological investigations were performed consisting of: gamma scans, discrete gamma measurements, Liquid Scintillation Counter (LSC) smears, beta-gamma smears, and concrete core samples. The

objective of the sampling was to determine the three-dimensional extent to which the vault surfaces were impacted and that may exceed the DSHS release criterion.

Gamma scans were conducted on all accessible interior surfaces of the cyclotron vault with a Ludlum 2221 survey instrument coupled to a shielded Ludlum 44-10 2" x 2" Sodium Iodide (NaI) detector. The scan was performed by passing the detector close to the surface at a speed of 0.5 meters per second. As the detector was moved across the surfaces of the vault, the only discernable increases in count rates were from items and equipment in the vault. Since it was difficult to identify elevated locations during the scan surveys, even when moving loose equipment, it was determined that contact static gamma measurements using the shielded NaI detector would provide better data for selection of concrete core sampling locations.

Static gamma measurements (on contact), beta-gamma smears, and LSC smears were taken at the intersections of a one meter systematic grid system that was marked onto the vault interior surfaces. Accessible locations on the ceiling were approximated relative to the floor grid. The grid system was documented on scaled drawings provided in Attachment 1. Gamma background measurements were performed outside the cyclotron vault door on the floor. Ten one-minute counts were taken and used to determine the average gamma background of 1,637 counts per minute (cpm).

One-minute static gamma measurements were collected with the NaI detector at each 1-meter grid intersection. Locations were identified by the surface and numbered location. The surfaces were floor (F), ceiling (C), east wall (E), west wall (W), north wall (N), south wall (S) and Pit (P). For example, location 26 on the floor was given the ID F26; location 13 on the east wall was given the ID E13, etc. The sample IDs with a "D" following the location number (e.g., N17D) are duplicate samples. The measurements were collected on contact with the surface. Since the vault still contained equipment that could not be moved easily, several locations were not accessible for survey. These included F36, F37, F67, F68, S8, E13, C50, and C60,

Following a careful examination of the gamma static measurements, Ameriphysics determined locations for concrete core sampling based on either elevated static gamma measurements or proximity to the cyclotron and the target array. Thirty (30) separate concrete core sample locations were chosen. Cores samples were performed to a 15.5 inches (40 cm) depth at locations exhibiting the highest NaI count rates. Depths were less at lower count rate locations. The sample locations collected are provided in Table 5-1.

The core samples were moved to a low background area and separated into six inch (15 cm) sections. One-minute static counts were performed on contact with a NaI detector for each 3 inche (7.5 cm) increments and recorded. The net count rates are summarized in Table 5-1.

Table 5-1: Concrete Core Sample Locations and

Net One-Minute NaI Static Count Rates on Core Samples

	Net Readings in Counts per Minute				
Location	0-3 inches (0-7.5 cm)	3-6 inches (7.5-15 cm)	6-9 inches (15-22.5 cm)	9-12 inches (22.5-30 cm)	12-15.5 inches (30-40 cm)
F16	**380**	**777**	562	583	-
F18	**326**	**599**	652	592	348
F20	**297**	**408**	387	390	317
F25	**114**	**209**	257	265	-
F46	**488**	**635**	**628**	**760**	471
F51	**1202**	**1142**	**1070**	**899**	**614**
F52	**185**	**307**	377	346	-
F56	**249**	**294**	423	348	-
F72	**394**	**500**	545	480	-
F76	**320**	**474**	471	491	-
F80	**225**	**482**	572	445	449
C46	**242**	**438**	-	-	-
C52	**270**	**380**	-	-	-
W3	**581**	**819**	-	-	-
W5	**413**	**525**	-	-	-
W11	**405**	**541**	446	371	-
W17	**465**	**696**	-	-	-
W19	**623**	**563**	-	-	-
E2	**80**	**245**	268	-	-
E4	**13**	**66**	-	-	-
E9	**-55**	**70**	-8	41	134
E17	**22**	**152**	-	-	-
N17	**197**	**343**	-	-	-
N20	**245**	**416**	-	-	-
N23	**51**	**161**	**274**	**211**	-
N30	**138**	**412**	-	-	-
S19	**95**	**369**	207	276	-
S21	**256**	**361**	-	-	-
S26	**372**	**669**	525	309	-
S40	**339**	**506**	-	-	-

The contact NaI readings on the vault surfaces and the contact NaI readings on the actual core samples were used to determine which core sections were submitted for analysis. The samples that are **bolded** in Table 5-1 were sent for analysis via gamma spectroscopy at GEL Laboratories in Charleston, SC. GEL Laboratories has experience preparing and analyzing concrete from cyclotron facilities. Moreover, since the library they use was developed with the help of our cyclotron-experienced Certified Health Physicist (CHP), the possibility of drawing incorrect characterization decisions because of laboratory error or emission is minimized. The laboratory sample report is provided in Attachment 2. Sample custody was maintained at all times using a chain of custody form that accompanied the samples from collection to analysis.

Based on our experience on other projects, certain hard to detect radionuclides may be present within the activated concrete. Analyses for the hard-to-detect radionuclides (H-3 and Fe-55) were performed on 10% of the total number of samples (4 samples). These were selected based on the highest 2" x 2" NaI detector readings (vault surfaces) on core samples F51, W3, W17, and W19.

Removable contamination measurements (smears) were collected at each grid intersection. For each sample, an area of approximately 100 cm^2 was wiped. These samples were counted onsite with a Ludlum 3030 coupled to a Ludlum 43-10-1. LSC smears were also taken at each location and were counted on UTHealth's liquid scintillation counter. LSC results can be found in Attachment 4.

The minimum detectable concentration (MDC) in disintegrations per minute (dpm) per 100 cm^2 at a 95% confidence level for the instrument measuring removable beta/gamma contamination was calculated using the following equation, which is from NUREG-1507, "Minimum Detectable Concentrations With Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", Table 3.1 (Strom & Stansbury, 1992):

$$MDC_{smear} = \frac{3 + 3.29\sqrt{B_r \cdot t_s \cdot (1 + \frac{t_s}{t_b})}}{t_s \cdot E \cdot \frac{A}{100cm^2}} \qquad 135\,dpm/100\,cm\text{^}2 = \frac{3 + 3.29\sqrt{56 \cdot 1 \cdot (1 + \frac{1}{1})}}{1 \cdot 0.28 \cdot \frac{100}{100cm^2}}$$

Where:

MDC_{smear} =	135	= minimum detectable concentration level in dpm/smear
B_r =	56	= background count rate in cpm
t_b =	1	= background count time in minutes
t_s =	1	= sample count time in minutes
E =	0.28	= 4π instrument efficiency for radionuclide emission of interest
A =	100	= physical area of the smear in cm^2

The UTHealth LSC counter's MDC is reported on each printout. The reported MDC values ranged between 40-42 dpm/smear. The following equation is used to determine the MDC for the LSC removable contamination measurements:

$$MDC_{smear} = \frac{2.71 + 4.75\sqrt{Background\{cpm\}}}{Efficiency}$$

The background value used in the calculation is the channel C value which is the counts from the entire spectrum (0-2000 keV). The efficiency used in the calculations is H-3 efficiency on an unquenched H-3 calibration standard.

The UTHealth action level in cpm for LSC removable contamination is determined from the following equation:

$$Action\_Level = Background + MDA \times Efficiency$$

5.1. Survey Instrumentation

Based on potential contaminants, their associated radiations, and the types of residual contamination categories to be evaluated, the detection sensitivities of various instruments and techniques were evaluated for use. Instruments were evaluated for use during surface scans, discrete measurements, and analysis of removable contamination wipes.

The instrumentation used for the characterization surveys is summarized in the following tables. Table 5-2 lists the standard features of each instrument such as detector area and efficiency. Table 5-3 lists the actual operational parameters used such as scan rate, count time, and the associated Minimum Detectable Concentration (MDC).

Table 5-2: Instrumentation Specifications

Detector Model	Detector Serial Number	Detector Type	Detector Area	Meter Model	Meter Serial Number	Window Thickness	Typical Total Efficiency
Ludlum 44-10	190200	Gamma Scintillation	2" x 2" NaI	Ludlum 2221	PR135860	N/A	~675 cpm/µrem/hr
Ludlum 44-10	196085	Gamma Scintillation	2" x 2" NaI	Ludlum 2221	PR181829	N/A	~675 cpm/µrem/hr
Ludlum 43-10-1	PR337587	Alpha/Beta Scintillation	100 cm^2	Ludlum 3030	328277	0.4 mg/cm^2	28% – Beta
Tri-Carb 4900TR	SGLO3415 0058	Liquid Scintillation	100 cm^2	Tri-Carb 4900TR	SGLO3415 0058	N/A	62% - H-3

Table 5-3: Instrument Operating Parameters and Sensitivities

Measurement Type	Detector Model	Meter Model	Scan Rate	Count Time	Background (cpm)	MDC
Gamma Scans	44-10 190200	Ludlum 2221	0.5 m/sec.	N/A	1,637	~1.5 pCi/g
Gamma Scans	44-10 196085	Ludlum 2221	0.5 m/sec.	N/A	1,648	~1.5 pCi/g
Removable Beta Activity	Ludlum 43-10-1	Ludlum 3030	N/A	60 sec.	56 – Beta	135 dpm/100cm^2
Removable H-3/C-14 Activity	Tri-Carb 4900TR	Tri-Carb 4900TR	N/A	60 sec.	22-25	40-42 dpm/100cm^2

These instruments are not equipped to distinguish between radionuclides. Where radionuclide-specific results were needed, samples were obtained and sent offsite for gamma spectroscopic analysis.

5.2. Instrument Calibration

Laboratory and portable field instruments are calibrated at least annually with National Institute of Standards and Technology (NIST) traceable sources and to radiation emission types and energies that provide detection capabilities similar to the nuclides of concern.

5.3. Daily Response Checks

For radiological instruments operated by Ameriphysics, a reference source was measured prior to use each day. The result is accurate if it fell within ±20% of originally determined values. This is consistent with the guidance in Section 6.5.4 of MARSSIM, Instrument Calibration. Background readings were taken as part of the daily response checks and compared with the acceptance range for instrument and site conditions determined during instrument set up in accordance with Ameriphysics Survey Instrument Procedure, RCP 4-3. All instrument successfully passed their daily response checks during the course of the project.

The LSC counter was operated by UTHealth personnel according to their procedures. The system is normalized daily using its SNC protocol.

5.4. Data Validation

Field data was reviewed and validated to ensure:

- Completeness of forms and that the type of survey was correctly assigned to the survey unit.

- The MDCs for measurements meet the established Data Quality Objectives (DQOs); independent calculations are performed for a representative sample of data sheets and survey areas.
- Instrument calibrations and daily functional checks were performed accurately and at the required frequency.
- QC samples were collected at the frequency prescribed in the Quality Assurance Project Plan (QAPP).
- Duplicate sample results were within 50% relative percent difference of the original sample.
- Chain of custody was maintained for all samples that were not controlled by the survey technician until the analysis is performed.

6. DATA INTERPRETATION

Characterization field survey data is provided in Attachment 1. The static gamma measurement results are reported in units of net cpm. These results were used along with the static NaI counts on the concrete core sections to determine which core samples were sent to the laboratory for gamma spectroscopy. Removable beta measurements at each location are reported in dpm/100 cm^2.

All concrete core samples were transferred under chain of custody to GEL Laboratories. The sample results returned by the laboratory are provided in Attachment 2. The results of the locations with the highest activities and second highest activities were used in RESRAD-BUILD modelling to compare to the release criterion of 25 mrem/yr which is discussed in further detail in Section 8.

7. FINDINGS AND RESULTS

The results of the characterization survey for the UTHealth MC-40 Cyclotron Vault are discussed in the following sections.

7.1. Explanation of Data Presentation

Attachment 1 of this report provides the field characterization survey results for the cyclotron vault floor, ceiling, walls, and pit. The survey results include:

1. Survey Instruction Sheets
2. General survey requirements
3. Instrument requirements with associated MDCs, count times and scan rates
4. Survey Data Results Sheets

5. Survey Maps
    a. Overview maps detailing survey locations
    b. Survey sub-unit maps with additional sample location information, as needed
6. Signatures of Data Collector and Reviewer

7.2. Surface Scans

Surface scans were performed on 100% of accessible surfaces to identify areas of elevated activity. The scan surveys did not indicate any areas that required any additional investigation other than the planned static measurements. However, the count rates did increase slightly on the floors and walls nearest the target array on the west side of the vault. There was significant interference in the scan readings due to the cyclotron, beam lines, target array, and various activated material in the vault.

7.3. Surface Activity Measurements

Static gamma measurements were taken with a shielded 2" x 2" NaI detector on the vault surfaces (floor, walls and ceiling). These were collected on contact with the surface at each intersection of a one-meter grid system. Even though a shielded NaI detector was used, there was some interference with the readings due to the cyclotron, target array, and other activated materials that remained in the vault when the measurements were collected.

Removable contamination measurements were collected at each accessible grid intersection. All beta/gamma removable contamination results were less than the MDC of 135 dpm/100cm^2 and are provided in Attachment 1. All LSC results were less than action levels determined by UTHealth except the initial count on sample C93. The initial result for sample C93 was 49 cpm in channel C and the action level was 47 cpm. Sample C93 was recounted and the result was 24 cpm compared to an action level of 47 cpm. The LSC results are provided in Attachment 4.

7.4. Radionuclide Concentrations in Samples

The radionuclides found in concrete core sample results were H-3, Co-60, Eu-152, and Eu-154.

The sample results are summarized in Table 7-1. Note that the samples ID includes the depth of the sample in inches. For example. F16 (1-6) is the sample collected at location F16 to a depth of 6 inches (15 cm).

Table 7-1: Core Sample Results

	Concentration in pCi/g for Radionuclides Detected			
Location ID	**H-3**	**Co-60**	**Eu-152**	**Eu-154**
F16 (1-6)	ND	0.592	8.91	ND
F18 (1-6)	ND	0.547	8.49	0.523
F20 (1-6)	ND	0.603	7.01	ND
F25 (1-6)	ND	0.199	3.27	ND
F46 (1-6)	ND	0.544	7.2	0.759
F46 (7-12)	ND	0.508	5.42	0.382
F51 (1-6)	5.19	1.22	16.3	0.847
F51 (7-12)	ND	1.10	13.8	1.22
F51 (13-16)	ND	0.768	9.67	0.783
F52 (1-6)	ND	0.268	4.56	ND
F56 (1-6)	ND	0.192	3.1	ND
F72 (1-6)	ND	0.472	5.25	ND
F72D (1-6)	ND	0.531	6.46	0.432
F76 (1-6)	ND	0.335	5.02	ND
F80 (1-6)	ND	0.412	4.65	ND
C46 (1-6)	ND	0.484	6.21	ND
C52 (1-6)	ND	0.469	3.71	ND
W3 (1-6)	ND	0.750	6.56	ND
W5 (1-6)	ND	0.440	4.26	ND
W5D (1-6)	ND	0.717	3.83	0.439
W11 (1-6)	ND	0.524	5.34	ND
W11D (1-6)	ND	0.713	5.13	0.244
W17 (1-6)	5.28	0.901	6.90	ND
W19 (1-6)	ND	0.766	4.37	ND
E2 (1-6)	ND	0.412	2.83	ND
E4 (1-6)	ND	0.373	2.48	ND
E9 (1-6)	ND	0.310	3.09	ND
E17 (1-6)	ND	0.313	2.51	ND
N17 (1-6)	ND	0.659	4.21	ND
N17D (1-6)	ND	0.478	3.92	0.334
N20 (1-6)	ND	0.616	4.63	ND
N23 (1-6)	ND	0.436	2.78	0.222
N23 (7-12)	ND	0.106	1.12	ND
N30 (1-6)	ND	0.291	3.48	ND
S19 (1-6)	ND	0.407	3.03	ND
S21 (1-6)	ND	0.655	4.72	ND
S26 (1-6)	ND	0.536	4.64	0.393
S40 (1-6)	ND	0.765	5.40	0.473

ND – Not detected above MDC.

7.5. Quality Control

Calculations were performed to determine the survey percent completeness and relative percent differences (RPD) for samples with results greater than five times MDC for static measurements and volumetric samples.

Percent completeness calculations were performed for static and removable measurements and all exceeded the 90% requirements. All volumetric samples that were planned were successfully collected and analyzed.

RPD calculations were all within 50%.

Laboratory data reports were reviewed and all quality control requirements specified in the QAPP were met.

8. COMPARISON OF RESULTS WITH GUIDELINES

All direct measurement results were evaluated to determine locations to be considered for remediation. Core sample results were reported in pCi/g and were compared directly to the release criterion of 25 mrem/yr. TEDE.

The samples analyzed from location F51 resulted in the highest activity concentrations (in pCi/g). Dose modeling software, RESRAD-BUILD (Argonne National Laboratory), V3.50, October 30, 2009 was run using the laboratory results from the most radioactive sample, the o-6 inch (0-15 cm), sample from location F51 (1132-F51 (1-6)). Other than the radionuclides and concentrations, default parameters were used. The RESRAD-BUILD report for this analysis is provided in Attachment 3. The dose resulting from this model is 41.9 mrem/yr. which is greater than the release criterion of 25 mrem/yr TEDE. The areal extent of the elevated activity can be bounded by the surrounding surface NaI readings. This results in approximately four square meters of area in which remediation may be required to meet the release criterion.

The sample with the second highest sample results was location F18. RESRAD-BUILD was run with the radionuclides and concentrations reported for this sample. The RESRAD-BUILD report for this analysis is provided in the second part of Attachment 3. The dose resulting from this model is 21.7 mrem/yr. which is less than the release criterion of 25 mrem/yr. TEDE. Since the balance of the sample locations have results that are less than those reported for location F18, it is safe to assume any required remediation of additional areas to meet the release criterion will be minor. Once the cyclotron and other components are removed, it will be easier to determine if any other areas of activation exceed the release criterion exist.

9. RECOMMENDED REMEDIATION OF VAULT SURFACES

As discussed in Section 8, approximately four square meters of surface area surrounding location F51 may require remediation to meet the release criterion. Based on the results from the 15-30 cm sample and the 30-40 cm sample at location F51, the depth of remediation for this location is estimated at 50 cm. The area surrounding location F51 appears to be the only area that would require remediation to meet the release criterion, but this assumption should be verified following removal of the cyclotron and other activated components.

There may be a need for some additional spot remediation in other areas that could not be properly characterized because of interference with scans and static readings from the cyclotron and other components still in the room.

This area surrounding location F51 would result in approximately 70 ft^3 (in place volume) or 10,500 lbs. of activated concrete waste.

In addition, the cyclotron and other components will also need to be disposed of as radioactive waste. The MC-40 cyclotron is estimated to weigh approximately 130,000 lbs. (~255 ft^3). The cyclotron beam lines, target array, and various other components are estimated at approximately 1,080 ft^3. These are estimates only and should be verified/determined prior to shipment and disposal.

There are also used components and other activated material that reside in the vault. There are roughly 50 potentially activated lead bricks dispersed around the vault. Other waste found in cyclotron vault includes: four drums of concrete slurry from characterization concrete core samples, eleven 55-gallon drums of radioactive material (at least one of these contains lead), two 10-gallon drums, ten black trash bags of assorted waste, and an assortment of unpackaged radioactive material.

10. CONCLUSIONS

Based on the NaI surveys performed and the core sample results, it is evident that there is activation in most of the vault surfaces. However, most of the vault surfaces would be less than the release criterion of 25 mrem/yr when using RESRAD-BUILD. The exception is approximately four square meters of the concrete floor surrounding location F51. This location is right below the beam line as it exits the cyclotron.

11. REFERENCES

1. NUREG-1575, “Multi-Agency Radiation Survey and Site Investigation Manual” (MARSSIM)
2. NUREG-1505, “A Nonparametric Statistical Methodology for the Design and Analysis of Final Decommissioning Surveys"
3. NUREG-1507, “Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions”
4. NUREG-1757, Volume 2 “Consolidated NMSS Decommissioning Guidance”
5. 25 Texas Administrative Code §289.202(ddd)(1)(D)(2), Radiological requirements for unrestricted use

ATTACHMENT 1

Characterization Survey Package

Characterization Survey Design Package

Building:	**Science Center**	**Survey Unit ID:**	**SU1**	**Page**	**of**
MARSSIM Classification:		**N/A**			
Room Nos. Included in Survey Unit:		**UT Health MC-40 Cyclotron Vault**			

Approvals

Prepared By:

Robbie Hansen/ _____ 9/7/2017

Print Name / Signature Date

Reviewed By:

Tim Pratt/ _____ 9/7/2017

Print Name / Signature Date

Completion and Review

Data Collected and/or Converted By:

Robbie Hansen/ _____ 9/16/2017

Print Name / Signature Date

Reviewed and Verified By:

Tim Pratt/ _____ 10/24/2017

Print Name / Signature Date

Characterization Survey Design Package

Building:	**Science Center**	**Survey Unit ID:**	**SU1**	**Page**	**of**
MARSSIM Classification:		**N/A**			
Room Nos. Included in Survey Unit:		**UT Health MC-40 Cyclotron Vault**			

Radionuclides of Concern:

Ag-108m, Ag-110m, Cd-109, Co-56, Co-57, Co-58, Co-60, Cs-134, Eu-152, Eu-154, Eu-155, Fe-59, Mn-54, Na-22, Nb-95, Sb-124, Sc-46, & Zn-65

Release Limits (DCGLs)			
	Total Activity Limits	**Removable Activity Limit**	**Limits Based On:**
Alpha	n/a	n/a	n/a
Gamma	n/a	n/a	n/a
Beta/Gamma	n/a	n/a	n/a

Applicable Survey Unit Surfaces	**% of Accessible Surface for Scan Surveys**		
☑ Floors	☐ 10%	☐ 25-100%	☑ 100%
☑ Lower Walls	☐ 10%	☐ 25-100%	☑ 100%
☑ Upper Walls	☐ 10%	☐ 25-100%	☑ 100%
☑ Ceiling	☐ 10%	☐ 25-100%	☑ 100%
☐ Structures (Interior and Exterior Surfaces)	☐ 10%	☐ 25-100%	☐ 100%

Required Survey Instrumentation	**Measurement Type**	**Static Count Time:**	**Scan Rate**	**Efficiency Based On:**
Ludlum 2221 / 44-10	Gamma	1 minute	1/2 meter/sec	Co-60
Ludlum 3030E / 43-10-1	Beta Removable Activity	1 minute	N/A	Beta Tc-99
Other: (Specify)	N/A	N/A	N/A	N/A

Characterization Survey Design Package

Building:	**Science Center**	**Survey Unit ID:**	**SU1**	**Page**	**of**
MARSSIM Classification:		**N/A**			
Room Nos. Included in Survey Unit:		**UT Health MC-40 Cyclotron Vault**			

Survey Instructions	
1)	Judgmentally select an origin for each surface area to surveyed. Origin selection should be chosen to correspond with the location of the cyclotron in relation to that surface. For each surface, lay out a one-meter grid system.
2)	For each surface (floor, wall, or ceiling), mark the grid intersections on a scaled drawing.
3)	Perform the required scan surveys at the rate prescribed on the previous page. Document the performance of the scan survey on the attached survey maps using markings and legends as necessary to allow the reviewer enough information to verify that sufficient area has been covered
4)	Collect static measurements for gross gamma at each identified grid intersection (close to the surface). Collect wipe samples for gross beta/gamma and for Liquid Scintillation Counter at each gamma sample location. Document the results on the associated data results sheets. Additional measurements may be taken in suspect areas at the discretion of the Project Manager.
5)	Collect core samples at locations determined by the Cerified Health Physicist and the Radiation Safety Officer. Separate samples into 6 inch long segments. Before shipping, move 6-inch segments to a low background area and perform one-minute static counts on contact.
6)	Collect 5% duplicate static measurements for gross gamma. Collect 5% duplicate wipe samples for gross beta/gamma. Document the results on the associated data results sheets.
7)	Notify the Project Manager of any elevated activity is determined during static measurements or applicable removable contamination measurements.
8)	Ensure that all package information is completed and signed prior to turning in this survey package to the Project Manager for review.

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Project Name:	Project Number:	Survey Number:	Date: 9/15/2017
UT Health Science Center Vault	1132	1	Time: 17:00

Instrument / Detector	Serial Number	Cal. Due Date	Total Efficiency	Background (cpm)	Probe Area (cm^2)
Ludlum 3030 / Ludlum 43-10-1	328277 / PR337587	3/3/2018	0.2828	46	100
Ludlum 2221 / Ludlum 44-10	190200 / PR135860	12/7/2017	n/a	1637	n/a
Ludlum 2221 / Ludlum 44-10	196085 / PR196085	12/7/2017	n/a	1648	n/a
	N/A				

Surveyor: Robbie Hansen / Tom Hansen III

Signature:

Reviewer: Tim Pratt

Signature:

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
N1	n/a	n/a	n/a	8188	1637	6551	n/a	n/a	47	4
N2	n/a	n/a	n/a	9844	1637	8207	n/a	n/a	56	35
N3	n/a	n/a	n/a	9144	1637	7507	n/a	n/a	39	-25
N4	n/a	n/a	n/a	9050	1637	7413	n/a	n/a	36	-35
N5	n/a	n/a	n/a	9310	1637	7673	n/a	n/a	44	-7
N6	n/a	n/a	n/a	9169	1637	7532	n/a	n/a	47	4
N7	n/a	n/a	n/a	9957	1637	8320	n/a	n/a	51	18
N8	n/a	n/a	n/a	10676	1637	9039	n/a	n/a	35	-39
N9	n/a	n/a	n/a	11066	1637	9429	n/a	n/a	50	14
N10	n/a	n/a	n/a	9295	1637	7658	n/a	n/a	52	21
N11	n/a	n/a	n/a	7697	1637	6060	n/a	n/a	41	-18

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
N12	n/a	n/a	n/a	7230	1637	5593	n/a	n/a	55	32
N13	n/a	n/a	n/a	6445	1637	4808	n/a	n/a	50	14
N14	n/a	n/a	n/a	7912	1637	6275	n/a	n/a	43	-11
N15	n/a	n/a	n/a	8830	1637	7193	n/a	n/a	42	-14
N16	n/a	n/a	n/a	8468	1637	6831	n/a	n/a	56	35
N17	n/a	n/a	n/a	8762	1637	7125	n/a	n/a	44	-7
N18	n/a	n/a	n/a	8844	1637	7207	n/a	n/a	42	-14
N19	n/a	n/a	n/a	9391	1637	7754	n/a	n/a	54	28
N20	n/a	n/a	n/a	10848	1637	9211	n/a	n/a	51	18
N21	n/a	n/a	n/a	10322	1637	8685	n/a	n/a	49	11
N22	n/a	n/a	n/a	9706	1637	8069	n/a	n/a	54	28
N23	n/a	n/a	n/a	8587	1637	6950	n/a	n/a	45	-4
N24	n/a	n/a	n/a	6295	1637	4658	n/a	n/a	52	21
N25	n/a	n/a	n/a	6542	1637	4905	n/a	n/a	45	-4
N26	n/a	n/a	n/a	6516	1637	4879	n/a	n/a	52	21
N27	n/a	n/a	n/a	8751	1637	7114	n/a	n/a	45	-4
N28	n/a	n/a	n/a	9581	1637	7944	n/a	n/a	59	46
N29	n/a	n/a	n/a	10312	1637	8675	n/a	n/a	56	35
N30	n/a	n/a	n/a	10900	1637	9263	n/a	n/a	34	-42
N31	n/a	n/a	n/a	10713	1637	9076	n/a	n/a	64	64
N32	n/a	n/a	n/a	10516	1637	8879	n/a	n/a	51	18
N33	n/a	n/a	n/a	11271	1637	9634	n/a	n/a	56	35
N34	n/a	n/a	n/a	11367	1637	9730	n/a	n/a	43	-11
N35	n/a	n/a	n/a	10094	1637	8457	n/a	n/a	49	11
N36	n/a	n/a	n/a	8397	1637	6760	n/a	n/a	54	28

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
N37	n/a	n/a	n/a	7250	1637	5613	n/a	n/a	50	14
N38	n/a	n/a	n/a	6618	1637	4981	n/a	n/a	57	39
N39	n/a	n/a	n/a	6203	1637	4566	n/a	n/a	57	39
N40	n/a	n/a	n/a	7751	1637	6114	n/a	n/a	45	-4
S1	n/a	n/a	n/a	7105	1637	5468	n/a	n/a	41	-18
S2	n/a	n/a	n/a	7066	1637	5429	n/a	n/a	47	4
S3	n/a	n/a	n/a	5631	1637	3994	n/a	n/a	35	-39
S4	n/a	n/a	n/a	7107	1637	5470	n/a	n/a	34	-42
S5	n/a	n/a	n/a	8508	1637	6871	n/a	n/a	42	-14
S6	n/a	n/a	n/a	10691	1637	9054	n/a	n/a	45	-4
S7	n/a	n/a	n/a	19190	1637	17553	n/a	n/a	43	-11
S8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
S9	n/a	n/a	n/a	14000	1637	12363	n/a	n/a	45	-4
S10	n/a	n/a	n/a	12073	1637	10436	n/a	n/a	47	4
S11	n/a	n/a	n/a	12798	1637	11161	n/a	n/a	41	-18
S12	n/a	n/a	n/a	10770	1637	9133	n/a	n/a	47	4
S13	n/a	n/a	n/a	10522	1637	8885	n/a	n/a	42	-14
S14	n/a	n/a	n/a	8496	1637	6859	n/a	n/a	37	-32
S15	n/a	n/a	n/a	8112	1637	6475	n/a	n/a	40	-21
S16	n/a	n/a	n/a	7906	1637	6269	n/a	n/a	39	-25
S17	n/a	n/a	n/a	5274	1637	3637	n/a	n/a	48	7
S18	n/a	n/a	n/a	7251	1637	5614	n/a	n/a	59	46
S19	n/a	n/a	n/a	9605	1637	7968	n/a	n/a	43	-11
S20	n/a	n/a	n/a	10748	1637	9111	n/a	n/a	51	18
S21	n/a	n/a	n/a	15501	1637	13864	n/a	n/a	43	-11

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
S22	n/a	n/a	n/a	24287	1637	22650	n/a	n/a	47	4
S23	n/a	n/a	n/a	12922	1637	11285	n/a	n/a	38	-28
S24	n/a	n/a	n/a	11017	1637	9380	n/a	n/a	39	-25
S25	n/a	n/a	n/a	11001	1637	9364	n/a	n/a	44	-7
S26	n/a	n/a	n/a	12151	1637	10514	n/a	n/a	53	25
S27	n/a	n/a	n/a	12051	1637	10414	n/a	n/a	52	21
S28	n/a	n/a	n/a	8575	1637	6938	n/a	n/a	51	18
S29	n/a	n/a	n/a	8160	1637	6523	n/a	n/a	50	14
S30	n/a	n/a	n/a	8245	1637	6608	n/a	n/a	43	-11
S31	n/a	n/a	n/a	6640	1637	5003	n/a	n/a	61	53
S32	n/a	n/a	n/a	7457	1637	5820	n/a	n/a	36	-35
S33	n/a	n/a	n/a	8631	1637	6994	n/a	n/a	46	0
S34	n/a	n/a	n/a	10247	1637	8610	n/a	n/a	44	-7
S35	n/a	n/a	n/a	12112	1637	10475	n/a	n/a	45	-4
S36	n/a	n/a	n/a	12363	1637	10726	n/a	n/a	34	-42
S37	n/a	n/a	n/a	11810	1637	10173	n/a	n/a	48	7
S38	n/a	n/a	n/a	11890	1637	10253	n/a	n/a	49	11
S39	n/a	n/a	n/a	12001	1637	10364	n/a	n/a	52	21
S40	n/a	n/a	n/a	12380	1637	10743	n/a	n/a	31	-53
S41	n/a	n/a	n/a	11653	1637	10016	n/a	n/a	54	28
S42	n/a	n/a	n/a	12113	1637	10476	n/a	n/a	49	11
S43	n/a	n/a	n/a	3816	1637	2179	n/a	n/a	46	0
S44	n/a	n/a	n/a	4577	1637	2940	n/a	n/a	47	4
S45	n/a	n/a	n/a	9413	1637	7776	n/a	n/a	46	0
W1	n/a	n/a	n/a	8350	1637	6713	n/a	n/a	48	7

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
W2	n/a	n/a	n/a	9053	1637	7416	n/a	n/a	45	-4
W3	n/a	n/a	n/a	10558	1637	8921	n/a	n/a	51	18
W4	n/a	n/a	n/a	12358	1637	10721	n/a	n/a	39	-25
W5	n/a	n/a	n/a	9430	1637	7793	n/a	n/a	47	4
W6	n/a	n/a	n/a	8575	1637	6938	n/a	n/a	43	-11
W7	n/a	n/a	n/a	7410	1637	5773	n/a	n/a	41	-18
W8	n/a	n/a	n/a	8541	1637	6904	n/a	n/a	43	-11
W9	n/a	n/a	n/a	9451	1637	7814	n/a	n/a	43	-11
W10	n/a	n/a	n/a	9971	1637	8334	n/a	n/a	35	-39
W11	n/a	n/a	n/a	11036	1637	9399	n/a	n/a	41	-18
W12	n/a	n/a	n/a	8894	1637	7257	n/a	n/a	44	-7
W13	n/a	n/a	n/a	8195	1637	6558	n/a	n/a	35	-39
W14	n/a	n/a	n/a	7499	1637	5862	n/a	n/a	55	32
W15	n/a	n/a	n/a	9873	1637	8236	n/a	n/a	41	-18
W16	n/a	n/a	n/a	10821	1637	9184	n/a	n/a	43	-11
W17	n/a	n/a	n/a	12957	1637	11320	n/a	n/a	47	4
W18	n/a	n/a	n/a	12366	1637	10729	n/a	n/a	46	0
W19	n/a	n/a	n/a	11049	1637	9412	n/a	n/a	36	-35
W20	n/a	n/a	n/a	9209	1637	7572	n/a	n/a	47	4
W21	n/a	n/a	n/a	8471	1637	6834	n/a	n/a	46	0
W22	n/a	n/a	n/a	9295	1637	7658	n/a	n/a	54	28
W23	n/a	n/a	n/a	9800	1637	8163	n/a	n/a	49	11
W24	n/a	n/a	n/a	8854	1637	7217	n/a	n/a	62	57
W25	n/a	n/a	n/a	8094	1637	6457	n/a	n/a	66	71
E1	n/a	n/a	n/a	9607	1637	7970	n/a	n/a	33	-46

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
E2	n/a	n/a	n/a	9845	1637	8208	n/a	n/a	51	18
E3	n/a	n/a	n/a	7819	1637	6182	n/a	n/a	39	-25
E4	n/a	n/a	n/a	8524	1637	6887	n/a	n/a	48	7
E5	n/a	n/a	n/a	6631	1637	4994	n/a	n/a	37	-32
E6	n/a	n/a	n/a	5796	1637	4159	n/a	n/a	51	18
E7	n/a	n/a	n/a	11501	1637	9864	n/a	n/a	48	7
E8	n/a	n/a	n/a	7702	1637	6065	n/a	n/a	31	-53
E9	n/a	n/a	n/a	7616	1637	5979	n/a	n/a	47	4
E10	n/a	n/a	n/a	9186	1637	7549	n/a	n/a	39	-25
E11	n/a	n/a	n/a	10042	1637	8405	n/a	n/a	46	0
E12	n/a	n/a	n/a	8570	1637	6933	n/a	n/a	49	11
E13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	48	7
E14	n/a	n/a	n/a	8295	1637	6658	n/a	n/a	49	11
E15	n/a	n/a	n/a	8872	1637	7235	n/a	n/a	36	-35
E16	n/a	n/a	n/a	7404	1637	5767	n/a	n/a	44	-7
E17	n/a	n/a	n/a	7994	1637	6357	n/a	n/a	50	14
E18	n/a	n/a	n/a	6903	1637	5266	n/a	n/a	34	-42
E19	n/a	n/a	n/a	4819	1637	3182	n/a	n/a	50	14
C1	n/a	n/a	n/a	9887	1637	8250	n/a	n/a	43	-11
C2	n/a	n/a	n/a	10484	1637	8847	n/a	n/a	46	0
C3	n/a	n/a	n/a	10607	1637	8970	n/a	n/a	49	11
C4	n/a	n/a	n/a	10432	1637	8795	n/a	n/a	46	0
C5	n/a	n/a	n/a	11073	1637	9436	n/a	n/a	39	-25
C6	n/a	n/a	n/a	9938	1637	8301	n/a	n/a	38	-28
C7	n/a	n/a	n/a	9713	1637	8076	n/a	n/a	45	-4

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
C8	n/a	n/a	n/a	9755	1637	8118	n/a	n/a	40	-21
C9	n/a	n/a	n/a	8861	1637	7224	n/a	n/a	53	25
C10	n/a	n/a	n/a	7166	1648	5518	n/a	n/a	45	-4
C11	n/a	n/a	n/a	6499	1648	4851	n/a	n/a	39	-25
C12	n/a	n/a	n/a	6312	1648	4664	n/a	n/a	52	21
C13	n/a	n/a	n/a	5978	1637	4341	n/a	n/a	44	-7
C14	n/a	n/a	n/a	5145	1637	3508	n/a	n/a	50	14
C15	n/a	n/a	n/a	10870	1637	9233	n/a	n/a	55	32
C16	n/a	n/a	n/a	11396	1637	9759	n/a	n/a	43	-11
C17	n/a	n/a	n/a	11471	1637	9834	n/a	n/a	47	4
C18	n/a	n/a	n/a	11478	1637	9841	n/a	n/a	38	-28
C19	n/a	n/a	n/a	10778	1637	9141	n/a	n/a	53	25
C20	n/a	n/a	n/a	11192	1637	9555	n/a	n/a	41	-18
C21	n/a	n/a	n/a	10812	1637	9175	n/a	n/a	35	-39
C22	n/a	n/a	n/a	11338	1637	9701	n/a	n/a	38	-28
C23	n/a	n/a	n/a	10016	1637	8379	n/a	n/a	43	-11
C24	n/a	n/a	n/a	6843	1648	5195	n/a	n/a	35	-39
C25	n/a	n/a	n/a	7024	1648	5376	n/a	n/a	39	-25
C26	n/a	n/a	n/a	7283	1648	5635	n/a	n/a	46	0
C27	n/a	n/a	n/a	6666	1637	5029	n/a	n/a	45	-4
C28	n/a	n/a	n/a	5922	1637	4285	n/a	n/a	33	-46
C29	n/a	n/a	n/a	10468	1637	8831	n/a	n/a	52	21
C30	n/a	n/a	n/a	12204	1637	10567	n/a	n/a	39	-25
C31	n/a	n/a	n/a	12427	1637	10790	n/a	n/a	47	4
C32	n/a	n/a	n/a	13485	1637	11848	n/a	n/a	44	-7

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
C33	n/a	n/a	n/a	11726	1637	10089	n/a	n/a	38	-28
C34	n/a	n/a	n/a	11669	1637	10032	n/a	n/a	43	-11
C35	n/a	n/a	n/a	11535	1637	9898	n/a	n/a	43	-11
C36	n/a	n/a	n/a	12171	1637	10534	n/a	n/a	41	-18
C37	n/a	n/a	n/a	9287	1648	7639	n/a	n/a	51	18
C38	n/a	n/a	n/a	7366	1648	5718	n/a	n/a	40	-21
C39	n/a	n/a	n/a	7264	1648	5616	n/a	n/a	42	-14
C40	n/a	n/a	n/a	7871	1637	6234	n/a	n/a	46	0
C41	n/a	n/a	n/a	7211	1637	5574	n/a	n/a	41	-18
C42	n/a	n/a	n/a	5820	1637	4183	n/a	n/a	41	-18
C43	n/a	n/a	n/a	9952	1637	8315	n/a	n/a	44	-7
C44	n/a	n/a	n/a	11648	1637	10011	n/a	n/a	35	-39
C45	n/a	n/a	n/a	12866	1637	11229	n/a	n/a	53	25
C46	n/a	n/a	n/a	13003	1637	11366	n/a	n/a	52	21
C47	n/a	n/a	n/a	12626	1637	10989	n/a	n/a	47	4
C48	n/a	n/a	n/a	12919	1637	11282	n/a	n/a	47	4
C49	n/a	n/a	n/a	12794	1637	11157	n/a	n/a	40	-21
C50	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
C51	n/a	n/a	n/a	10971	1648	9323	n/a	n/a	38	-28
C52	n/a	n/a	n/a	7777	1648	6129	n/a	n/a	57	39
C53	n/a	n/a	n/a	7758	1648	6110	n/a	n/a	37	-32
C54	n/a	n/a	n/a	7583	1637	5946	n/a	n/a	41	-18
C55	n/a	n/a	n/a	7346	1637	5709	n/a	n/a	38	-28
C56	n/a	n/a	n/a	6187	1637	4550	n/a	n/a	43	-11
C57	n/a	n/a	n/a	10353	1637	8716	n/a	n/a	62	57

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
C58	n/a	n/a	n/a	10308	1637	8671	n/a	n/a	58	42
C59	n/a	n/a	n/a	11717	1637	10080	n/a	n/a	54	28
C60	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
C61	n/a	n/a	n/a	11584	1648	9936	n/a	n/a	45	-4
C62	n/a	n/a	n/a	11796	1648	10148	n/a	n/a	42	-14
C63	n/a	n/a	n/a	11519	1648	9871	n/a	n/a	43	-11
C64	n/a	n/a	n/a	11257	1648	9609	n/a	n/a	42	-14
C65	n/a	n/a	n/a	11222	1648	9574	n/a	n/a	33	-46
C66	n/a	n/a	n/a	7811	1648	6163	n/a	n/a	48	7
C67	n/a	n/a	n/a	6472	1648	4824	n/a	n/a	44	-7
C68	n/a	n/a	n/a	6607	1637	4970	n/a	n/a	35	-39
C69	n/a	n/a	n/a	6205	1637	4568	n/a	n/a	48	7
C70	n/a	n/a	n/a	5823	1637	4186	n/a	n/a	41	-18
C71	n/a	n/a	n/a	9009	1637	7372	n/a	n/a	49	11
C72	n/a	n/a	n/a	9632	1637	7995	n/a	n/a	58	42
C73	n/a	n/a	n/a	11130	1637	9493	n/a	n/a	37	-32
C74	n/a	n/a	n/a	11747	1637	10110	n/a	n/a	41	-18
C75	n/a	n/a	n/a	11299	1637	9662	n/a	n/a	31	-53
C76	n/a	n/a	n/a	12068	1637	10431	n/a	n/a	44	-7
C77	n/a	n/a	n/a	11855	1637	10218	n/a	n/a	46	0
C78	n/a	n/a	n/a	11822	1637	10185	n/a	n/a	46	0
C79	n/a	n/a	n/a	11186	1637	9549	n/a	n/a	43	-11
C80	n/a	n/a	n/a	8737	1637	7100	n/a	n/a	42	-14
C81	n/a	n/a	n/a	6664	1648	5016	n/a	n/a	36	-35
C82	n/a	n/a	n/a	6714	1637	5077	n/a	n/a	45	-4

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
C83	n/a	n/a	n/a	6557	1637	4920	n/a	n/a	42	-14
C84	n/a	n/a	n/a	5905	1637	4268	n/a	n/a	40	-21
C85	n/a	n/a	n/a	5599	1637	3962	n/a	n/a	47	4
C86	n/a	n/a	n/a	8282	1637	6645	n/a	n/a	58	42
C87	n/a	n/a	n/a	8574	1637	6937	n/a	n/a	46	0
C88	n/a	n/a	n/a	8978	1637	7341	n/a	n/a	43	-11
C89	n/a	n/a	n/a	9334	1637	7697	n/a	n/a	48	7
C90	n/a	n/a	n/a	9875	1637	8238	n/a	n/a	51	18
C91	n/a	n/a	n/a	9258	1637	7621	n/a	n/a	46	0
C92	n/a	n/a	n/a	10167	1637	8530	n/a	n/a	45	-4
C93	n/a	n/a	n/a	10346	1637	8709	n/a	n/a	34	-42
C94	n/a	n/a	n/a	8890	1637	7253	n/a	n/a	58	42
C95	n/a	n/a	n/a	7989	1637	6352	n/a	n/a	48	7
C96	n/a	n/a	n/a	6182	1637	4545	n/a	n/a	39	-25
C97	n/a	n/a	n/a	5833	1637	4196	n/a	n/a	48	7
C98	n/a	n/a	n/a	5629	1637	3992	n/a	n/a	50	14
F1	n/a	n/a	n/a	10172	1637	8535	n/a	n/a	43	-11
F2	n/a	n/a	n/a	11794	1637	10157	n/a	n/a	41	-18
F3	n/a	n/a	n/a	17226	1637	15589	n/a	n/a	54	28
F4	n/a	n/a	n/a	15173	1637	13536	n/a	n/a	38	-28
F5	n/a	n/a	n/a	14527	1637	12890	n/a	n/a	49	11
F6	n/a	n/a	n/a	14419	1637	12782	n/a	n/a	39	-25
F7	n/a	n/a	n/a	20712	1637	19075	n/a	n/a	52	21
F8	n/a	n/a	n/a	18635	1637	16998	n/a	n/a	47	4
F9	n/a	n/a	n/a	12811	1637	11174	n/a	n/a	37	-32

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
F10	n/a	n/a	n/a	8839	1637	7202	n/a	n/a	43	-11
F11	n/a	n/a	n/a	7365	1637	5728	n/a	n/a	38	-28
F12	n/a	n/a	n/a	7530	1637	5893	n/a	n/a	35	-39
F13	n/a	n/a	n/a	8781	1637	7144	n/a	n/a	38	-28
F14	n/a	n/a	n/a	6645	1637	5008	n/a	n/a	64	64
F15	n/a	n/a	n/a	11973	1637	10336	n/a	n/a	65	67
F16	n/a	n/a	n/a	14592	1637	12955	n/a	n/a	55	32
F17	n/a	n/a	n/a	17286	1637	15649	n/a	n/a	60	50
F18	n/a	n/a	n/a	17653	1637	16016	n/a	n/a	64	64
F19	n/a	n/a	n/a	15113	1637	13476	n/a	n/a	55	32
F20	n/a	n/a	n/a	15860	1637	14223	n/a	n/a	56	35
F21	n/a	n/a	n/a	16694	1637	15057	n/a	n/a	59	46
F22	n/a	n/a	n/a	19369	1637	17732	n/a	n/a	62	57
F23	n/a	n/a	n/a	19119	1637	17482	n/a	n/a	61	53
F24	n/a	n/a	n/a	11085	1637	9448	n/a	n/a	66	71
F25	n/a	n/a	n/a	7714	1637	6077	n/a	n/a	47	4
F26	n/a	n/a	n/a	11803	1637	10166	n/a	n/a	52	21
F27	n/a	n/a	n/a	10383	1637	8746	n/a	n/a	52	21
F28	n/a	n/a	n/a	7618	1637	5981	n/a	n/a	52	21
F29	n/a	n/a	n/a	12682	1637	11045	n/a	n/a	47	4
F30	n/a	n/a	n/a	17382	1637	15745	n/a	n/a	53	25
F31	n/a	n/a	n/a	23273	1637	21636	n/a	n/a	54	28
F32	n/a	n/a	n/a	22204	1637	20567	n/a	n/a	55	32
F33	n/a	n/a	n/a	21063	1637	19426	n/a	n/a	62	57
F34	n/a	n/a	n/a	18277	1637	16640	n/a	n/a	62	57

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
F35	n/a	n/a	n/a	19529	1637	17892	n/a	n/a	51	18
F36	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
F37	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
F38	n/a	n/a	n/a	11073	1637	9436	n/a	n/a	47	4
F39	n/a	n/a	n/a	19283	1637	17646	n/a	n/a	49	11
F40	n/a	n/a	n/a	13772	1637	12135	n/a	n/a	45	-4
F41	n/a	n/a	n/a	9953	1637	8316	n/a	n/a	65	67
F42	n/a	n/a	n/a	8249	1637	6612	n/a	n/a	40	-21
F43	n/a	n/a	n/a	11455	1637	9818	n/a	n/a	50	14
F44	n/a	n/a	n/a	13704	1637	12067	n/a	n/a	46	0
F45	n/a	n/a	n/a	21605	1637	19968	n/a	n/a	46	0
F46	n/a	n/a	n/a	25742	1637	24105	n/a	n/a	42	-14
F47	n/a	n/a	n/a	25622	1637	23985	n/a	n/a	49	11
F48	n/a	n/a	n/a	18284	1637	16647	n/a	n/a	43	-11
F49	n/a	n/a	n/a	18563	1637	16926	n/a	n/a	40	-21
F50	n/a	n/a	n/a	34225	1637	32588	n/a	n/a	44	-7
F51	n/a	n/a	n/a	42536	1637	40899	n/a	n/a	46	0
F52	n/a	n/a	n/a	12645	1637	11008	n/a	n/a	54	28
F53	n/a	n/a	n/a	7960	1637	6323	n/a	n/a	39	-25
F54	n/a	n/a	n/a	12685	1637	11048	n/a	n/a	46	0
F55	n/a	n/a	n/a	11872	1637	10235	n/a	n/a	41	-18
F56	n/a	n/a	n/a	8252	1637	6615	n/a	n/a	40	-21
F57	n/a	n/a	n/a	10194	1637	8557	n/a	n/a	53	25
F58	n/a	n/a	n/a	12325	1637	10688	n/a	n/a	40	-21
F59	n/a	n/a	n/a	19632	1637	17995	n/a	n/a	59	46

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
F60	n/a	n/a	n/a	42382	1637	40745	n/a	n/a	36	-35
F61	n/a	n/a	n/a	26014	1637	24377	n/a	n/a	48	7
F62	n/a	n/a	n/a	16618	1637	14981	n/a	n/a	40	-21
F63	n/a	n/a	n/a	15114	1637	13477	n/a	n/a	46	0
F64	n/a	n/a	n/a	21746	1637	20109	n/a	n/a	37	-32
F65	n/a	n/a	n/a	33691	1637	32054	n/a	n/a	47	4
F66	n/a	n/a	n/a	9049	1637	7412	n/a	n/a	47	4
F67	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
F68	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
F69	n/a	n/a	n/a	9433	1637	7796	n/a	n/a	47	4
F70	n/a	n/a	n/a	9431	1637	7794	n/a	n/a	48	7
F71	n/a	n/a	n/a	9012	1637	7375	n/a	n/a	47	4
F72	n/a	n/a	n/a	13766	1637	12129	n/a	n/a	42	-14
F73	n/a	n/a	n/a	16512	1637	14875	n/a	n/a	45	-4
F74	n/a	n/a	n/a	25948	1637	24311	n/a	n/a	45	-4
F75	n/a	n/a	n/a	14843	1637	13206	n/a	n/a	36	-35
F76	n/a	n/a	n/a	13810	1637	12173	n/a	n/a	40	-21
F77	n/a	n/a	n/a	12578	1637	10941	n/a	n/a	53	25
F78	n/a	n/a	n/a	16926	1637	15289	n/a	n/a	59	46
F79	n/a	n/a	n/a	16130	1637	14493	n/a	n/a	35	-39
F80	n/a	n/a	n/a	12358	1637	10721	n/a	n/a	40	-21
F81	n/a	n/a	n/a	9871	1637	8234	n/a	n/a	46	0
F82	n/a	n/a	n/a	9537	1637	7900	n/a	n/a	52	21
F83	n/a	n/a	n/a	7788	1637	6151	n/a	n/a	34	-42
F84	n/a	n/a	n/a	8155	1637	6518	n/a	n/a	44	-7

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
F85	n/a	n/a	n/a	7560	1637	5923	n/a	n/a	46	0
F86	n/a	n/a	n/a	8682	1637	7045	n/a	n/a	34	-42
F87	n/a	n/a	n/a	10376	1637	8739	n/a	n/a	39	-25
F88	n/a	n/a	n/a	12413	1637	10776	n/a	n/a	46	0
F89	n/a	n/a	n/a	10755	1637	9118	n/a	n/a	51	18
F90	n/a	n/a	n/a	10957	1637	9320	n/a	n/a	44	-7
F91	n/a	n/a	n/a	10664	1637	9027	n/a	n/a	41	-18
F92	n/a	n/a	n/a	11053	1637	9416	n/a	n/a	50	14
F93	n/a	n/a	n/a	11888	1637	10251	n/a	n/a	56	35
F94	n/a	n/a	n/a	12088	1637	10451	n/a	n/a	37	-32
F95	n/a	n/a	n/a	10982	1637	9345	n/a	n/a	33	-46
F96	n/a	n/a	n/a	10145	1637	8508	n/a	n/a	42	-14
F97	n/a	n/a	n/a	7950	1637	6313	n/a	n/a	37	-32
F98	n/a	n/a	n/a	8101	1637	6464	n/a	n/a	39	-25
F99	n/a	n/a	n/a	4343	1637	2706	n/a	n/a	50	14
F100	n/a	n/a	n/a	4601	1637	2964	n/a	n/a	42	-14
P1	n/a	n/a	n/a	25498	1637	23861	n/a	n/a	38	-28
P2	n/a	n/a	n/a	25542	1637	23905	n/a	n/a	44	-7
P3	n/a	n/a	n/a	10795	1637	9158	n/a	n/a	50	14
P4	n/a	n/a	n/a	13811	1637	12174	n/a	n/a	36	-35
P5	n/a	n/a	n/a	13975	1637	12338	n/a	n/a	52	21
P6	n/a	n/a	n/a	8557	1637	6920	n/a	n/a	40	-21
P7	n/a	n/a	n/a	6696	1637	5059	n/a	n/a	39	-25
P8	n/a	n/a	n/a	7414	1637	5777	n/a	n/a	38	-28
P9	n/a	n/a	n/a	8950	1637	7313	n/a	n/a	39	-25

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
P10	n/a	n/a	n/a	10413	1637	8776	n/a	n/a	46	0
P11	n/a	n/a	n/a	17749	1637	16112	n/a	n/a	48	7
N5D	n/a	n/a	n/a	8874	1637	7237	n/a	n/a	53	25
N9D	n/a	n/a	n/a	11142	1637	9505	n/a	n/a	49	11
N15D	n/a	n/a	n/a	9074	1637	7437	n/a	n/a	37	-32
N34D	n/a	n/a	n/a	10881	1637	9244	n/a	n/a	38	-28
S5D	n/a	n/a	n/a	7865	1637	6228	n/a	n/a	51	18
S11D	n/a	n/a	n/a	11733	1637	10096	n/a	n/a	45	-4
S20D	n/a	n/a	n/a	11078	1637	9441	n/a	n/a	43	-11
S38D	n/a	n/a	n/a	12002	1637	10365	n/a	n/a	49	11
W4D	n/a	n/a	n/a	10526	1637	8889	n/a	n/a	43	-11
W13D	n/a	n/a	n/a	8397	1637	6760	n/a	n/a	38	-28
E6D	n/a	n/a	n/a	5980	1637	4343	n/a	n/a	54	28
E11D	n/a	n/a	n/a	7180	1637	5543	n/a	n/a	50	14
C14D	n/a	n/a	n/a	5032	1637	3395	n/a	n/a	41	-18
C31D	n/a	n/a	n/a	12225	1637	10588	n/a	n/a	44	-7
C33D	n/a	n/a	n/a	12127	1637	10490	n/a	n/a	45	-4
C37D	n/a	n/a	n/a	9491	1637	7854	n/a	n/a	33	-46
C44D	n/a	n/a	n/a	11512	1637	9875	n/a	n/a	51	18
C55D	n/a	n/a	n/a	7379	1637	5742	n/a	n/a	54	28
C66D	n/a	n/a	n/a	7574	1637	5937	n/a	n/a	51	18
C75D	n/a	n/a	n/a	11434	1637	9797	n/a	n/a	48	7
C92D	n/a	n/a	n/a	10028	1637	8391	n/a	n/a	36	-35
C95D	n/a	n/a	n/a	7743	1637	6106	n/a	n/a	49	11
F1D	n/a	n/a	n/a	9983	1637	8346	n/a	n/a	44	-7

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Location Code	Total Activity Results						Removable Activity Results			
	Alpha			Gamma			Alpha		Beta-Gamma	
	Gross Counts	BKG Counts	Net DPM/ 100 cm^2	Gross Counts	BKG Counts	Net CPM	Gross Counts	Net DPM/ 100 cm^2	Gross Counts	Net DPM/ 100 cm^2
F18D	n/a	n/a	n/a	13790	1637	12153	n/a	n/a	43	-11
F25D	n/a	n/a	n/a	7764	1637	6127	n/a	n/a	58	42
F41D	n/a	n/a	n/a	10024	1637	8387	n/a	n/a	43	-11
F49D	n/a	n/a	n/a	18278	1637	16641	n/a	n/a	37	-32
F54D	n/a	n/a	n/a	13029	1637	11392	n/a	n/a	43	-11
F70D	n/a	n/a	n/a	9050	1637	7413	n/a	n/a	42	-14
F78D	n/a	n/a	n/a	16454	1637	14817	n/a	n/a	45	-4
F88D	n/a	n/a	n/a	12285	1637	10648	n/a	n/a	61	53
F97D	n/a	n/a	n/a	7524	1637	5887	n/a	n/a	48	7
P4D	n/a	n/a	n/a	13312	1637	11675	n/a	n/a	40	-21

N/A

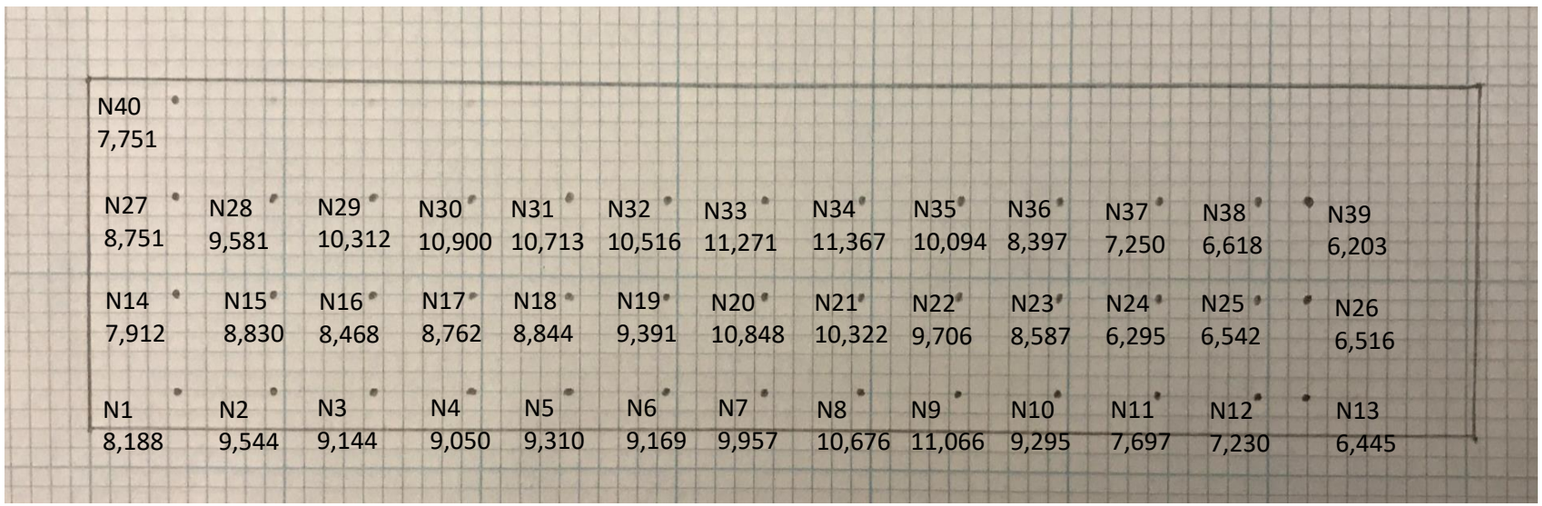
Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

North Wall



Comments: Locations determined using one meter grid. Location N23 was used as origin of the gird. Duplicate core sample taken at location N17 to satisfy QA requirements.

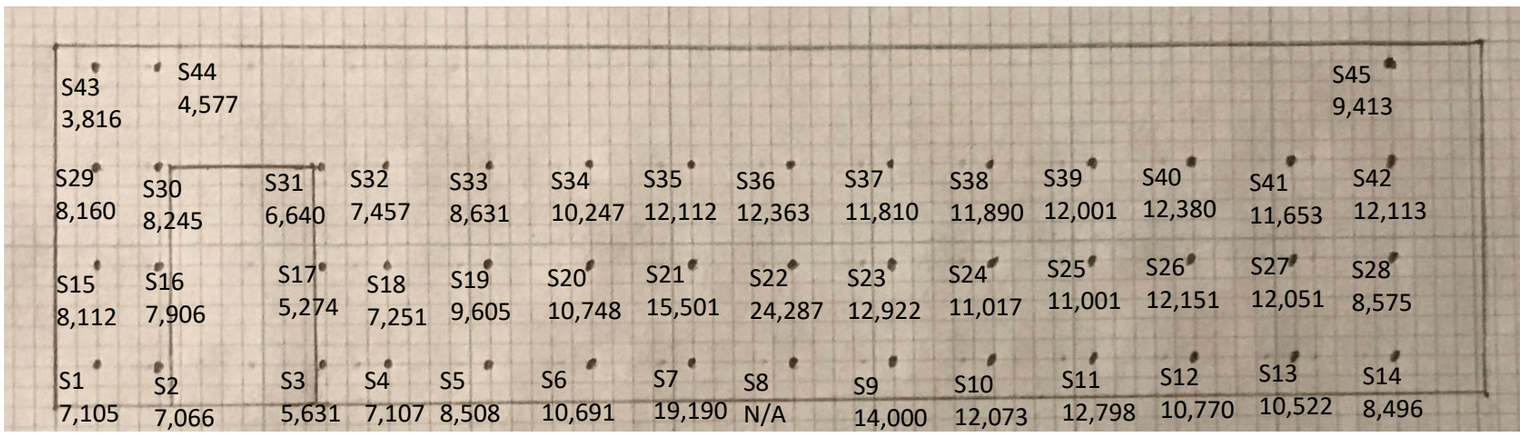
Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

South Wall



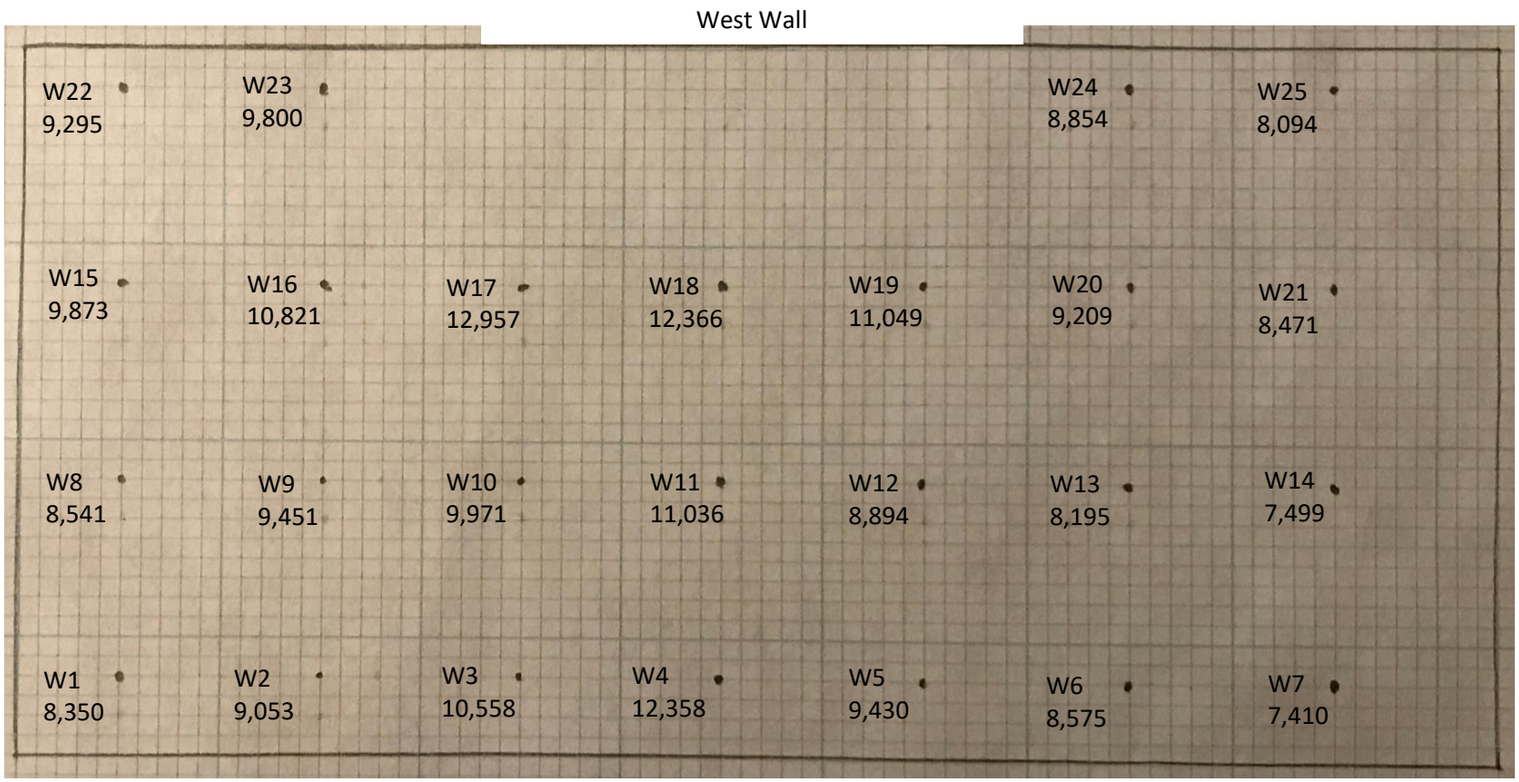
Comments: Locations determined using one meter grid. Location S19 was used as origin of the gird. Surface of wall was not accessible at location S8.

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault



Comments: Locations determined using one meter grid. Location W11 was used as origin of the gird. Duplicate core samples taken at locations W5 and W11 to satisfy QA requirements.

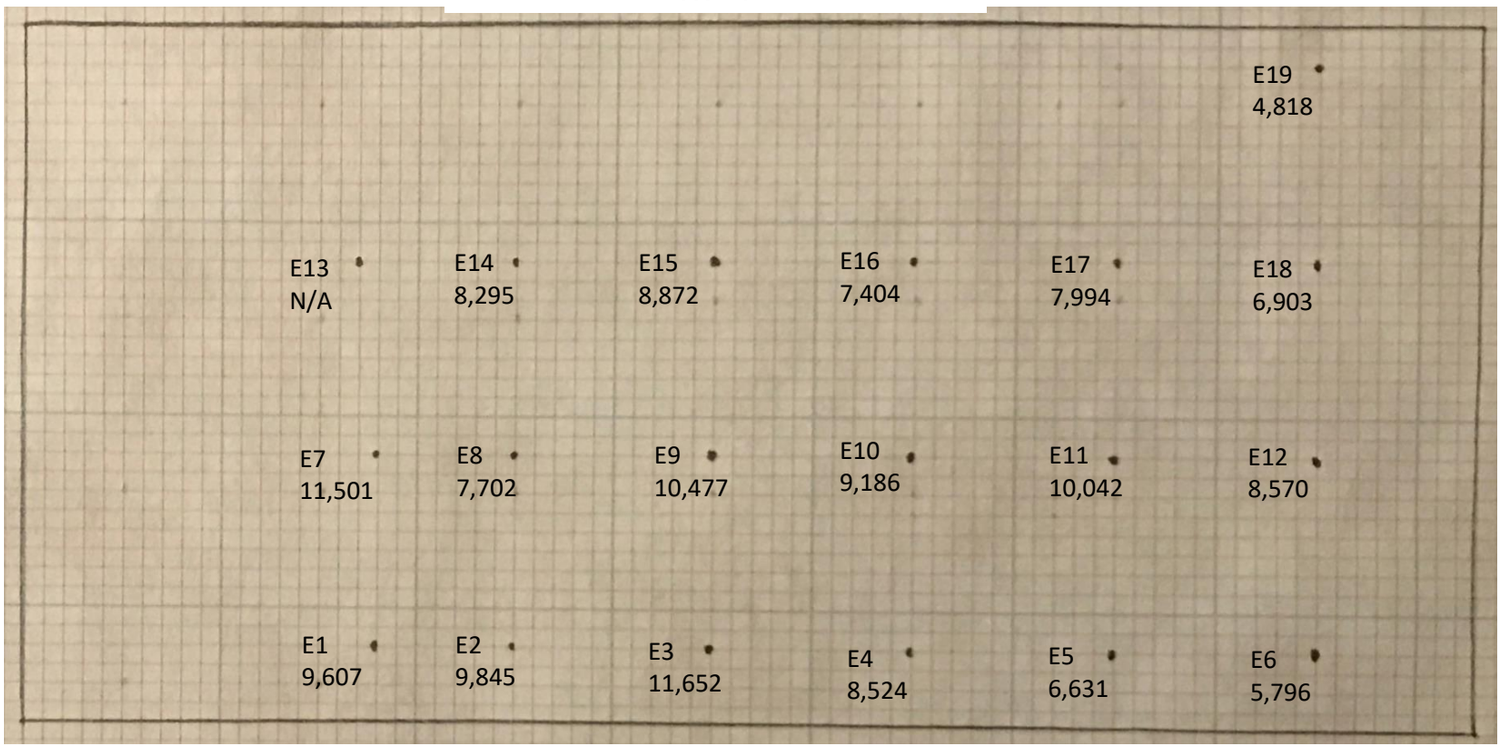
Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

East Wall



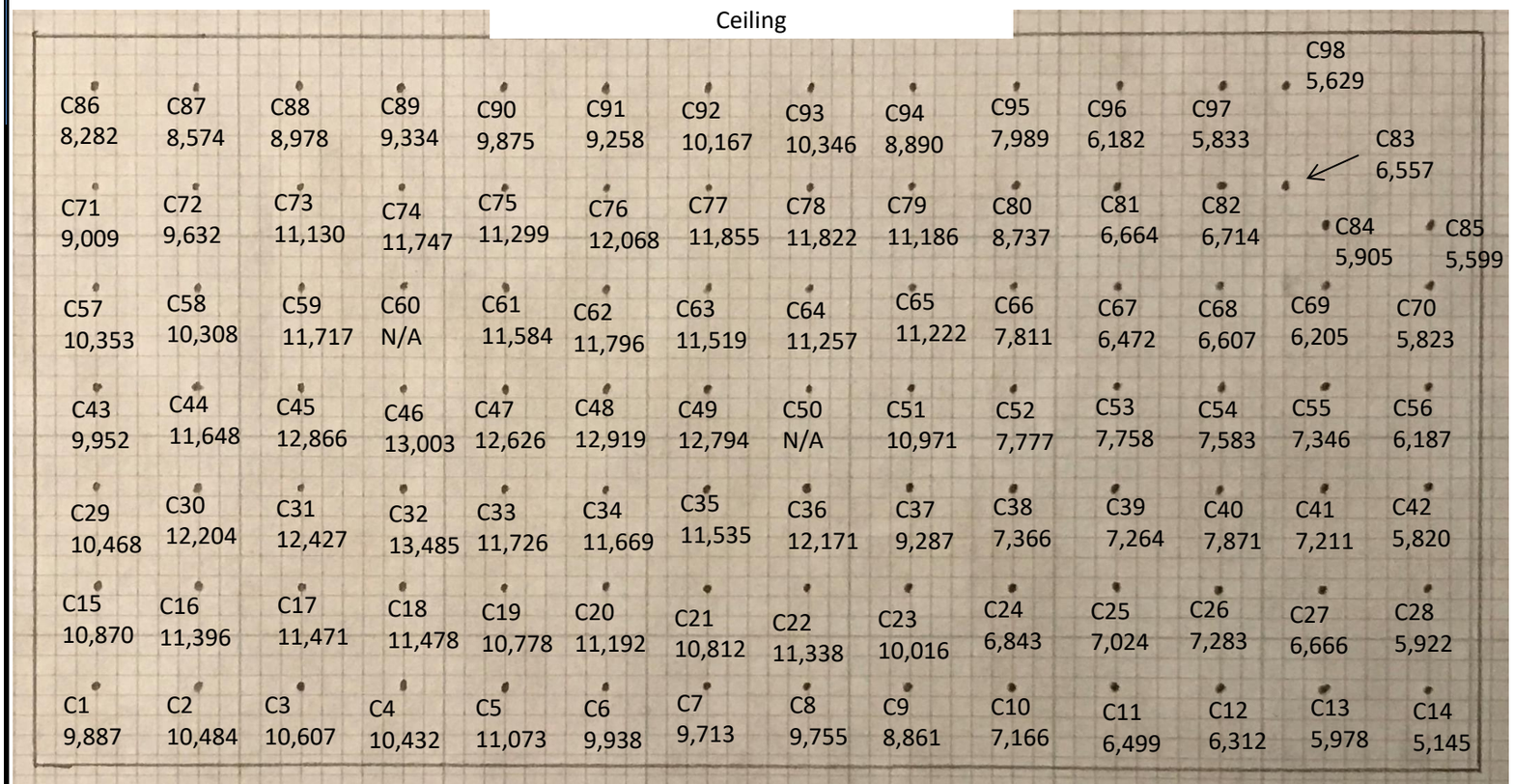
Comments: Locations determined using one meter grid. Location E9 was used as origin of the gird.

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault



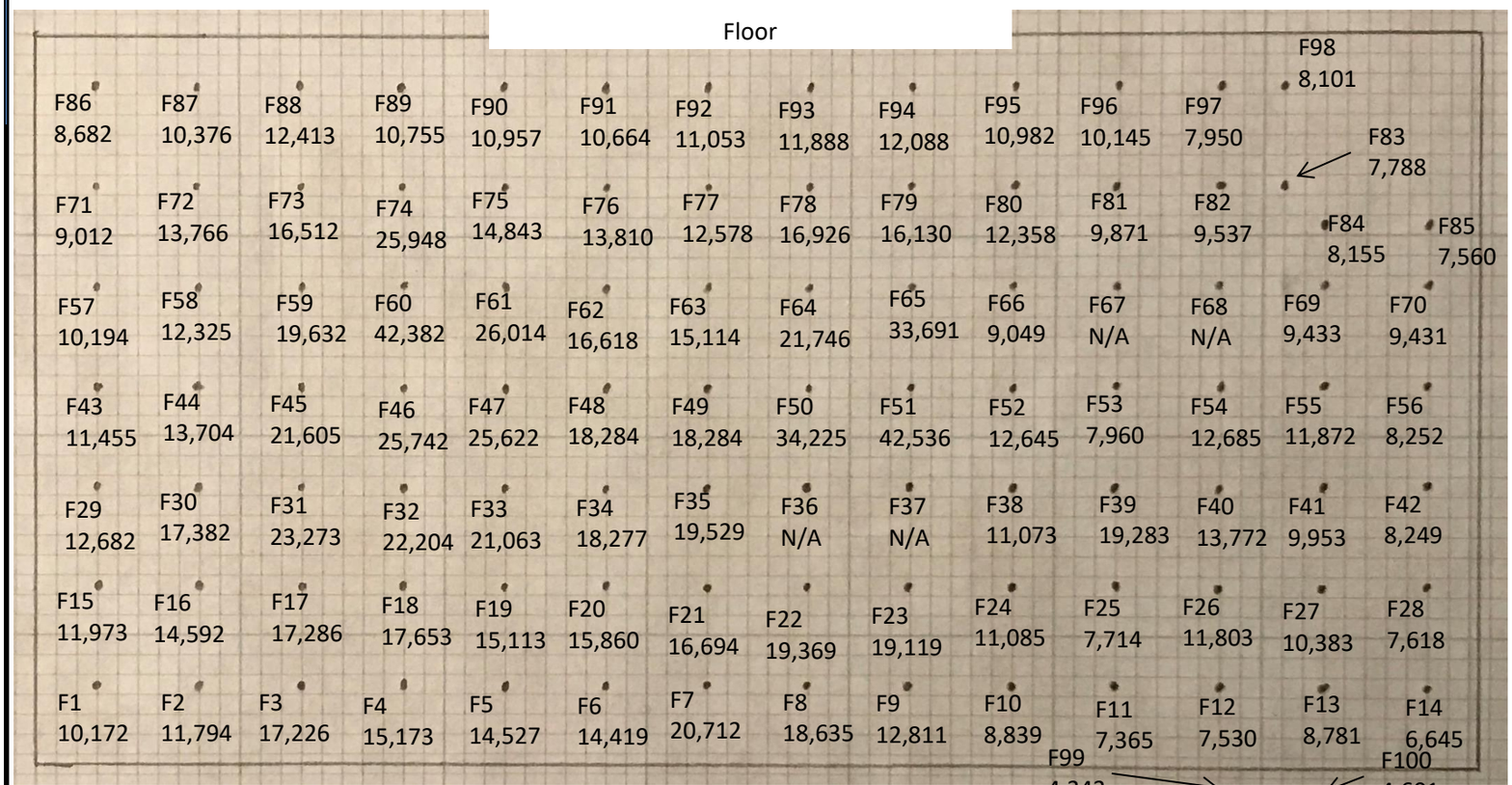
Comments: Locations for ceiling were approximated based on locations on floor grid. Location C52 was used as origin of the gird. Locations C50 and C60 were inaccessible and no static counts or smear were taken.

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault



Comments: Locations determined using one meter grid. Location F52 was used as origin of the gird. Locations F36, F37, F67, and F68 were inaccessible and no static counts or smear were taken. Duplicate core sample taken at location F72 to satisfy QA requirements.

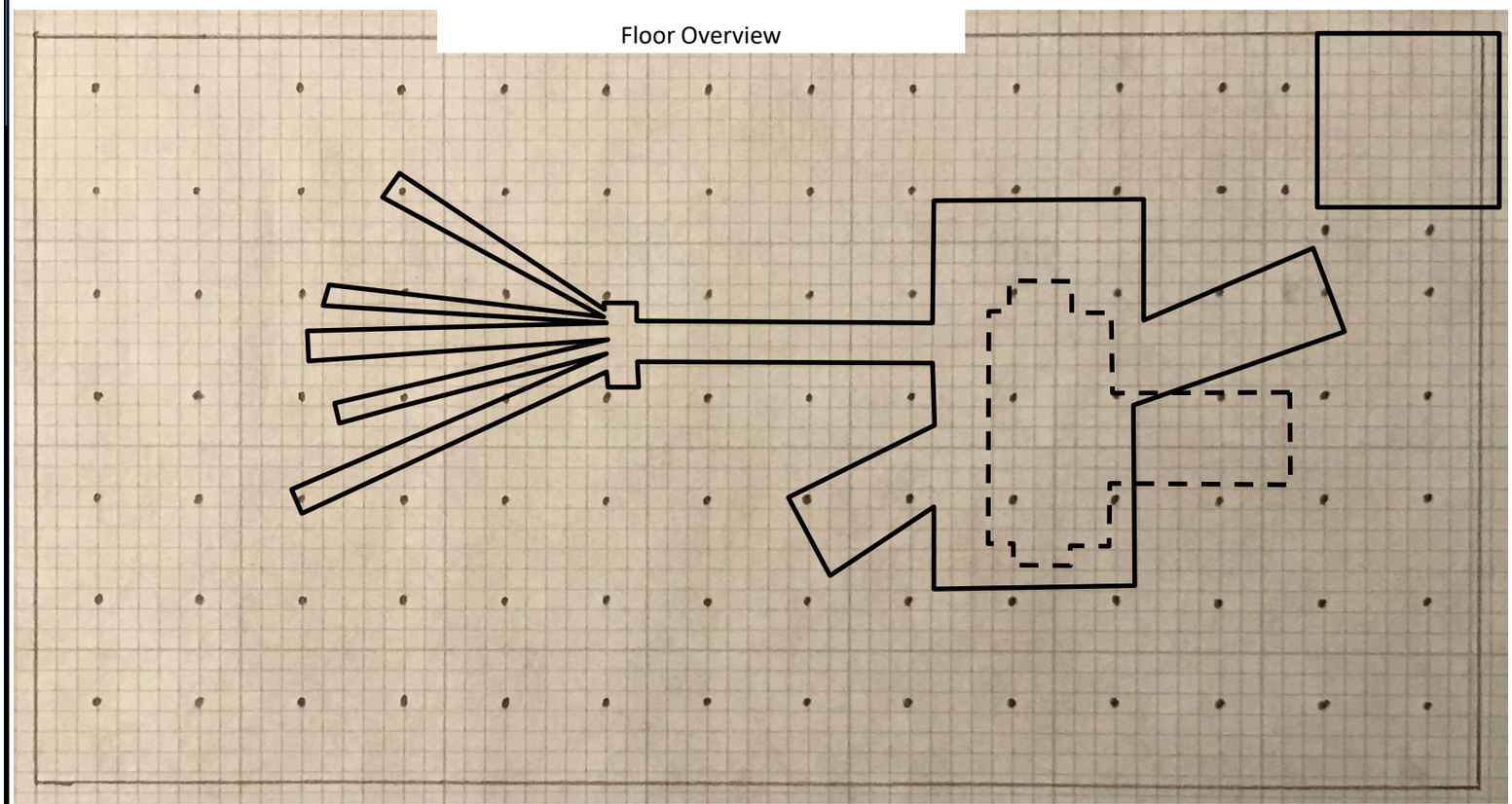
Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Floor Overview



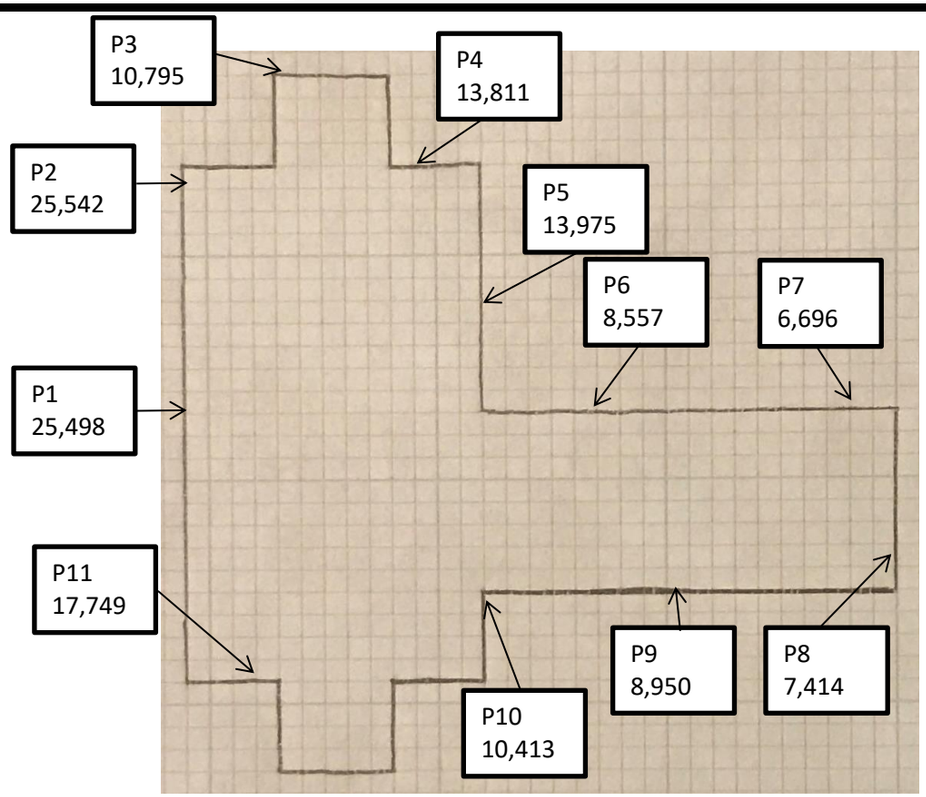
Comments: Area outlined in solid black line shows location of cyclotron. Area outlined in dashed black line shows location of the pit area. Square area located in Northeast corner was inaccessible for surveying.

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault



Pit Below Cyclotron

Comments: Pit wall locations marked using one meter spacing measured from origin at P1. Wall height measured from Pit floor to vault floor is 1.1 meters and grid height is 0.9 meters from Pit floor.

Characterization Survey Design Package

Building: Science Center **Survey Unit ID:** SU1 **Page** _____ **of** _____

Marssim Classification: N/A

Room Nos. Included in Survey Unit: UT Health MC-40 Cyclotron Vault

Comments Section

Date	Comment
9/15/2017	100% of accessible surfaces scanned with NaI detector. Due to interference from cyclotron and remaining components, no elevated areas were marked. All walls and ceiling assumed to be uniformly activated.
9/15/2017	No removable activity was detected from beta-gamma smears or from LSC smears.

ATTACHMENT 2

Laboratory Reports for Concrete Volumetric Samples

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

October 26, 2017

Mr. Paul Jones
Ameriphysics, LLC
911 Cross Park Dr.
Knoxville, Tennessee 37923

Re: Ameriphysics, LLC
Work Order: 433373

Dear Mr. Jones:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on September 21, 2017. This revised data report has been prepared and reviewed in accordance with GEL's standard operating procedures. The data package has been revised to correct the Gamma Spec data.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4453.

Sincerely,

Edith M. Kent

Edith Kent
Project Manager

Purchase Order: 0316-001
Enclosures

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 − (843) 556−8171 − www.gel.com

Certificate of Analysis Report
for

AMPH002 Ameriphysics, LLC

Client SDG: 433373 GEL Work Order: 433373

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a Tracer compound

** Analyte is a surrogate compound

U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

UI Gamma Spectroscopy−−Uncertain identification

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Edith Kent.

Reviewed by 

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-F16 (1-6) Project: AMPH002
Sample ID: 433373001 Client ID: AMPH002
Matrix: Misc Solid
Collect Date: 14-SEP-17 08:15
Receive Date: 21-SEP-17
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.00626	+/-0.0786	0.172		pCi/g			MXR1	09/28/17	1354	1702974	1
Cadmium-109	U	-0.0642	+/-0.962	1.84		pCi/g							
Cesium-134	U	0.0385	+/-0.0683	0.130		pCi/g							
Chromium-51	U	-0.0545	+/-0.485	0.930		pCi/g							
Cobalt-56	U	0.0278	+/-0.0711	0.139		pCi/g							
Cobalt-57	UI	0.00	+/-0.136	0.264		pCi/g							
Cobalt-58	U	0.00269	+/-0.0647	0.125		pCi/g							
Cobalt-60		0.592	+/-0.114	0.0889		pCi/g							
Europium-152		8.91	+/-0.555	0.230		pCi/g							
Europium-154	UI	0.00	+/-0.252	0.581		pCi/g							
Europium-155	U	-0.0601	+/-0.141	0.261		pCi/g							
Iron-59	U	0.0341	+/-0.146	0.273		pCi/g							
Manganese-54	U	0.0427	+/-0.0611	0.123		pCi/g							
Niobium-95	U	-0.0208	+/-0.081	0.125		pCi/g							
Scandium-46	U	-0.012	+/-0.0688	0.128		pCi/g							
Silver-108m	U	-0.0319	+/-0.0374	0.0654		pCi/g							
Silver-110m	U	-0.0679	+/-0.0868	0.153		pCi/g							
Sodium-22	UI	0.00	+/-0.088	0.206		pCi/g							
Zinc-65	U	-0.0664	+/-0.160	0.246		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-F18 (1-6)
Sample ID: 433373002
Matrix: Misc Solid
Collect Date: 14-SEP-17 08:35
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.00521	+/-0.068	0.148		pCi/g			MXR1	09/28/17	1354	1702974	1
Cadmium-109	U	0.456	+/-1.23	1.53		pCi/g							
Cesium-134	U	-0.0275	+/-0.0542	0.0987		pCi/g							
Chromium-51	U	-0.000865	+/-0.385	0.732		pCi/g							
Cobalt-56	U	0.0877	+/-0.055	0.116		pCi/g							
Cobalt-57	U	0.186	+/-0.172	0.224		pCi/g							
Cobalt-58	U	-0.0296	+/-0.0544	0.0986		pCi/g							
Cobalt-60		0.547	+/-0.121	0.0753		pCi/g							
Europium-152		8.49	+/-0.487	0.217		pCi/g							
Europium-154		0.523	+/-0.202	0.222		pCi/g							
Europium-155	U	-0.00594	+/-0.132	0.240		pCi/g							
Iron-59	U	0.110	+/-0.123	0.226		pCi/g							
Manganese-54	U	0.013	+/-0.0529	0.101		pCi/g							
Niobium-95	U	0.0186	+/-0.0591	0.107		pCi/g							
Scandium-46	U	0.00239	+/-0.0549	0.104		pCi/g							
Silver-108m	U	-0.00788	+/-0.0328	0.0601		pCi/g							
Silver-110m	U	-0.00134	+/-0.0677	0.128		pCi/g							
Sodium-22	UI	0.00	+/-0.0713	0.131		pCi/g							
Zinc-65	U	0.153	+/-0.152	0.224		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-F20 (1-6)	Project:	AMPH002
Sample ID:	433373003	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 09:00		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	7.70E-05	+/-0.036	0.096		pCi/g			MXR1	09/28/17	1354	1702974	1
Cadmium-109	U	-0.661	+/-1.05	1.85		pCi/g							
Cesium-134	U	0.0201	+/-0.0535	0.103		pCi/g							
Chromium-51	U	0.220	+/-0.444	0.881		pCi/g							
Cobalt-56	U	0.0491	+/-0.109	0.107		pCi/g							
Cobalt-57	UI	0.00	+/-0.118	0.232		pCi/g							
Cobalt-58	U	0.0352	+/-0.0558	0.109		pCi/g							
Cobalt-60		0.603	+/-0.119	0.0754		pCi/g							
Europium-152		7.01	+/-0.486	0.233		pCi/g							
Europium-154	UI	0.00	+/-0.220	0.423		pCi/g							
Europium-155	U	0.0367	+/-0.157	0.288		pCi/g							
Iron-59	U	-0.0186	+/-0.116	0.196		pCi/g							
Manganese-54	U	0.0116	+/-0.0468	0.0887		pCi/g							
Niobium-95	U	0.0168	+/-0.0557	0.105		pCi/g							
Scandium-46	U	-0.0092	+/-0.0603	0.108		pCi/g							
Silver-108m	U	0.0152	+/-0.036	0.0708		pCi/g							
Silver-110m	U	-0.0503	+/-0.0742	0.124		pCi/g							
Sodium-22	UI	0.00	+/-0.0776	0.0756		pCi/g							
Zinc-65	U	0.0585	+/-0.119	0.221		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-F25 (1-6)
Sample ID: 433373004
Matrix: Misc Solid
Collect Date: 14-SEP-17 09:25
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0247	+/-0.0485	0.0635		pCi/g			MXR1	09/28/17	1355	1702974	1
Cadmium-109	U	1.55	+/-1.62	1.67		pCi/g							
Cesium-134	U	0.0705	+/-0.0769	0.161		pCi/g							
Chromium-51	U	-0.0547	+/-0.410	0.741		pCi/g							
Cobalt-56	U	0.052	+/-0.0564	0.127		pCi/g							
Cobalt-57	UI	0.00	+/-0.149	0.0591		pCi/g							
Cobalt-58	U	0.0123	+/-0.0699	0.136		pCi/g							
Cobalt-60		0.199	+/-0.075	0.0976		pCi/g							
Europium-152		3.27	+/-0.417	0.222		pCi/g							
Europium-154	UI	0.00	+/-0.221	0.533		pCi/g							
Europium-155	U	-0.0334	+/-0.116	0.219		pCi/g							
Iron-59	U	0.00995	+/-0.133	0.272		pCi/g							
Manganese-54	U	-0.00114	+/-0.0455	0.0894		pCi/g							
Niobium-95	U	0.0259	+/-0.0735	0.145		pCi/g							
Scandium-46	U	0.0504	+/-0.0609	0.133		pCi/g							
Silver-108m	U	-0.00443	+/-0.0388	0.0761		pCi/g							
Silver-110m	U	-0.0275	+/-0.0829	0.149		pCi/g							
Sodium-22	UI	0.00	+/-0.078	0.0873		pCi/g							
Zinc-65	U	0.0381	+/-0.176	0.318		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.

Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-F46 (1-6) Project: AMPH002
Sample ID: 433373005 Client ID: AMPH002
Matrix: Misc Solid
Collect Date: 14-SEP-17 09:45
Receive Date: 21-SEP-17
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0312	+/-0.0991	0.200		pCi/g			MXR1	09/28/17	1355	1702974	1
Cadmium-109	U	0.133	+/-0.803	1.47		pCi/g							
Cesium-134	U	-0.0412	+/-0.0717	0.129		pCi/g							
Chromium-51	U	0.431	+/-0.518	0.963		pCi/g							
Cobalt-56	U	0.043	+/-0.0742	0.149		pCi/g							
Cobalt-57	UI	0.00	+/-0.186	0.252		pCi/g							
Cobalt-58	U	0.0756	+/-0.0798	0.161		pCi/g							
Cobalt-60		0.544	+/-0.130	0.0909		pCi/g							
Europium-152		7.20	+/-0.492	0.273		pCi/g							
Europium-154		0.759	+/-0.270	0.194		pCi/g							
Europium-155	U	0.0513	+/-0.130	0.240		pCi/g							
Iron-59	U	0.0218	+/-0.158	0.304		pCi/g							
Manganese-54	U	-1.52E-05	+/-0.0671	0.128		pCi/g							
Niobium-95	U	-0.0176	+/-0.0844	0.157		pCi/g							
Scandium-46	U	0.0367	+/-0.0686	0.139		pCi/g							
Silver-108m	U	-0.0518	+/-0.0419	0.0676		pCi/g							
Silver-110m	U	-0.0517	+/-0.0972	0.174		pCi/g							
Sodium-22	UI	0.00	+/-0.0954	0.206		pCi/g							
Zinc-65	U	0.0968	+/-0.172	0.310		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-F46 (7-12)	Project:	AMPH002
Sample ID:	433373006	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 09:55		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0158	+/-0.0675	0.135		pCi/g			MXR1	09/28/17	1414	1702974	1
Cadmium-109	U	0.637	+/-1.08	0.935		pCi/g							
Cesium-134	U	-0.0195	+/-0.0456	0.0798		pCi/g							
Chromium-51	U	0.022	+/-0.362	0.650		pCi/g							
Cobalt-56	U	0.0427	+/-0.0479	0.0816		pCi/g							
Cobalt-57	UI	0.00	+/-0.0891	0.179		pCi/g							
Cobalt-58	UI	0.00	+/-0.0785	0.079		pCi/g							
Cobalt-60		0.508	+/-0.0996	0.0684		pCi/g							
Europium-152		5.42	+/-0.376	0.172		pCi/g							
Europium-154		0.382	+/-0.154	0.191		pCi/g							
Europium-155	U	0.0708	+/-0.0884	0.176		pCi/g							
Iron-59	U	-0.0273	+/-0.110	0.205		pCi/g							
Manganese-54	U	-0.000374	+/-0.044	0.0796		pCi/g							
Niobium-95	U	0.0209	+/-0.0562	0.107		pCi/g							
Scandium-46	U	-0.0273	+/-0.0513	0.0871		pCi/g							
Silver-108m	U	-0.0181	+/-0.0302	0.0552		pCi/g							
Silver-110m	U	0.0609	+/-0.0725	0.142		pCi/g							
Sodium-22	UI	0.00	+/-0.0542	0.119		pCi/g							
Zinc-65	U	-0.0653	+/-0.170	0.185		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-F51 (1-6) Project: AMPH002
Sample ID: 433373007 Client ID: AMPH002
Matrix: Misc Solid
Collect Date: 14-SEP-17 10:10
Receive Date: 21-SEP-17
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0227	+/-0.107	0.239		pCi/g			MXR1	09/29/17	1152	1702974	1
Cadmium-109	U	-0.651	+/-1.33	2.43		pCi/g							
Cesium-134	U	-0.0144	+/-0.0999	0.172		pCi/g							
Chromium-51	U	-0.175	+/-0.669	1.24		pCi/g							
Cobalt-56	U	-0.0202	+/-0.0908	0.166		pCi/g							
Cobalt-57	UI	0.00	+/-0.183	0.375		pCi/g							
Cobalt-58	U	0.152	+/-0.175	0.168		pCi/g							
Cobalt-60		1.22	+/-0.174	0.117		pCi/g							
Europium-152		16.3	+/-0.759	0.308		pCi/g							
Europium-154		0.847	+/-0.413	0.373		pCi/g							
Europium-155	U	0.0659	+/-0.196	0.368		pCi/g							
Iron-59	U	0.0384	+/-0.158	0.305		pCi/g							
Manganese-54	U	0.0782	+/-0.0861	0.170		pCi/g							
Niobium-95	U	-0.0016	+/-0.0969	0.170		pCi/g							
Scandium-46	U	-0.0569	+/-0.0961	0.170		pCi/g							
Silver-108m	U	0.0314	+/-0.0546	0.105		pCi/g							
Silver-110m	U	-0.0167	+/-0.117	0.216		pCi/g							
Sodium-22	UI	0.00	+/-0.146	0.243		pCi/g							
Zinc-65	U	0.144	+/-0.220	0.381		pCi/g							
Rad Liquid Scintillation Analysis													
LSC, Tritium Dist, Solid "As Received"													
Tritium		5.19	+/-2.74	4.39	6.00	pCi/g			BXM4	09/29/17	0739	1703187	2
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	5.50	+/-7.21	11.3	20.0	pCi/g			TXJ1	10/09/17	1257	1703166	3

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	
2	EPA 906.0 Modified	
3	DOE RESL Fe-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits

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Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-F51 (1-6)	Project:	AMPH002
Sample ID:	433373007	Client ID:	AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			73.9	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-F51 (7-12)
Sample ID: 433373008
Matrix: Misc Solid
Collect Date: 14-SEP-17 10:20
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.060	+/-0.114	0.281		pCi/g			MXR1	09/29/17	1152	1702974	1
Cadmium-109	U	-0.181	+/-1.08	2.01		pCi/g							
Cesium-134	U	0.013	+/-0.0984	0.180		pCi/g							
Chromium-51	U	-0.0117	+/-0.661	1.28		pCi/g							
Cobalt-56	U	0.0843	+/-0.0927	0.186		pCi/g							
Cobalt-57	UI	0.00	+/-0.262	0.0852		pCi/g							
Cobalt-58	U	0.0726	+/-0.0966	0.189		pCi/g							
Cobalt-60		1.10	+/-0.203	0.164		pCi/g							
Europium-152		13.8	+/-0.792	0.338		pCi/g							
Europium-154		1.22	+/-0.423	0.753		pCi/g							
Europium-155	U	0.0284	+/-0.170	0.320		pCi/g							
Iron-59	U	-0.0102	+/-0.161	0.311		pCi/g							
Manganese-54	U	-0.0378	+/-0.100	0.151		pCi/g							
Niobium-95	U	0.0873	+/-0.099	0.194		pCi/g							
Scandium-46	U	-0.047	+/-0.0956	0.175		pCi/g							
Silver-108m	U	-0.0352	+/-0.0616	0.0979		pCi/g							
Silver-110m	U	-0.0424	+/-0.129	0.239		pCi/g							
Sodium-22	U	0.0954	+/-0.189	0.120		pCi/g							
Zinc-65	U	0.0451	+/-0.185	0.327		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-F51 (13-16)	Project:	AMPH002
Sample ID:	433373009	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 10:25		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0332	+/-0.0946	0.219		pCi/g			MXR1	09/29/17	1234	1702974	1
Cadmium-109	U	0.150	+/-1.43	2.52		pCi/g							
Cesium-134	U	0.0736	+/-0.0687	0.139		pCi/g							
Chromium-51	U	0.0848	+/-0.534	1.01		pCi/g							
Cobalt-56	U	-0.0297	+/-0.0776	0.134		pCi/g							
Cobalt-57	UI	0.00	+/-0.229	0.296		pCi/g							
Cobalt-58	U	0.0371	+/-0.0733	0.140		pCi/g							
Cobalt-60		0.768	+/-0.130	0.0782		pCi/g							
Europium-152		9.67	+/-0.593	0.265		pCi/g							
Europium-154		0.783	+/-0.283	0.575		pCi/g							
Europium-155	U	-0.0532	+/-0.199	0.341		pCi/g							
Iron-59	U	-0.0986	+/-0.141	0.230		pCi/g							
Manganese-54	U	0.0444	+/-0.0663	0.128		pCi/g							
Niobium-95	U	0.00159	+/-0.0768	0.139		pCi/g							
Scandium-46	U	-0.0668	+/-0.0739	0.120		pCi/g							
Silver-108m	U	0.00294	+/-0.0439	0.0825		pCi/g							
Silver-110m	U	-0.0642	+/-0.0969	0.163		pCi/g							
Sodium-22	U	0.041	+/-0.143	0.0926		pCi/g							
Zinc-65	U	0.0351	+/-0.159	0.264		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-F52 (1-6)	Project:	AMPH002
Sample ID:	433373010	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 10:35		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0163	+/-0.0641	0.161		pCi/g			MXR1	09/29/17	1235	1702974	1
Cadmium-109	U	0.414	+/-1.01	1.91		pCi/g							
Cesium-134	U	0.0528	+/-0.0551	0.109		pCi/g							
Chromium-51	U	-0.441	+/-0.460	0.804		pCi/g							
Cobalt-56	U	0.0128	+/-0.0581	0.114		pCi/g							
Cobalt-57	UI	0.00	+/-0.169	0.0592		pCi/g							
Cobalt-58	U	0.039	+/-0.0546	0.113		pCi/g							
Cobalt-60		0.268	+/-0.0962	0.0962		pCi/g							
Europium-152		4.56	+/-0.439	0.188		pCi/g							
Europium-154	U	0.161	+/-0.177	0.372		pCi/g							
Europium-155	U	0.0891	+/-0.143	0.273		pCi/g							
Iron-59	U	0.00165	+/-0.110	0.212		pCi/g							
Manganese-54	U	0.0107	+/-0.050	0.0983		pCi/g							
Niobium-95	U	0.0776	+/-0.0824	0.103		pCi/g							
Scandium-46	U	-0.016	+/-0.0582	0.094		pCi/g							
Silver-108m	U	0.0171	+/-0.0364	0.0718		pCi/g							
Silver-110m	U	-0.0235	+/-0.0664	0.123		pCi/g							
Sodium-22	U	0.0538	+/-0.0621	0.130		pCi/g							
Zinc-65	U	-0.108	+/-0.162	0.233		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-F56 (1-6)	Project:	AMPH002
Sample ID:	433373011	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 10:55		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0356	+/-0.0696	0.170		pCi/g			MXR1	09/29/17	1235	1702974	1
Cadmium-109	U	0.644	+/-1.40	1.45		pCi/g							
Cesium-134	U	0.0205	+/-0.0553	0.0946		pCi/g							
Chromium-51	U	-0.0253	+/-0.329	0.633		pCi/g							
Cobalt-56	U	0.023	+/-0.0424	0.0881		pCi/g							
Cobalt-57	UI	0.00	+/-0.120	0.0465		pCi/g							
Cobalt-58	U	0.014	+/-0.0437	0.0883		pCi/g							
Cobalt-60		0.192	+/-0.113	0.0829		pCi/g							
Europium-152		3.10	+/-0.314	0.213		pCi/g							
Europium-154	U	0.247	+/-0.171	0.331		pCi/g							
Europium-155	U	0.0549	+/-0.100	0.193		pCi/g							
Iron-59	U	0.0491	+/-0.0854	0.182		pCi/g							
Manganese-54	U	0.0406	+/-0.0431	0.0912		pCi/g							
Niobium-95	U	0.0295	+/-0.0537	0.0945		pCi/g							
Scandium-46	U	0.053	+/-0.0443	0.0976		pCi/g							
Silver-108m	U	-0.0114	+/-0.0265	0.0483		pCi/g							
Silver-110m	U	-0.0142	+/-0.0512	0.0971		pCi/g							
Sodium-22	UI	0.00	+/-0.0604	0.0769		pCi/g							
Zinc-65	U	-0.0588	+/-0.126	0.192		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-F72 (1-6)	Project:	AMPH002
Sample ID:	433373012	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 11:15		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0245	+/-0.0499	0.135		pCi/g			MXR1	09/29/17	1235	1702974	1
Cadmium-109	U	-0.0987	+/-0.900	1.65		pCi/g							
Cesium-134	U	0.0127	+/-0.0578	0.107		pCi/g							
Chromium-51	U	0.00504	+/-0.363	0.706		pCi/g							
Cobalt-56	U	-0.0167	+/-0.0548	0.0957		pCi/g							
Cobalt-57	U	0.0899	+/-0.149	0.201		pCi/g							
Cobalt-58	U	0.0352	+/-0.0547	0.106		pCi/g							
Cobalt-60		0.472	+/-0.103	0.080		pCi/g							
Europium-152		5.25	+/-0.383	0.205		pCi/g							
Europium-154	UI	0.00	+/-0.232	0.407		pCi/g							
Europium-155	U	0.0557	+/-0.126	0.237		pCi/g							
Iron-59	U	0.0469	+/-0.113	0.228		pCi/g							
Manganese-54	U	0.0203	+/-0.0438	0.0849		pCi/g							
Niobium-95	U	-0.0274	+/-0.0546	0.0948		pCi/g							
Scandium-46	U	-0.017	+/-0.0483	0.0841		pCi/g							
Silver-108m	U	-0.0252	+/-0.0375	0.0583		pCi/g							
Silver-110m	U	-0.0112	+/-0.0674	0.120		pCi/g							
Sodium-22	U	0.0375	+/-0.118	0.0743		pCi/g							
Zinc-65	U	0.0309	+/-0.153	0.201		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-F76 (1-6)	Project:	AMPH002
Sample ID:	433373013	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 11:45		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0387	+/-0.0525	0.142		pCi/g			MXR1	09/29/17	1236	1702974	1
Cadmium-109	U	0.472	+/-0.751	1.41		pCi/g							
Cesium-134	U	0.0222	+/-0.0499	0.0947		pCi/g							
Chromium-51	UI	0.00	+/-0.780	0.687		pCi/g							
Cobalt-56	U	0.0114	+/-0.0503	0.0929		pCi/g							
Cobalt-57	U	0.00987	+/-0.130	0.0522		pCi/g							
Cobalt-58	U	0.00511	+/-0.0526	0.0955		pCi/g							
Cobalt-60		0.335	+/-0.109	0.0663		pCi/g							
Europium-152		5.02	+/-0.398	0.180		pCi/g							
Europium-154	U	0.222	+/-0.145	0.322		pCi/g							
Europium-155	U	0.0543	+/-0.106	0.198		pCi/g							
Iron-59	U	-0.0225	+/-0.0961	0.177		pCi/g							
Manganese-54	U	-0.0265	+/-0.0469	0.0788		pCi/g							
Niobium-95	U	0.0172	+/-0.0449	0.0857		pCi/g							
Scandium-46	U	-0.0029	+/-0.0509	0.0908		pCi/g							
Silver-108m	U	-0.00269	+/-0.0311	0.058		pCi/g							
Silver-110m	U	-0.0269	+/-0.0635	0.108		pCi/g							
Sodium-22	U	0.0808	+/-0.0505	0.113		pCi/g							
Zinc-65	U	0.0649	+/-0.128	0.227		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-F80 (1-6)	Project:	AMPH002
Sample ID:	433373014	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 12:05		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0366	+/-0.113	0.277		pCi/g			MXR1	09/29/17	1236	1702974	1
Cadmium-109	U	-0.532	+/-0.934	1.75		pCi/g							
Cesium-134	U	-0.00955	+/-0.0694	0.129		pCi/g							
Chromium-51	U	0.131	+/-0.520	0.965		pCi/g							
Cobalt-56	U	-0.00389	+/-0.075	0.140		pCi/g							
Cobalt-57	UI	0.00	+/-0.170	0.0684		pCi/g							
Cobalt-58	U	0.0231	+/-0.0667	0.134		pCi/g							
Cobalt-60		0.412	+/-0.133	0.0822		pCi/g							
Europium-152		4.65	+/-0.462	0.237		pCi/g							
Europium-154	U	0.252	+/-0.235	0.524		pCi/g							
Europium-155	U	0.0705	+/-0.137	0.270		pCi/g							
Iron-59	U	-0.0435	+/-0.129	0.249		pCi/g							
Manganese-54	U	-0.0456	+/-0.0638	0.107		pCi/g							
Niobium-95	U	-0.011	+/-0.0779	0.143		pCi/g							
Scandium-46	U	0.0774	+/-0.0736	0.159		pCi/g							
Silver-108m	U	-0.0165	+/-0.0395	0.0746		pCi/g							
Silver-110m	U	0.072	+/-0.0886	0.188		pCi/g							
Sodium-22	U	0.089	+/-0.0829	0.185		pCi/g							
Zinc-65	UI	0.00	+/-0.158	0.207		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.

Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-C46 (1-6)
Sample ID: 433373015
Matrix: Misc Solid
Collect Date: 14-SEP-17 12:30
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.00114	+/-0.0468	0.128		pCi/g			MXR1	09/29/17	1236	1702974	1
Cadmium-109	U	0.935	+/-1.46	1.16		pCi/g							
Cesium-134	U	-0.00282	+/-0.0573	0.111		pCi/g							
Chromium-51	U	0.165	+/-0.410	0.818		pCi/g							
Cobalt-56	U	0.0455	+/-0.065	0.134		pCi/g							
Cobalt-57	U	0.0248	+/-0.153	0.0534		pCi/g							
Cobalt-58	U	-0.00344	+/-0.0616	0.119		pCi/g							
Cobalt-60		0.484	+/-0.112	0.0786		pCi/g							
Europium-152		6.21	+/-0.463	0.224		pCi/g							
Europium-154	UI	0.00	+/-0.269	0.504		pCi/g							
Europium-155	U	0.0176	+/-0.117	0.216		pCi/g							
Iron-59	U	0.0334	+/-0.124	0.248		pCi/g							
Manganese-54	U	0.0951	+/-0.0753	0.0998		pCi/g							
Niobium-95	U	-0.0232	+/-0.065	0.121		pCi/g							
Scandium-46	U	0.0395	+/-0.0701	0.142		pCi/g							
Silver-108m	U	0.0248	+/-0.0731	0.0736		pCi/g							
Silver-110m	U	-0.0429	+/-0.107	0.168		pCi/g							
Sodium-22	UI	0.00	+/-0.0948	0.0964		pCi/g							
Zinc-65	U	-0.175	+/-0.159	0.204		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-C52 (1-6)	Project:	AMPH002
Sample ID:	433373016	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 12:40		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0114	+/-0.0441	0.101		pCi/g			MXR1	09/29/17	1237	1702974	1
Cadmium-109	U	-0.354	+/-0.979	1.54		pCi/g							
Cesium-134	U	0.0132	+/-0.0533	0.104		pCi/g							
Chromium-51	U	-0.263	+/-0.456	0.706		pCi/g							
Cobalt-56	U	0.000214	+/-0.0533	0.101		pCi/g							
Cobalt-57	UI	0.00	+/-0.137	0.0537		pCi/g							
Cobalt-58	U	0.0149	+/-0.0528	0.104		pCi/g							
Cobalt-60		0.469	+/-0.102	0.0713		pCi/g							
Europium-152		3.71	+/-0.343	0.200		pCi/g							
Europium-154	U	0.239	+/-0.219	0.362		pCi/g							
Europium-155	U	0.0633	+/-0.131	0.237		pCi/g							
Iron-59	U	-0.0562	+/-0.0897	0.156		pCi/g							
Manganese-54	U	0.00393	+/-0.0493	0.0845		pCi/g							
Niobium-95	U	0.0062	+/-0.0542	0.104		pCi/g							
Scandium-46	U	0.0278	+/-0.0522	0.105		pCi/g							
Silver-108m	U	-0.0128	+/-0.0367	0.0641		pCi/g							
Silver-110m	U	-0.0178	+/-0.0655	0.121		pCi/g							
Sodium-22	UI	0.00	+/-0.0774	0.0798		pCi/g							
Zinc-65	U	0.0251	+/-0.146	0.188		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-W3 (1-6) Project: AMPH002
Sample ID: 433373017 Client ID: AMPH002
Matrix: Misc Solid
Collect Date: 14-SEP-17 13:25
Receive Date: 21-SEP-17
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.023	+/-0.0451	0.0798		pCi/g			MXR1	09/29/17	1240	1702974	1
Cadmium-109	U	0.217	+/-0.861	1.61		pCi/g							
Cesium-134	U	0.00512	+/-0.0541	0.105		pCi/g							
Chromium-51	U	-0.409	+/-0.442	0.783		pCi/g							
Cobalt-56	U	-0.0156	+/-0.0593	0.110		pCi/g							
Cobalt-57	UI	0.00	+/-0.173	0.0566		pCi/g							
Cobalt-58	U	-0.0181	+/-0.054	0.101		pCi/g							
Cobalt-60		0.750	+/-0.127	0.0636		pCi/g							
Europium-152		6.56	+/-0.463	0.204		pCi/g							
Europium-154	U	0.286	+/-0.172	0.383		pCi/g							
Europium-155	U	0.015	+/-0.134	0.245		pCi/g							
Iron-59	U	-0.0118	+/-0.104	0.197		pCi/g							
Manganese-54	U	-0.0122	+/-0.0459	0.0862		pCi/g							
Niobium-95	U	0.0176	+/-0.057	0.106		pCi/g							
Scandium-46	U	0.00602	+/-0.0564	0.109		pCi/g							
Silver-108m	U	-0.00337	+/-0.0289	0.0546		pCi/g							
Silver-110m	U	-0.0138	+/-0.0771	0.144		pCi/g							
Sodium-22	U	0.103	+/-0.061	0.136		pCi/g							
Zinc-65	U	0.237	+/-0.130	0.284		pCi/g							
Rad Liquid Scintillation Analysis													
LSC, Tritium Dist, Solid "As Received"													
Tritium	U	4.25	+/-2.73	4.45	6.00	pCi/g			BXM4	09/29/17	0841	1703187	2
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	7.13	+/-7.17	11.1	20.0	pCi/g			TXJ1	10/09/17	1328	1703166	3

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	
2	EPA 906.0 Modified	
3	DOE RESL Fe-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-W3 (1-6)	Project:	AMPH002
Sample ID:	433373017	Client ID:	AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst Date	Time	Batch	Method

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			73.6	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-W5 (1-6)	Project:	AMPH002
Sample ID:	433373018	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 13:35		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.036	+/-0.0572	0.148		pCi/g			MXR1	09/29/17	1240	1702974	1
Cadmium-109	U	0.456	+/-0.689	1.23		pCi/g							
Cesium-134	U	-0.000697	+/-0.0393	0.0766		pCi/g							
Chromium-51	U	-0.231	+/-0.370	0.668		pCi/g							
Cobalt-56	U	0.00217	+/-0.048	0.0912		pCi/g							
Cobalt-57	U	0.0987	+/-0.123	0.161		pCi/g							
Cobalt-58	U	0.0347	+/-0.0474	0.0969		pCi/g							
Cobalt-60		0.440	+/-0.0827	0.0565		pCi/g							
Europium-152		4.26	+/-0.339	0.182		pCi/g							
Europium-154	U	0.0936	+/-0.222	0.199		pCi/g							
Europium-155	U	-0.0474	+/-0.0952	0.168		pCi/g							
Iron-59	U	0.0231	+/-0.0962	0.184		pCi/g							
Manganese-54	U	0.0312	+/-0.0707	0.0747		pCi/g							
Niobium-95	U	-0.0325	+/-0.0516	0.0854		pCi/g							
Scandium-46	U	0.0126	+/-0.047	0.0921		pCi/g							
Silver-108m	U	0.012	+/-0.027	0.0537		pCi/g							
Silver-110m	U	0.00865	+/-0.0599	0.116		pCi/g							
Sodium-22	U	0.0331	+/-0.0783	0.110		pCi/g							
Zinc-65	U	-0.0116	+/-0.111	0.180		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-W11 (1-6)	Project:	AMPH002
Sample ID:	433373019	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 14:05		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.031	+/-0.043	0.0448		pCi/g			MXR1	09/29/17	1240	1702974	1
Cadmium-109	U	0.182	+/-1.08	1.96		pCi/g							
Cesium-134	U	0.0153	+/-0.0628	0.119		pCi/g							
Chromium-51	U	0.235	+/-0.429	0.833		pCi/g							
Cobalt-56	U	0.00824	+/-0.0667	0.123		pCi/g							
Cobalt-57	UI	0.00	+/-0.105	0.220		pCi/g							
Cobalt-58	U	0.0207	+/-0.0686	0.129		pCi/g							
Cobalt-60		0.524	+/-0.105	0.0843		pCi/g							
Europium-152		5.34	+/-0.466	0.242		pCi/g							
Europium-154	UI	0.00	+/-0.255	0.530		pCi/g							
Europium-155	U	0.00646	+/-0.148	0.264		pCi/g							
Iron-59	U	-0.0225	+/-0.128	0.240		pCi/g							
Manganese-54	U	-0.0763	+/-0.0577	0.0878		pCi/g							
Niobium-95	U	0.00937	+/-0.0644	0.120		pCi/g							
Scandium-46	U	0.00659	+/-0.0642	0.119		pCi/g							
Silver-108m	U	0.0108	+/-0.0385	0.0716		pCi/g							
Silver-110m	U	0.0213	+/-0.0809	0.153		pCi/g							
Sodium-22	UI	0.00	+/-0.090	0.0897		pCi/g							
Zinc-65	U	0.0568	+/-0.145	0.257		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-W17 (1-6) Project: AMPH002
Sample ID: 433373020 Client ID: AMPH002
Matrix: Misc Solid
Collect Date: 14-SEP-17 14:25
Receive Date: 21-SEP-17
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0479	+/-0.0541	0.0427		pCi/g			MXR1	09/29/17	1323	1702974	1
Cadmium-109	U	-0.394	+/-1.15	2.09		pCi/g							
Cesium-134	U	0.0431	+/-0.0637	0.126		pCi/g							
Chromium-51	U	-0.117	+/-0.459	0.875		pCi/g							
Cobalt-56	U	0.00779	+/-0.0651	0.109		pCi/g							
Cobalt-57	UI	0.00	+/-0.188	0.070		pCi/g							
Cobalt-58	U	0.00584	+/-0.0593	0.111		pCi/g							
Cobalt-60		0.901	+/-0.139	0.0823		pCi/g							
Europium-152		6.90	+/-0.526	0.234		pCi/g							
Europium-154	UI	0.00	+/-0.269	0.408		pCi/g							
Europium-155	U	0.0323	+/-0.159	0.297		pCi/g							
Iron-59	U	0.0288	+/-0.133	0.240		pCi/g							
Manganese-54	U	0.0421	+/-0.0601	0.110		pCi/g							
Niobium-95	U	0.035	+/-0.0774	0.123		pCi/g							
Scandium-46	U	-0.0136	+/-0.0652	0.116		pCi/g							
Silver-108m	U	-0.0297	+/-0.0409	0.0732		pCi/g							
Silver-110m	U	0.0317	+/-0.0803	0.154		pCi/g							
Sodium-22	UI	0.00	+/-0.095	0.0905		pCi/g							
Zinc-65	U	-0.0238	+/-0.139	0.233		pCi/g							
Rad Liquid Scintillation Analysis													
LSC, Tritium Dist, Solid "As Received"													
Tritium		5.28	+/-2.73	4.36	6.00	pCi/g			BXM4	09/29/17	0943	1703187	2
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	0.486	+/-7.63	12.4	20.0	pCi/g			TXJ1	10/09/17	1359	1703166	3

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0854	1702937

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	
2	EPA 906.0 Modified	
3	DOE RESL Fe-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits

GEL LABORATORIES LLC
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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-W17 (1-6)	Project:	AMPH002
Sample ID:	433373020	Client ID:	AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			70.8	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
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Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-W19 (1-6) Project: AMPH002
Sample ID: 433373021 Client ID: AMPH002
Matrix: Misc Solid
Collect Date: 14-SEP-17 14:35
Receive Date: 21-SEP-17
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0238	+/-0.060	0.167		pCi/g			MXR1	09/29/17	1321	1702977	1
Cadmium-109	U	-0.785	+/-0.773	1.38		pCi/g							
Cesium-134	U	0.0642	+/-0.052	0.113		pCi/g							
Chromium-51	U	-0.218	+/-0.365	0.674		pCi/g							
Cobalt-56	U	-0.0179	+/-0.0568	0.106		pCi/g							
Cobalt-57	UI	0.00	+/-0.0965	0.196		pCi/g							
Cobalt-58	U	0.0414	+/-0.0563	0.118		pCi/g							
Cobalt-60		0.766	+/-0.137	0.0703		pCi/g							
Europium-152		4.37	+/-0.438	0.225		pCi/g							
Europium-154	U	0.102	+/-0.149	0.324		pCi/g							
Europium-155	U	0.00664	+/-0.117	0.222		pCi/g							
Iron-59	U	0.0492	+/-0.121	0.247		pCi/g							
Manganese-54	U	0.0197	+/-0.0442	0.092		pCi/g							
Niobium-95	U	-0.0242	+/-0.0681	0.118		pCi/g							
Scandium-46	U	-0.0103	+/-0.0597	0.113		pCi/g							
Silver-108m	U	-0.00366	+/-0.0327	0.0624		pCi/g							
Silver-110m	U	0.00734	+/-0.0793	0.154		pCi/g							
Sodium-22	U	0.0292	+/-0.0536	0.114		pCi/g							
Zinc-65	U	-0.0788	+/-0.158	0.238		pCi/g							
Rad Liquid Scintillation Analysis													
LSC, Tritium Dist, Solid "As Received"													
Tritium	U	3.97	+/-2.66	4.35	6.00	pCi/g			BXM4	09/28/17	1524	1703187	2
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	4.11	+/-7.46	11.7	20.0	pCi/g			TXJ1	10/09/17	1430	1703166	3

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	
2	EPA 906.0 Modified	
3	DOE RESL Fe-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-W19 (1-6)	Project:	AMPH002
Sample ID:	433373021	Client ID:	AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			75.9	(15%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

QC Summary

Report Date: October 26, 2017

Ameriphysics, LLC
911 Cross Park Dr.
Knoxville, Tennessee

Contact: **Mr. Paul Jones**

Workorder: **433373**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch 1702974											
QC1203880734 433373001 DUP											
Antimony-124	U	-0.00626	U	0.00759	pCi/g	N/A		N/A	MXR1	09/29/17	13:23
	Uncertainty	+/-0.0786		+/-0.0426							
Cadmium-109	U	-0.0642	U	0.820	pCi/g	N/A		N/A			
	Uncertainty	+/-0.962		+/-1.74							
Cesium-134	U	0.0385	U	-0.0139	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0683		+/-0.0511							
Chromium-51	U	-0.0545	U	-0.145	pCi/g	N/A		N/A			
	Uncertainty	+/-0.485		+/-0.430							
Cobalt-56	U	0.0278	U	0.00348	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0711		+/-0.0555							
Cobalt-57	UI	0.00	U	0.0409	pCi/g	N/A		N/A			
	Uncertainty	+/-0.136		+/-0.175							
Cobalt-58	U	0.00269	U	-0.00399	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0647		+/-0.0541							
Cobalt-60		0.592		0.567	pCi/g	4.35		(0%-20%)			
	Uncertainty	+/-0.114		+/-0.141							
Europium-152		8.91		8.66	pCi/g	2.86		(0%-20%)			
	Uncertainty	+/-0.555		+/-0.438							
Europium-154	UI	0.00		0.891	pCi/g	18.4		(0% - 100%)			
	Uncertainty	+/-0.252		+/-0.215							
Europium-155	U	-0.0601	U	0.0274	pCi/g	N/A		N/A			
	Uncertainty	+/-0.141		+/-0.150							
Iron-59	U	0.0341	U	-0.0692	pCi/g	N/A		N/A			
	Uncertainty	+/-0.146		+/-0.111							
Manganese-54	U	0.0427	U	0.0253	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0611		+/-0.0479							
Niobium-95	U	-0.0208	U	0.00217	pCi/g	N/A		N/A			
	Uncertainty	+/-0.081		+/-0.0551							

QC Summary

Workorder: **433373**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1702974										
Scandium-46	U	-0.012	U	0.0196	pCi/g	N/A		N/A	MXR1	09/29/17 13:23
	Uncertainty	+/-0.0688		+/-0.0514						
Silver-108m	U	-0.0319	U	0.00677	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0374		+/-0.0326						
Silver-110m	U	-0.0679	U	-0.00408	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0868		+/-0.0652						
Sodium-22	UI	0.00	UI	0.00	pCi/g	N/A		N/A		
	Uncertainty	+/-0.088		+/-0.108						
Zinc-65	U	-0.0664	UI	0.00	pCi/g	N/A		N/A		
	Uncertainty	+/-0.160		+/-0.175						
QC1203880735 LCS										
Americium-241	488			538	pCi/g		110	(75%-125%)		09/29/17 13:42
	Uncertainty			+/-4.40						
Cesium-137	175			182	pCi/g		104	(75%-125%)		
	Uncertainty			+/-3.03						
Antimony-124			U	0.552	pCi/g					
	Uncertainty			+/-1.01						
Cadmium-109				225	pCi/g					
	Uncertainty			+/-15.5						
Cesium-134			U	0.341	pCi/g					
	Uncertainty			+/-0.556						
Chromium-51			U	0.0318	pCi/g					
	Uncertainty			+/-3.41						
Cobalt-56			U	-0.129	pCi/g					
	Uncertainty			+/-0.613						
Cobalt-57				0.451	pCi/g					
	Uncertainty			+/-0.383						
Cobalt-58			U	-0.0595	pCi/g					
	Uncertainty			+/-0.528						
Cobalt-60	141			140	pCi/g		99.4	(75%-125%)		
	Uncertainty			+/-3.23						

QC Summary

Workorder: 433373

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1702974										
Europium-152			U	0.295	pCi/g				MXR1	09/29/17 13:42
	Uncertainty			+/-1.19						
Europium-154			U	0.861	pCi/g					
	Uncertainty			+/-0.853						
Europium-155			U	-0.0162	pCi/g					
	Uncertainty			+/-0.762						
Iron-59			U	1.40	pCi/g					
	Uncertainty			+/-1.28						
Manganese-54			U	-0.0552	pCi/g					
	Uncertainty			+/-0.583						
Niobium-95			U	0.120	pCi/g					
	Uncertainty			+/-0.482						
Scandium-46			U	0.549	pCi/g					
	Uncertainty			+/-0.639						
Silver-108m			U	0.236	pCi/g					
	Uncertainty			+/-0.445						
Silver-110m			U	-0.0476	pCi/g					
	Uncertainty			+/-0.852						
Sodium-22			U	0.306	pCi/g					
	Uncertainty			+/-0.300						
Zinc-65			U	1.12	pCi/g					
	Uncertainty			+/-1.35						
QC1203880733 MB										
Antimony-124			U	0.0497	pCi/g					09/29/17 13:25
	Uncertainty			+/-0.0621						
Cadmium-109			UI	0.00	pCi/g					
	Uncertainty			+/-0.538						
Cesium-134			U	0.0072	pCi/g					
	Uncertainty			+/-0.0215						
Chromium-51			U	-0.0653	pCi/g					
	Uncertainty			+/-0.143						

QC Summary

Workorder: **433373**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch 1702974											
Cobalt-56			U	-0.00046	pCi/g				MXR1	09/29/17	13:25
	Uncertainty			+/-0.0219							
Cobalt-57			U	0.00264	pCi/g						
	Uncertainty			+/-0.012							
Cobalt-58			U	-0.02	pCi/g						
	Uncertainty			+/-0.0233							
Cobalt-60			U	-9.98E-05	pCi/g						
	Uncertainty			+/-0.0189							
Europium-152			U	-0.0529	pCi/g						
	Uncertainty			+/-0.0663							
Europium-154			U	-0.0131	pCi/g						
	Uncertainty			+/-0.0447							
Europium-155			U	0.0175	pCi/g						
	Uncertainty			+/-0.0501							
Iron-59			U	0.00115	pCi/g						
	Uncertainty			+/-0.0359							
Manganese-54			U	0.00139	pCi/g						
	Uncertainty			+/-0.0224							
Niobium-95			U	-0.00571	pCi/g						
	Uncertainty			+/-0.0192							
Scandium-46			U	-0.0111	pCi/g						
	Uncertainty			+/-0.0177							
Silver-108m			U	-0.00784	pCi/g						
	Uncertainty			+/-0.0184							
Silver-110m			U	-0.0156	pCi/g						
	Uncertainty			+/-0.0286							
Sodium-22			U	-0.0046	pCi/g						
	Uncertainty			+/-0.0157							
Zinc-65			U	-0.0154	pCi/g						
	Uncertainty			+/-0.049							

QC Summary

Workorder: **433373**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch 1702977											
QC1203880741 433373021 DUP											
Antimony-124	U	0.0238	U	-0.055	pCi/g	N/A		N/A	MXR1	09/29/17	19:17
	Uncertainty	+/-0.060		+/-0.0623							
Cadmium-109	U	-0.785	U	0.494	pCi/g	N/A		N/A			
	Uncertainty	+/-0.773		+/-0.762							
Cesium-134	U	0.0642	U	-0.0256	pCi/g	N/A		N/A			
	Uncertainty	+/-0.052		+/-0.0585							
Chromium-51	U	-0.218	U	-0.0966	pCi/g	N/A		N/A			
	Uncertainty	+/-0.365		+/-0.452							
Cobalt-56	U	-0.0179	U	0.0378	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0568		+/-0.0725							
Cobalt-57	UI	0.00	UI	0.00	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0965		+/-0.155							
Cobalt-58	U	0.0414	U	0.089	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0563		+/-0.119							
Cobalt-60		0.766		0.636	pCi/g	18.6		(0%-20%)			
	Uncertainty	+/-0.137		+/-0.144							
Europium-152		4.37		4.78	pCi/g	8.83		(0%-20%)			
	Uncertainty	+/-0.438		+/-0.411							
Europium-154	U	0.102	U	0.259	pCi/g	N/A		N/A			
	Uncertainty	+/-0.149		+/-0.283							
Europium-155	U	0.00664	U	-0.0178	pCi/g	N/A		N/A			
	Uncertainty	+/-0.117		+/-0.113							
Iron-59	U	0.0492	U	0.0201	pCi/g	N/A		N/A			
	Uncertainty	+/-0.121		+/-0.152							
Manganese-54	U	0.0197	U	-0.0151	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0442		+/-0.0671							
Niobium-95	U	-0.0242	U	0.0544	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0681		+/-0.0588							
Scandium-46	U	-0.0103	U	-0.0727	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0597		+/-0.081							

QC Summary

Workorder: **433373**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch 1702977											
Silver-108m	U	-0.00366	U	-0.0169	pCi/g	N/A		N/A	MXR1	09/29/17	19:17
	Uncertainty	+/-0.0327		+/-0.0426							
Silver-110m	U	0.00734	U	0.0633	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0793		+/-0.162							
Sodium-22	U	0.0292	U	0.0913	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0536		+/-0.0999							
Zinc-65	U	-0.0788	U	-0.0295	pCi/g	N/A		N/A			
	Uncertainty	+/-0.158		+/-0.169							
QC1203880742 LCS											
Americium-241	488			542	pCi/g		111	(75%-125%)		09/29/17	14:02
	Uncertainty			+/-5.03							
Cesium-137	175			183	pCi/g		104	(75%-125%)			
	Uncertainty			+/-3.08							
Antimony-124			U	0.185	pCi/g						
	Uncertainty			+/-0.558							
Cadmium-109				231	pCi/g						
	Uncertainty			+/-14.7							
Cesium-134			U	0.225	pCi/g						
	Uncertainty			+/-0.614							
Chromium-51			U	0.731	pCi/g						
	Uncertainty			+/-3.54							
Cobalt-56			U	-0.219	pCi/g						
	Uncertainty			+/-0.592							
Cobalt-57				0.586	pCi/g						
	Uncertainty			+/-0.291							
Cobalt-58			U	-0.238	pCi/g						
	Uncertainty			+/-0.514							
Cobalt-60	141			140	pCi/g		99	(75%-125%)			
	Uncertainty			+/-3.24							
Europium-152			U	0.762	pCi/g						
	Uncertainty			+/-1.20							

QC Summary

Workorder: 433373

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1702977										
Europium-154			U	-0.108	pCi/g				MXR1	09/29/17 14:02
	Uncertainty			+/-0.937						
Europium-155			U	-0.0348	pCi/g					
	Uncertainty			+/-0.752						
Iron-59			U	0.0971	pCi/g					
	Uncertainty			+/-1.27						
Manganese-54			U	0.071	pCi/g					
	Uncertainty			+/-0.533						
Niobium-95			U	0.103	pCi/g					
	Uncertainty			+/-0.461						
Scandium-46			U	-0.138	pCi/g					
	Uncertainty			+/-0.627						
Silver-108m			U	-0.00623	pCi/g					
	Uncertainty			+/-0.442						
Silver-110m			U	0.634	pCi/g					
	Uncertainty			+/-0.831						
Sodium-22			U	-0.0379	pCi/g					
	Uncertainty			+/-0.329						
Zinc-65			U	2.17	pCi/g					
	Uncertainty			+/-1.98						
QC1203880740 MB										
Antimony-124			U	-0.00354	pCi/g					09/29/17 19:16
	Uncertainty			+/-0.0593						
Cadmium-109			U	-0.469	pCi/g					
	Uncertainty			+/-0.394						
Cesium-134			U	0.0041	pCi/g					
	Uncertainty			+/-0.016						
Chromium-51			U	0.0847	pCi/g					
	Uncertainty			+/-0.167						
Cobalt-56			U	0.00331	pCi/g					
	Uncertainty			+/-0.0203						

QC Summary

Workorder: **433373**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch 1702977											
Cobalt-57			U	-0.00441	pCi/g				MXR1	09/29/17	19:16
	Uncertainty			+/-0.0133							
Cobalt-58			U	0.0107	pCi/g						
	Uncertainty			+/-0.0172							
Cobalt-60			U	-0.00861	pCi/g						
	Uncertainty			+/-0.0218							
Europium-152			U	0.0216	pCi/g						
	Uncertainty			+/-0.0536							
Europium-154			U	-0.0318	pCi/g						
	Uncertainty			+/-0.044							
Europium-155			U	-0.0252	pCi/g						
	Uncertainty			+/-0.0528							
Iron-59			U	-0.0384	pCi/g						
	Uncertainty			+/-0.0335							
Manganese-54			U	0.0125	pCi/g						
	Uncertainty			+/-0.0199							
Niobium-95			U	0.0158	pCi/g						
	Uncertainty			+/-0.0181							
Scandium-46			U	0.00451	pCi/g						
	Uncertainty			+/-0.0162							
Silver-108m			U	0.0286	pCi/g						
	Uncertainty			+/-0.0144							
Silver-110m			U	-0.0195	pCi/g						
	Uncertainty			+/-0.0363							
Sodium-22			U	-0.0121	pCi/g						
	Uncertainty			+/-0.0149							
Zinc-65			U	0.00266	pCi/g						
	Uncertainty			+/-0.042							

QC Summary

Workorder: 433373

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Liquid Scintillation											
Batch 1703166											
QC1203881234 433373007 DUP											
Iron-55	U	5.50	U	3.76	pCi/g	N/A		N/A	TXJ1	10/09/17	15:33
	Uncertainty	+/-7.21		+/-6.58							
QC1203881235 LCS											
Iron-55	231			234	pCi/g		101	(75%-125%)		10/09/17	16:04
	Uncertainty			+/-12.8							
QC1203881233 MB											
Iron-55			U	2.46	pCi/g					10/09/17	15:01
	Uncertainty			+/-6.08							
Batch 1703187											
QC1203881266 433373007 DUP											
Tritium		5.19		5.09	pCi/g	1.97		(0% - 100%)	BXM4	09/29/17	10:46
	Uncertainty	+/-2.74		+/-2.76							
QC1203881268 LCS											
Tritium	33.8			28.2	pCi/g		83.6	(75%-125%)		09/28/17	19:33
	Uncertainty			+/-3.52							
QC1203881265 MB											
Tritium			U	1.47	pCi/g					09/28/17	16:26
	Uncertainty			+/-2.59							
QC1203881267 433373007 MS											
Tritium	72.0	5.19		66.8	pCi/g		85.6	(75%-125%)		09/28/17	18:31
	Uncertainty	+/-2.74		+/-7.96							

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded
- J Value is estimated
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- M M if above MDC and less than LLD

QC Summary

Workorder: **433373**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

M	REMP Result > MDC/CL and < RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UI	Gamma Spectroscopy--Uncertain identification
UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Ameriphysics, LLC	Chain of Custody (COC)			
QA Program Form	Doc	QAF 14-1	Rev #	1
	Date	2/10/2015	Form #	1

Section 1

Project Number: **1132** Project Name: **UT Health**

Send Report To: **Ameriphysics, LLC**

Address: **9111 Cross Park Drive, Suite D200, Knoxville, TN 37923**

Phone: **(865)705-1136** Fax:

Sampler (Print Name): **Robbie Hansen**

Shipment Method: **FedEx** Airbill Number:

Laboratory Receiving: **GEL Laboratories**

Section 4

433373

Page 1 of 2

Purchase Order #: N/A

Batch #: 1132-001

Section 2

Sample ID	Sample Description	Sample Date	Sample Time	Sample Matrix	Sample Volume	Cont. Type	Cont. Quantity	Gamm Spec (Na-22, Sc-46, Cr-51, Mn-54, Fe-59, Co-56, Co-57, Co-58, Co-60, Zn-65, Nb-95, Ag-108m, Ag-110M, Cd-109, Sb-124, Cs-134, Eu-152, Eu-154, and Eu-155	All True Positives	H3 & Fe55			Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab
1132-F16 (1-6)	Concrete Sample	9/14/17	8:15	S	0.5 L	P	1	X	X					
1132-F18 (1-6)	Concrete Sample	9/14/17	8:35	S	0.5 L	P	1	X	X					
1132-F20 (1-6)	Concrete Sample	9/14/17	9:00	S	0.5 L	P	1	X	X					
1132-F25 (1-6)	Concrete Sample	9/14/17	9:25	S	0.5 L	P	1	X	X					
1132-F46 (1-6)	Concrete Sample	9/14/17	9:45	S	0.5 L	P	1	X	X					
1132-F46 (7-12)	Concrete Sample	9/14/17	9:55	S	0.5 L	P	1	X	X					
1132-F51 (1-6)	Concrete Sample	9/14/17	10:10	S	0.5 L	P	1	X	X	X				
1132-F51 (7-12)	Concrete Sample	9/14/17	10:20	S	0.5 L	P	1	X	X					

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
[signature]	[signature]	9/21/17	9505
Relinquished by: (Signature)	**Received by: (Signature)**	**Date:**	**Time:**
Relinquished by: (Signature)	**Received by: (Signature)**	**Date:**	**Time:**

Sample Custodian Remarks (Completed By laboratory):

QA/QC level	Turnaround	Sample Receipt	
Level I	Routine	Total # Containers Received?	
Level II	24 Hour	COC Seals Present?	
Level III	1 Week	COC Seals Intact?	
Other	Other:_____	Received Containers Intact?	
		Temperature?	

Ameriphysics, LLC	Chain of Custody (COC)			
QA Program Form	Doc	QAF 14-1	Rev #	1
	Date	2/10/2015	Form #	1

SUPPLEMENTAL SECTION 2 Page 2 of 2 Batch #: 1132-001

Section 2

Sample ID	Sample Description	Sample Date	Sample Time	Sample Matrix	Sample Volume	Cont. Type	Cont. Quantity	Refer to Page 1 for Analysis Requested					Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab
1132-F51 (13-16)	Concrete Sample	9/14/17	10:25	S	0.5 L	P	1	X	X					
1132-F52 (1-6)	Concrete Sample	9/14/17	10:35	S	0.5 L	P	1	X	X					
1132-F56 (1-6)	Concrete Sample	9/14/17	10:55	S	0.5 L	P	1	X	X					
1132-F72 (1-6)	Concrete Sample	9/14/17	11:15	S	0.5 L	P	1	X	X					
1132-F76 (1-6)	Concrete Sample	9/14/17	11:45	S	0.5 L	P	1	X	X					
1132-F80 (1-6)	Concrete Sample	9/14/17	12:05	S	0.5 L	P	1	X	X					
1132-C46 (1-6	Concrete Sample	9/14/17	12:30	S	0.5 L	P	1	X	X					
1132-C52 (1-6)	Concrete Sample	9/14/17	12:40	S	0.5 L	P	1	X	X					
1132-W3 (1-6)	Concrete Sample	9/14/17	13:25	S	0.5 L	P	1	X	X	X				
1132-W5 (1-6)	Concrete Sample	9/14/17	13:35	S	0.5 L	P	1	X	X					
1132-W11 (1-6)	Concrete Sample	9/14/17	14:05	S	0.5 L	P	1	X	X					
1132-W17 (1-6)	Concrete Sample	9/14/17	14:25	S	0.5 L	P	1	X	X	X				
1132-W19 (1-6)	Concrete Sample	9/14/17	14:35	S	0.5 L	P	1	X	X	X				

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client:	**SDG/AR/COC/Work Order:**
Received By: Stacy Boone	**Date Received:** 21-SEPT-17
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 7877 8470 3300 - 21c 7877 8470 3310 - 21c

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
COC/Samples marked or classified as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): 0 CPM / mR/Hr **Classified as: Rad 1 Rad 2 Rad 3**
Is package, COC, and/or Samples marked HAZ?		✓	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP:_____
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR3-17 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?		✓		Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	If Yes, Are Encores or Soil Kits present? Yes___ No___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes No___ N/A (If unknown, select No) VOA vials free of headspace? Yes No___ N/A Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials _____ Date 9/21/17 Page 1 of 1

GL-CHL-SR-001 Rev 5

Subject: Re: Questions on detected radionuclides
From: Edie Kent <emk@gel.com>
Date: 10/26/2017 1:19 PM
To: Tim Pratt <tpratt@ameriphysics.com>
CC: Nancy Mattern <Nancy.Mattern@gel.com>

Tim:

The Na-22 and Cd-109 results were intended to be rejected but were not qualified properly. The Co-57 was a false positive and should have been reported as rejected. We are in the process of correcting this and will issue a revised report.

Edie

On 10/25/2017 2:54 PM, Tim Pratt wrote:

> Edie,
>
> The ones I question are Sample 1132-F20 (1-6) with the Na-22; Sample 1132-W5D (1-6) with the Cd-109; and Samples 1132-F52 (1-6), 1132-F56 (1-6), 1132-C52 (1-6), 1132-W3 (1-6), and 1132-W17 (1-6) with the Co-57.
>
> As I mentioned, with the short relatively short half-lives of these radionuclides and the time that has elapsed since this place was operational (2001), there is very little chance that these are really there.
>
> Thanks,
>
> Tim
>
> Timothy J. Pratt
> Corporate Radiation Safety Officer
> Ameriphysics LLC
> 9111 Cross Park Drive, Suite D200
> Knoxville, TN 37923
> Office: 865-470-4171
> Cell: 865-386-8066
> Fax: 865-470-4179

--

Edith M. Kent
Project Manager

GEL Laboratories LLC

2040 Savage Road, Charleston, SC 29407 | PO Box 30712, Charleston, SC 29417
Office Direct: 843.769.7385 | Office Main: 843.556.8171 | Fax: 843.766.1178
E-Mail: emk@gel.com | Website: www.gel.com

Environmental | Engineering | Surveying | Analytical Testing

List of current GEL Certifications as of 10 October 2017

State	Certification
Alaska	UST−0110
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
Delaware	SC00012
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−15−00283, P330−15−00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA170010
Maryland	270
Massachusetts	M−SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122018−1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R−158
Oklahoma	9904
Pennsylvania NELAP	68−00485
Puerto Rico	SC00012
S.Carolina Radchem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−17−12
Utah NELAP	SC000122017−23
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404

Product: **Dry Weight**
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 21
Preparation Batch: 1702937

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
433373001	1132-F16 (1-6)
433373002	1132-F18 (1-6)
433373003	1132-F20 (1-6)
433373004	1132-F25 (1-6)
433373005	1132-F46 (1-6)
433373006	1132-F46 (7-12)
433373007	1132-F51 (1-6)
433373008	1132-F51 (7-12)
433373009	1132-F51 (13-16)
433373010	1132-F52 (1-6)
433373011	1132-F56 (1-6)
433373012	1132-F72 (1-6)
433373013	1132-F76 (1-6)
433373014	1132-F80 (1-6)
433373015	1132-C46 (1-6)
433373016	1132-C52 (1-6)
433373017	1132-W3 (1-6)
433373018	1132-W5 (1-6)
433373019	1132-W11 (1-6)
433373020	1132-W17 (1-6)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Dry Weight**
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 21
Preparation Batch: 1702947

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The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
433373021	1132-W19 (1-6)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Gammaspec, Gamma, Solid - Client List**
Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Analytical Procedure: GL-RAD-A-013 REV# 27
Analytical Batch: 1702974

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 21
Preparation Batch: 1702937

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
433373001	1132-F16 (1-6)
433373002	1132-F18 (1-6)
433373003	1132-F20 (1-6)
433373004	1132-F25 (1-6)
433373005	1132-F46 (1-6)
433373006	1132-F46 (7-12)
433373007	1132-F51 (1-6)
433373008	1132-F51 (7-12)
433373009	1132-F51 (13-16)
433373010	1132-F52 (1-6)
433373011	1132-F56 (1-6)
433373012	1132-F72 (1-6)
433373013	1132-F76 (1-6)
433373014	1132-F80 (1-6)
433373015	1132-C46 (1-6)
433373016	1132-C52 (1-6)
433373017	1132-W3 (1-6)
433373018	1132-W5 (1-6)
433373019	1132-W11 (1-6)
433373020	1132-W17 (1-6)
1203880733	Method Blank (MB)
1203880734	433373001(1132-F16 (1-6)) Sample Duplicate (DUP)
1203880735	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

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Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to high counting uncertainty.	Chromium-51	433373013	1132-F76 (1-6)
		Cobalt-57	433373004	1132-F25 (1-6)
			433373010	1132-F52 (1-6)
			433373011	1132-F56 (1-6)
			433373016	1132-C52 (1-6)
			433373017	1132-W3 (1-6)
			433373020	1132-W17 (1-6)
		Cobalt-58	433373006	1132-F46 (7-12)
		Europium-154	433373012	1132-F72 (1-6)
		Sodium-22	433373011	1132-F56 (1-6)
UI	Results are considered a false positive due to high peak-width.		433373016	1132-C52 (1-6)
			433373020	1132-W17 (1-6)
UI	Results are considered a false positive due to interference.	Cobalt-57	433373008	1132-F51 (7-12)
			433373014	1132-F80 (1-6)
		Sodium-22	433373003	1132-F20 (1-6)
			433373004	1132-F25 (1-6)
			433373015	1132-C46 (1-6)
			433373019	1132-W11 (1-6)
			1203880734	1132-F16 (1-6)(433373001DUP)
UI	Results are considered a false positive due to low abundance.	Cobalt-57	433373001	1132-F16 (1-6)

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			433373003	1132-F20 (1-6)
			433373005	1132-F46 (1-6)
			433373006	1132-F46 (7-12)
			433373007	1132-F51 (1-6)
			433373009	1132-F51 (13-16)
			433373019	1132-W11 (1-6)
		Europium-154	433373001	1132-F16 (1-6)
			433373003	1132-F20 (1-6)
			433373004	1132-F25 (1-6)
			433373015	1132-C46 (1-6)
			433373019	1132-W11 (1-6)
			433373020	1132-W17 (1-6)
		Sodium-22	433373001	1132-F16 (1-6)
			433373002	1132-F18 (1-6)
			433373005	1132-F46 (1-6)
			433373006	1132-F46 (7-12)
			433373007	1132-F51 (1-6)
		Zinc-65	1203880734	1132-F16 (1-6)(433373001DUP)
UI	Results are considered a false positive due to no valid peak.	Cadmium-109	1203880733	MB for batch 1702974
		Zinc-65	433373014	1132-F80 (1-6)

Product: **Gammaspec, Gamma, Solid - Client List**
Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Analytical Procedure: GL-RAD-A-013 REV# 27
Analytical Batch: 1702977

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 21
Preparation Batch: 1702947

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
433373021	1132-W19 (1-6)
1203880740	Method Blank (MB)
1203880741	433373021(1132-W19 (1-6)) Sample Duplicate (DUP)
1203880742	Laboratory Control Sample (LCS)

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The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to high counting uncertainty.	Cobalt-57	1203880741	1132-W19 (1-6)(433373021DUP)
UI	Results are considered a false positive due to low abundance.		433373021	1132-W19 (1-6)

Product: **Liquid Scint Fe55, Solid**
Analytical Method: DOE RESL Fe-1, Modified
Analytical Procedure: GL-RAD-A-040 REV# 13
Analytical Batch: 1703166

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 21
Preparation Batches: 1702937 and 1702947

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
433373007	1132-F51 (1-6)
433373017	1132-W3 (1-6)
433373020	1132-W17 (1-6)
433373021	1132-W19 (1-6)
1203881233	Method Blank (MB)
1203881234	433373007(1132-F51 (1-6)) Sample Duplicate (DUP)
1203881235	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

Product: **LSC, Tritium Dist, Solid**
Analytical Method: EPA 906.0 Modified
Analytical Procedure: GL-RAD-A-002 REV# 22
Analytical Batch: 1703187

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
433373007	1132-F51 (1-6)
433373017	1132-W3 (1-6)
433373020	1132-W17 (1-6)
433373021	1132-W19 (1-6)
1203881265	Method Blank (MB)
1203881266	433373007(1132-F51 (1-6)) Sample Duplicate (DUP)
1203881267	433373007(1132-F51 (1-6)) Matrix Spike (MS)
1203881268	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
Samples 1203881266 (1132-F51 (1-6)DUP), 433373007 (1132-F51 (1-6)), 433373017 (1132-W3 (1-6)) and 433373020 (1132-W17 (1-6)) were recounted to verify sample results. Recounts are reported.

Miscellaneous Information

Additional Comments
The matrix spike, 1203881267 (1132-F51 (1-6)MS), aliquot was reduced to conserve sample volume.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

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GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
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October 26, 2017

Mr. Paul Jones
Ameriphysics, LLC
911 Cross Park Dr.
Knoxville, Tennessee 37923

Re: Ameriphysics, LLC
Work Order: 433374

Dear Mr. Jones:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on September 21, 2017. This revised data report has been prepared and reviewed in accordance with GEL's standard operating procedures. The data package has been revised to correct the Gamma Spec data.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4453.

Sincerely,

Edith M. Kent

Edith Kent
Project Manager

Purchase Order: 0316-001
Enclosures

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 − (843) 556−8171 − www.gel.com

Certificate of Analysis Report
for

AMPH002 Ameriphysics, LLC

Client SDG: 433374 GEL Work Order: 433374

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria

** Analyte is a Tracer compound

** Analyte is a surrogate compound

U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

UI Gamma Spectroscopy−−Uncertain identification

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Edith Kent.

Reviewed by 

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-E2 (1-6) Project: AMPH002
Sample ID: 433374001 Client ID: AMPH002
Matrix: Misc Solid
Collect Date: 14-SEP-17 15:35
Receive Date: 21-SEP-17
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.012	+/-0.0578	0.125		pCi/g			MXR1	09/29/17	1324	1702977	1
Cadmium-109	U	0.0108	+/-0.469	0.829		pCi/g							
Cesium-134	U	0.00779	+/-0.0386	0.0783		pCi/g							
Chromium-51	U	0.140	+/-0.326	0.654		pCi/g							
Cobalt-56	U	0.0156	+/-0.0464	0.093		pCi/g							
Cobalt-57	UI	0.00	+/-0.061	0.121		pCi/g							
Cobalt-58	U	-0.0532	+/-0.0407	0.0653		pCi/g							
Cobalt-60		0.421	+/-0.106	0.0732		pCi/g							
Europium-152		2.83	+/-0.293	0.158		pCi/g							
Europium-154	U	0.191	+/-0.109	0.275		pCi/g							
Europium-155	U	0.00771	+/-0.0704	0.134		pCi/g							
Iron-59	U	-0.0143	+/-0.0932	0.175		pCi/g							
Manganese-54	U	0.00255	+/-0.0322	0.0648		pCi/g							
Niobium-95	U	0.013	+/-0.0467	0.0922		pCi/g							
Scandium-46	U	0.0162	+/-0.0413	0.0847		pCi/g							
Silver-108m	U	-0.0172	+/-0.025	0.044		pCi/g							
Silver-110m	U	0.00243	+/-0.0576	0.112		pCi/g							
Sodium-22	U	0.0664	+/-0.0384	0.0964		pCi/g							
Zinc-65	U	-0.0559	+/-0.112	0.197		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-E4 (1-6) Project: AMPH002
Sample ID: 433374002 Client ID: AMPH002
Matrix: Misc Solid
Collect Date: 14-SEP-17 15:15
Receive Date: 21-SEP-17
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0705	+/-0.0983	0.153		pCi/g			MXR1	09/29/17	1324	1702977	1
Cadmium-109	U	0.472	+/-0.691	1.31		pCi/g							
Cesium-134	U	0.0669	+/-0.0582	0.131		pCi/g							
Chromium-51	U	-0.0927	+/-0.424	0.831		pCi/g							
Cobalt-56	U	-0.0174	+/-0.0647	0.117		pCi/g							
Cobalt-57	UI	0.00	+/-0.121	0.0527		pCi/g							
Cobalt-58	U	-0.0349	+/-0.0559	0.0944		pCi/g							
Cobalt-60		0.373	+/-0.122	0.0834		pCi/g							
Europium-152		2.48	+/-0.374	0.231		pCi/g							
Europium-154	U	0.0938	+/-0.133	0.316		pCi/g							
Europium-155	U	0.0274	+/-0.103	0.202		pCi/g							
Iron-59	U	-0.0286	+/-0.113	0.221		pCi/g							
Manganese-54	U	-0.0134	+/-0.0586	0.0848		pCi/g							
Niobium-95	U	-0.0358	+/-0.0588	0.100		pCi/g							
Scandium-46	U	0.0395	+/-0.0507	0.116		pCi/g							
Silver-108m	U	-0.0286	+/-0.0361	0.0639		pCi/g							
Silver-110m	U	-0.0209	+/-0.0658	0.128		pCi/g							
Sodium-22	U	0.0331	+/-0.0468	0.112		pCi/g							
Zinc-65	U	-0.015	+/-0.159	0.269		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-E9 (1-6)
Sample ID: 433374003
Matrix: Misc Solid
Collect Date: 14-SEP-17 15:25
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0335	+/-0.0708	0.167		pCi/g			MXR1	09/29/17	1415	1702977	1
Cadmium-109	U	-0.066	+/-0.597	1.06		pCi/g							
Cesium-134	U	0.00749	+/-0.044	0.0831		pCi/g							
Chromium-51	U	-0.0969	+/-0.292	0.503		pCi/g							
Cobalt-56	U	-0.0164	+/-0.0434	0.0762		pCi/g							
Cobalt-57	UI	0.00	+/-0.100	0.0388		pCi/g							
Cobalt-58	U	-0.0026	+/-0.0377	0.0701		pCi/g							
Cobalt-60		0.310	+/-0.0662	0.060		pCi/g							
Europium-152		3.09	+/-0.246	0.116		pCi/g							
Europium-154	U	0.132	+/-0.161	0.279		pCi/g							
Europium-155	U	-0.064	+/-0.0825	0.146		pCi/g							
Iron-59	U	-0.00566	+/-0.0699	0.139		pCi/g							
Manganese-54	U	-0.0186	+/-0.0373	0.0645		pCi/g							
Niobium-95	U	0.0103	+/-0.0443	0.0841		pCi/g							
Scandium-46	U	0.0165	+/-0.0416	0.0811		pCi/g							
Silver-108m	U	-0.0018	+/-0.0218	0.0425		pCi/g							
Silver-110m	U	0.034	+/-0.053	0.106		pCi/g							
Sodium-22	U	0.0465	+/-0.0567	0.0659		pCi/g							
Zinc-65	U	0.0624	+/-0.0856	0.146		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-E17 (1-6)	Project:	AMPH002
Sample ID:	433374004	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 15:50		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0264	+/-0.0442	0.112		pCi/g			MXR1	09/29/17	1428	1702977	1
Cadmium-109	U	0.921	+/-0.687	1.27		pCi/g							
Cesium-134	U	0.0395	+/-0.0292	0.063		pCi/g							
Chromium-51	U	-0.148	+/-0.272	0.500		pCi/g							
Cobalt-56	U	-0.00632	+/-0.0322	0.0575		pCi/g							
Cobalt-57	U	0.0269	+/-0.0893	0.0368		pCi/g							
Cobalt-58	U	-0.00479	+/-0.0324	0.0585		pCi/g							
Cobalt-60		0.313	+/-0.0751	0.0501		pCi/g							
Europium-152		2.51	+/-0.264	0.137		pCi/g							
Europium-154	UI	0.00	+/-0.136	0.225		pCi/g							
Europium-155	U	-0.0202	+/-0.0893	0.160		pCi/g							
Iron-59	U	-0.00466	+/-0.0658	0.128		pCi/g							
Manganese-54	U	0.00253	+/-0.0285	0.053		pCi/g							
Niobium-95	U	-0.0234	+/-0.0351	0.0594		pCi/g							
Scandium-46	U	-9.66E-05	+/-0.0345	0.0627		pCi/g							
Silver-108m	U	-0.00512	+/-0.024	0.0435		pCi/g							
Silver-110m	U	-0.0166	+/-0.0449	0.0758		pCi/g							
Sodium-22	UI	0.00	+/-0.0479	0.0399		pCi/g							
Zinc-65	U	0.0239	+/-0.0788	0.140		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-N17 (1-6)	Project:	AMPH002
Sample ID:	433374005	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 16:00		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0301	+/-0.0629	0.110		pCi/g			MXR1	09/29/17	1429	1702977	1
Cadmium-109	U	0.707	+/-0.809	1.11		pCi/g							
Cesium-134	U	0.00601	+/-0.0379	0.069		pCi/g							
Chromium-51	U	0.0611	+/-0.289	0.557		pCi/g							
Cobalt-56	U	-0.00448	+/-0.0394	0.0691		pCi/g							
Cobalt-57	U	8.85E-05	+/-0.105	0.132		pCi/g							
Cobalt-58	U	0.00773	+/-0.0382	0.0697		pCi/g							
Cobalt-60		0.659	+/-0.0856	0.0548		pCi/g							
Europium-152		4.21	+/-0.281	0.147		pCi/g							
Europium-154	UI	0.00	+/-0.177	0.286		pCi/g							
Europium-155	U	-0.0242	+/-0.0833	0.151		pCi/g							
Iron-59	U	-0.00553	+/-0.0749	0.141		pCi/g							
Manganese-54	U	0.0119	+/-0.0328	0.0611		pCi/g							
Niobium-95	U	0.00889	+/-0.0394	0.0719		pCi/g							
Scandium-46	U	-0.00982	+/-0.0374	0.0696		pCi/g							
Silver-108m	U	0.0079	+/-0.0235	0.0415		pCi/g							
Silver-110m	U	-0.00982	+/-0.0498	0.0927		pCi/g							
Sodium-22	U	0.046	+/-0.0799	0.0607		pCi/g							
Zinc-65	U	0.0637	+/-0.0768	0.156		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-N20 (1-6)
Sample ID: 433374006
Matrix: Misc Solid
Collect Date: 14-SEP-17 16:20
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0383	+/-0.0485	0.0783		pCi/g			MXR1	09/29/17	1438	1702977	1
Cadmium-109	U	0.397	+/-0.810	1.49		pCi/g							
Cesium-134	U	0.016	+/-0.0354	0.0695		pCi/g							
Chromium-51	U	-0.0755	+/-0.306	0.549		pCi/g							
Cobalt-56	U	-0.000423	+/-0.0374	0.0704		pCi/g							
Cobalt-57	UI	0.00	+/-0.111	0.0453		pCi/g							
Cobalt-58	U	0.0222	+/-0.0357	0.0708		pCi/g							
Cobalt-60		0.616	+/-0.0867	0.0539		pCi/g							
Europium-152		4.63	+/-0.280	0.124		pCi/g							
Europium-154	U	0.189	+/-0.0999	0.224		pCi/g							
Europium-155	U	-0.0658	+/-0.107	0.192		pCi/g							
Iron-59	U	-0.0221	+/-0.0683	0.125		pCi/g							
Manganese-54	U	-0.0167	+/-0.0357	0.0628		pCi/g							
Niobium-95	U	-0.0411	+/-0.0445	0.0715		pCi/g							
Scandium-46	U	-0.00119	+/-0.0397	0.0743		pCi/g							
Silver-108m	U	-0.0115	+/-0.0258	0.045		pCi/g							
Silver-110m	U	-0.0056	+/-0.0473	0.0882		pCi/g							
Sodium-22	U	0.0654	+/-0.0351	0.0784		pCi/g							
Zinc-65	U	-0.0256	+/-0.110	0.124		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-N23 (1-6)
Sample ID: 433374007
Matrix: Misc Solid
Collect Date: 14-SEP-17 16:30
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.00736	+/-0.0364	0.0863		pCi/g			MXR1	09/29/17	1430	1702977	1
Cadmium-109	U	1.07	+/-1.16	1.19		pCi/g							
Cesium-134	U	-0.000345	+/-0.0308	0.0561		pCi/g							
Chromium-51	U	-0.123	+/-0.285	0.507		pCi/g							
Cobalt-56	U	0.0208	+/-0.0328	0.0666		pCi/g							
Cobalt-57	U	0.0247	+/-0.0823	0.0354		pCi/g							
Cobalt-58	U	-0.0162	+/-0.033	0.0559		pCi/g							
Cobalt-60		0.436	+/-0.0826	0.0556		pCi/g							
Europium-152		2.78	+/-0.260	0.145		pCi/g							
Europium-154		0.222	+/-0.156	0.147		pCi/g							
Europium-155	U	-0.0319	+/-0.0843	0.150		pCi/g							
Iron-59	U	-0.0156	+/-0.0667	0.124		pCi/g							
Manganese-54	U	0.0386	+/-0.0332	0.0663		pCi/g							
Niobium-95	U	0.00798	+/-0.0372	0.068		pCi/g							
Scandium-46	U	-0.00897	+/-0.0309	0.0578		pCi/g							
Silver-108m	U	0.0016	+/-0.0205	0.0389		pCi/g							
Silver-110m	U	0.00292	+/-0.0407	0.0788		pCi/g							
Sodium-22	U	0.0784	+/-0.0549	0.0877		pCi/g							
Zinc-65	U	-0.0511	+/-0.0916	0.138		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-N23 ~~(1-6)~~ (6-12) MP 10/26/17	Project:	AMPH002
Sample ID:	433374008	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 16:40		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.00945	+/-0.0405	0.0814		pCi/g			MXR1	09/29/17	1430	1702977	1
Cadmium-109	U	0.376	+/-0.911	0.675		pCi/g							
Cesium-134	U	0.0199	+/-0.0206	0.0418		pCi/g							
Chromium-51	U	0.0769	+/-0.188	0.349		pCi/g							
Cobalt-56	U	0.00306	+/-0.0205	0.039		pCi/g							
Cobalt-57	UI	0.00	+/-0.0523	0.0242		pCi/g							
Cobalt-58	U	-0.0083	+/-0.0182	0.033		pCi/g							
Cobalt-60		0.106	+/-0.0403	0.0344		pCi/g							
Europium-152		1.12	+/-0.121	0.0887		pCi/g							
Europium-154	U	0.041	+/-0.0511	0.129		pCi/g							
Europium-155	U	0.0267	+/-0.0583	0.107		pCi/g							
Iron-59	U	-0.0168	+/-0.0391	0.0691		pCi/g							
Manganese-54	U	-0.00332	+/-0.017	0.0315		pCi/g							
Niobium-95	U	0.00697	+/-0.0248	0.0399		pCi/g							
Scandium-46	U	-0.00729	+/-0.0176	0.0319		pCi/g							
Silver-108m	U	-0.00641	+/-0.0141	0.0257		pCi/g							
Silver-110m	U	0.00257	+/-0.0255	0.0426		pCi/g							
Sodium-22	U	0.0145	+/-0.018	0.0286		pCi/g							
Zinc-65	U	0.0437	+/-0.078	0.0936		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-N30 (1-6)	Project:	AMPH002
Sample ID:	433374009	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 16:50		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0329	+/-0.0405	0.0677		pCi/g			MXR1	09/29/17	1430	1702977	1
Cadmium-109	U	0.252	+/-0.873	0.995		pCi/g							
Cesium-134	U	0.025	+/-0.036	0.0608		pCi/g							
Chromium-51	U	0.0583	+/-0.242	0.477		pCi/g							
Cobalt-56	U	0.0158	+/-0.0345	0.068		pCi/g							
Cobalt-57	UI	0.00	+/-0.0869	0.0323		pCi/g							
Cobalt-58	U	0.0292	+/-0.0323	0.0666		pCi/g							
Cobalt-60		0.291	+/-0.0891	0.0551		pCi/g							
Europium-152		3.48	+/-0.273	0.131		pCi/g							
Europium-154	UI	0.00	+/-0.158	0.240		pCi/g							
Europium-155	U	-0.0215	+/-0.0709	0.134		pCi/g							
Iron-59	U	-0.0287	+/-0.0745	0.116		pCi/g							
Manganese-54	U	0.00678	+/-0.0299	0.0582		pCi/g							
Niobium-95	U	-0.0134	+/-0.0362	0.0623		pCi/g							
Scandium-46	U	0.0166	+/-0.0294	0.0597		pCi/g							
Silver-108m	U	-0.00176	+/-0.0202	0.0381		pCi/g							
Silver-110m	U	0.00838	+/-0.0365	0.072		pCi/g							
Sodium-22	UI	0.00	+/-0.0558	0.0486		pCi/g							
Zinc-65	U	0.0475	+/-0.0785	0.115		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-S19 (1-6)	Project:	AMPH002
Sample ID:	433374010	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	15-SEP-17 08:30		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0269	+/-0.0388	0.0673		pCi/g			MXR1	09/29/17	1430	1702977	1
Cadmium-109	U	0.174	+/-0.551	0.556		pCi/g							
Cesium-134	U	0.0521	+/-0.0508	0.0628		pCi/g							
Chromium-51	U	0.00911	+/-0.216	0.412		pCi/g							
Cobalt-56	U	-0.0245	+/-0.0275	0.0476		pCi/g							
Cobalt-57	UI	0.00	+/-0.0744	0.0239		pCi/g							
Cobalt-58	U	-0.00729	+/-0.0271	0.0504		pCi/g							
Cobalt-60		0.407	+/-0.0713	0.0509		pCi/g							
Europium-152		3.03	+/-0.216	0.114		pCi/g							
Europium-154	U	0.140	+/-0.115	0.203		pCi/g							
Europium-155	U	0.0407	+/-0.0515	0.0994		pCi/g							
Iron-59	U	-0.0211	+/-0.0578	0.104		pCi/g							
Manganese-54	U	0.000597	+/-0.0251	0.0477		pCi/g							
Niobium-95	U	0.0108	+/-0.0302	0.0571		pCi/g							
Scandium-46	U	0.00203	+/-0.0319	0.060		pCi/g							
Silver-108m	U	0.00304	+/-0.0189	0.0357		pCi/g							
Silver-110m	U	-0.0146	+/-0.0412	0.0747		pCi/g							
Sodium-22	U	0.0494	+/-0.0405	0.0618		pCi/g							
Zinc-65	U	-0.00288	+/-0.0811	0.129		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-S21 (1-6)
Sample ID: 433374011
Matrix: Misc Solid
Collect Date: 15-SEP-17 08:50
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0228	+/-0.0316	0.106		pCi/g			MXR1	09/29/17	1913	1702977	1
Cadmium-109	U	0.289	+/-0.941	0.860		pCi/g							
Cesium-134	U	0.017	+/-0.044	0.0855		pCi/g							
Chromium-51	U	0.0352	+/-0.304	0.559		pCi/g							
Cobalt-56	U	0.0179	+/-0.0454	0.0876		pCi/g							
Cobalt-57	UI	0.00	+/-0.0745	0.151		pCi/g							
Cobalt-58	U	0.0241	+/-0.0425	0.0843		pCi/g							
Cobalt-60		0.655	+/-0.102	0.0592		pCi/g							
Europium-152		4.72	+/-0.325	0.154		pCi/g							
Europium-154	U	0.247	+/-0.185	0.291		pCi/g							
Europium-155	U	0.0364	+/-0.0703	0.142		pCi/g							
Iron-59	U	-0.0744	+/-0.0779	0.133		pCi/g							
Manganese-54	U	0.00012	+/-0.0413	0.0753		pCi/g							
Niobium-95	U	-0.0111	+/-0.0439	0.0805		pCi/g							
Scandium-46	U	-0.00872	+/-0.0384	0.0695		pCi/g							
Silver-108m	U	0.00474	+/-0.0254	0.0508		pCi/g							
Silver-110m	U	-0.00797	+/-0.0515	0.0937		pCi/g							
Sodium-22	UI	0.00	+/-0.0651	0.052		pCi/g							
Zinc-65	U	-0.0424	+/-0.125	0.139		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-S26 (1-6)
Sample ID: 433374012
Matrix: Misc Solid
Collect Date: 15-SEP-17 09:00
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.00597	+/-0.0369	0.0749		pCi/g			MXR1	09/29/17	1431	1702977	1
Cadmium-109	U	0.172	+/-0.510	0.894		pCi/g							
Cesium-134	U	0.0149	+/-0.0331	0.0621		pCi/g							
Chromium-51	U	-0.0507	+/-0.232	0.440		pCi/g							
Cobalt-56	U	0.0113	+/-0.0305	0.0571		pCi/g							
Cobalt-57	U	0.089	+/-0.0912	0.120		pCi/g							
Cobalt-58	U	0.0208	+/-0.0304	0.0586		pCi/g							
Cobalt-60		0.536	+/-0.0729	0.0357		pCi/g							
Europium-152		4.64	+/-0.244	0.100		pCi/g							
Europium-154		0.393	+/-0.156	0.230		pCi/g							
Europium-155	U	0.0236	+/-0.0715	0.134		pCi/g							
Iron-59	U	0.0756	+/-0.0607	0.125		pCi/g							
Manganese-54	U	-7.12E-05	+/-0.0279	0.0505		pCi/g							
Niobium-95	U	0.00734	+/-0.0305	0.0566		pCi/g							
Scandium-46	U	0.013	+/-0.0307	0.0577		pCi/g							
Silver-108m	U	0.00429	+/-0.0179	0.0348		pCi/g							
Silver-110m	U	-0.00419	+/-0.0397	0.071		pCi/g							
Sodium-22	U	0.0346	+/-0.0745	0.0457		pCi/g							
Zinc-65	U	0.093	+/-0.0905	0.136		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-S40 (1-6)
Sample ID: 433374013
Matrix: Misc Solid
Collect Date: 15-SEP-17 09:20
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0432	+/-0.0895	0.157		pCi/g			MXR1	09/29/17	1431	1702977	1
Cadmium-109	U	0.547	+/-0.947	1.05		pCi/g							
Cesium-134	U	-0.014	+/-0.0564	0.0982		pCi/g							
Chromium-51	U	-0.0938	+/-0.354	0.665		pCi/g							
Cobalt-56	U	-0.0125	+/-0.0601	0.103		pCi/g							
Cobalt-57	UI	0.00	+/-0.121	0.0431		pCi/g							
Cobalt-58	U	0.0517	+/-0.0559	0.109		pCi/g							
Cobalt-60		0.765	+/-0.113	0.0549		pCi/g							
Europium-152		5.40	+/-0.371	0.194		pCi/g							
Europium-154		0.473	+/-0.156	0.355		pCi/g							
Europium-155	U	0.0159	+/-0.0905	0.168		pCi/g							
Iron-59	U	0.0086	+/-0.113	0.192		pCi/g							
Manganese-54	U	-0.035	+/-0.0514	0.081		pCi/g							
Niobium-95	U	-0.0261	+/-0.0569	0.0971		pCi/g							
Scandium-46	U	0.0384	+/-0.0525	0.106		pCi/g							
Silver-108m	U	0.00587	+/-0.0326	0.0621		pCi/g							
Silver-110m	U	-0.0706	+/-0.0655	0.113		pCi/g							
Sodium-22	U	0.0157	+/-0.0792	0.0521		pCi/g							
Zinc-65	U	-0.0717	+/-0.152	0.191		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-F72D	Project:	AMPH002
Sample ID:	433374014	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 11:35		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0684	+/-0.0465	0.0507		pCi/g			MXR1	09/29/17	1431	1702977	1
Cadmium-109	U	0.379	+/-1.33	1.38		pCi/g							
Cesium-134	U	0.00848	+/-0.0402	0.073		pCi/g							
Chromium-51	U	-0.0697	+/-0.316	0.586		pCi/g							
Cobalt-56	U	-0.0113	+/-0.0412	0.0716		pCi/g							
Cobalt-57	UI	0.00	+/-0.0789	0.158		pCi/g							
Cobalt-58	U	0.0119	+/-0.0627	0.0675		pCi/g							
Cobalt-60		0.531	+/-0.0773	0.0565		pCi/g							
Europium-152		6.46	+/-0.333	0.146		pCi/g							
Europium-154		0.432	+/-0.152	0.171		pCi/g							
Europium-155	U	0.0515	+/-0.109	0.197		pCi/g							
Iron-59	U	-0.0388	+/-0.0823	0.149		pCi/g							
Manganese-54	U	0.00339	+/-0.0366	0.0656		pCi/g							
Niobium-95	U	0.00558	+/-0.0407	0.0734		pCi/g							
Scandium-46	U	-0.0142	+/-0.0409	0.0703		pCi/g							
Silver-108m	U	0.00263	+/-0.024	0.0449		pCi/g							
Silver-110m	U	0.00107	+/-0.0484	0.0865		pCi/g							
Sodium-22	UI	0.00	+/-0.0535	0.105		pCi/g							
Zinc-65	U	0.0722	+/-0.101	0.178		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: October 26, 2017

Company :	Ameriphysics, LLC
Address :	911 Cross Park Dr.
	Knoxville, Tennessee 37923
Contact:	Mr. Paul Jones
Project:	Ameriphysics, LLC

Client Sample ID:	1132-W5D	Project:	AMPH002
Sample ID:	433374015	Client ID:	AMPH002
Matrix:	Misc Solid		
Collect Date:	14-SEP-17 13:55		
Receive Date:	21-SEP-17		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.0354	+/-0.0695	0.179		pCi/g			MXR1	09/29/17	1913	1702977	1
Cadmium-109	UI	0.00	+/-1.44	1.49		pCi/g							
Cesium-134	U	0.0231	+/-0.0516	0.100		pCi/g							
Chromium-51	U	-0.154	+/-0.355	0.679		pCi/g							
Cobalt-56	U	0.0321	+/-0.0484	0.102		pCi/g							
Cobalt-57	UI	0.00	+/-0.0923	0.179		pCi/g							
Cobalt-58	U	-0.00286	+/-0.0493	0.0963		pCi/g							
Cobalt-60		0.717	+/-0.152	0.0787		pCi/g							
Europium-152		3.83	+/-0.398	0.188		pCi/g							
Europium-154		0.439	+/-0.198	0.355		pCi/g							
Europium-155	U	0.0586	+/-0.106	0.213		pCi/g							
Iron-59	U	-0.0373	+/-0.109	0.201		pCi/g							
Manganese-54	U	0.00923	+/-0.0488	0.0873		pCi/g							
Niobium-95	UI	0.00	+/-0.170	0.0982		pCi/g							
Scandium-46	U	0.0101	+/-0.0444	0.0904		pCi/g							
Silver-108m	U	0.00545	+/-0.0309	0.0612		pCi/g							
Silver-110m	U	-0.0216	+/-0.0604	0.114		pCi/g							
Sodium-22	UI	0.00	+/-0.0698	0.0816		pCi/g							
Zinc-65	U	0.108	+/-0.116	0.245		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-W11D
Sample ID: 433374016
Matrix: Misc Solid
Collect Date: 14-SEP-17 13:45
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	0.00368	+/-0.0344	0.0951		pCi/g			MXR1	09/29/17	1914	1702977	1
Cadmium-109	U	1.11	+/-1.02	1.36		pCi/g							
Cesium-134	U	-0.0101	+/-0.0435	0.0793		pCi/g							
Chromium-51	U	-0.0618	+/-0.384	0.732		pCi/g							
Cobalt-56	U	0.00635	+/-0.0401	0.0774		pCi/g							
Cobalt-57	U	0.0204	+/-0.143	0.184		pCi/g							
Cobalt-58	U	-0.0134	+/-0.0523	0.0938		pCi/g							
Cobalt-60		0.713	+/-0.107	0.0463		pCi/g							
Europium-152		5.13	+/-0.390	0.176		pCi/g							
Europium-154		0.244	+/-0.214	0.177		pCi/g							
Europium-155	U	0.0505	+/-0.120	0.223		pCi/g							
Iron-59	U	0.0649	+/-0.0884	0.174		pCi/g							
Manganese-54	U	0.0626	+/-0.103	0.0742		pCi/g							
Niobium-95	U	-0.0305	+/-0.0502	0.0855		pCi/g							
Scandium-46	U	-0.0447	+/-0.0504	0.0829		pCi/g							
Silver-108m	U	0.00181	+/-0.0292	0.0566		pCi/g							
Silver-110m	U	-0.0225	+/-0.059	0.104		pCi/g							
Sodium-22	U	0.0862	+/-0.0754	0.111		pCi/g							
Zinc-65	U	0.022	+/-0.109	0.185		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: October 26, 2017

Company : Ameriphysics, LLC
Address : 911 Cross Park Dr.
Knoxville, Tennessee 37923
Contact: Mr. Paul Jones
Project: Ameriphysics, LLC

Client Sample ID: 1132-N17D
Sample ID: 433374017
Matrix: Misc Solid
Collect Date: 14-SEP-17 16:10
Receive Date: 21-SEP-17
Collector: Client

Project: AMPH002
Client ID: AMPH002

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gammaspec, Gamma, Solid - Client List "Dry Weight Corrected"													
Antimony-124	U	-0.0222	+/-0.0549	0.108		pCi/g			MXR1	09/29/17	1915	1702977	1
Cadmium-109	U	0.360	+/-1.36	1.21		pCi/g							
Cesium-134	U	-0.0186	+/-0.0362	0.0639		pCi/g							
Chromium-51	U	-0.0742	+/-0.317	0.614		pCi/g							
Cobalt-56	U	-0.00317	+/-0.0434	0.0803		pCi/g							
Cobalt-57	UI	0.00	+/-0.127	0.0416		pCi/g							
Cobalt-58	U	-0.00926	+/-0.0377	0.0692		pCi/g							
Cobalt-60		0.478	+/-0.0882	0.0281		pCi/g							
Europium-152		3.92	+/-0.323	0.146		pCi/g							
Europium-154		0.334	+/-0.116	0.289		pCi/g							
Europium-155	U	0.0486	+/-0.0954	0.185		pCi/g							
Iron-59	U	-0.0202	+/-0.0899	0.161		pCi/g							
Manganese-54	U	0.0131	+/-0.0335	0.0671		pCi/g							
Niobium-95	U	0.0323	+/-0.0408	0.084		pCi/g							
Scandium-46	U	0.0177	+/-0.0397	0.0794		pCi/g							
Silver-108m	U	0.00228	+/-0.0225	0.0452		pCi/g							
Silver-110m	U	0.00932	+/-0.0506	0.0977		pCi/g							
Sodium-22	UI	0.00	+/-0.0408	0.066		pCi/g							
Zinc-65	U	0.106	+/-0.0851	0.186		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	LYT1	09/22/17	0914	1702947

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

QC Summary

Report Date: October 26, 2017

Ameriphysics, LLC
911 Cross Park Dr.
Knoxville, Tennessee

Contact: **Mr. Paul Jones**

Workorder: **433374**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch 1702977											
QC1203880741 433373021 DUP											
Antimony-124	U	0.0238	U	-0.055	pCi/g	N/A		N/A	MXR1	09/29/17	19:17
	Uncertainty	+/-0.060		+/-0.0623							
Cadmium-109	U	-0.785	U	0.494	pCi/g	N/A		N/A			
	Uncertainty	+/-0.773		+/-0.762							
Cesium-134	U	0.0642	U	-0.0256	pCi/g	N/A		N/A			
	Uncertainty	+/-0.052		+/-0.0585							
Chromium-51	U	-0.218	U	-0.0966	pCi/g	N/A		N/A			
	Uncertainty	+/-0.365		+/-0.452							
Cobalt-56	U	-0.0179	U	0.0378	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0568		+/-0.0725							
Cobalt-57	UI	0.00	UI	0.00	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0965		+/-0.155							
Cobalt-58	U	0.0414	U	0.089	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0563		+/-0.119							
Cobalt-60		0.766		0.636	pCi/g	18.6		(0%-20%)			
	Uncertainty	+/-0.137		+/-0.144							
Europium-152		4.37		4.78	pCi/g	8.83		(0%-20%)			
	Uncertainty	+/-0.438		+/-0.411							
Europium-154	U	0.102	U	0.259	pCi/g	N/A		N/A			
	Uncertainty	+/-0.149		+/-0.283							
Europium-155	U	0.00664	U	-0.0178	pCi/g	N/A		N/A			
	Uncertainty	+/-0.117		+/-0.113							
Iron-59	U	0.0492	U	0.0201	pCi/g	N/A		N/A			
	Uncertainty	+/-0.121		+/-0.152							
Manganese-54	U	0.0197	U	-0.0151	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0442		+/-0.0671							
Niobium-95	U	-0.0242	U	0.0544	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0681		+/-0.0588							

QC Summary

Workorder: **433374**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1702977										
Scandium-46	U	-0.0103	U	-0.0727	pCi/g	N/A		N/A	MXR1	09/29/17 19:17
	Uncertainty	+/-0.0597		+/-0.081						
Silver-108m	U	-0.00366	U	-0.0169	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0327		+/-0.0426						
Silver-110m	U	0.00734	U	0.0633	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0793		+/-0.162						
Sodium-22	U	0.0292	U	0.0913	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0536		+/-0.0999						
Zinc-65	U	-0.0788	U	-0.0295	pCi/g	N/A		N/A		
	Uncertainty	+/-0.158		+/-0.169						
QC1203880742 LCS										
Americium-241	488			542	pCi/g		111	(75%-125%)		09/29/17 14:02
	Uncertainty			+/-5.03						
Cesium-137	175			183	pCi/g		104	(75%-125%)		
	Uncertainty			+/-3.08						
Antimony-124			U	0.185	pCi/g					
	Uncertainty			+/-0.558						
Cadmium-109				231	pCi/g					
	Uncertainty			+/-14.7						
Cesium-134			U	0.225	pCi/g					
	Uncertainty			+/-0.614						
Chromium-51			U	0.731	pCi/g					
	Uncertainty			+/-3.54						
Cobalt-56			U	-0.219	pCi/g					
	Uncertainty			+/-0.592						
Cobalt-57				0.586	pCi/g					
	Uncertainty			+/-0.291						
Cobalt-58			U	-0.238	pCi/g					
	Uncertainty			+/-0.514						
Cobalt-60	141			140	pCi/g		99	(75%-125%)		
	Uncertainty			+/-3.24						

QC Summary

Workorder: **433374**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1702977										
Europium-152			U	0.762	pCi/g				MXR1	09/29/17 14:02
	Uncertainty			+/-1.20						
Europium-154			U	-0.108	pCi/g					
	Uncertainty			+/-0.937						
Europium-155			U	-0.0348	pCi/g					
	Uncertainty			+/-0.752						
Iron-59			U	0.0971	pCi/g					
	Uncertainty			+/-1.27						
Manganese-54			U	0.071	pCi/g					
	Uncertainty			+/-0.533						
Niobium-95			U	0.103	pCi/g					
	Uncertainty			+/-0.461						
Scandium-46			U	-0.138	pCi/g					
	Uncertainty			+/-0.627						
Silver-108m			U	-0.00623	pCi/g					
	Uncertainty			+/-0.442						
Silver-110m			U	0.634	pCi/g					
	Uncertainty			+/-0.831						
Sodium-22			U	-0.0379	pCi/g					
	Uncertainty			+/-0.329						
Zinc-65			U	2.17	pCi/g					
	Uncertainty			+/-1.98						
QC1203880740 MB										
Antimony-124			U	-0.00354	pCi/g					09/29/17 19:16
	Uncertainty			+/-0.0593						
Cadmium-109			U	-0.469	pCi/g					
	Uncertainty			+/-0.394						
Cesium-134			U	0.0041	pCi/g					
	Uncertainty			+/-0.016						
Chromium-51			U	0.0847	pCi/g					
	Uncertainty			+/-0.167						

QC Summary

Workorder: **433374**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1702977										
Cobalt-56			U	0.00331	pCi/g				MXR1	09/29/17 19:16
	Uncertainty			+/-0.0203						
Cobalt-57			U	-0.00441	pCi/g					
	Uncertainty			+/-0.0133						
Cobalt-58			U	0.0107	pCi/g					
	Uncertainty			+/-0.0172						
Cobalt-60			U	-0.00861	pCi/g					
	Uncertainty			+/-0.0218						
Europium-152			U	0.0216	pCi/g					
	Uncertainty			+/-0.0536						
Europium-154			U	-0.0318	pCi/g					
	Uncertainty			+/-0.044						
Europium-155			U	-0.0252	pCi/g					
	Uncertainty			+/-0.0528						
Iron-59			U	-0.0384	pCi/g					
	Uncertainty			+/-0.0335						
Manganese-54			U	0.0125	pCi/g					
	Uncertainty			+/-0.0199						
Niobium-95			U	0.0158	pCi/g					
	Uncertainty			+/-0.0181						
Scandium-46			U	0.00451	pCi/g					
	Uncertainty			+/-0.0162						
Silver-108m			U	0.0286	pCi/g					
	Uncertainty			+/-0.0144						
Silver-110m			U	-0.0195	pCi/g					
	Uncertainty			+/-0.0363						
Sodium-22			U	-0.0121	pCi/g					
	Uncertainty			+/-0.0149						
Zinc-65			U	0.00266	pCi/g					
	Uncertainty			+/-0.042						

Notes:

QC Summary

Workorder: 433374

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).
The Qualifiers in this report are defined as follows:

**	Analyte is a Tracer compound
<	Result is less than value reported
>	Result is greater than value reported
BD	Results are either below the MDC or tracer recovery is low
FA	Failed analysis.
H	Analytical holding time was exceeded
J	Value is estimated
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
M	M if above MDC and less than LLD
M	REMP Result > MDC/CL and < RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UI	Gamma Spectroscopy--Uncertain identification
UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Ameriphysics, LLC	Chain of Custody (COC)			
QA Program Form	Doc	QAF 14-1	Rev #	1
	Date	2/10/2015	Form #	1

Section 1

Project Number:	1132
Project Name:	UT Health
Send Report To:	Ameriphysics, LLC
Address:	9111 Cross Park Drive, Suite D200, Knoxville, TN 37923
Phone:	(865)705-1136
Fax:	
Sampler (Print Name):	Robbie Hansen
Shipment Method:	FedEx
Airbill Number:	
Laboratory Receiving:	GEL Laboratories

Section 3 Analysis Requested

Section 4

433374

Page 1 of 2

Purchase Order #: N/A

Batch #: 1132-002

Section 2

Sample ID	Sample Description	Sample Date	Sample Time	Sample Matrix	Sample Volume	Cont. Type	Cont. Quantity	Gamm Spec (Na-22, Sc-46, Cr-51, Mn-54, Fe-59, Co-56, Co-57, Co-58, Co-60, Zn-65, Nb-95, Ag-108m, Ag-110M, Cd-109, Sb-124, Cs-134, Eu-152, Eu-154, and Eu-155	All True Positives	N/A	N/A	N/A	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab
1132-E2 (1-6)	Concrete Sample	9/14/17	15:35	S	0.5 L	P	1	X	X					
1132-E4 (1-6)	Concrete Sample	9/14/17	15:15	S	0.5 L	P	1	X	X					
1132-E9 (1-6)	Concrete Sample	9/14/17	15:25	S	0.5 L	P	1	X	X					
1132-E17 (1-6)	Concrete Sample	9/14/17	15:50	S	0.5 L	P	1	X	X					
1132-N17 (1-6)	Concrete Sample	9/14/17	16:00	S	0.5 L	P	1	X	X					
1132-N20 (1-6)	Concrete Sample	9/14/17	16:20	S	0.5 L	P	1	X	X					
1132-N23 (1-6)	Concrete Sample	9/14/17	16:30	S	0.5 L	P	1	X	X					
1132-N23 (1-6)	Concrete Sample	9/14/17	16:40	S	0.5 L	P	1	X	X					

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
[signature]	[signature]	9/21/17	9:05
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By laboratory):

QA/QC level	Turnaround	Sample Receipt	
Level I	(Routine)	Total # Containers Received?	
Level II	24 Hour	COC Seals Present?	
Level III	1 Week	COC Seals Intact?	
Other	Other:	Received Containers Intact?	
		Temperature?	

Ameriphysics, LLC	Chain of Custody (COC)			
QA Program Form	Doc	QAF 14-1	Rev #	1
	Date	2/10/2015	Form #	1

SUPPLEMENTAL SECTION 2 Page 2 of 2 Batch #: 1132-002

Section 2

Sample ID	Sample Description	Sample Date	Sample Time	Sample Matrix	Sample Volume	Cont. Type	Cont. Quantity	Refer to Page 1 for Analysis Requested					Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab
1132-N30 (1-6)	Concrete Sample	9/14/17	16:50	S	0.5 L	P	1	X	X					
1132-S19 (1-6)	Concrete Sample	9/15/17	8:30	S	0.5 L	P	1	X	X					
1132-S21 (1-6)	Concrete Sample	9/1517	8:50	S	0.5 L	P	1	X	X					
1132-S26 (1-6)	Concrete Sample	9/15/17	9:00	S	0.5 L	P	1	X	X					
1132-S40 (1-6)	Concrete Sample	9/15/17	9:20	S	0.5 L	P	1	X	X					
1132-F72D	Concrete Sample	9/14/17	11:35	S	0.5 L	P	1	X	X					
1132-W5D	Concrete Sample	9/14/17	13:55	S	0.5 L	P	1	X	X					
1132-W11D	Concrete Sample	9/14/17	13:45	S	0.5 L	P	1	X	X					
1132-N17D	Concrete Sample	9/14/17	16:10	S	0.5 L	P	1	X	X					

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client:	**SDG/AR/COC/Work Order:**
Received By: Stacy Boone	**Date Received:** 21-SEPT-17
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 7877 8470 3300 - 21c 7877 8470 3310 - 21c

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
COC/Samples marked or classified as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): 0 CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
Is package, COC, and/or Samples marked HAZ?		✓	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP:_____
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR3-17 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?		✓		Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	If Yes, Are Encores or Soil Kits present? Yes___ No___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes No___ N/A (If unknown, select No) VOA vials free of headspace? Yes No___ N/A Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials _____ Date 9/21/17 Page 1 of 1

GL-CHL-SR-001 Rev 5

Subject: Re: Questions on detected radionuclides
From: Edie Kent <emk@gel.com>
Date: 10/26/2017 1:19 PM
To: Tim Pratt <tpratt@ameriphysics.com>
CC: Nancy Mattern <Nancy.Mattern@gel.com>

Tim:

The Na-22 and Cd-109 results were intended to be rejected but were not qualified properly. The Co-57 was a false positive and should have been reported as rejected. We are in the process of correcting this and will issue a revised report.

Edie

On 10/25/2017 2:54 PM, Tim Pratt wrote:

> Edie,
>
> The ones I question are Sample 1132-F20 (1-6) with the Na-22; Sample 1132-W5D (1-6) with the Cd-109; and Samples 1132-F52 (1-6), 1132-F56 (1-6), 1132-C52 (1-6), 1132-W3 (1-6), and 1132-W17 (1-6) with the Co-57.
>
> As I mentioned, with the short relatively short half-lives of these radionuclides and the time that has elapsed since this place was operational (2001), there is very little chance that these are really there.
>
> Thanks,
>
> Tim
>
> Timothy J. Pratt
> Corporate Radiation Safety Officer
> Ameriphysics LLC
> 9111 Cross Park Drive, Suite D200
> Knoxville, TN 37923
> Office: 865-470-4171
> Cell: 865-386-8066
> Fax: 865-470-4179

--

Edith M. Kent
Project Manager

GEL Laboratories LLC

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Environmental | Engineering | Surveying | Analytical Testing

List of current GEL Certifications as of 02 October 2017

State	Certification
Alaska	UST−0110
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
Delaware	SC00012
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−15−00283, P330−15−00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA170010
Maryland	270
Massachusetts	M−SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122018−1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R−158
Oklahoma	9904
Pennsylvania NELAP	68−00485
Puerto Rico	SC00012
S.Carolina Radchem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−17−12
Utah NELAP	SC000122017−23
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404

Product: **Dry Weight**
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 21
Preparation Batch: 1702947

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
433374001	1132-E2 (1-6)
433374002	1132-E4 (1-6)
433374003	1132-E9 (1-6)
433374004	1132-E17 (1-6)
433374005	1132-N17 (1-6)
433374006	1132-N20 (1-6)
433374007	1132-N23 (1-6)
433374008	1132-N23 (1-6)
433374009	1132-N30 (1-6)
433374010	1132-S19 (1-6)
433374011	1132-S21 (1-6)
433374012	1132-S26 (1-6)
433374013	1132-S40 (1-6)
433374014	1132-F72D
433374015	1132-W5D
433374016	1132-W11D
433374017	1132-N17D

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Gammaspec, Gamma, Solid - Client List**
Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Analytical Procedure: GL-RAD-A-013 REV# 27
Analytical Batch: 1702977

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 21
Preparation Batch: 1702947

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The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
433374001	1132-E2 (1-6)
433374002	1132-E4 (1-6)
433374003	1132-E9 (1-6)
433374004	1132-E17 (1-6)
433374005	1132-N17 (1-6)
433374006	1132-N20 (1-6)
433374007	1132-N23 (1-6)
433374008	1132-N23 (1-6)
433374009	1132-N30 (1-6)
433374010	1132-S19 (1-6)
433374011	1132-S21 (1-6)
433374012	1132-S26 (1-6)
433374013	1132-S40 (1-6)
433374014	1132-F72D
433374015	1132-W5D
433374016	1132-W11D
433374017	1132-N17D
1203880740	Method Blank (MB)
1203880741	433373021(1132-W19 (1-6)) Sample Duplicate (DUP)
1203880742	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to high counting uncertainty.	Cadmium-109	433374015	1132-W5D
		Cobalt-57	433374002	1132-E4 (1-6)
			433374003	1132-E9 (1-6)
			433374006	1132-N20 (1-6)
			433374008	1132-N23 (1-6)
			433374009	1132-N30 (1-6)
			433374013	1132-S40 (1-6)
			433374017	1132-N17D

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			1203880741	1132-W19 (1-6)(433373021DUP)
		Europium-154	433374005	1132-N17 (1-6)
UI	Results are considered a false positive due to high peak-width.	Niobium-95	433374015	1132-W5D
UI	Results are considered a false positive due to interference.	Cobalt-57	433374010	1132-S19 (1-6)
		Sodium-22	433374004	1132-E17 (1-6)
			433374009	1132-N30 (1-6)
			433374011	1132-S21 (1-6)
			433374015	1132-W5D
			433374017	1132-N17D
UI	Results are considered a false positive due to low abundance.	Cobalt-57	433374001	1132-E2 (1-6)
			433374011	1132-S21 (1-6)
			433374014	1132-F72D
			433374015	1132-W5D
		Europium-154	433374004	1132-E17 (1-6)
			433374009	1132-N30 (1-6)
		Sodium-22	433374014	1132-F72D

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

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ATTACHMENT 3

REDRAD-BUILD Reports

Title : Sample F51 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld

RESRAD-BUILD Table of Contents

Title : Sample F51 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld

RESRAD-BUILD Input Parameters

Number of Sources : 1
Number of Receptors: 1
Total Time : 3.650000E+02 days
Fraction Inside : 5.000000E-01

Receptor Information

Receptor	Room	x [m]	y [m]	z [m]	FracTime	Inhalation [m3/day]	Ingestion(Dust) [m2/hr]
1	1	1.000	1.000	1.000	1.000	1.80E+01	1.00E-04

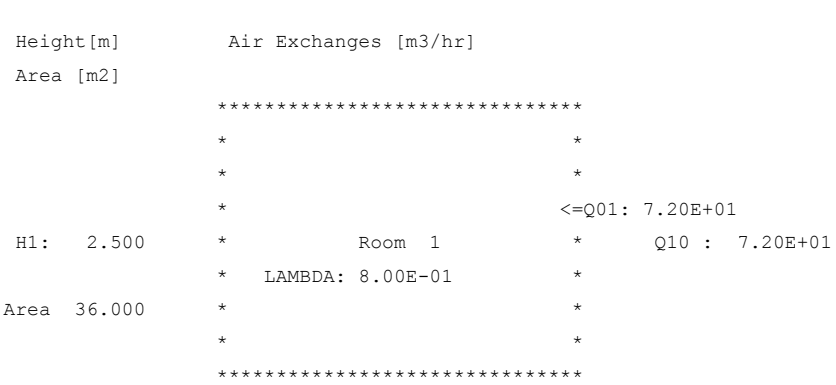
Receptor-Source Shielding Relationship

Receptor	Source	Density [g/cm3]	Thickness [cm]	Material
1	1	2.40E+00	0.00E+00	Concrete

Title : Sample F51 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld

======== Building Information ========

Building Air Exchange Rate: 8.00E-01 1/hr



Deposition velocity: 1.00E-02 [m/s] Resuspension Rate: 5.00E-07 [1/s]

Title : Sample F51 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld

======== Source Information ========

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00[m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate: 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1

Region	: 1
Thickness [cm]	:1.50E+01
Density [g/cm3]	:2.40E+00
Material	:Concrete
Erosion Rate [cm/day]	:2.40E-08

Contamination::

Nuclide	Concentration	Dose Conversion Factor (Library: FGR 13 Morbidity)		
	[pCi/g]	Ingestion [mrem/pCi]	Inhalation [mrem/pCi]	Submersion [mrem/yr/ (pCi/m3)]
GD-152	0.000E+00	1.610E-04	2.430E-01	0.000E+00
EU-154	7.830E-01	9.550E-06	2.860E-04	7.172E-03
EU-152	1.630E+01	6.480E-06	2.210E-04	6.599E-03
CO-60	1.220E+00	2.690E-05	2.190E-04	1.472E-02

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 0.00000000E+00 years

═══ Assessment for Time: 1 ═══
═══ Time =0.00E+00 yr ═══

═══ Source Information ═══

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate : 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1
Region : 1
Thickness [cm] :1.50E+01
Fraction Contaminated :1.00E+00
Density [g/cm3] :2.40E+00

Contamination:: Nuclide Concentration
[pCi/g]
GD-152 0.000E+00
EU-154 7.830E-01
EU-152 1.630E+01
CO-60 1.220E+00

Title : Sample F51 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 0.00000000E+00 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	4.19E+01	4.19E+01
Total	4.19E+01	4.19E+01

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 0.00000000E+00 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	4.19E+01	6.64E-06	7.12E-08	1.47E-05	0.00E+00	1.37E-06
Total	4.19E+01	6.64E-06	7.12E-08	1.47E-05	0.00E+00	1.37E-06

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 0.00000000E+00 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
EU-154	1.78E+00	1.78E+00
GD-152	4.93E-17	4.93E-17
EU-152	3.45E+01	3.45E+01
CO-60	5.63E+00	5.63E+00

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1.00000000 years

═══ Assessment for Time: 2 ═══
═══ Time =1.00E+00 yr ═══

═══ Source Information ═══

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate : 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1
Region : 1
Thickness [cm] :1.50E+01
Fraction Contaminated :1.00E+00
Density [g/cm3] :2.40E+00

Contamination:: Nuclide Concentration
[pCi/g]
GD-152 1.019E-13
EU-154 7.237E-01
EU-152 1.547E+01
CO-60 1.070E+00

Title : Sample F51 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 1.00000000 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	3.93E+01	3.93E+01
Total	3.93E+01	3.93E+01

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1.00000000 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	3.93E+01	6.24E-06	6.69E-08	1.39E-05	0.00E+00	1.27E-06
Total	3.93E+01	6.24E-06	6.69E-08	1.39E-05	0.00E+00	1.27E-06

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1.00000000 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
EU-154	1.65E+00	1.65E+00
GD-152	1.45E-16	1.45E-16
EU-152	3.27E+01	3.27E+01
CO-60	4.94E+00	4.94E+00

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 10.0000000 years

═══ Assessment for Time: 3 ═══
═══ Time =1.00E+01 yr ═══

═══ Source Information ═══

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate : 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1
Region : 1
Thickness [cm] :1.50E+01
Fraction Contaminated :1.00E+00
Density [g/cm3] :2.40E+00

Contamination::	Nuclide	Concentration [pCi/g]
	GD-152	8.153E-13
	EU-154	3.562E-01
	EU-152	9.679E+00
	CO-60	3.275E-01

Title : Sample F51 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 10.0000000 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	2.28E+01	2.28E+01
Total	2.28E+01	2.28E+01

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 10.0000000 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	2.28E+01	3.66E-06	3.90E-08	8.34E-06	0.00E+00	7.11E-07
Total	2.28E+01	3.66E-06	3.90E-08	8.34E-06	0.00E+00	7.11E-07

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 10.0000000 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
EU-154	8.12E-01	8.12E-01
GD-152	8.12E-16	8.12E-16
EU-152	2.05E+01	2.05E+01
CO-60	1.51E+00	1.51E+00

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 100.000008 years

═══ Assessment for Time: 4 ═══
═══ Time =1.00E+02 yr ═══

═══ Source Information ═══

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate : 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1
Region : 1
Thickness [cm] :1.50E+01
Fraction Contaminated :1.00E+00
Density [g/cm3] :2.40E+00

Contamination:: Nuclide Concentration [pCi/g]
GD-152 1.996E-12
EU-154 2.971E-04
EU-152 8.888E-02
CO-60 2.367E-06

Title : Sample F51 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 100.000008 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	1.89E-01	1.89E-01
Total	1.89E-01	1.89E-01

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 100.000008 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	1.89E-01	3.06E-08	3.25E-10	7.15E-08	0.00E+00	5.58E-09
Total	1.89E-01	3.06E-08	3.25E-10	7.15E-08	0.00E+00	5.58E-09

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 100.000008 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
EU-154	6.77E-04	6.77E-04
GD-152	1.92E-15	1.92E-15
EU-152	1.88E-01	1.88E-01
CO-60	1.09E-05	1.09E-05

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1000.00000 years

Assessment for Time: 5
Time =1.00E+03 yr

Source Information

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate : 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1
Region : 1
Thickness [cm] :1.50E+01
Fraction Contaminated :1.00E+00
Density [g/cm3] :2.40E+00

Contamination::

Nuclide	Concentration [pCi/g]
GD-152	2.007E-12
EU-154	4.851E-35
EU-152	3.788E-22
CO-60	0.000E+00

Title : Sample F51 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 1000.00000 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	1.93E-15	1.93E-15
Total	1.93E-15	1.93E-15

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1000.00000 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	8.01E-22	1.30E-28	1.38E-30	1.92E-15	0.00E+00	3.40E-18
Total	8.01E-22	1.30E-28	1.38E-30	1.92E-15	0.00E+00	3.40E-18

 Title : Sample F51 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1000.00000 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
EU-154	0.00E+00	0.00E+00
GD-152	1.93E-15	1.93E-15
EU-152	8.01E-22	8.01E-22

Title : Sample F51 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Full Summary

RESRAD-BUILD Dose (Time) Tables

Receptor Dose Received for the Exposure Duration

(mrem)

	Evaluation Time [yr]				
	0.00E+00	1.00E+00	1.00E+01	1.00E+02	1.00E+03
1	4.19E+01	3.93E+01	2.28E+01	1.89E-01	1.93E-15

Receptor Dose/Yr Averaged Over Exposure Duration

(mrem/yr)

	Evaluation Time [yr]				
	0.00E+00	1.00E+00	1.00E+01	1.00E+02	1.00E+03
1	4.19E+01	3.93E+01	2.28E+01	1.89E-01	1.93E-15

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld

RESRAD-BUILD Table of Contents

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld

RESRAD-BUILD Input Parameters

Number of Sources : 1
Number of Receptors: 1
Total Time : 3.650000E+02 days
Fraction Inside : 5.000000E-01

Receptor Information

Receptor	Room	x [m]	y [m]	z [m]	FracTime	Inhalation [m3/day]	Ingestion(Dust) [m2/hr]
1	1	1.000	1.000	1.000	1.000	1.80E+01	1.00E-04

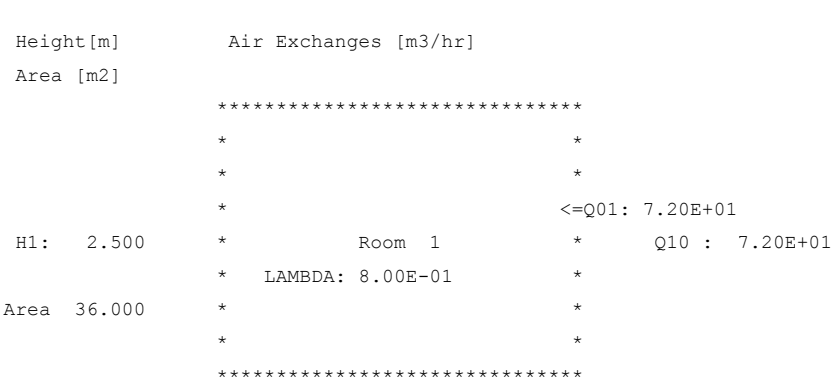
Receptor-Source Shielding Relationship

Receptor	Source	Density [g/cm3]	Thickness [cm]	Material
1	1	2.40E+00	0.00E+00	Concrete

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld

======== Building Information ========

Building Air Exchange Rate: 8.00E-01 1/hr



Deposition velocity: 1.00E-02 [m/s] Resuspension Rate: 5.00E-07 [1/s]

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld

======== Source Information ========

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00[m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate: 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1

Region	: 1
Thickness [cm]	:1.50E+01
Density [g/cm3]	:2.40E+00
Material	:Concrete
Erosion Rate [cm/day]	:2.40E-08

Contamination::

Nuclide	Concentration	Dose Conversion Factor (Library: FGR 13 Morbidity)		
	[pCi/g]	Ingestion [mrem/pCi]	Inhalation [mrem/pCi]	Submersion [mrem/yr/ (pCi/m3)]
GD-152	0.000E+00	1.610E-04	2.430E-01	0.000E+00
EU-154	5.230E-01	9.550E-06	2.860E-04	7.172E-03
EU-152	8.490E+00	6.480E-06	2.210E-04	6.599E-03
CO-60	5.470E-01	2.690E-05	2.190E-04	1.472E-02

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 0.00000000E+00 years

Assessment for Time: 1
Time =0.00E+00 yr

Source Information

Source: 1
        Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]
        Geometry:: Type: Volume   Area:3.60E+01 [m2] Direction: x
        Pathway ::
             Direct Ingestion Rate   : 0.000E+00 [gm/hr]
             Fraction released to air: 1.000E-01

        Containment ::   Number of Regions: 1 Contaminated Region: 1
    Region   :   1
    Thickness [cm]   :1.50E+01
    Fraction Contaminated :1.00E+00
    Density [g/cm3]   :2.40E+00

Contamination:: Nuclide	Concentration [pCi/g]
GD-152	0.000E+00
EU-154	5.230E-01
EU-152	8.490E+00
CO-60	5.470E-01

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 0.00000000E+00 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	2.17E+01	2.17E+01
Total	2.17E+01	2.17E+01

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 0.00000000E+00 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	2.17E+01	3.45E-06	3.69E-08	7.71E-06	0.00E+00	7.01E-07
Total	2.17E+01	3.45E-06	3.69E-08	7.71E-06	0.00E+00	7.01E-07

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 0.00000000E+00 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
EU-154	1.19E+00	1.19E+00
GD-152	2.57E-17	2.57E-17
EU-152	1.80E+01	1.80E+01
CO-60	2.52E+00	2.52E+00

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 1.00000000 years

Assessment for Time: 2
Time =1.00E+00 yr

Source Information

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate : 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1
Region : 1
Thickness [cm] :1.50E+01
Fraction Contaminated :1.00E+00
Density [g/cm3] :2.40E+00

Contamination::

Nuclide	Concentration [pCi/g]
GD-152	5.309E-14
EU-154	4.834E-01
EU-152	8.059E+00
CO-60	4.796E-01

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 1.00000000 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	2.04E+01	2.04E+01
Total	2.04E+01	2.04E+01

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1.00000000 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	2.04E+01	3.24E-06	3.47E-08	7.28E-06	0.00E+00	6.56E-07
Total	2.04E+01	3.24E-06	3.47E-08	7.28E-06	0.00E+00	6.56E-07

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1.00000000 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
EU-154	1.10E+00	1.10E+00
GD-152	7.53E-17	7.53E-17
EU-152	1.71E+01	1.71E+01
CO-60	2.21E+00	2.21E+00

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 10.0000000 years

═══ Assessment for Time: 3 ═══
═══ Time =1.00E+01 yr ═══

═══ Source Information ═══

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate : 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1
Region : 1
Thickness [cm] :1.50E+01
Fraction Contaminated :1.00E+00
Density [g/cm3] :2.40E+00

Contamination:: Nuclide Concentration [pCi/g]
GD-152 4.247E-13
EU-154 2.379E-01
EU-152 5.042E+00
CO-60 1.468E-01

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 10.0000000 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	1.19E+01	1.19E+01
Total	1.19E+01	1.19E+01

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 10.0000000 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	1.19E+01	1.91E-06	2.03E-08	4.38E-06	0.00E+00	3.69E-07
Total	1.19E+01	1.91E-06	2.03E-08	4.38E-06	0.00E+00	3.69E-07

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 10.0000000 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
EU-154	5.42E-01	5.42E-01
GD-152	4.23E-16	4.23E-16
EU-152	1.07E+01	1.07E+01
CO-60	6.78E-01	6.78E-01

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 100.000008 years

═══ Assessment for Time: 4 ═══
═══ Time =1.00E+02 yr ═══

═══ Source Information ═══

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate : 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1
Region : 1
Thickness [cm] :1.50E+01
Fraction Contaminated :1.00E+00
Density [g/cm3] :2.40E+00

Contamination:: Nuclide Concentration
[pCi/g]
GD-152 1.040E-12
EU-154 1.985E-04
EU-152 4.629E-02
CO-60 1.061E-06

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 100.000008 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	9.84E-02	9.84E-02
Total	9.84E-02	9.84E-02

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 100.000008 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	9.84E-02	1.60E-08	1.70E-10	3.73E-08	0.00E+00	2.91E-09
Total	9.84E-02	1.60E-08	1.70E-10	3.73E-08	0.00E+00	2.91E-09

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 100.000008 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
EU-154	4.52E-04	4.52E-04
GD-152	9.98E-16	9.98E-16
EU-152	9.79E-02	9.79E-02
CO-60	4.90E-06	4.90E-06

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1000.00000 years

Assessment for Time: 5
Time =1.00E+03 yr

Source Information

Source: 1
Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]
Geometry:: Type: Volume Area:3.60E+01 [m2] Direction: x
Pathway ::
Direct Ingestion Rate : 0.000E+00 [gm/hr]
Fraction released to air: 1.000E-01

Containment :: Number of Regions: 1 Contaminated Region: 1
Region : 1
Thickness [cm] :1.50E+01
Fraction Contaminated :1.00E+00
Density [g/cm3] :2.40E+00

Contamination::

Nuclide	Concentration [pCi/g]
GD-152	1.046E-12
EU-154	3.240E-35
EU-152	1.973E-22
CO-60	0.000E+00

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Evaluation Time: 1000.00000 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	1.00E-15	1.00E-15
Total	1.00E-15	1.00E-15

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1000.00000 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	4.17E-22	6.78E-29	7.19E-31	1.00E-15	0.00E+00	1.77E-18
Total	4.17E-22	6.78E-29	7.19E-31	1.00E-15	0.00E+00	1.77E-18

 Title : Sample F18 0-6 inches
 Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
 Evaluation Time: 1000.00000 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
EU-154	0.00E+00	0.00E+00
GD-152	1.00E-15	1.00E-15
EU-152	4.17E-22	4.17E-22

Title : Sample F18 0-6 inches
Input File : C:\RESRAD_Family\BUILD\3.5\UTHealth.bld
Full Summary

RESRAD-BUILD Dose (Time) Tables

Receptor Dose Received for the Exposure Duration

(mrem)

	Evaluation Time [yr]				
	0.00E+00	1.00E+00	1.00E+01	1.00E+02	1.00E+03
1	2.17E+01	2.04E+01	1.19E+01	9.84E-02	1.00E-15

Receptor Dose/Yr Averaged Over Exposure Duration

(mrem/yr)

	Evaluation Time [yr]				
	0.00E+00	1.00E+00	1.00E+01	1.00E+02	1.00E+03
1	2.17E+01	2.04E+01	1.19E+01	9.85E-02	1.00E-15

ATTACHMENT 4

Liquid Scintillation Counting Results

Protocol# 10 - Wipe Test.lsa User: Sai Yan

vault floor

Assay Definition

Assay Description:
Wipe Test
Assay Type: CPM
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170912_1701
Raw Results Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170912_1701\20170912_1701.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170912_1701\Report1.csv
Assay File Name: C:\Packard\TriCarb\Assays\Wipe Test.lsa

Count Conditions

Nuclide: Fun Wipes
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Quench Set: n/a
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
Number of Vials/Sample: 1 Calculate % Reference: Off

Background = 23. cpm

MDA = 41 dpm

with H-3 efficiency = 62%

tion Level = 48 cpm

All wipes are < MDA

unless otherwise marked.

Background Subtract

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

Regions	LL	UL
A	0.0	18.6
B	18.6	156.0
C	0.0	2000.0

Count Corrections

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

Instrument Block Data

MODEL=Tri-Carb 4910TR
SERIAL=SGLO34150058

Cycle 1 Results

PID	P#	S#	Count Time	CPMA	CPMB	CPMC	SIS	DATE	TIME
10	10	1	1.00	15	11	26	58.21	9/12/2017	5:02:19 PM
10	10	2	1.00	13	9	22	50.10	9/12/2017	5:03:37 PM
10	10	3	1.00	26	6	33	53.57	9/12/2017	5:04:54 PM
10	10	4	1.00	19	7	27	102.29	9/12/2017	5:06:12 PM
10	10	5	1.00	17	4	21	39.40	9/12/2017	5:07:30 PM
10	10	6	1.00	17	6	23	53.28	9/12/2017	5:08:48 PM
10	10	7	1.00	14	12	26	63.40	9/12/2017	5:10:06 PM

Protocol# 10 - Wipe Test.lsa User: Sai Yan

vault floor

10	10	8	1.00	16	6	23	82.73	9/12/2017	5:11:23 PM
10	10	9	1.00	13	13	26	74.69	9/12/2017	5:12:42 PM
10	10	10	1.00	21	5	27	78.85	9/12/2017	5:13:59 PM
10	10	11	1.00	15	6	22	94.18	9/12/2017	5:15:17 PM
10	10	12	1.00	20	9	29	50.32	9/12/2017	5:16:35 PM
2	10	13	1.00	24	12	37	77.26	9/12/2017	5:17:59 PM
2	10	14	1.00	19	6	26	68.15	9/12/2017	5:19:17 PM
2	10	15	1.00	17	5	25	144.16	9/12/2017	5:20:35 PM
2	10	16	1.00	21	13	34	87.18	9/12/2017	5:21:53 PM
2	10	17	1.00	19	12	31	95.86	9/12/2017	5:23:10 PM
2	10	18	1.00	16	8	24	61.02	9/12/2017	5:24:28 PM
2	10	19	1.00	19	13	34	135.22	9/12/2017	5:25:46 PM
2	10	20	1.00	11	7	19	91.48	9/12/2017	5:27:04 PM
2	10	21	1.00	14	8	22	55.37	9/12/2017	5:28:22 PM
2	10	22	1.00	18	12	31	102.95	9/12/2017	5:29:40 PM
2	10	23	1.00	10	13	24	138.70	9/12/2017	5:30:57 PM
2	10	24	1.00	12	11	23	79.10	9/12/2017	5:32:16 PM
9	10	25	1.00	11	4	17	117.87	9/12/2017	5:33:39 PM
9	10	26	1.00	17	9	27	64.53	9/12/2017	5:34:57 PM
9	10	27	1.00	22	2	24	32.03	9/12/2017	5:36:15 PM
9	10	28	1.00	13	10	24	98.93	9/12/2017	5:37:33 PM
9	10	29	1.00	10	4	14	66.85	9/12/2017	5:38:51 PM
9	10	30	1.00	13	8	21	74.79	9/12/2017	5:40:09 PM
9	10	31	1.00	18	10	28	79.80	9/12/2017	5:41:27 PM
9	10	32	1.00	13	8	21	79.45	9/12/2017	5:42:45 PM
9	10	33	1.00	19	11	31	98.87	9/12/2017	5:44:03 PM
9	10	34	1.00	16	8	25	109.47	9/12/2017	5:45:21 PM
9	10	35	1.00	15	7	22	60.77	9/12/2017	5:46:39 PM
9	10	36	1.00	18	7	26	89.14	9/12/2017	5:47:57 PM
21	10	37	1.00	16	11	27	110.14	9/12/2017	5:49:21 PM
21	10	38	1.00	9	11	21	114.38	9/12/2017	5:50:39 PM
21	10	39	1.00	13	8	21	59.30	9/12/2017	5:51:57 PM
21	10	40	1.00	11	7	18	58.40	9/12/2017	5:53:15 PM
21	10	41	1.00	21	7	30	92.29	9/12/2017	5:54:33 PM
21	10	42	1.00	14	7	22	124.16	9/12/2017	5:55:51 PM
21	10	43	1.00	13	3	17	98.42	9/12/2017	5:57:09 PM
21	10	44	1.00	14	9	25	105.13	9/12/2017	5:58:26 PM
Missing vial 45. (Area not accessible)									
Missing vial 46. (Area not accessible)									
21	10	47	1.00	15	4	19	40.25	9/12/2017	5:59:47 PM
21	10	48	1.00	19	3	23	84.40	9/12/2017	6:01:05 PM
22	10	49	1.00	17	10	27	66.90	9/12/2017	6:02:29 PM
22	10	50	1.00	15	7	23	98.85	9/12/2017	6:03:48 PM
22	10	51	1.00	16	7	24	80.63	9/12/2017	6:05:06 PM
22	10	52	1.00	18	8	26	90.37	9/12/2017	6:06:24 PM
22	10	53	1.00	12	9	21	108.26	9/12/2017	6:07:42 PM
22	10	54	1.00	24	11	35	49.27	9/12/2017	6:09:00 PM
22	10	55	1.00	18	10	28	88.42	9/12/2017	6:10:18 PM
22	10	56	1.00	18	7	27	111.61	9/12/2017	6:11:36 PM
22	10	57	1.00	15	7	22	68.98	9/12/2017	6:12:53 PM
22	10	58	1.00	16	13	29	64.54	9/12/2017	6:14:11 PM
22	10	59	1.00	18	13	33	118.07	9/12/2017	6:15:29 PM
22	10	60	1.00	16	10	26	92.47	9/12/2017	6:16:47 PM
23	10	61	1.00	10	10	21	103.98	9/12/2017	6:18:12 PM
23	10	62	1.00	15	9	24	76.71	9/12/2017	6:19:29 PM
23	10	63	1.00	17	11	28	67.80	9/12/2017	6:20:47 PM
23	10	64	1.00	15	12	27	68.87	9/12/2017	6:22:05 PM
23	10	65	1.00	15	10	25	96.30	9/12/2017	6:23:23 PM
23	10	66	1.00	12	5	19	101.92	9/12/2017	6:24:41 PM
Missing vial 67. (Area not accessible)									
Missing vial 68. (Area not accessible)									
23	10	69	1.00	25	16	41	50.36	9/12/2017	6:26:01 PM
23	10	70	1.00	19	15	34	73.76	9/12/2017	6:27:19 PM

Protocol# 10 - Wipe Test.lsa User: Sai Yan

vault floor

23	10	71	1.00	15	7	22	47.67	9/12/2017	6:28:37 PM
23	10	72	1.00	29	8	39	87.47	9/12/2017	6:29:55 PM
65	10	73	1.00	18	13	32	108.70	9/12/2017	6:31:20 PM
65	10	74	1.00	14	5	20	119.01	9/12/2017	6:32:38 PM
65	10	75	1.00	9	9	20	146.60	9/12/2017	6:33:56 PM
65	10	76	1.00	18	8	26	75.68	9/12/2017	6:35:14 PM
65	10	77	1.00	15	6	22	99.19	9/12/2017	6:36:32 PM
65	10	78	1.00	18	11	30	84.65	9/12/2017	6:37:49 PM
65	10	79	1.00	11	11	23	112.94	9/12/2017	6:39:07 PM
65	10	80	1.00	19	9	28	64.89	9/12/2017	6:40:25 PM
65	10	81	1.00	19	8	27	52.52	9/12/2017	6:41:43 PM
65	10	82	1.00	15	9	25	79.45	9/12/2017	6:43:01 PM
65	10	83	1.00	24	13	38	85.61	9/12/2017	6:44:19 PM
65	10	84	1.00	10	13	23	107.92	9/12/2017	6:45:36 PM
3	10	85	1.00	18	11	30	85.59	9/12/2017	6:47:01 PM
3	10	86	1.00	12	14	28	128.31	9/12/2017	6:48:19 PM
3	10	87	1.00	16	10	27	88.13	9/12/2017	6:49:37 PM
3	10	88	1.00	15	9	27	159.28	9/12/2017	6:50:55 PM
3	10	89	1.00	19	7	28	89.19	9/12/2017	6:52:12 PM
3	10	90	1.00	17	10	28	95.74	9/12/2017	6:53:30 PM
3	10	91	1.00	10	13	23	98.78	9/12/2017	6:54:48 PM
3	10	92	1.00	16	11	28	96.18	9/12/2017	6:56:06 PM
3	10	93	1.00	13	8	21	55.07	9/12/2017	6:57:24 PM
3	10	94	1.00	22	7	29	68.27	9/12/2017	6:58:42 PM
3	10	95	1.00	18	14	34	122.64	9/12/2017	7:00:00 PM
3	10	96	1.00	27	9	36	34.00	9/12/2017	7:01:18 PM
26	10	97	1.00	17	6	24	98.43	9/12/2017	7:02:42 PM
26	10	98	1.00	16	6	22	67.07	9/12/2017	7:04:00 PM
26	10	99	1.00	14	16	33	138.78	9/12/2017	7:05:18 PM
26	10	100	1.00	17	8	26	108.79	9/12/2017	7:06:36 PM
26	10	101(F1D)	1.00	13	8	22	101.04	9/12/2017	7:07:54 PM
26	10	102(F18D)	1.00	19	2	21	25.18	9/12/2017	7:09:12 PM
26	10	103(F25D)	1.00	12	7	21	166.35	9/12/2017	7:10:30 PM
26	10	104(F41D)	1.00	27	5	32	57.44	9/12/2017	7:11:48 PM
26	10	105(F49D)	1.00	12	2	14	45.51	9/12/2017	7:13:05 PM
26	10	106(F54D)	1.00	25	9	36	72.83	9/12/2017	7:14:23 PM
26	10	107(F70D)	1.00	8	7	15	85.98	9/12/2017	7:15:41 PM
26	10	108(F78D)	1.00	14	9	26	150.75	9/12/2017	7:16:59 PM
127	10	109(F88D)	1.00	22	13	35	62.66	9/12/2017	7:18:42 PM
127	10	110(F97D)	1.00	24	9	34	88.45	9/12/2017	7:20:00 PM

Missing vial 111.

127	10	112	1.00	16	5	23	113.66	9/12/2017	7:21:20 PM

Protocol# 6 - Wipe Test.lsa **User: Sai Yan**

vault ceiling

Assay Definition

Assay Description:
Wipe Test
Assay Type: CPM
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170913_0859
Raw Results Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170913_0859\20170913_0859.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170913_0859\Report1.csv
Assay File Name: C:\Packard\TriCarb\Assays\Wipe Test.lsa

Count Conditions

Nuclide: Fun Wipes
   Quench Indicator: SIS
   External Std Terminator (sec): n/a
   Pre-Count Delay (min): 0.00
Quench Set: n/a
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
Number of Vials/Sample: 1 Calculate % Reference: Off

Background Subtract

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

Regions	LL	UL
A	0.0	18.6
B	18.6	156.0
C	0.0	2000.0

Count Corrections

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

Instrument Block Data

MODEL=Tri-Carb 4910TR
SERIAL=SGLO34150058

Cycle 1 Results

PID	P#	S#	Count Time	CPMA	CPMB	CPMC	SIS	DATE	TIME
2	6	1	1.00	31	6	37	34.04	9/13/2017	9:01:13 AM
2	6	2	1.00	23	10	33	66.85	9/13/2017	9:02:31 AM
2	6	3	1.00	11	3	16	147.20	9/13/2017	9:03:49 AM
2	6	4	1.00	18	5	23	49.18	9/13/2017	9:05:07 AM
2	6	5	1.00	11	9	22	124.39	9/13/2017	9:06:25 AM

vault ceiling

2	6	6	1.00	20	4	25	79.38	9/13/2017 9:07:42 AM
2	6	7	1.00	24	6	30	33.38	9/13/2017 9:09:01 AM
2	6	8	1.00	16	9	25	70.65	9/13/2017 9:10:19 AM
2	6	9	1.00	11	13	24	79.59	9/13/2017 9:11:36 AM
2	6	10	1.00	25	8	33	61.49	9/13/2017 9:12:55 AM
2	6	11	1.00	15	5	21	65.16	9/13/2017 9:14:12 AM
2	6	12	1.00	17	6	23	59.35	9/13/2017 9:15:30 AM
14	6	13	1.00	11	9	20	70.41	9/13/2017 9:16:55 AM
14	6	14	1.00	18	13	31	71.47	9/13/2017 9:18:13 AM
14	6	15	1.00	16	3	19	31.47	9/13/2017 9:19:31 AM
14	6	16	1.00	16	6	23	90.24	9/13/2017 9:20:49 AM
14	6	17	1.00	15	13	28	94.12	9/13/2017 9:22:07 AM
14	6	18	1.00	16	7	23	50.49	9/13/2017 9:23:25 AM
14	6	19	1.00	12	13	25	132.86	9/13/2017 9:24:43 AM
14	6	20	1.00	15	7	23	86.70	9/13/2017 9:26:01 AM
14	6	21	1.00	9	8	17	73.50	9/13/2017 9:27:19 AM
14	6	22	1.00	16	9	25	108.21	9/13/2017 9:28:36 AM
14	6	23	1.00	13	6	19	44.48	9/13/2017 9:29:54 AM
14	6	24	1.00	7	16	27	247.02	9/13/2017 9:31:12 AM
18	6	25	1.00	21	5	27	71.74	9/13/2017 9:32:37 AM
18	6	26	1.00	20	8	29	67.52	9/13/2017 9:33:55 AM
18	6	27	1.00	21	8	31	83.57	9/13/2017 9:35:13 AM
18	6	28	1.00	19	7	27	74.57	9/13/2017 9:36:31 AM
18	6	29	1.00	20	7	27	44.08	9/13/2017 9:37:49 AM
18	6	30	1.00	19	17	38	119.53	9/13/2017 9:39:07 AM
18	6	31	1.00	16	7	24	81.68	9/13/2017 9:40:24 AM
18	6	32	1.00	35	6	42	58.51	9/13/2017 9:41:42 AM
18	6	33	1.00	16	13	30	100.31	9/13/2017 9:43:01 AM
18	6	34	1.00	19	8	28	103.89	9/13/2017 9:44:18 AM
18	6	35	1.00	23	7	30	56.01	9/13/2017 9:45:36 AM
18	6	36	1.00	19	12	32	107.72	9/13/2017 9:46:54 AM
37	6	37	1.00	10	8	18	100.76	9/13/2017 9:48:19 AM
37	6	38	1.00	23	8	31	48.12	9/13/2017 9:49:37 AM
37	6	39	1.00	15	4	20	91.16	9/13/2017 9:50:55 AM
37	6	40	1.00	17	7	25	66.09	9/13/2017 9:52:13 AM
37	6	41	1.00	24	12	37	83.25	9/13/2017 9:53:31 AM
37	6	42	1.00	11	8	19	59.60	9/13/2017 9:54:49 AM
37	6	43	1.00	18	8	26	48.18	9/13/2017 9:56:07 AM
37	6	44	1.00	11	6	17	70.86	9/13/2017 9:57:24 AM
37	6	45	1.00	24	4	29	61.68	9/13/2017 9:58:42 AM
37	6	46	1.00	19	6	26	73.73	9/13/2017 10:00:00 AM
37	6	47	1.00	23	8	31	65.89	9/13/2017 10:01:18 AM
37	6	48	1.00	17	3	20	40.85	9/13/2017 10:02:36 AM
2	6	49	1.00	18	8	28	131.88	9/13/2017 10:04:00 AM
Missing vial 50. (Area not accessible)								
2	6	51	1.00	12	4	16	45.14	9/13/2017 10:05:19 AM
2	6	52	1.00	13	4	17	79.54	9/13/2017 10:06:37 AM
2	6	53	1.00	13	8	21	60.83	9/13/2017 10:07:55 AM
2	6	54	1.00	18	4	22	32.52	9/13/2017 10:09:13 AM
2	6	55	1.00	20	12	34	94.41	9/13/2017 10:10:31 AM
2	6	56	1.00	10	8	19	115.86	9/13/2017 10:11:49 AM
2	6	57	1.00	24	6	30	36.49	9/13/2017 10:13:07 AM
2	6	58	1.00	16	9	26	95.56	9/13/2017 10:14:25 AM
2	6	59	1.00	22	12	34	57.96	9/13/2017 10:15:43 AM
Missing vial 60. (Area not accessible)								
3	6	61	1.00	16	9	27	120.46	9/13/2017 10:17:09 AM
3	6	62	1.00	21	16	38	105.13	9/13/2017 10:18:27 AM
3	6	63	1.00	22	9	34	117.38	9/13/2017 10:19:45 AM
3	6	64	1.00	24	6	30	39.72	9/13/2017 10:21:03 AM
3	6	65	1.00	15	6	21	47.27	9/13/2017 10:22:21 AM
3	6	66	1.00	16	13	29	81.88	9/13/2017 10:23:39 AM
3	6	67	1.00	7	6	17	303.14	9/13/2017 10:24:57 AM

Protocol# 6 - Wipe Test.lsa User: Sai Yan

vault ceiling

3	6	68	1.00	24	11	36	77.20	9/13/2017	10:26:15 AM
3	6	69	1.00	11	9	21	114.12	9/13/2017	10:27:33 AM
3	6	70	1.00	17	10	27	74.69	9/13/2017	10:28:51 AM
3	6	71	1.00	13	6	19	42.44	9/13/2017	10:30:09 AM
3	6	72	1.00	19	4	25	99.54	9/13/2017	10:31:27 AM
26	6	73	1.00	18	7	26	77.91	9/13/2017	10:32:52 AM
26	6	74	1.00	11	7	19	148.29	9/13/2017	10:34:10 AM
26	6	75	1.00	23	7	31	69.92	9/13/2017	10:35:27 AM
26	6	76	1.00	20	8	28	62.59	9/13/2017	10:36:46 AM
26	6	77	1.00	19	10	30	140.33	9/13/2017	10:38:04 AM
26	6	78	1.00	19	8	27	53.05	9/13/2017	10:39:22 AM
26	6	79	1.00	16	8	24	55.57	9/13/2017	10:40:40 AM
26	6	80	1.00	26	15	41	77.45	9/13/2017	10:41:58 AM
26	6	81	1.00	12	9	21	103.92	9/13/2017	10:43:16 AM
26	6	82	1.00	29	8	41	122.50	9/13/2017	10:44:34 AM
26	6	83	1.00	20	5	25	37.72	9/13/2017	10:45:52 AM
26	6	84	1.00	21	8	30	74.47	9/13/2017	10:47:10 AM
65	6	85	1.00	28	10	39	80.58	9/13/2017	10:48:34 AM
65	6	86	1.00	19	8	27	57.59	9/13/2017	10:49:53 AM
65	6	87	1.00	12	9	23	139.32	9/13/2017	10:51:10 AM
65	6	88	1.00	16	5	22	75.63	9/13/2017	10:52:28 AM
65	6	89	1.00	22	5	29	117.30	9/13/2017	10:53:46 AM
65	6	90	1.00	30	9	42	125.13	9/13/2017	10:55:05 AM
65	6	91	1.00	14	12	26	70.84	9/13/2017	10:56:23 AM
65	6	92	1.00	19	7	27	93.89	9/13/2017	10:57:41 AM
65	6	93	1.00	32	12	49	122.22	9/13/2017	10:58:59 AM
65	6	94	1.00	19	7	27	72.41	9/13/2017	11:00:17 AM
65	6	95	1.00	18	14	32	68.81	9/13/2017	11:01:35 AM
65	6	96	1.00	13	10	23	78.96	9/13/2017	11:02:53 AM
23	6	97	1.00	23	13	37	106.32	9/13/2017	11:04:17 AM
23	6	98	1.00	14	12	26	64.94	9/13/2017	11:05:35 AM
23	6	99(C14D)	1.00	22	7	30	73.99	9/13/2017	11:06:54 AM
23	6	100(C31D)	1.00	22	12	34	66.09	9/13/2017	11:08:11 AM
23	6	101(C33D)	1.00	16	8	25	86.38	9/13/2017	11:09:29 AM
23	6	102(C37D)	1.00	17	7	25	96.50	9/13/2017	11:10:47 AM
23	6	103(C44D)	1.00	19	10	29	52.58	9/13/2017	11:12:05 AM
23	6	104(C55D)	1.00	20	7	28	82.08	9/13/2017	11:13:23 AM
23	6	105(C66D)	1.00	18	9	27	45.62	9/13/2017	11:14:42 AM
23	6	106(C75D)	1.00	14	12	27	113.09	9/13/2017	11:16:00 AM
23	6	107(C92D)	1.00	13	7	20	76.64	9/13/2017	11:17:18 AM
23	6	108(C95D)	1.00	15	11	27	103.71	9/13/2017	11:18:35 AM
Missing vial 109.									
22	6	110	1.00	18	3	22	61.72	9/13/2017	11:20:19 AM

Background = 22 cpm
MDA = 40 dpm
With H-3 efficiency = 62%
Action Level = 47 cpm
All wipes are < MDA
Unless otherwise marked
Sample #93 was recounted, see the recount

vault ceiling sample 93 rerun

Assay Definition

Assay Description:
Wipe Test
Assay Type: CPM
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170913_1223
Raw Results Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170913_1223\20170913_1223.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170913_1223\Report1.csv
Assay File Name: C:\Packard\TriCarb\Assays\Wipe Test.lsa

Count Conditions

Nuclide: Fun Wipes
   Quench Indicator: SIS
   External Std Terminator (sec): n/a
   Pre-Count Delay (min): 0.00
Quench Set: n/a
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
Number of Vials/Sample: 1 Calculate % Reference: Off

Background Subtract

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

Regions	LL	UL
A	0.0	18.6
B	18.6	156.0
C	0.0	2000.0

Background = 22 cpm
MDA = 40 dpm
With H-3 efficiency = 62%
Action Level = 47 cpm
All wipes are < MDA
Unless otherwise marked
Recount of sample #93 was less than action level and MDA

Count Corrections

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

Instrument Block Data

MODEL=Tri-Carb 4910TR
SERIAL=SGLO34150058

Cycle 1 Results

PID	P#	S#	Count Time	CPMA	CPMB	CPMC	SIS	DATE	TIME
25	8	1	1.00	14	8	24	126.80	9/13/2017	12:24:14 PM
Missing vial 2.									
25	8	3	1.00	16	5	22	94.66	9/13/2017	12:25:34 PM

Protocol# 10 - Wipe Test.lsa User: Sai Yan

vault south wall

Assay Definition

Assay Description:
Wipe Test
Assay Type: CPM
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1757
Raw Results Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1757\20170911_1757.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1757\Report1.csv
Assay File Name: C:\Packard\TriCarb\Assays\Wipe Test.lsa

Count Conditions

Nuclide: Fun Wipes
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Quench Set: n/a
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
Number of Vials/Sample: 1 Calculate % Reference: Off

Background = 25 cpm

MDA = 42 dpm

with H-3 efficiency = 62%

tion Level = 51 cpm

All wipes are < MDA

unless otherwise marked.

Background Subtract

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

Regions	LL	UL
A	0.0	18.6
B	18.6	156.0
C	0.0	2000.0

Count Corrections

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

Instrument Block Data

MODEL=Tri-Carb 4910TR
SERIAL=SGLO34150058

Cycle 1 Results

PID	P#	S#	Count Time	CPMA	CPMB	CPMC	SIS	DATE	TIME
9	10	1	1.00	14	6	22	139.93	9/11/2017	5:58:42 PM
9	10	2	1.00	20	3	25	94.55	9/11/2017	6:00:00 PM
9	10	3	1.00	13	14	29	148.19	9/11/2017	6:01:18 PM
9	10	4	1.00	17	4	22	88.36	9/11/2017	6:02:36 PM
9	10	5	1.00	19	14	36	154.56	9/11/2017	6:03:54 PM
9	10	6	1.00	18	11	29	78.40	9/11/2017	6:05:12 PM
9	10	7	1.00	11	3	15	66.93	9/11/2017	6:06:30 PM

Protocol# 10 - Wipe Test.lsa User: Sai Yan

vault south wall

Missing vial 8. (Area not accessible)

9	10	9	1.00	21	4	25	55.31	9/11/2017	6:07:49 PM
9	10	10	1.00	11	12	26	189.04	9/11/2017	6:09:07 PM
9	10	11	1.00	12	16	31	154.73	9/11/2017	6:10:25 PM
9	10	12	1.00	19	5	29	249.13	9/11/2017	6:11:43 PM
23	10	13	1.00	15	5	22	116.80	9/11/2017	6:13:07 PM
23	10	14	1.00	13	5	19	74.72	9/11/2017	6:14:26 PM
23	10	15	1.00	8	13	21	64.70	9/11/2017	6:15:44 PM
23	10	16	1.00	15	8	24	71.89	9/11/2017	6:17:01 PM
23	10	17	1.00	18	6	26	111.79	9/11/2017	6:18:19 PM
23	10	18	1.00	23	6	30	85.48	9/11/2017	6:19:37 PM
23	10	19	1.00	10	5	19	261.62	9/11/2017	6:20:55 PM
23	10	20	1.00	9	6	16	118.37	9/11/2017	6:22:13 PM
23	10	21	1.00	13	6	19	60.83	9/11/2017	6:23:31 PM
23	10	22	1.00	20	11	32	95.25	9/11/2017	6:24:49 PM
23	10	23	1.00	14	10	24	67.61	9/11/2017	6:26:07 PM
23	10	24	1.00	16	7	24	63.66	9/11/2017	6:27:25 PM
22	10	25	1.00	11	3	17	191.30	9/11/2017	6:29:08 PM
22	10	26	1.00	16	7	26	177.11	9/11/2017	6:30:27 PM
22	10	27	1.00	16	9	26	94.02	9/11/2017	6:31:45 PM
22	10	28	1.00	18	11	32	147.11	9/11/2017	6:33:03 PM
22	10	29	1.00	14	6	22	144.32	9/11/2017	6:34:21 PM
22	10	30	1.00	17	7	24	67.54	9/11/2017	6:35:39 PM
22	10	31	1.00	15	10	27	145.68	9/11/2017	6:36:56 PM
22	10	32	1.00	14	9	24	85.20	9/11/2017	6:38:14 PM
22	10	33	1.00	14	4	18	33.97	9/11/2017	6:39:32 PM
22	10	34	1.00	15	7	24	105.93	9/11/2017	6:40:50 PM
22	10	35	1.00	12	8	20	85.78	9/11/2017	6:42:08 PM
22	10	36	1.00	25	9	35	84.54	9/11/2017	6:43:26 PM
10	10	37	1.00	12	1	13	38.09	9/11/2017	6:45:12 PM
10	10	38	1.00	16	13	32	152.02	9/11/2017	6:46:30 PM
10	10	39	1.00	14	9	23	61.16	9/11/2017	6:47:48 PM
10	10	40	1.00	10	6	16	47.88	9/11/2017	6:49:06 PM
10	10	41	1.00	21	8	31	98.50	9/11/2017	6:50:24 PM
10	10	42	1.00	23	6	29	57.31	9/11/2017	6:51:42 PM
10	10	43	1.00	21	13	37	123.23	9/11/2017	6:52:59 PM
10	10	44	1.00	27	12	39	47.05	9/11/2017	6:54:17 PM
10	10	45	1.00	18	15	33	123.89	9/11/2017	6:55:35 PM
10	10	46(S5D)	1.00	17	11	30	127.12	9/11/2017	6:56:53 PM
10	10	47(S11D)	1.00	9	6	17	148.56	9/11/2017	6:58:11 PM
10	10	48(S20D)	1.00	10	7	17	79.05	9/11/2017	6:59:29 PM
25	10	49(S38D)	1.00	11	4	15	81.91	9/11/2017	7:01:12 PM

Missing vial 50.

25	10	51	1.00	17	8	25	77.78	9/11/2017	7:02:32 PM

Protocol# 4 - Wipe Test.lsa User: Sai Yan

vault north wall

Assay Definition

Assay Description:
Wipe Test
Assay Type: CPM
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1621
Raw Results Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1621\20170911_1621.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1621\Report1.csv
Assay File Name: C:\Packard\TriCarb\Assays\Wipe Test.lsa

Count Conditions

Nuclide: Fun Wipes
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Quench Set: n/a
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
Number of Vials/Sample: 1 Calculate % Reference: Off

ackground = 22 cpm

MDA = 40 dpm

with H-3 efficiency = 62%

tion Level = 47 cpm

All wipes are < MDA

unless otherwise marked.

Background Subtract

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

Regions	LL	UL
A	0.0	18.6
B	18.6	156.0
C	0.0	2000.0

Count Corrections

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

Instrument Block Data

MODEL=Tri-Carb 4910TR
SERIAL=SGLO34150058

Cycle 1 Results

PID	P#	S#	Count Time	CPMA	CPMB	CPMC	SIS	DATE	TIME
14	4	1	1.00	10	10	20	76.08	9/11/2017	4:22:48 PM
14	4	2	1.00	9	9	19	118.64	9/11/2017	4:24:06 PM
14	4	3	1.00	17	6	24	89.50	9/11/2017	4:25:24 PM
14	4	4	1.00	12	5	19	135.71	9/11/2017	4:26:42 PM
14	4	5	1.00	16	8	25	103.66	9/11/2017	4:28:00 PM
14	4	6	1.00	13	7	21	82.35	9/11/2017	4:29:18 PM
14	4	7	1.00	16	8	26	116.98	9/11/2017	4:30:36 PM

Protocol# 4 - Wipe Test.lsa User: Sai Yan

vault north wall

14	4	8	1.00	12	7	19	66.78	9/11/2017	4:31:54 PM
14	4	9	1.00	14	5	21	210.75	9/11/2017	4:33:12 PM
14	4	10	1.00	10	11	23	188.10	9/11/2017	4:34:30 PM
14	4	11	1.00	13	9	24	124.81	9/11/2017	4:35:48 PM
14	4	12	1.00	8	12	22	132.92	9/11/2017	4:37:06 PM
3	4	13	1.00	13	7	22	161.30	9/11/2017	4:38:30 PM
3	4	14	1.00	14	14	30	164.25	9/11/2017	4:39:48 PM
3	4	15	1.00	16	12	29	96.99	9/11/2017	4:41:06 PM
3	4	16	1.00	20	9	29	70.71	9/11/2017	4:42:24 PM
3	4	17	1.00	15	5	22	111.55	9/11/2017	4:43:42 PM
3	4	18	1.00	15	9	24	55.44	9/11/2017	4:45:00 PM
3	4	19	1.00	16	12	29	68.43	9/11/2017	4:46:18 PM
3	4	20	1.00	15	5	20	46.06	9/11/2017	4:47:36 PM
3	4	21	1.00	15	11	28	107.94	9/11/2017	4:48:54 PM
3	4	22	1.00	14	4	18	49.40	9/11/2017	4:50:12 PM
3	4	23	1.00	14	7	22	70.47	9/11/2017	4:51:30 PM
3	4	24	1.00	15	11	28	143.29	9/11/2017	4:52:48 PM
26	4	25	1.00	10	12	23	161.37	9/11/2017	4:54:12 PM
26	4	26	1.00	12	4	16	77.54	9/11/2017	4:55:31 PM
26	4	27	1.00	21	12	34	83.08	9/11/2017	4:56:48 PM
26	4	28	1.00	14	7	22	70.11	9/11/2017	4:58:06 PM
26	4	29	1.00	20	7	27	46.52	9/11/2017	4:59:24 PM
26	4	30	1.00	7	10	18	139.55	9/11/2017	5:00:43 PM
26	4	31	1.00	15	10	25	59.87	9/11/2017	5:02:00 PM
26	4	32	1.00	11	7	21	226.50	9/11/2017	5:03:18 PM
26	4	33	1.00	6	2	8	34.11	9/11/2017	5:04:36 PM
26	4	34	1.00	23	5	30	136.67	9/11/2017	5:05:54 PM
26	4	35	1.00	11	9	21	97.74	9/11/2017	5:07:12 PM
26	4	36	1.00	12	7	20	119.57	9/11/2017	5:08:30 PM
27	4	37	1.00	15	12	27	62.31	9/11/2017	5:09:54 PM
127	4	38	1.00	15	3	19	68.63	9/11/2017	5:11:12 PM
127	4	39	1.00	12	8	23	171.49	9/11/2017	5:12:30 PM
127	4	40	1.00	11	3	14	45.40	9/11/2017	5:13:48 PM
127	4	41(N5D)	1.00	12	17	32	188.37	9/11/2017	5:15:06 PM
127	4	42(N9D)	1.00	15	9	26	104.57	9/11/2017	5:16:24 PM
127	4	43(N15D)	1.00	24	5	30	57.41	9/11/2017	5:17:42 PM
127	4	44(N34D)	1.00	20	6	28	167.35	9/11/2017	5:19:00 PM
Missing vial 45.									
127	4	46	1.00	16	6	22	66.97	9/11/2017	5:20:19 PM

Protocol# 8 - Wipe Test.lsa User: Sai Yan

vault west wall

Assay Definition

Assay Description:
Wipe Test
Assay Type: CPM
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1720
Raw Results Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1720\20170911_1720.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1720\Report1.csv
Assay File Name: C:\Packard\TriCarb\Assays\Wipe Test.lsa

Count Conditions

Nuclide: Fun Wipes
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Quench Set: n/a
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
Number of Vials/Sample: 1 Calculate % Reference: Off

Background = 32 cpm

MDA = 47 dpm

with H-3 efficiency = 62%

tion Level = 61 cpm

All wipes are < MDA

unless otherwise marked.

Background Subtract

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

Regions	LL	UL
A	0.0	18.6
B	18.6	156.0
C	0.0	2000.0

Count Corrections

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

Instrument Block Data

MODEL=Tri-Carb 4910TR
SERIAL=SGLO34150058

Cycle 1 Results

PID	P#	S#	Count Time	CPMA	CPMB	CPMC	SIS	DATE	TIME
21	8	1	1.00	12	14	27	120.88	9/11/2017	5:21:48 PM
21	8	2	1.00	23	12	37	94.33	9/11/2017	5:23:06 PM
21	8	3	1.00	16	6	23	72.89	9/11/2017	5:24:24 PM
21	8	4	1.00	20	6	27	68.75	9/11/2017	5:25:41 PM
21	8	5	1.00	14	6	20	63.64	9/11/2017	5:26:59 PM
21	8	6	1.00	17	10	27	60.87	9/11/2017	5:28:17 PM
21	8	7	1.00	22	10	32	73.80	9/11/2017	5:29:35 PM

vault west wall

21	8	8	1.00	16	8	27	171.96	9/11/2017	5:30:53 PM
21	8	9	1.00	11	8	20	99.75	9/11/2017	5:32:11 PM
21	8	10	1.00	15	9	24	75.12	9/11/2017	5:33:29 PM
21	8	11	1.00	23	8	32	81.50	9/11/2017	5:34:47 PM
21	8	12	1.00	18	5	24	78.51	9/11/2017	5:36:05 PM
65	8	13	1.00	14	10	25	102.52	9/11/2017	5:37:29 PM
65	8	14	1.00	15	3	19	92.55	9/11/2017	5:38:47 PM
65	8	15	1.00	20	7	28	69.65	9/11/2017	5:40:05 PM
65	8	16	1.00	11	8	19	73.87	9/11/2017	5:41:23 PM
65	8	17	1.00	15	7	24	136.16	9/11/2017	5:42:41 PM
65	8	18	1.00	15	9	26	118.77	9/11/2017	5:43:59 PM
65	8	19	1.00	14	7	24	195.57	9/11/2017	5:45:17 PM
65	8	20	1.00	17	7	25	100.38	9/11/2017	5:46:35 PM
65	8	21	1.00	14	3	18	99.75	9/11/2017	5:47:53 PM
65	8	22	1.00	16	14	31	106.68	9/11/2017	5:49:11 PM
65	8	23	1.00	15	5	20	45.49	9/11/2017	5:50:28 PM
65	8	24	1.00	8	7	16	96.60	9/11/2017	5:51:46 PM
2	8	25	1.00	13	7	20	59.71	9/11/2017	5:53:10 PM
2	8	26(W4D)	1.00	17	8	26	117.20	9/11/2017	5:54:29 PM
2	8	27(W13D)	1.00	23	9	32	64.85	9/11/2017	5:55:47 PM
Missing vial 28.									
2	8	29	1.00	18	12	32	108.39	9/11/2017	5:57:06 PM

vault east wall

Assay Definition

Assay Description:
Wipe Test
Assay Type: CPM
Report Name: Report1
Output Data Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1552
Raw Results Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1552\20170911_1552.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1552\Report1.csv
Assay File Name: C:\Packard\TriCarb\Assays\Wipe Test.lsa

Count Conditions

Nuclide: Fun Wipes
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Quench Set: n/a
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
Number of Vials/Sample: 1 Calculate % Reference: Off

Background = 25. cpm
MDA = 42 dpm
with H-3 efficiency = 62%
tion Level = 51 cpm
All wipes are < MDA
unless otherwise marked.

Background Subtract

Background Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

Regions	LL	UL
A	0.0	18.6
B	18.6	156.0
C	0.0	2000.0

Count Corrections

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

Instrument Block Data

MODEL=Tri-Carb 4910TR
SERIAL=SGLO34150058

Cycle 1 Results

PID	P#	S#	Count Time	CPMA	CPMB	CPMC	SIS	DATE	TIME
2	3	1	1.00	15	4	19	48.70	9/11/2017	3:53:57 PM
2	3	2	1.00	12	13	26	128.21	9/11/2017	3:55:14 PM
2	3	3	1.00	25	8	33	55.84	9/11/2017	3:56:32 PM
2	3	4	1.00	23	9	34	87.47	9/11/2017	3:57:50 PM
2	3	5	1.00	10	7	18	90.15	9/11/2017	3:59:08 PM
2	3	6	1.00	16	9	28	148.06	9/11/2017	4:00:26 PM
2	3	7	1.00	19	6	25	51.20	9/11/2017	4:01:44 PM

Protocol# 3 - Wipe Test.lsa User: Sai Yan

vault east wall

2	3	8	1.00	15	7	25	146.93	9/11/2017	4:03:02 PM
2	3	9	1.00	12	11	25	182.44	9/11/2017	4:04:20 PM
2	3	10	1.00	15	9	25	106.46	9/11/2017	4:05:38 PM
2	3	11	1.00	10	0	10	27.93	9/11/2017	4:06:55 PM
2	3	12	1.00	10	4	14	67.52	9/11/2017	4:08:13 PM
25	3	13	1.00	16	10	28	139.66	9/11/2017	4:09:38 PM
25	3	14	1.00	14	9	23	53.18	9/11/2017	4:10:55 PM
25	3	15	1.00	15	5	21	103.12	9/11/2017	4:12:13 PM
25	3	16	1.00	9	6	17	133.83	9/11/2017	4:13:32 PM
25	3	17	1.00	16	15	32	99.51	9/11/2017	4:14:49 PM
25	3	18	1.00	22	13	35	73.38	9/11/2017	4:16:07 PM
25	3	19	1.00	24	13	40	119.33	9/11/2017	4:17:25 PM
25	3	20(E6D)	1.00	9	10	19	74.19	9/11/2017	4:18:44 PM
25	3	21(E11D)	1.00	25	9	34	69.12	9/11/2017	4:20:01 PM
Missing vial 22.									
25	3	23	1.00	15	9	25	98.64	9/11/2017	4:21:21 PM

Protocol# 7 - Wipe Test.lsa User: Sai Yan

vault pit wall

Assay Definition

Assay Description:
Wipe Test
Assay Type: CPM
Report Name: Report1
Output Data Path: C:\Packard\TriCarb\Results\Tri Le\Wipe Test
Raw Results Path: C:\Packard\Tricarb\Results\Sai Yan\Wipe Test\20170911_1535\20170911_1535.results
Comma-Delimited File Name: C:\Packard\TriCarb\Results\Tri Le\Wipe Test\Report1.csv
Assay File Name: C:\Packard\TriCarb\Assays\Wipe Test.lsa

Count Conditions

Nuclide: Fun Wipes
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Quench Set: n/a
Count Time (min): 1.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
Number of Vials/Sample: 1 Calculate % Reference: Off

Background = 33 cpm
MDA = 48 dpm
with H-3 efficiency = 62%
tion Level = 62 cpm
All wipes are < MDA
unless otherwise marked.

Background Subtract

ackground Subtract: Off
Low CPM Threshold: Off
2 Sigma % Terminator: Off

Regions	LL	UL
A	0.0	18.6
B	18.6	156.0
C	0.0	2000.0

Count Corrections

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

Instrument Block Data

MODEL=Tri-Carb 4910TR
SERIAL=SGLO34150058

Cycle 1 Results

PID	P#	S#	Count Time	CPMA	CPMB	CPMC	SIS	DATE	TIME
21	7	1	1.00	19	5	24	52.16	9/11/2017	3:36:33 PM
21	7	2	1.00	15	9	25	76.75	9/11/2017	3:37:50 PM
21	7	3	1.00	14	5	19	55.63	9/11/2017	3:39:09 PM
21	7	4	1.00	24	9	35	88.61	9/11/2017	3:40:27 PM
21	7	5	1.00	21	11	34	123.49	9/11/2017	3:41:45 PM
21	7	6	1.00	9	11	22	130.95	9/11/2017	3:43:02 PM
21	7	7	1.00	17	12	30	76.83	9/11/2017	3:44:20 PM
21	7	8	1.00	18	9	29	126.66	9/11/2017	3:45:38 PM

Protocol# 7 - Wipe Test.lsa User: Sai Yan

vault pit wall

21	7	9	1.00	19	12	31	52.27	9/11/2017	3:46:56 PM
21	7	10	1.00	11	10	21	82.74	9/11/2017	3:48:14 PM
21	7	11	1.00	23	6	30	79.45	9/11/2017	3:49:32 PM
21	7	12(P4D)	1.00	12	12	27	169.82	9/11/2017	3:50:50 PM
Missing vial 13.									
5	7	14	1.00	20	13	33	76.38	9/11/2017	3:52:16 PM