November 2010 Area Air and Surface Dust Monitoring Report

General Services Administration

Bannister Road

Kansas City, Jackson County, Missouri

June 30, 2011

Terracon Project No. 02107144

Prepared for:

General Services Administration

Kansas City, Missouri

Prepared by:

Terracon Consultants, Inc.

Lenexa, Kansas

Offices Nationwide Established in 1965
Employee-Owned terracon.com

Terracon

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

June 30, 2011

Terracon

General Services Administration
Heartland Region
1500 East Bannister Rd (6PME)
Kansas City, MO 64131

Attn: Mr. Kevin Santee, Environmental & Energy Branch Chief
Phone: 816.823.2219
Email: kevin.santee@gsa.gov

Re: November 2010 Area Air and Dust Monitoring Report
Bannister Federal Complex
1500 East Bannister Road
Kansas City, Missouri 64131
Terracon Project Number: 02107144

Dear Mr. Santee:

Terracon Consultants, Inc. (Terracon) is pleased to submit this report summarizing area air monitoring and surface dust sampling for beryllium, uranium and yttrium at the General Services Administration (GSA) Federal Complex located at 1500 East Bannister Road, Kansas City, Missouri. Terracon personnel conducted the area monitoring and dust sampling on November 23, 24 and 30, 2010. Services were performed in general accordance with Terracon's proposal (Proposal Number P02100887) dated September 23, 2010 and with Tetra Tech EM Inc.'s Final Work Plan and Quality Assurance Project Plan for Site Investigation and Limited Removal Action Activities dated September 1, 2010 and the subsequent addendum dated November November 24, 2010.

We appreciate the opportunity to be of service and provide this information as part of the ongoing evaluation work at the Bannister Complex. If you have any questions regarding this report, please call us at 913-492-7777.

Sincerely,
Terracon Consultants, Inc.

Wil King, P.G.
Project Geologist

Ashley D. Stueve :for
Gary A. Ganson, CIH, CSP
Senior Consultant

C.A. Baldwin :for
Cindy A. Baldwin, CIH, LIH
Senior Industrial Hygienist

Copies to: Addressee (2)

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW 1

2.0 AIR AND DUST MONITORING 4

3.0 ANALYTICAL METHODS 5

4.0 ANALYTICAL RESULTS 6

5.0 QUALITY ASSURANCE 9

6.0 CONCLUSIONS AND RECOMMENDATIONS 10

APPENDICES

APPENDIX A – Exhibits

Exhibit 1 Sample Location Diagram Building 1 – Floor 1
Exhibit 2 Sample Location Diagram Building 1 – Sub-Basement
Exhibit 3 Sample Location Diagram Building 2 – Floor 1
Exhibit 4 Sample Location Diagram Building 2 – Basement
Exhibit 5 Sample Location Diagram Building 1-2 – Roof

APPENDIX B – Photographic Documentation

APPENDIX C – Field Logs

APPENDIX D – Analytical Tables

Table 1 Air Sampling Data Summary – Be/U/Y
Table 2 Air Sampling Data Summary – Isotopic Uranium
Table 3 Dust Sampling Data Summary – Be/U/Y
Table 4 Dust Sampling Data Summary – Isotopic Uranium

APPENDIX E – Laboratory Analytical Reports

NOVEMBER 2010 AREA AIR AND DUST MONITORING REPORT
BANNISTER FEDERAL COMPLEX
GENERAL SERVICES ADMINISTRATION
1500 EAST BANNISTER ROAD
KANSAS CITY, MISSOURI 64131

TERRACON PROJECT NUMBER: 02107144
June 30, 2011

1.0 PROJECT OVERVIEW

1.1 Introduction

This report presents the results of air and dust sampling conducted at the General Services Administration (GSA) Bannister Federal Complex (BFC) located at 1500 East Bannister Road, Kansas City, Missouri on November 23, 24 and 30, 2010. Terracon Consultants, Inc. (Terracon) conducted area air monitoring and surface dust sampling in accordance with the Tetra Tech EM, Inc. (TetraTech) developed Work Plan and Quality Assurance Project Plan for Site Investigation and limited Removal Action Activities (Work Plan/QAPP), dated September 1, 2010 and addendum dated November 24, 2010.

The BFC is a 300-acre federal complex, bordered on the north by a wooded bluff and Legacy Park, on the east by the Blue River and Blue River Road, on the south by Bannister Road and Indian Creek, and on the west by Troost Avenue. The original BFC was established in 1942 to build aircraft engines for the U.S. Navy. After World War II, manufacture of aircraft engines continued on the west side of the BFC until the 1960s, while manufacture of non-nuclear components of nuclear weapons began at the east side of the BFC in 1949 as explained in the May 2008 Site Preliminary Assessment (PA) and Site Inspection Report performed by SCS Engineers (SCS). Currently, more than half of the BFC (generally the eastern portion of the BFC) is managed by the U.S. Department of Energy (DOE) as the Kansas City Plant (KCP), while the remaining portion of the BFC is managed by GSA and is used primarily as warehouse and office space.

1.2 Services

In accordance with the Work Plan/QAPP, Terracon's services are described below. Services were provided in accordance with Terracon's proposal dated September 30, 2010.

Air and surface sampling was conducted in Buildings 1 and 2 to assess for presence of beryllium, uranium and yttrium. The beryllium and uranium are two materials that have historically been used at the BFC. Air sampling was conducted primarily to evaluate potential health threats posed to building occupants by beryllium and uranium in air, but also to evaluate potential pathways for migration of airborne beryllium and uranium into GSA-controlled building space. Surface sampling was conducted to provide information on possible past releases of beryllium and uranium into GSA-controlled building spaces, evaluate potential pathways for migration of beryllium and uranium into the building environment, and evaluate the need for

action to mitigate exposure to settled dust. Air and surface dust sample locations are depicted on Exhibits 1-5 provided in Appendix A.

Yttrium was included in the sample analysis to evaluate the source of beryllium detected in air and dust samples. Based on information provided by the National Nuclear Security Administration (NNSA) in their email to Kevin Santee with GSA dated November 10, 2010, NNSA has historically machined beryllium metal stock that has not contained yttrium, with the possible exception of trace levels. Therefore, it is NNSA's opinion that a high beryllium to yttrium ratio would indicate an anthropogenic source of beryllium.

Indoor and Ambient Air Sampling – Thirteen indoor and five outdoor ambient air sampling locations were selected for collection and laboratory analysis. The air sampling locations were selected to:

- Evaluate airborne concentrations of beryllium and uranium in indoor air and evaluate potential health threats posed to building occupants.
- Evaluate potential migration pathways created by air exchange through perforations in the firewall separating GSA- and DOE-controlled spaces and by DOE-employees entering GSA-managed property.
- Evaluate concentrations of beryllium and uranium in outdoor air entering rooftop air intakes and evaluate the potential migration pathway created by possible re-entrainment of exhausted air from DOE-controlled ventilation systems into the outdoor air intakes of GSA ventilation systems.
- Evaluate background concentrations of beryllium and uranium in outdoor air north and west of the GSA-controlled Buildings 1 and 2.

Samples were collected during a typical workday (a non-holiday weekday) over an approximately 10-hour period starting at approximately 0730 hours and ending at 1730 hours in order to coincide with periods of typical worker activities. Samples were collected as described in the QAPP, Section 4.3 – Sampling Procedures and Requirements, and were analyzed for beryllium and uranium.

Surface Dust Sampling – Thirteen bulk dust sampling locations were selected for collection and laboratory analysis. The surface dust sampling locations were selected to:

- Assess for presence of beryllium and uranium in settled dust on surfaces near perforations in the firewall separating GSA- and DOE-controlled spaces that could indicate historical releases of airborne beryllium and uranium through the perforations.
- Assess for presence of beryllium and uranium in settled dust within rooftop air intakes that could indicate historical intake of airborne beryllium and uranium into rooftop air intakes.

- Assess for presence of beryllium and uranium in settled dust on ventilation system surfaces associated with Fan House #3 on Building 2, which formerly received return air from DOE-controlled portions of Building 2.
- Evaluate if actions are necessary to mitigate exposure to settled dust.

1.3 Scope and Report Limitations

Terracon's services were performed in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time period. Terracon makes no other warranties, either express or implied, regarding the findings, conclusions or recommendations. Please note that Terracon does not warrant the work of laboratories, regulatory agencies or other third parties supplying information used in the preparation of the report.

These services were performed in accordance with the scope of work agreed with you, our client, as reflected in our proposal.

The level of effort and associated tasks completed for this assessment were limited to the scope of services outlined in our September 30, 2010 proposal and in accordance with Contract GS-10F-0256K. Terracon did not attempt to identify every potential exposure or hazard present in the client's operation.

The results, findings, conclusions, and recommendations expressed in this report are based on information reported to Terracon by the client. Many factors such as workload, variations in work material composition, work processes, and weather conditions can affect member exposure concentrations and air monitoring results. The information contained in this report should not be relied upon to represent conditions that existed previously or at a later date. Terracon does not warrant the services of regulatory agencies, laboratories, or other third parties supplying information, which may have been used in the preparation of this report. No warranty, express or implied is made.

This report is prepared for the exclusive use of our client for the specific application to the project discussed and has been prepared in accordance with generally accepted industrial hygiene practices. In the event any changes in nature or location of processes, materials, or other conditions as outlined in this report are observed, the conclusions contained in this report cannot be considered valid unless the changes are reviewed and the conclusions of this report are modified or verified in writing by the industrial hygienist.

2.0 AIR AND DUST MONITORING

2.1 Air Sampling

On November 23, and 24, 2010, Terracon environmental personnel conducted air sampling at the GSA Bannister Federal Complex. Air sampling was performed consistent with procedures described in National Institute for Occupational Safety and Health (NIOSH) Method 7300 – Elements by ICP and Environmental Protection Agency (EPA) Environmental Response Team (ERT) Standard Operating Procedure #2119 – Air Sampling for Metals. Area samples were collected during a typical workday (a non-holiday weekday) over an approximately 10-hour period starting at approximately 0730 hours and ending at 1730 hours. The sampling pumps were operated at approximately 7 liters per minute (Lpm) to allow for collection of approximately 4,000+ liters of air.

Sampling equipment consisted of SKC Leland Legacy pumps equipped with Tygon® tubing attached to 37-millimeter (mm) cassettes with 0.8-micrometer (µm) mixed cellulose ester (MCE) filters (sampling media). Pumps were placed approximate to predetermined locations, as described in the Work Plan/QAPP. Using aluminum tripods, sampling media was held at an approximate height of 4.5 to 5 feet above grade, to approximate the breathing zone. The pumps were pre- and post-calibrated using a TSI model 4146 primary calibrator.

Terracon personnel documented all pertinent information on the field logs, including sample locations, start and stop times and flow rates. Upon completion of the air sampling, the sampling media was detached from the Tygon® tubing, sealed, and submitted to ALS Environmental, Cincinnati, Ohio, under standard chain-of-custody (COC) protocol, for laboratory analysis.

2.2 Dust Sampling

Terracon environmental personnel returned to the site on November 30, 2011 to collect surface dust samples. The surface dust samples were collected with Mine Safety Appliances (MSA) Escort-Elf air sampling pumps equipped with 37-mm, pre-weighed, cassettes with 5.0-µm polyvinyl chloride (PVC) filters. The sampling technique was selected to facilitate collection of dust from crevices, irregular surfaces, and hard-to-reach areas that would be difficult to sample using other techniques.

The MSA pumps operate with an electronic laminar flow sensor that provides constant flow control, with +/- 2.5% regulation of flow rate (from 1 to 3 Lpm) and automatic compensation for changes in battery voltage, temperature, altitude, and sample load. Each sampling pump was pre- and post- calibrated using the TSI model 4146 primary calibrator that was calibrated to manufacturer specifications on November 17, 2010.

Sampling procedures as described in ASTM International (ASTM) D7144 (Standard Practice for Collection of Surface Dust by Micro-vacuum Sampling for Subsequent Metals Determination) were followed to collect the bulk surface dust samples. Terracon environmental personnel measured an area by placing a template of 10 x 10 centimeters (cm) and proceeded to vacuum surface dust onto the PVC filter media. The bulk samples were analyzed to give a concentration on a mass concentration basis (i.e., mass of metal per unit mass of sample collected), as opposed to a mass of metal per unit of surface area. Upon completion of sampling, the filters were sealed, and submitted to ALS, under standard COC protocol, for laboratory analysis.

Photographic documentation of air and dust sampling activities are provided in Appendix B. Field documentation is provided in Appendix C.

As required by the Work Plan/QAPP, blank sample media and duplicate samples (where appropriate) were collected and submitted to the laboratory for laboratory analysis. The results for the blank samples and duplicates are provided in Appendix D, Tables 1 through 4.

3.0 ANALYTICAL METHODS

3.1 Beryllium, Uranium and Yttrium Analysis

Air samples were submitted for laboratory analysis of beryllium and uranium by Modified NIOSH Method 7300. Dust samples were submitted for laboratory analysis of beryllium and uranium by EPA Method 6010B. Yttrium was additionally analyzed in an attempt to evaluate the source of beryllium detected in air and dust samples.

For beryllium concentrations, there is correlation with yttrium concentrations showing the presence of background concentrations from naturally occurring beryllium. Studies by the DOE (Worker Environment Beryllium Characterization Study, Prepared by National Security Technologies, LLC., Environment, Safety, Health & Quality P.O. Box 98521 Las Vegas, NV 89193-8521 December 2009) document the concentration of naturally occurring beryllium and yttrium.

Building dust typically contains soil from the outside environment; therefore, detections of trace metals that naturally occur in soil (such as Be and Y) are expected to be present in samples of interior building dust. The Be and Y concentrations detected in the Building 1 and 2 bulk dust samples as identified in Table 1 below, are consistent with Be and Y concentrations typically found in Missouri soils.

Table 1
Be and Y Concentrations in Building 1 and 2 Bulk Dust Samples and Missouri Soils.

Sample Location/Study Description	Be [2]	Y [2]
Bulk dust samples collected from GSA Buildings 1 and 2 in November 2010	<0.30 – 1.5	< 3.1 – 9.9
Missouri soils [1]	<1.0 – 2.5	<10 – 70

Notes:
[1] Typical concentrations in Missouri soils as reported in Elements In North American Soils by James Dragun, Ph.D. and Andrew Chiasson. Hazardous Materials Control Resources Institute.
[2] Concentrations are in milligrams per kilogram

Based on information provided by the NNSA in their email to Kevin Santee, with GSA, dated November 10, 2010, NNSA has historically machined beryllium metal stock that has not contained yttrium, with the possible exception of trace levels. Therefore, it is NNSA's opinion that a high beryllium to yttrium ratio would indicate an anthropogenic source of beryllium. However, due to the limited beryllium detections in both air and dust samples collected, beryllium to yttrium ratios could not be developed. Analytical laboratory results are provided in Appendix D, Tables 1 and 3. Laboratory reports are provided in Appendix E.

3.2 Isotopic Uranium Analysis

Isotopic uranium sampling was conducted to evaluate for specific isotopes in air and dust samples collected from the site. The purpose of the isotopic uranium sampling was to distinguish between naturally occurring uranium and anthropogenic uranium sources.

The air and dust samples were submitted for isotopic uranium analysis for the uranium isotopes 234, 235 and 238. These samples were analyzed by ALS at their Colorado Springs, Colorado laboratory using alpha spectroscopy. ALS standard operating procedures SOP773R10 and SOP778R13 were followed to prepare the samples for analysis. The samples were analyzed for the presence of isotopic uranium by Alpha Spectroscopy PAI 714 Revision 12. Laboratory results are provided in Appendix D, Tables 2 and 4.

4.0 ANALYTICAL RESULTS

4.1 Analytical Screening Limits

The EPA Regional Screening Levels (RSLs) for Industrial Use were used as comparison values for the air and dust samples collected. The lowest (most conservative) Industrial RSLs were utilized for comparison to the sample concentrations. EPA RSLs utilized are provided on the tables presented in Appendix D.

4.1.1 Air Sampling Results

The November 2010 air monitoring results do not indicate concentrations of beryllium, yttrium, or total uranium at concentrations above the laboratory reporting limits when analyzed by NIOSH method 7300 modified and SW6010B. The laboratory reporting limits did not exceed the applicable EPA Industrial RSLs. Laboratory results are provided in Appendix D, Table 1.

4.1.2 Surface Dust Sampling Results

The November 2010 surface dust monitoring results do not indicate concentrations of uranium at concentrations above the laboratory reporting limits. Beryllium was detected in two of the dust samples collected (B1-Roof-ECAI and B1F1-F25) at concentrations of 0.18 milligrams per kilogram (mg/kg) and 1.5 mg/kg, respectively. The identified beryllium concentrations do not exceed the applicable EPA Industrial RSL of 2,000 mg/kg. The laboratory reporting limits did not exceed the applicable EPA Industrial RSLs. Laboratory results are provided in Appendix D, Table 3.

4.1.3 Isotopic Uranium Results

The air and dust samples were additionally analyzed for isotopic uranium (U234, U235 and U238). The intent of isotopic uranium analysis was to provide sampling results that would assist the GSA to evaluate the source of uranium identified at the GSA BFC. The following information briefly describes the uncertainty of how isotopic uranium abundances exhibited by a sample can be used to evaluate whether uranium in the sample is characteristic of natural or depleted uranium. The analytical results indicate that the majority of the air and dust samples did not exhibit uranium isotopes above the minimum detectable concentration, precluding any determination of the uranium source. Dust sample (FH3-MC-Be/U/Y-Dust Iso) exhibited detectable activities of all three uranium isotopes (U-234, U-235, and U-238). The following discussion explains the laboratory-reported uncertainties associated with the low sample activity and to conclude that, in addition to the numerous non-detections, the large uncertainties also preclude making any determination of whether detected uranium was characteristic of natural or depleted uranium.

Isotopic uranium results for the air and surface dust samples collected are provided in Tables 2 and 4, Appendix D.

Operations at the NNSA-controlled areas of the GSA BFC have reportedly used depleted uranium (DU). DU is a byproduct material produced during the enrichment of natural uranium. Both natural uranium and DU contain three isotopes of uranium: U-234, U-235, and U-238. The enrichment process concentrates both the U-235 and the U-234 isotopes in the enriched uranium product, resulting in the DU byproduct that is depleted in both U-235 and U-234. The resultant DU retains a smaller percentage of U-235 and U-234, and a greater percentage of U-238. Table 2, provided below, lists typical isotopic abundances of natural and depleted uranium. Isotope concentrations are often measured and reported in

terms of radioactivity (e.g. picoCuries per gram), and not reported on a mass basis; therefore, abundances of uranium isotopes are listed in Table 2 below as a percentage of their activities. Isotopes differ in their radioactivities (i.e., half-lives); therefore, abundances expressed as mass and activity differ.

Table 2
Typical Isotopic Abundances in Natural and Depleted Uranium

Isotope	Percent Abundance by Mass		Percent Abundance by Activity	
	Natural Uranium	Depleted Uranium	Natural Uranium	Depleted Uranium
U-234	0.0057%	0.001%	48.8%	15.2%
U-235	0.72%	0.2%	2.4%	1.1%
U-238	99.28%	99.8%	48.8%	83.7%

Source: International Atomic Energy Agency

Because DU contains isotope abundances different from those in naturally occurring uranium, isotopic analysis of the air and dust samples collected in Buildings 1 and 2 was conducted to determine if uranium detected in the samples had isotope abundances characteristic of natural uranium or of DU. Several air and dust samples exhibited detectable concentrations of individual uranium isotopes; however, only one sample—sample FH3-MC-Be/U/Y-Dust Iso—exhibited detectable concentrations of more than one uranium isotope. Table 3 below lists the isotopic uranium results for sample FH3-MC-Be/U/Y-Dust Iso, and presents a calculation of the isotopic abundances in terms of percent activity.

Table 3
Uranium Isotope Abundances for Sample FH3-MC-Be/U/Y-Dust Iso

Isotope	Activity (picoCuries/sample)	Relative Abundance (% activity)
U-234	0.065 +/– 0.046	34 +/– 27%
U-235	0.027 +/– 0.028	14 +/– 15%
U-238	0.102 +/– 0.055	53 +/– 35%

Table 4 provided below compares uranium isotope abundances of sample FH3-MC-Be/U/Y-Dust Iso to typical uranium isotope abundances of natural uranium and DU.

Table 4
Calculated Abundances of Uranium Isotopes
Detected in Sample FH3-MC-Be/U/Y-Dust Isotopic Analysis
Compared to Natural and Depleted Uranium

Percent Abundance by Activity			
Isotope	**Natural Uranium**	**Depleted Uranium**	**Sample FH3-MC-Be/U/Y-Dust Iso**
U-234	48.8%	15.2%	34 +/– 27%
U-235	2.4%	1.1%	14 +/– 15%
U-238	48.8%	83.7%	53 +/– 35%

Given the uncertainty associated with the isotopic activities reported by the laboratory and the uncertainty associated with the calculated percent abundance, no inference can be made regarding the source of the uranium detected in sample FH3-MC-Be/U/Y-Dust Iso.

5.0 QUALITY ASSURANCE

Following the QAPP requirements for data validation during sampling, Terracon conducted oversight of all sampling procedures. All calibration equipment used to set pump air flows were current to within one year of being laboratory calibrated. Calibration equipment documentation is included in Appendix C.

5.1 Duplicate Results

5.1.1 Air Sample Duplicate Results

Terracon collected two duplicate air samples at air sampling points B1SB-Q25 and B1SB-R18. The corresponding duplicate samples are identified as Be/U/Y – Dup 1 Air and Dup 2-Be/U/Y, respectively. The reported laboratory values were below the detection limits and therefore the relative percent difference (RPD) values for the beryllium, uranium and yttrium could not be calculated.

5.1.2 Sample Media Blank Results

Terracon submitted three media blank samples for laboratory analysis of beryllium, uranium, yttrium and isotopic uranium. Laboratory analysis of media blank samples did not indicate beryllium, uranium, yttrium, and isotopic uranium at concentrations above the laboratory reporting limits. Tables 1 through 4 in Appendix D provide a summary of media blank laboratory analysis data.

5.1.3 Laboratory Controls

Laboratory data were reported within acceptable ranges for relevant quality control parameters (e.g. laboratory control samples, matrix spikes, etc.) and no results were rejected through the ALS's quality control reviews. Internal laboratory QA/QC packages are provided with the Appendix E analytical reports.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

- The November 2010 air monitoring results do not indicate concentrations of beryllium, uranium, or yttrium at concentrations above the laboratory reporting limits. The laboratory reporting limits did not exceed the applicable EPA Industrial RSLs.

- The November 2010 surface dust monitoring results do not indicate concentrations of uranium at concentrations above the laboratory reporting limits. Beryllium was detected in two of the dust samples collected (B1-Roof-ECAI and B1F1-F25) at concentrations of 0.18 milligrams per kilogram (mg/kg) and 1.5 mg/kg, respectively. The identified beryllium concentrations do not exceed the applicable EPA Industrial RSL of 2,000 mg/kg. The laboratory reporting limits did not exceed the applicable EPA Industrial RSLs.

- As previously described, building dust typically contains soil from the outside environment, and detections of naturally occurring trace metals such as Be and Y were considered in interpretation of the results. The Be and Y concentrations detected in the Building 1 and 2 bulk dust samples as identified in Table 1, were consistent with Be and Y concentrations typically found in Missouri soils.

  Due to the limited beryllium detections in both air and dust sample collected, beryllium to yttrium ratios could not be developed. Therefore, the identified beryllium concentrations cannot be attributed either to anthropogenic or naturally occurring (background) sources.

- The air and dust samples were subjected to further analysis for three isotopes of uranium, U-234, U-235 and U-238. To evaluate the samples for levels of each isotope the air and dust samples collected in Buildings 1 and 2 were analyzed to determine if uranium detected in the samples had isotope abundances characteristic of natural uranium or of DU. Several air and dust samples exhibited detectable concentrations of individual uranium isotopes; however, only one sample—sample FH3-MC-Be/U/Y-Dust Iso—exhibited detectable concentrations of more than one uranium isotope. Given the

uncertainty associated with the isotopic activities reported by the laboratory and the uncertainty associated with the calculated percent abundance, no inference can be made regarding the source of the uranium detected in sample FH3-MC-Be/U/Y-Dust Iso. Based on limited detection of isotopic uranium in both the air and surface dust samples, the source of the uranium cannot be determined.

- Project-required reporting limits for total uranium in air and dust samples were selected during development of the Work Plan/QAPP based on the Regional Screening Levels (RSL) for industrial air and soil. However, the RSL tables do not include a carcinogenic screening level for uranium. Thus, comparing analytical results to the RSLs alone does not provide a screening of cancer risk associated with uranium's radioactivity. EPA provides risk-based screening levels for radionulcides in its *Radionuclide Toxicity and Preliminary Remediation Goals for Superfund* tables (EPA 2007) and in risk assessment guidance applicable to radionuclides (EPA, 2000, 2001). This information was used to derive total uranium concentrations in air and dust that corresponding to an acceptable cancer risk range of 1.0×10^{-6} to 1.0×10^{-4} (EPA 1990).
- Uranium was not detected (excluding the qualitative isotopic uranium analysis) in the air or dust samples collected during the November 2010 sampling event. Uranium detection limits for November 2010 air and dust samples were below their respective non-cancer screening levels provided in EPA's RSL tables. Comparison of the same detection limits for the November 2010 air and dust samples show that, the typical detection limit for total uranium in dust (approximately 57 milligrams per kilogram [mg/kg]) was less than total uranium concentrations corresponding to an acceptable cancer risk rang and the typical detection limit for total uranium in air (approximately 7.3×10^{-5} milligrams per cubic meter [mg/m3]) was within the concentration range corresponding to an acceptable cancer risk range.

- Based on data collected during the November 2010 air and surface dust monitoring event, current building occupants do not appear to be exposed to concentrations of beryllium or uranium in air and surface dust at levels above EPA RSLs for Industrial Use.

- Contaminant migrations may exist through perforations in the firewall separating GSA and DOE controlled spaces and outdoor intakes of GSA ventilation systems. However, based on identified contaminant concentrations at levels below the applicable EPA RSLs for Industrial Use, it does not appear that contaminants, if present in the DOE controlled spaces, are migrating to the GSA controlled spaces at concentrations above the applicable EPA RSLs for Industrial Use.

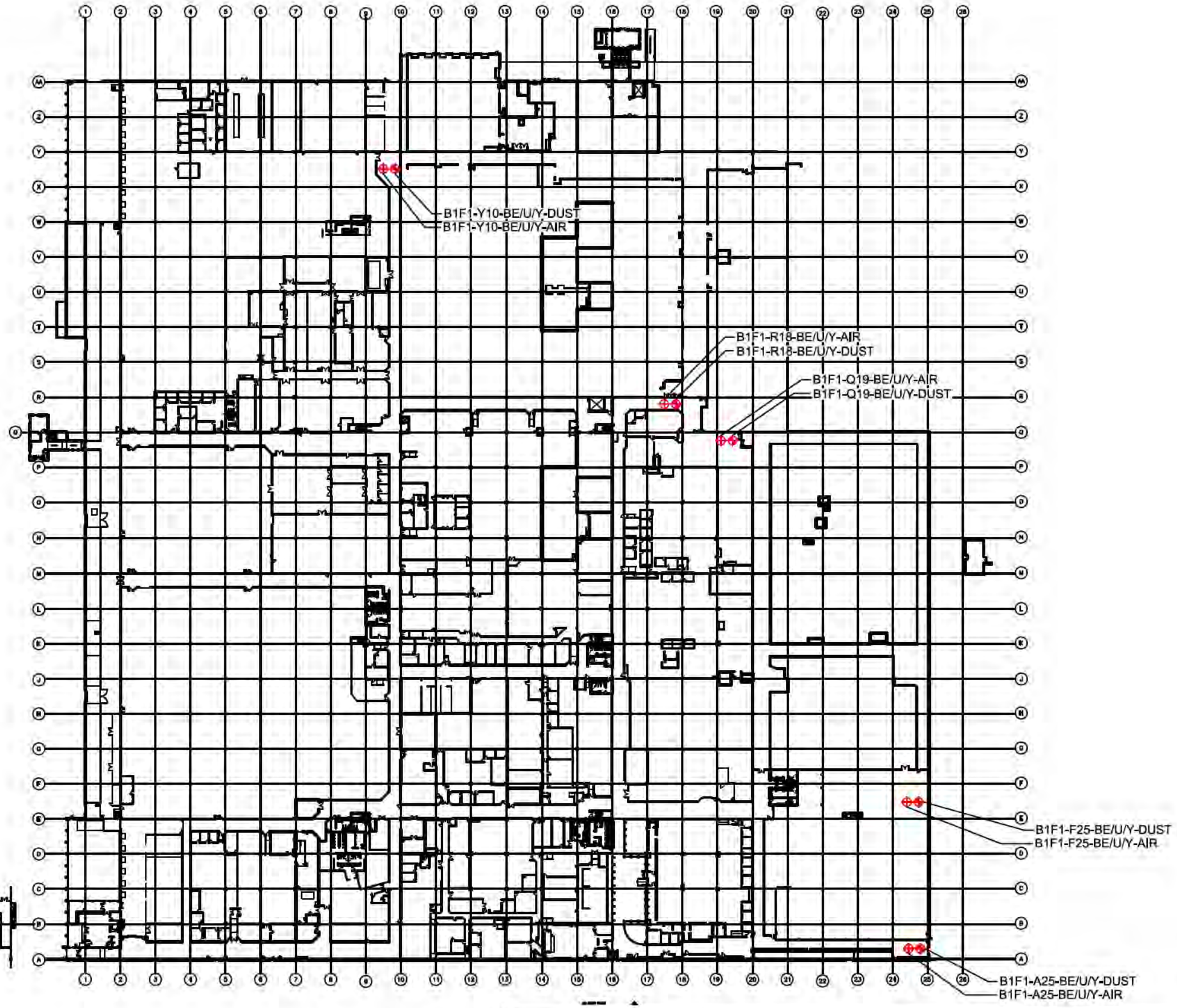
- At this time, additional actions do not appear necessary to mitigate exposure to settled dust.

6.2 Recommendations

Based on the results of the November 2010 air and surface dust sampling event, Terracon recommends continued quarterly air and surface dust sampling, per the site specific Work Plan/QAPP. However, Terracon does not recommend continued isotopic uranium or yttrium laboratory analyses, as further sampling and laboratory analyses do not appear beneficial to the objective of the Work Plan/QAPP which is to evaluate potential migration pathways and beryllium/uranium exposure to building occupants. Terracon recommends in the event that uranium is detected at reportable levels in future sampling events, the isotopic analysis be performed at that time.

APPENDIX A

Exhibits



N

LEGEND

- BERYLLIUM/URANIUM BULK DUST SAMPLE LOCATION
- BERYLLIUM/URANIUM INDOOR AIR SAMPLE LOCATION

SENSITIVE BUT UNCLASSIFIED (SBU)
PROPERTY OF THE UNITED STATES GOVERNMENT
FOR OFFICIAL USE ONLY
Do not remove this notice
Properly destroy documents when no longer needed.

BASE FIGURE PROVIDED BY TETRA TECH

Project Mngr:	WWK
Drawn By:	DBM
Checked By:	WWK
Approved By:	WWK
Project No.	02107144
Scale:	NOT TO SCALE
File No.	E1
Date:	03/04/11

Terracon
Consulting Engineers and Scientists
13910 W. 98TH TERRACE KANSAS CITY, KS 66215
PH. (913) 492-7777 FAX. (913) 492-7443

EXHIBIT 1 - SAMPLE LOCATION DIAGRAM

BUILDING 1 - FLOOR 1

FIRST QUARTER BE/U/Y AIR & DUST SAMPLING
1500 E. BANNISTER ROAD
KANSAS CITY, MISSOURI

Exhibit # 1

N

LEGEND

- BERYLLIUM/URANIUM BULK DUST SAMPLE LOCATION
- BERYLLIUM/URANIUM INDOOR AIR SAMPLE LOCATION

PROPERTY OF THE UNITED STATES GOVERNMENT
COPYING, DISSEMINATION, OR DISTRIBUTION OF THESE DRAWINGS, PLANS, OR SPECIFICATIONS TO UNAUTHORIZED USERS IS PROHIBITED.
Do not remove this notice.
Properly destroy documents when no longer needed.

BASE FIGURE PROVIDED BY TETRA TECH

Project Mngr:	WWK
Drawn By:	DBM
Checked By:	WWK
Approved By:	WWK
Project No.	02107144
Scale:	NOT TO SCALE
File No.	E2
Date:	03/04/11

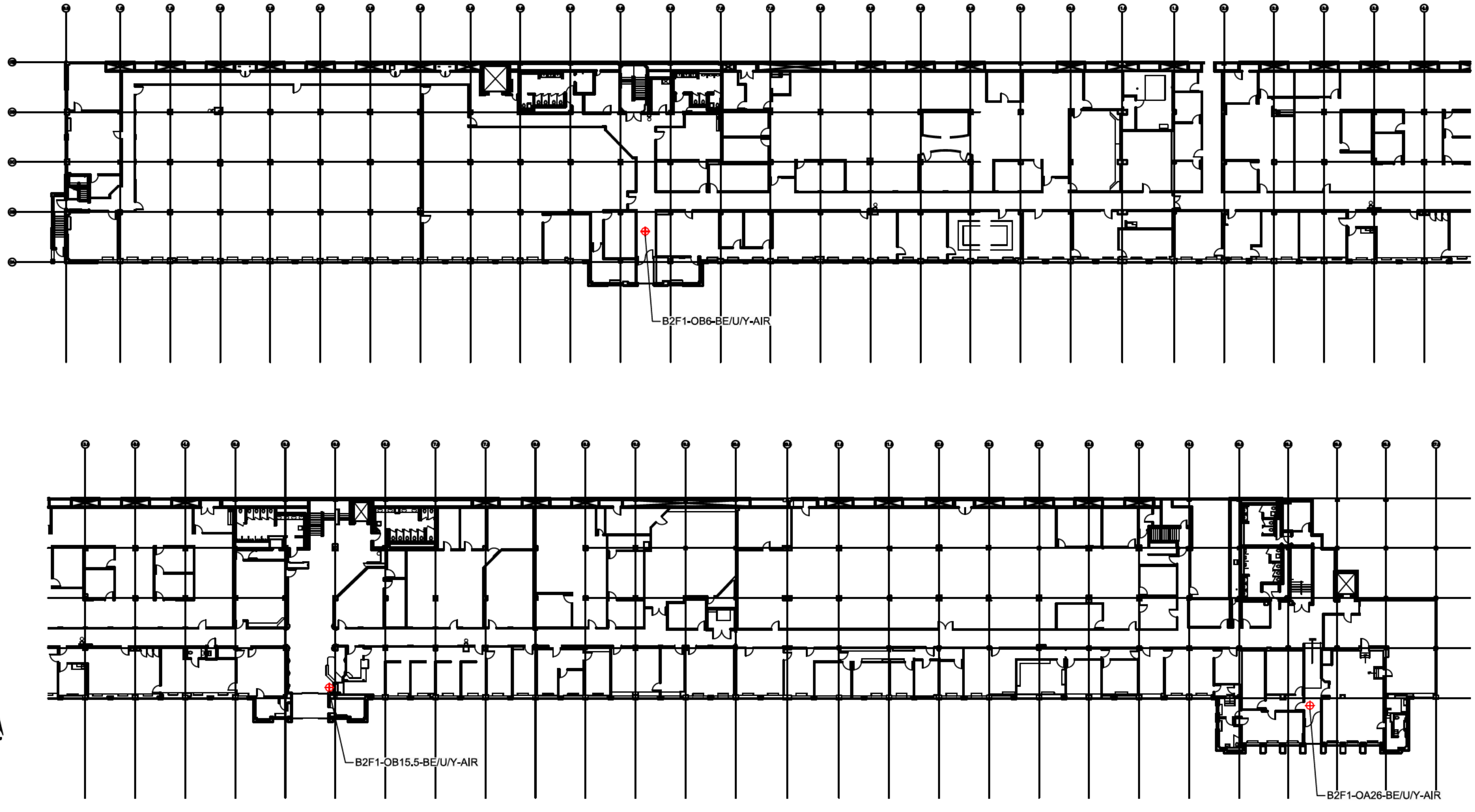
Terracon
Consulting Engineers and Scientists
13910 W. 96TH TERRACE KANSAS CITY, KS 66215
PH. (913) 492-7777 FAX. (913) 492-7443

EXHIBIT 2 - SAMPLE LOCATION DIAGRAM

BUILDING 1 SUB-BASEMENT

FIRST QUARTER BE/U/Y AIR & DUST SAMPLING
1500 E. BANNISTER ROAD
KANSAS CITY, MISSOURI

Exhibit # 2



LEGEND

- BERYLLIUM/URANIUM BULK DUST SAMPLE LOCATION
- BERYLLIUM/URANIUM INDOOR AIR SAMPLE LOCATION

SENSITIVE BUT UNCLASSIFIED (SBU)
PROPERTY OF THE UNITED STATES GOVERNMENT
FOR OFFICIAL USE ONLY
Do not remove this notice
Properly destroy documents when no longer needed.

BASE FIGURE PROVIDED BY TETRA TECH

Project Mngr:	WWK
Drawn By:	DBM
Checked By:	WWK
Approved By:	WWK

Project No.	02107144
Scale:	NOT TO SCALE
File No.	E3
Date:	03/04/11

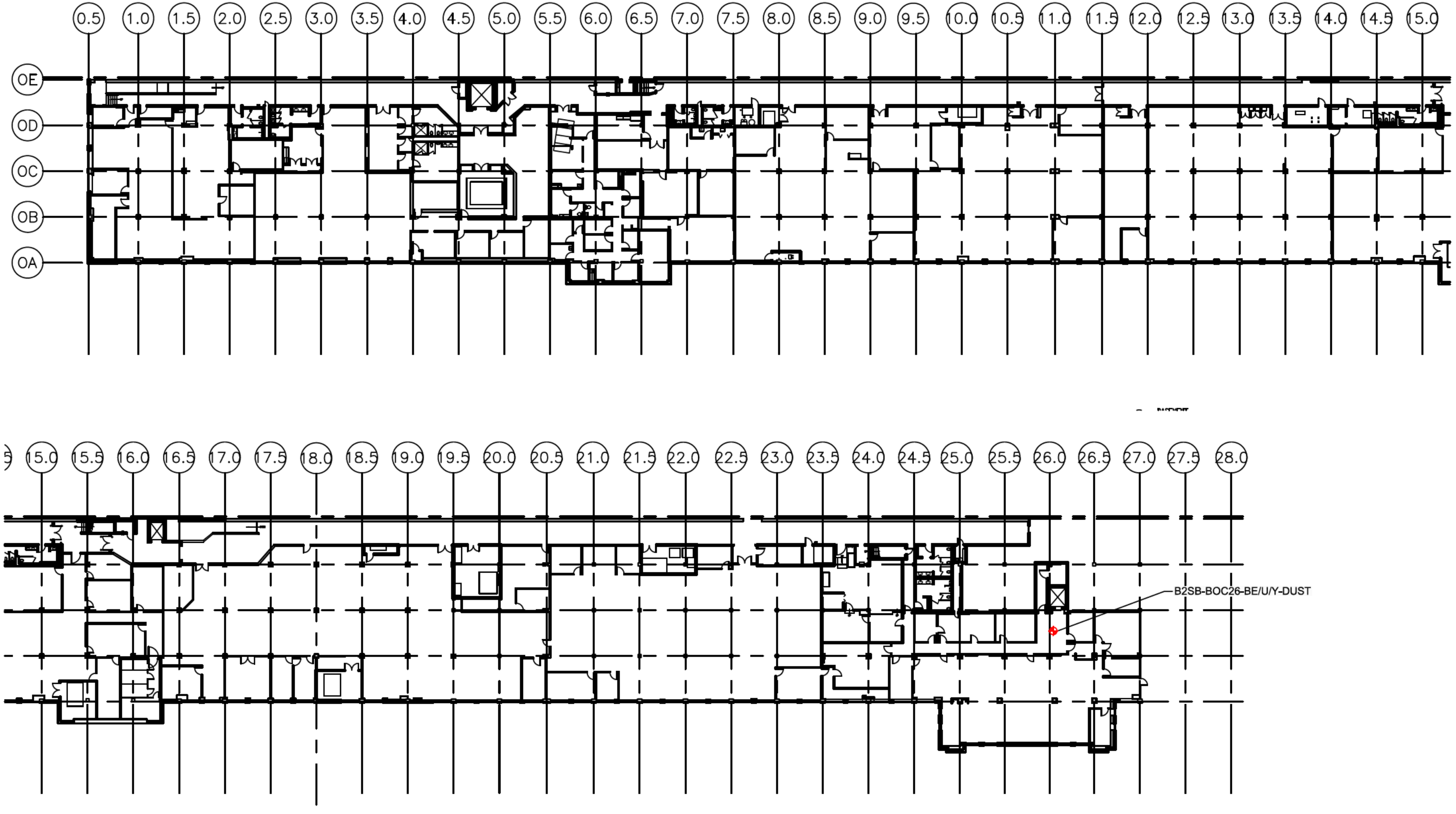
Terracon
Consulting Engineers and Scientists
13910 W. 96TH TERRACE KANSAS CITY, KS 66215
PH. (913) 492-7777 FAX. (913) 492-7443

EXHIBIT 3 - SAMPLE LOCATION DIAGRAM

BUILDING 2 - FLOOR 1

FIRST QUARTER BE/U/Y AIR & DUST SAMPLING
1500 E. BANNISTER ROAD
KANSAS CITY, MISSOURI

Exhibit # 3



LEGEND

- BERYLLIUM/URANIUM BULK DUST SAMPLE LOCATION
- BERYLLIUM/URANIUM INDOOR AIR SAMPLE LOCATION

SENSITIVE BUT UNCLASSIFIED (SBU)
PROPERTY OF THE UNITED STATES GOVERNMENT
FOR OFFICIAL USE ONLY
Do not remove this notice
Properly destroy documents when no longer needed.

BASE FIGURE PROVIDED BY TETRA TECH

Project Mngr:	WWK
Drawn By:	DBM
Checked By:	WWK
Approved By:	WWK
Project No.	02107144
Scale:	NOT TO SCALE
File No.	E4
Date:	03/04/11

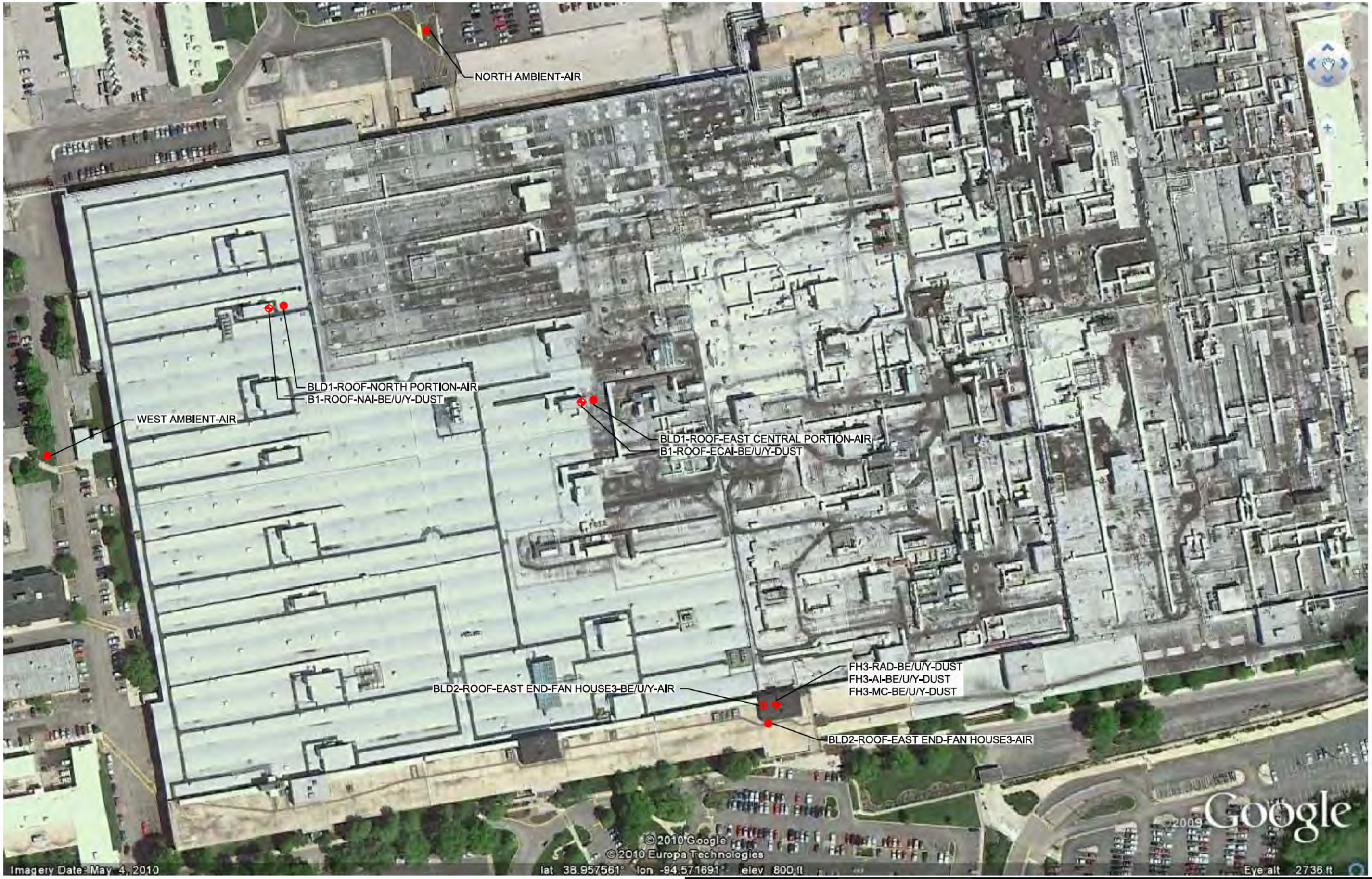
Terracon
Consulting Engineers and Scientists
13910 W. 96TH TERRACE KANSAS CITY, KS 66215
PH. (913) 492-7777 FAX. (913) 492-7443

EXHIBIT 4 - SAMPLE LOCATION DIAGRAM

BUILDING 2 - BASEMENT

FIRST QUARTER BE/U/Y AIR & DUST SAMPLING
1500 E. BANNISTER ROAD
KANSAS CITY, MISSOURI

Exhibit # 4



N

LEGEND

- BERYLLIUM/URANIUM BULK DUST SAMPLE LOCATION
- BERYLLIUM/URANIUM INDOOR AIR SAMPLE LOCATION
- BERYLLIUM/URANIUM OUTDOOR AIR SAMPLE LOCATION

SENSITIVE BUT UNCLASSIFIED (SBU)
PROPERTY OF THE UNITED STATES GOVERNMENT
FOR OFFICIAL USE ONLY
Do not remove this notice
Properly destroy documents when no longer needed

BASE FIGURE PROVIDED BY TETRA TECH

Project Mngr:	WWK
Drawn By:	DBM
Checked By:	WWK
Approved By:	WWK

Project No.	02107144
Scale:	NOT TO SCALE
File No.	E5
Date:	03/04/11

Terracon
Consulting Engineers and Scientists
13910 W. 96TH TERRACE KANSAS CITY, KS 66215
PH. (913) 492-7777 FAX. (913) 492-7443

EXHIBIT 5 - SAMPLE LOCATION DIAGRAM

BUILDING 1-2 - ROOF

FIRST QUARTER BE/U/Y AIR & DUST SAMPLING
1500 E. BANNISTER ROAD
KANSAS CITY, MISSOURI

Exhibit # 5

APPENDIX B

Photographic Documentation

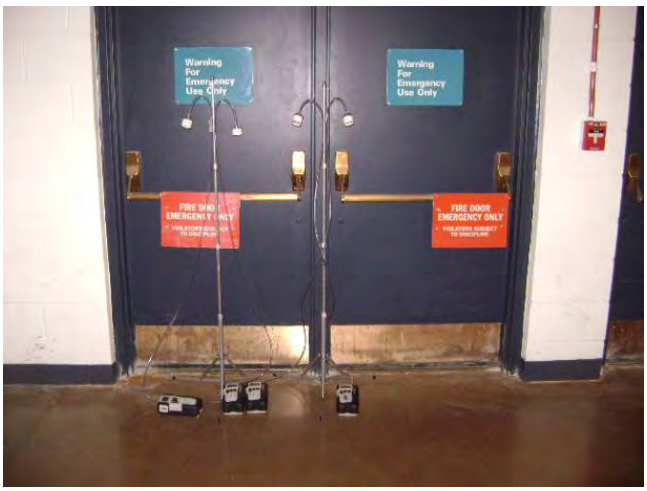
PHOTO #1 Building 1 – Sub-Basement – Near North Security Desk (AA16) Sample No. B1SB-AA16-Be/U/Y Air	
PHOTO #2 Building 1 – Sub-Basement – Cafeteria (K17) Sample No. B1SB-K17-Be/U/Y Air	
PHOTO #3 Building 1 – Sub-Basement – East End of Q-Corridor (Q25) Sample No. B1SB Q25-Be/U/Y Air and Duplicate Sample Location	

PHOTO #4 Building 1 – Sub-Basement – Mechanical Room 3B Air Intake (V19) Sample No. B1SB-V19-Be/U/Y Air	
PHOTO #5 Building 1 – Roof – Air Intake on North Portion of GSA-Controlled Building Sample No. Bld1-Roof-North Portion-Air	
PHOTO #6 Building 1 – Roof – Air Intake on East-Central Portion of GSA-Controlled Building Sample No. Bld1-Roof-East Central Portion-Air	

PHOTO #7 Building 2 – Roof – Rooftop Air Intake on East End of GSA-Controlled Building (Fan House 3) Sample No. Bld2-Roof-East End-Fan House 3-Air	
PHOTO #8 Exterior – North Ambient – Between North Parking Lot and North Entrance to Sub-Basement of Building 1 Sample No. North Ambient-Air	
PHOTO #9 Exterior – West Ambient – Across Freedom Drive and Near Q-Corridor Sample No. West Ambient-Air	

PHOTO #1 Building 2 – Floor 1 – Lobby 16 Entrance (OB15.5) Sample No. B2F1-OB15.5-Be/U/Y-Air	
PHOTO #2 Building 2 – Floor 1 – Lobby 6 Entrance (OB6) Sample No. B2F1-OB6-Be/U/Y-Air	
PHOTO #3 Building 2 – Floor 1 – Shared Entrance (OA26) Sample No. B2F1-OB6-Be/U/Y-Air	

PHOTO #4 Building 2 – Floor 2 – Fan House 3 – Shared Relief Air Duct Sample No. Bld2-Fan House 3-Be/U/Y-Air	
PHOTO #5 Building 1 – Floor 1 – Northeast Corner of GSA Warehouse (F25) Sample No. B1F1-F25-Be/U/Y-Air	
PHOTO #6 Building 1 – Floor 1 – East End of Carpet Hallway Near Fire Doors to DOE-Controlled Area (A25) Sample No. B1F1-A25-Be/U/Y-Air	

PHOTO #7 Building 1 – Floor 1 – Northeast Corner of FEMA Warehouse Near Fire Doors to DOE-Controlled Area (Q19) B1F1-Q19-Be/U/Y-Air	
PHOTO #8 Building 1 – Floor 1 – Hallway Near Sliding Fire Door to DOE-Controlled Area (Y10) B1F1-Y10-Be/U/Y-Air	
PHOTO #9 Building 1 – Floor 1 – Hallway Near FEMA Warehouse - Near Fire Doors to DOE-Controlled Area (R18) Sample No. B1F1-R18-Be/U/Y-Air and Duplicate Sample Location	

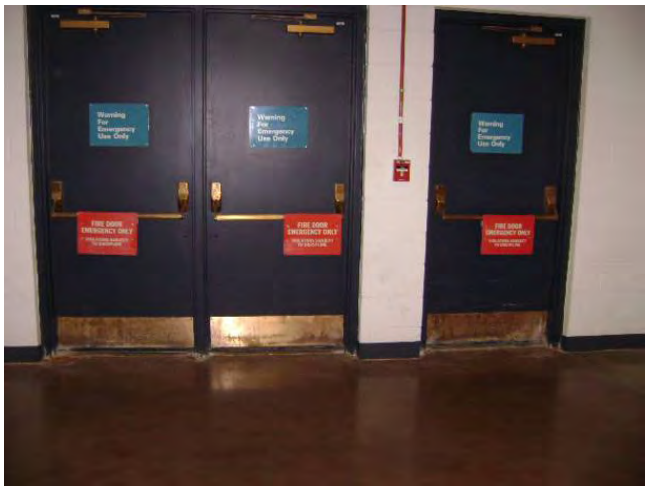
PHOTO #1 Building 1 – Sub-Basement – East End of Q-Corridor – Concrete Floor By Fire Doors to DOE-Controlled Area (Q25) Sample No. B1SB-Q25-Be/U/Y-Dust	
PHOTO #2 Building 1 – Sub-Basement – East End of Q-Corridor – Top of Piping (Q25) Sample No. B1SB-Q25-Be/U/Y-Dust	
PHOTO #3 Building 1 – Sub-Basement – East End of Q-Corridor – Top of Shelving on North Side of Corridor (Q25) Sample No. B1SB-Q25-Be/U/Y-Dust	

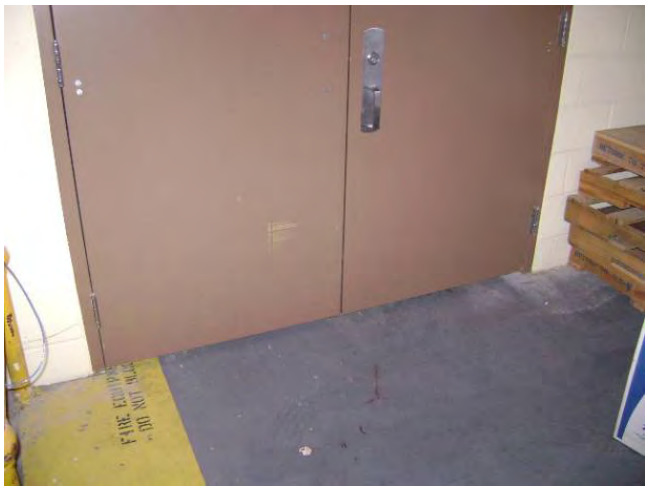
PHOTO #4 Building 1 – Sub-Basement – Mechanical Room 3B Air Intake – Metal Filter Ledge (V19) Sample No. B1SB-V19-Be/U/Y-Dust	
PHOTO #5 Building 1 – Sub-Basement – Mechanical Room 3B Air Intake – Concrete Floor (V19) Sample No. B1SB-V19-Be/U/Y-Dust	
PHOTO #6 Building 1 – Floor 1 – Northeast Corner of FEMA Warehouse by Fire Doors to DOE-Controlled Area – Concrete Floor (Q19) Sample No. B1F1-Q19-Be/U/Y-Dust	

PHOTO #7 Building 1 – Floor 1 – Northeast Corner of FEMA Warehouse by Fire Suppressant System Piping– Concrete Floor (Q19) Sample No. B1F1-Q19-Be/U/Y-Dust	
PHOTO #8 Building 1 – Floor 1 – Fire Doors to DOE-Controlled Area By FEMA Warehouse – Concrete Floor (R18) Sample No. B1F1-R18-Be/U/Y-Dust	
PHOTO #9 Building 1 – Floor 1 – Fire Doors to DOE-Controlled Area by FEMA Warehouse – Metal Door Handle (R18) Sample No. B1F1-R18-Be/U/Y-Dust	

PHOTO #10 Building 1 – Floor 1 – Sliding Fire Door to DOE-Controlled Area – Concrete Floor (Y10) Sample No. B1F1-Y10-Be/U/Y-Dust	
PHOTO #11 Building 1 – Floor 1 – Sliding Fire Door to DOE-Controlled Area – Bay Door Ledge (Y10) Sample No. B1F1-Y10-Be/U/Y-Dust	
PHOTO #12 Building 1 – Floor 1 – Sliding Fire Door to DOE-Controlled Area – Sliding Door Ledge (Y10) Sample No. B1F1-Y10-Be/U/Y-Dust	

PHOTO #13 Building 2 – Sub-Basement – Hall By East Elevator – Supply Duct In Ceiling (BOC26) Sample No. B2SB-BOC26-Be/U/Y-Dust	
PHOTO #14 Building 2 – Sub-Basement – Hall By East Elevator – Supply Duct Cover (BOC26) Sample No. B2SB-BOC26-Be/U/Y-Dust	
PHOTO #15 Building 2 – Roof – Fan House 3 – Return Air Duct – Metal Floor of Air Handling Unit Sample No. FH3-RAD-Be/U/Y-Dust	

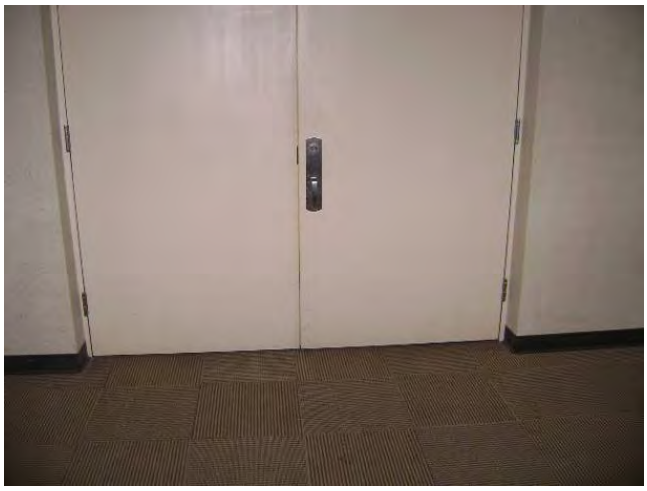
PHOTO #16 Building 2 – Roof – Fan House 3 – Air Intake – Metal Duct Associated with Intake Louver Sample No. FH3-AI-Be/U/Y-Dust	
PHOTO #17 Building 2 – Roof – Fan House 3 – Former Mixing Chamber – Metal Ledge Near Southwest Corner of Room Sample No. FH3-MC-Be/U/Y-Dust	
PHOTO #18 Building 1 – Floor 1 – East End of Hall By GSA Warehouse Near Fire Doors to DOE-Controlled Area - Carpet Floor (A25) Sample No. B1F1-A25-Be/U/Y-Dust	

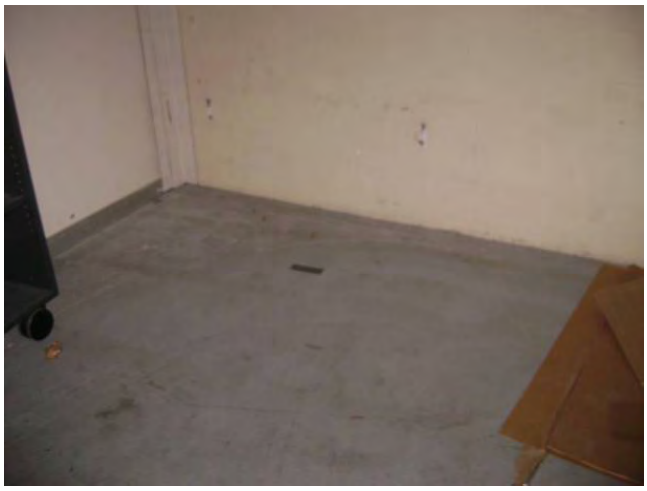
PHOTO #19 Building 1 – Floor 1 – Northeast Corner of GSA Warehouse – Concrete Floor (F25) Sample No. B1F1-F25-Be/U/Y-Dust	
PHOTO #20 Building 1 – Roof – East Central Air Intake – Diagonal Slat Before Filter Wall Sample No. B1-Roof-ECAI-Be/U/Y-Dust	
PHOTO #21 Building 1 – Roof – Northern Air Intake – Lower Ledge Before Roll Filter Sample No. B1-Roof-NAI-Be/U/Y-Dust	

PHOTO #22 Sampling Template and Pump/Cassette Set-Up For Dust Sampling	

APPENDIX C

Field Logs

✓

Field Sample Descriptions

Field Sample ID	General Sample Location
B1513-U19-Be/U/4 Air	Mechanical Room 3B air intake
Collection Date 11/23/10	
Collected By Christopher S Cast	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone	☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	7:20	1723	603	4281.30			
					Sampling Equipment		
					~~R12113~~ 64 - Hi-Vol Pump		
	Total Runtime / Volume						

Work shift Information	Shift: Day	Shift Start	Shift End	Total Minutes ~600

Factors that Could Modify Results of this Sample

Sample Comments

Pump cal 7.2 Lpm @ 7:20
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
Pump cal 7.0 L/min @ 1723

photo # 101-8968

✓

Field Sample Descriptions

Field Sample ID	General Sample Location
B1SB-V19-Be/U/4 ISO	Mechanical Room 3B air intake
Collection Date 11/23/10	
Collected By Christopher Scast	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	7:20	1723	603	4275.27			
					Sampling Equipment: RH102 67 - Hi-Vol Pump		
	Total Runtime / Volume						
Work shift Information	Shift: (Day)	Shift Start	Shift End	Total Minutes ~600			

Factors that Could Modify Results of this Sample

Sample Comments

Pump cal 7.184 l/min @ 7:20
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
Pump post cal 6.994 l/min @ 1723

photo # 101-8968

✓

Field Sample Descriptions

Field Sample ID	General Sample Location
B1SB-Q25-Be/U/Pb Air	East End of Q-Corridor near five doors to DOE-controlled area
Collection Date 11/23/10	
Collected By Christopher S Cast	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☒ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☒ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☐ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0735 ~~1730~~	1742	607	4127.60	29.27	78.1	
					Sampling Equipment R12165 - Legacy Pump		
	Total Runtime / Volume						

Work shift Information	Shift: (Day)	Shift Start	Shift End	Total Minutes
				4600

Factors that Could Modify Results of this Sample

Sample Comments pump cal to 7.02 L/min at 1716 on 11-22-10

validity check approx 9:15 to 9:45

validity check approx 11:30 to 12:00

validity check approx 13:00 to 13:45

validity check approx 15:30 to 15:45

pump post cal to 6.57 L/min at 1742 on 11-23-10

photo # 101 - 8969

Field Sample ID B1SB-Q25-Be/U/4 Iso	**General Sample Location** East End of Q-corridor near fire doors to DOE-controlled area
Collection Date 11/23/10	
Collected By Christopher S Cast	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
~~0735~~ 1130	1742	607	4273.28	29.02	~~80~~ 73	
Total Runtime / Volume						

Sampling Equipment: R12169 - Legacy Pump

Work shift Information	Shift: (Day)	Shift Start	Shift End	Total Minutes
				4600

Factors that Could Modify Results of this Sample

Sample Comments pumppreCal to 7.01 L/min on 1722 11-22-10
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump postCal to 7.07 L/min at 1742 on 11-23-10

photo # 101-8969

Field Sample ID	General Sample Location
~~B1ST5~~ - Be/U/Y - Dup 1 Air	East End of Q-corridor near fire doors to DOE-controlled area
Collection Date 11/23/10	
Collected By Christopher Scast	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone	☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (~~mm~~ Hg)	Avg. Temp (F)	RH (%)
Sample Runtimes and Volumes	0735 ~~7:30~~	1740	605	417.53 ~~416.55~~	29.09	77.7	
					Sampling Equipment: R1210 - Legacy Pump		
	Total Runtime / Volume						
Work shift Information	Shift: (Day)	Shift Start	Shift End	Total 4600 Minutes			

Factors that Could Modify Results of this Sample

Sample Comments pump pre-cal to 7.01 L/min at 1724 on 11-22-10
validity check at approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post-cal to 6.80 L/min at 1740 on 11-23-10

photo # 101-8969

Field Sample ID	General Sample Location
Be/U/4-Dup1 Iso	East End of Q-Corridor near fire doors to DOE-controlled area
Collection Date 11/23/10	
Collected By Christopher Scast	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone	☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
Sample Runtimes and Volumes	~~0757~~ 7:30	1740	603	4184.82	29.23	79.1	
					Sampling Equipment: R12168 - Legacy Pump		
	Total Runtime / Volume						
Work shift Information	Shift: (Day)	Shift Start	Shift End	Total ~600 Minutes			

Factors that Could Modify Results of this Sample

Sample Comments pump pre-cal to 7.03 L/min at 1727 on 11-22-10
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post cal to 6.84 L/min at 1740 on 11-23-10
photo # 101-8969

✓

Field Sample Descriptions

Field Sample ID B1SB-AA16-Be/U/4 Air	**General Sample Location** Security Desk at North Entrance
Collection Date 11/23/10	
Collected By Christopher S Cast	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone	☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
Sample Runtimes and Volumes	~~7:30~~ 0740	17:55	615	4292.70	29.18	75.5	
					Sampling Equipment: R12175 - Legacy Pump		
	Total Runtime / Volume						
Work shift Information	Shift: (Day)	Shift Start	Shift End	Total ~600 Minutes			

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal to 7.03 L/min at 1652 on 11-22-10
validity check approx. 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post cal to 6.93 L/min at 1810 on 11-23-10

photo 101-8970

Field Sample ID: B1SB-AA16-Be/U/4 Iso	General Sample Location: Security Desk at North Entrance
Collection Date: 11/23/10	
Collected By: Christopher S Cast	Facility: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	Workload (check one): ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building: 1
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	Sample Placement (check one): ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0740 2:30	17:55	615	4298.85	28.97	72.7	
					Sampling Equipment: R12170 - Legacy Pump		
	Total Runtime / Volume						

Work shift Information	Shift: Day	Shift Start	Shift End	Total ~600 Minutes

Factors that Could Modify Results of this Sample

Sample Comments: pump pre cal to 7.02 L/min at 1658 on 11-22-10
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post cal to 6.95 L/min at 1811 on 11-22-10

photo 101-8970

Field Sample ID	General Sample Location
North Ambient - Air	Between North Parking + North Entance N - 38.95920 W - 094.57346 ± 15ft
Collection Date: 11/23/10	
Collected By: Christopher Scast	**Facility**: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)**: ☐ Light ☑ Normal ☐ Heavy ☐ Unknown
Building: None - Exterior	
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)**: ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)	

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
0741 7:30	1757	616	4324.32	29.08	32.0	
Total Runtime / Volume						

Sampling Equipment: R72176 - Legacy Pump

Work shift Information	Shift: Day	Shift Start	Shift End	Total Minutes
				460

Factors that Could Modify Results of this Sample

Sample Comments

pump pre cal to 7.09 L/min at 1800 on 11-22-10
validity check approx 9:15 to 9:30
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post-cal to 7.01 L/min at 1813 on 11-23-10

photo # - M - 8971

Field Sample ID	General Sample Location
North Ambient - ISO	Between North Parking & North Entrance N-38.95980 W-094.57346 ±15ft
Collection Date 11/23/10	
Collected By Christopher S Cast	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building None - Exterior
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
~~0741~~ 7:30	17:58	617	4380.70	29.13	32.0	
Total Runtime / Volume						

Sampling Equipment
~~64~~
R12113 - Legacy Pump

Work shift Information	Shift: (Day)	Shift Start	Shift End	Total Minutes
				~600

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal to 7.011 L/min at 1732 on 11-22-10

Validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post-cal to 7.19 L/min at 1812 on 11-23-10

photo # - 101 - 8971

Field Sample ID	General Sample Location
B1SB-K17-Be/U/Y Air	Cafeteria
Collection Date 11/23/10	
Collected By Christopher S Cast	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☐ Bulk ☒ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone	☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
Sample Runtimes and Volumes	~~1730~~ 0745	17:53	608	4268.16	29.12	77.0	
					Sampling Equipment: R12108 - Legacy Pump		
	Total Runtime / Volume						
Work shift Information	Shift: Day	Shift Start	Shift End	Total ~600 Minutes			

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal to 7.05 L/min at 1705 on 11-22-10
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post cal to 6.99 L/min at 1758 on 11-23-10

pluto -101 - 8976

Field Sample ID	General Sample Location
B1SB-K17-Be/U/4A ISO	Cafeteria
Collection Date 11/23/10	
Collected By Christopher SCast	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
~~7:30~~ 0945	17:53	608	4219.52	29.06	79.0	
				Sampling Equipment		
				R11149 – Legacy Pump		
Total Runtime / Volume						

Work shift Information	Shift: Day	Shift Start	Shift End	Total Minutes ≈420

Factors that Could Modify Results of this Sample

Sample Comments pump precal to 7.01 L/min at 1712 on 11-22-10
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post cal to 6.87 L/min at 1758 on 11-23-10

photo 101 - 9976

Field Sample ID West Ambient - Air	**General Sample Location** Across West Street near Q-corridor N. 38.95733 ± 13ft W. 094.57542
Collection Date 11/23/10	
Collected By Christopher S Cast	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building None - exterior
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
~~0752~~ 1130	1806	614	4457.64	29.01	~~50.7~~ 32.0	
Total Runtime / Volume						

Sampling Equipment
RI2112 - Legacy Pump

Work shift Information	Shift: Day	Shift Start	Shift End	Total ~600 Minutes

Factors that Could Modify Results of this Sample

Sample Comments

pump pre-cal to ~~FR~~ 7.03 L/min at 1800 on 11-22-10
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
- road construction + repair and lawn mowing adjacent to sampling area ~11:45
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
- road construction still ongoing adjacent to sampling area. ✓15:30
pump post cal to 7.49 L/min at 1815 on 11-23-10

photo - 101-8972

Field Sample ID	General Sample Location
West Ambient - I30	Across West Street Near Q-Corridor N - 38.95733 ± 13ft W - 094.57542
Collection Date 11/23/10	
Collected By Christopher S East	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building None - exterior
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
~~7:30~~ 0752	18:06	614	4402.38	29.11	~~49.0~~ 32.0	
Total Runtime / Volume						

Sampling Equipment
R7213 - Legacy Pump

Work shift Information	Shift: Day	Shift Start	Shift End	Total Minutes
				4600

Factors that Could Modify Results of this Sample

Sample Comments pump pre-cal to 6.99 L/min at 1804 on 11-22-10

validity check approx 9:15 to 9:45

Validity check approx 11:00 to 12:00

- road construction and repair - and lawn mowing adjacent to sampling area ~ 11:45

validity check approx 13:00 to 13:45

validity check approx 15:30 to 15:45

- road construction ongoing adjacent to sampling area ~ 15:30

pump post cal to 7.34 L/min at 1816 on 11-23-10

photo 101 - 8972

Field Sample ID Bld 2 - Roof - East End - Fan House 3 Air	**General Sample Location** Rooftop air intake on east end of GSA-controlled Building 2 (fan house 3) N-38.95617 ± 16ft W-094.57119
Collection Date 11/23/10	
Collected By Christopher S Cast	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	2

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone	☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
~~0754~~ 2:30	1910	611	4289.22	742	45.3	
				Sampling Equipment		
				BT212 - Legacy Pump		
Total Runtime / Volume						

Work shift Information	Shift: (Day)	Shift Start	Shift End	Total Minutes
				~600

Factors that Could Modify Results of this Sample

Sample Comments pump pre-cal to 7.00 L/min at 1755 on 11-22-10
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post cal ~~at~~ to 7.03 L/min at 1821 on 11-23-10

photo 101-8973

✓

Field Sample Descriptions

Field Sample ID: Bld 2-Roof-East End-Fan House 3 #130	General Sample Location: Rooftop air intake on east end of QSA-controlled Building 2 (fan house 3) N-38.95617 ± 16ft W-094.59119
Collection Date: 11/23/10	
Collected By: Christopher S Cast	Facility: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	Workload (check one): ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building: 2
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	Sample Placement (check one): ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
Sample Runtimes and Volumes	0759 ~~7:30~~	1810	611	4270.89	28.96 in	37.9	
					Sampling Equipment: R12171 - Legacy Pump		
	Total Runtime / Volume						
Work shift Information	Shift: (Day)	Shift Start	Shift End	Total Minutes 460			

Factors that Could Modify Results of this Sample

Sample Comments: pump pre-cal to 7.02 L/min at 1758 on 11-22-10
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post cal to 6.95 L/min at 1822 on 11-23-10

photo 101-8973

✓

Field Sample Descriptions

Field Sample ID Bld 1 - Roof - East Central Portion Air	**General Sample Location** Rooftop air intake on east central portion of GSA-controlled Building 1 N - 38.95769 ±16 ft W - 094.57223
Collection Date 11/23/10	
Collected By Christopher S Cast	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	~~0803~~ 1230	1818	615	4397.25			
					Sampling Equipment		
	Total Runtime / Volume				R1209 - Legacy Pump		

Work shift Information	Shift: (Day)	Shift Start	Shift End	Total Minutes
				4600

Factors that Could Modify Results of this Sample

Sample Comments pump pre-cal to 7.05 at 1747 on 11-22-10
validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post cal to 7.24 at 1820 on 11-23-10

photo - 101 - 8974

Field Sample ID Bld 1 - Roof - East Central Portion FSD	**General Sample Location** Rooftop air intake on east central portion of GSA-controlled Building 1 N-38.95763 ±16ft W-094.57223
Collection Date 11/23/10	
Collected By Christopher Scust	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0803 7:30	1818	615	4397.25			
					Sampling Equipment		
	Total Runtime / Volume				R12163 - Legacy Pump		
Work shift Information	Shift: (Day)	**Shift Start**	**Shift End**	**Total Minutes** 7600			

Factors that Could Modify Results of this Sample

Sample Comments pump pre-cal to 7.01 L/min at 1152 on 11-22-10

validity check approx 9:15 to 9:45

validity check approx 11:30 to 12:00

validity check approx 13:00 to 13:45

validity check approx 15:30 to 15:45

pump post cal to 7.29 L/min at 1820 on 11-23-10

photo 101-8974

Field Sample ID B101 - Roof - North Portion - Air	**General Sample Location** Rooftop air intake on north portion of GSA-controlled Building 1 N - 38.95794 ±15ft W - 094.57418
Collection Date 11/23/10	
Collected By Christopher S Cast	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone	☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
Sample Runtimes and Volumes	~~0747~~ ~~7:30~~ 0805	1820	615	4421.85			
					Sampling Equipment: R12164 - Legacy Pump		
	Total Runtime / Volume						
Work shift Information	Shift: (Day)	Shift Start	Shift End	Total Minutes ~600			

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal to 7.02 L/min at 1743 on 11-22-10

validity check approx 9:15 to 9:45

validity check approx 11:30 to 12:00

validity check approx 13:00 to 13:45

validity check approx 15:30 to 15:45

pump post-cal to 7.36 L/min at 1858 on 11-23-10

photo - 101-8973

Field Sample ID	General Sample Location
Bld 1-Roof-North Portion-ISO	Rooftop air intake on north portion of GSA controlled Building 1 N-38.95794 ±15 ft W-094.57458
Collection Date 11/23/10	
Collected By Christopher Scast	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone	☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
~~0744~~ ~~1430~~ 0805	1820	615	4415.70		~~32~~	
				Sampling Equipment		
				R1150 - Legacy Pump		
Total Runtime / Volume						

Work shift Information	Shift: (Day)	Shift Start	Shift End	Total Minutes 1600

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal at to 7.02 L/min at 1745 on 11-22-10
Validity check approx 9:15 to 9:45
validity check approx 11:30 to 12:00
validity check approx 13:00 to 13:45
validity check approx 15:30 to 15:45
pump post cal to 7.34 L/min at 1819 on 11-23-10

photo 101-8975

Field Sample ID	General Sample Location
B2F1-0515.5-Be/U/Y-Ar	Building 2, Lobby 16 Entrance
Collection Date 11-24-10	
Collected By WWK, GAG, CSC, TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	2

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone	☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
Sample Runtimes and Volumes	0730	1730	600	4302.00	—	—	
					Sampling Equipment: HV-67		
	Total Runtime / Volume						

Work shift Information	Shift: Day	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal to 7.154 L/min at 0518 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post cal to 7.118 L/min at 1730 on 11-24-10

photo 101-8978

Field Sample ID	General Sample Location
B2F1-0815.5-Be/U/4-ISO	Building 2, Lobby 16 Entrance
Collection Date 11-24-10	
Collected By GAG, WWK, CSC, TEE	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 2
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0730	1730	600	4272.00	—	—	
					Sampling Equipment: HV-64		
	Total Runtime / Volume						
Work shift Information	Shift: Day 10hr	Shift Start	Shift End	Total Minutes 600			

Factors that Could Modify Results of this Sample

Sample Comments pump pre-cal to 7.02 L/min at 0530 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post cal to 7.22 L/min at 1730 on 11-24-10

photo 101-8978

Field Sample ID	General Sample Location
B2F1-0B6-Be/U/Y-Air	Building 2, Lobby 6 Entrance
Collection Date 11-24-10	
Collected By WWK, GAG-CSC, TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	2

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone	☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
0740	1740	600	4194.00	28.54	76.1 F°	
Total Runtime / Volume						

Sampling Equipment: R 12113 - Legacy Pump

Work shift Information	Shift: Day 10hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal to 7.05 L/min at 0459 on 11-24-10
validity check at approx 9:00 to 9:30
validity check at approx 11:00 to 11:30
validity check at approx 13:00 to 13:30
validity check at approx 15:15 to 15:45
pump post cal to 6.92 L/min at 1740 on 11-24-10

photo 101-8480

Field Sample ID	General Sample Location
~~B2F~~ B2F1-0836-Be1014-I30	Building 2, Lobby & Entrance
Collection Date: 11-24-10	
Collected By: WWK, GAG, ~~CES~~, TEE	**Facility**: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)**: ☐ Light ☒ Normal ☐ Heavy ~~☒ Unknown~~	**Building**: 2
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☑ TWA	**Sample Placement (check one)**: ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ~~☒~~ General breathing zone	**Exposure Estimate Method (check one)**: ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (~~mm~~ in Hg)	Avg. Temp (F)	RH (%)
	0740	1740	600	4170.00	28.53	26.7°C	
					Sampling Equipment: R 12176 - Legacy Pump		
	Total Runtime / Volume						

Work shift Information	Shift: Day 10hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal to 7.00 L/min at 0801 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post cal to 6.89 L/min at 1740 on 11-24-10

photo 101-8980

Field Sample ID	General Sample Location
B2F1-0426-Be/U-4-Air	Building 2, Shared Entrance
Collection Date: 11-24-10	
Collected By: WWJK, GAG, CSC, TEE	**Facility**: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)**: ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building: 2
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)**: ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0733	1746	613	4278.74	28.49	76.0°	
					Sampling Equipment: R7212 - Legacy Pump		
	Total Runtime / Volume						

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal to 7.05 L/min at 0504 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post cal to 6.93 L/min at 1746 on 11-24-10

photo 101-8979

Field Sample ID	General Sample Location
B2F1-0A26-Be/U/4-Iso	Building 2, Shared Entrance
Collection Date 11-24-10	
Collected By WWK, GAG, CSC, TEE	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 2
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
0747	1747	600	4104.00	28.52	76.0°	
Total Runtime / Volume						

Sampling Equipment: R7213 - Legacy Pump

Work shift Information	Shift: Day / 10 hr	Shift Start	Shift End	Total Minutes
				600

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal to 7.14 L/min at 0503 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post cal to 6.54 L/min at 1747 on 11-24-10

photo 101-8979

Field Sample ID B102 - Fan House 3 - Be/U/Y - Air	**General Sample Location** SW of Air-Handler
Collection Date 11-24-10	
Collected By WWK, GAG, CSC, TEE	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 2
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
0747	1757	610	4324.9	28.44	61.4°	
0747						
Total Runtime / Volume						

Sampling Equipment: R/2170 - Legacy Pump

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Sample Comments pump pre cal to 7.10 L/min at 1457 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 1300 to 13:30
validity check approx 15:15 to 15:45
~~Validity check approx +~~
pump post cal to 7.08 L/min at 1757 on 11-24-10

photo 101-8977

Field Sample ID	General Sample Location
Bld 2. Fan House 3-Be/U/4-Iso	SWC of Air Handler
Collection Date 11-24-10	
Collected By WWK, GAG, CSC, TEE	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 2
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
0747	1757	610	4385.90	28.58	64.1°	
Total Runtime / Volume						

Sampling Equipment: R/2175-Legacy Pump

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes
				600

Factors that Could Modify Results of this Sample

Sample Comments

pump pre cal to 7.17 L/min at 0458 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post-cal to 7.21 L/min at 1757 on 11-24-10

photo 101 ~ 8977

Field Sample ID B1F1-F25-Be/U/Y-Air	**General Sample Location** GSA warehouse near fire door at utility perforations into DOE controlled area
Collection Date 11-24-10	
Collected By WWK, GAG, CSC, TEE	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
0753	1813	620	4352.40	28.84	78.1°	
Total Runtime / Volume						

Sampling Equipment: R/2163 - Legacy Pump

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Sample Comments

pump pre cal to @ 7.01 L/min at 0509 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:145
pump post cal to 7.02 L/min at 1813 on 11-24-10

photo 101-8982

Field Sample ID: BIF1-F25-Be/U/4-I80	General Sample Location: GSA warehouse near five doors & utility perforations into DOE-controlled area
Collection Date: 11-24-10	
Collected By: WWJK, GAG, CSC, TEE	Facility: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	Building: 1
Workload (check one): ☐ Light ☒ Normal ☐ Heavy ☐ Unknown	
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	Sample Placement (check one): ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0753	1813	620	4408.20	728.75	83.5	
					Sampling Equipment: R/2109 - Legacy Pump		
	Total Runtime / Volume						
Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600			

Factors that Could Modify Results of this Sample

Sample Comments: pump pre cal to 7.20 L/min at 0570 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
Validity check approx 15:15 to 15:45
pump post cal to 7.01 L/min at 1813 on 11-24-10

photo 101-8982

Field Sample ID	General Sample Location
B1F1-A25-Be/U/4-Air	End of carpeted hallway ending at fire doors to DOE-controlled area
Collection Date: 11-24-10	
Collected By: WWK, GAG, CSC, TEE	**Facility**: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)**: ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building: 1
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)**: ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
0750	1818	628	4383.44	29.59	80.9	
Total Runtime / Volume						

Sampling Equipment: ~~HV-67~~ R 12168 - Legacy Pump

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes: 600

Factors that Could Modify Results of this Sample

Sample Comments

pump ~~pre~~ precal to 7.09 L/min at 0447 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post cal to 6.87 L/min at 1818 on 11-24-10

photo 101-8981

Field Sample ID: B1F1-A25-Be/U/4-Iso	General Sample Location: End of carpeted hallway ending at fire doors to DOE-controlled area
Collection Date: 11-24-10	
Collected By: WWK, BAG, CSC, TEE	Facility: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☒ Personal ☐ Wipe	Workload (check one): ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building: 1
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	Sample Placement (check one): ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0750	1818	628	4352.04	28.49	79.4	
					Sampling Equipment: ~~HV-64~~ R12106 - Legacy Pump		
	Total Runtime / Volume						
Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600			

Factors that Could Modify Results of this Sample

Sample Comments: pump pre cal to 7.05 L/min at 0446 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post cal to 6.81 L/min at 1819 on 11-24-10

photo 101-8981

Field Sample ID: BIF1-Q19-Be/U/9-Air	General Sample Location: FEMA warehouse space near fire doors + utility perforations into DOE-controlled area
Collection Date: 11-24-10	
Collected By: WWK, GAG, CSC, TEE	Facility: Bannister Complex
Sample Type (check one): [X] Area [ ] Blank [ ] Bulk [ ] Personal [ ] Wipe	Workload (check one): [ ] Light [X] Normal [ ] Heavy [ ] Unknown
	Building: 1
Exposure Type (check one): [ ] Blank [ ] Bulk [ ] Ceiling [ ] Grab [ ] Peak [ ] STEL [X] TWA	Sample Placement (check one): [ ] Area [ ] Collar [ ] Inside helmet [ ] Wipe [ ] Bulk [X] General breathing zone
	Exposure Estimate Method (check one): [X] Use sample period TWA as exposure (assume constant exposure) [ ] Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0758	1800	602	4244.10	28.46	76	
	Total Runtime / Volume						

Sampling Equipment: R12108 - Legacy Pump

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Sample Comments: pump pre cal to 7.116 L/min at 0455 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
Fema office closed this afternoon - no access to warehouse area
pump post cal to 6.941 L/min at 1800 on 11-24-10

photo # 101-8285

Field Sample ID	General Sample Location
BIF1-Q19-Be/U/4-ISO	FEMA warehouse space near fire doors + utility perforations into DOE-controlled area
Collection Date: 11-24-10	
Collected By: WWK, GAG, CSC, TEE	**Facility**: Bannister Complex
Sample Type (check one): [X] Area [ ] Blank [ ] Bulk [ ] Personal [ ] Wipe	**Workload (check one)**: [ ] Light [X] Normal [ ] Heavy [ ] Unknown
	Building: 1
Exposure Type (check one): [ ] Blank [ ] Bulk [ ] Ceiling [ ] Grab [ ] Peak [ ] STEL [X] TWA	**Sample Placement (check one)**: [ ] Area [ ] Collar [ ] Inside helmet [ ] Wipe [ ] Bulk [X] General breathing zone
	Exposure Estimate Method (check one): [X] Use sample period TWA as exposure (assume constant exposure) [ ] Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
0758	1800	602	4298.28	28.45	78.7	
Total Runtime / Volume						

Sampling Equipment: R 11149 - Legacy Pump

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes: 600

Factors that Could Modify Results of this Sample

Sample Comments

pump pre-cal to 7.16 L/min at 0453 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
Fema office closed this afternoon - no access to warehouse area.
pump post-cal to 7.11 L/min at 1801 on 11-24-10

photo 101-8985

Field Sample ID: BIF1-410-Be/U/4-Air	General Sample Location: Hallway near sliding fire door to DOE-controlled area
Collection Date: 11-24-10	
Collected By: WWK, GAG, CSC, TEE	Facility: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	Workload (check one): ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building: 1
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	Sample Placement (check one): ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0800	1810	610	4349.30	28.36	79.7	
					Sampling Equipment: R 12169 - Legacy Pump		
	Total Runtime / Volume						

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Sample Comments: pump pre-cal to 7.03 L/min at 0449 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
Pump post cal to 7.23 L/min at 1810 on 11-24-10

photo 101 - 8983

Field Sample ID: BIF1-910 Be/U/4-Iso	General Sample Location: Hallway near sliding fire door to DOE-controlled area
Collection Date: 11-24-10	
Collected By: WWK, GAG, CSC, TEE	Facility: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	Workload (check one): ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building: 1
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	Sample Placement (check one): ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0800	1810	610	4251.70	28.66	78.6	
					Sampling Equipment: R 12165 - Legacy Pump		
	Total Runtime / Volume						

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Sample Comments: pump pre-cal to 7.26 L/min at ~~1805~~ 0448 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post-cal to 6.67 L/min at 1810 on 11-24-10

photo 101-8983

Field Sample ID: BIF1-B18-Be/U/Y-~~I00~~ Air	General Sample Location: Hallway near fire doors to DOE-controlled area
Collection Date: 11-24-10	
Collected By: WWK, GAG, CSC, TEE	Facility: Bannister Complex
Sample Type (check one): [X] Area [ ] Blank [ ] Bulk [ ] Personal [ ] Wipe	Building: 1
Workload (check one): [ ] Light [X] Normal [ ] Heavy [ ] Unknown	
Exposure Type (check one): [ ] Blank [ ] Bulk [ ] Ceiling [ ] Grab [ ] Peak [ ] STEL [X] TWA	Sample Placement (check one): [ ] Area [ ] Collar [ ] Inside helmet [ ] Wipe [ ] Bulk [X] General breathing zone
	Exposure Estimate Method (check one): [X] Use sample period TWA as exposure (assume constant exposure) [ ] Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	0756	1756	600	4362.00	728	80.3	
	Total Runtime / Volume						

Sampling Equipment: R12112 - Legacy Pump

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Sample Comments: pump pre-cal to 7.37 L/min at 0806 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post-cal to 7.17 L/min at 1756 on 11-24-10

photo 101-8984

Field Sample ID BIF1-R18-Be/U/4-~~Air~~ Iso	**General Sample Location** Hallway near five doors to DOE-controlled area
Collection Date 11-24-10	
Collected By WWK, GAG, CSC, TEE	**Facility** Bannister Complex
Sample Type (check one) ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one) ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
0756	1639	523	3687.15	28.57	80.3	
	1756					
Total Runtime / Volume						

Sampling Equipment: R 12171 - Legacy Pump

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Pump Stopped @

Sample Comments pump pre-cal to 7.03 L/min at 0508 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post-cal to 7.07 L/min at 0904 on 11-29-10 - dead battery prior to finishing sample

photo 101-8984

Field Sample ID	General Sample Location
~~BIF1-1~~ Dup 2 - ~~Air~~ Be/U/4-Air	BIF1-R18; Hallway near fire doors to DOE-controlled area
Collection Date: 11-24-10	
Collected By: WWK, BAG, CSC, TEE	**Facility**: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)**: ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building: 1
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)**: ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
0756	1756	600	4188.00	28.57	75.2	
Total Runtime / Volume						

Sampling Equipment: R / 2164 - Legacy Pump

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes
				600

Factors that Could Modify Results of this Sample

Sample Comments

pump pre-cal to 7.00 L/min at 0512 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
validity check approx 15:15 to 15:45
pump post-cal to 6.96 L/min at 1756 on 11-24-10

photo 101-8484

Field Sample ID	General Sample Location
Dup 2-Be/U/4-Iso	B1F1-R18; Hallway near five doors to DOE-controlled area
Collection Date: 11-24-10	
Collected By: WLK, GAG, CSC, TEE	**Facility**: Bannister Complex
Sample Type (check one): ☒ Area ☐ Blank ☐ Bulk ☐ Personal ☐ Wipe	**Workload (check one)**: ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building: 1
Exposure Type (check one): ☐ Blank ☐ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☒ TWA	**Sample Placement (check one)**: ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☐ Bulk ☒ General breathing zone
	Exposure Estimate Method (check one): ☒ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (°C)	RH (%)
	0756	1756	600	4206.00	28.56	23.7°C	
					Sampling Equipment: k 11150 - Legacy Pump		
	Total Runtime / Volume						

Work shift Information	Shift: Day 10 hr	Shift Start	Shift End	Total Minutes 600

Factors that Could Modify Results of this Sample

Sample Comments pump pre-cal to 7.108 L/min at 0514 on 11-24-10
validity check approx 9:00 to 9:30
validity check approx 11:00 to 11:30
validity check approx 13:00 to 13:30
Validity check approx 15:15 to 15:45
pump post cal to 6.93 L/min at 1756 on 11-24-10

photo 101-8984

Field Sample ID	General Sample Location
B1SB-Q25-Be/U/Y-Dust	East End of Q-Corridor Near Fire Doors to DOE-Controlled Area
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1038	1049	11	27.55			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 11 minutes → 1038 - 1049
10 100 cm² templates used → 1000 cm² total
↳ 6 on floor, 1 on pipe, 1 on air conditioning unit, 2 on shelves (N. Wall)
Pump 1 post cal to 2.50 L/min on 11-30-10

Picture 101-8991 thru 101-8993

Field Sample ID	General Sample Location
B1SB-Q25-Be/U/4-Dust Iso	East End of Q-Corridor Near Fire Doors to DOE-controlled Area
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
Sample Runtimes and Volumes	1144	1151	7min	17.54			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.512 L/min on 11-30-10
sample collected for 11 minutes → 1144-1157
10 templates (100cm²) used → 1000 cm² total
↳ 6 on floor, 1 on pipe, 1 on air conditioning unit, 2 on shelves (N. wall)
Pump 1 post-cal to 2.50 L/min on 11-30-10

Picture 101-8991 thru 101-8993

Field Sample ID	General Sample Location
B1SB-V19-Be/U/4-Dust	Mechanical Room 3B Air Intake
Collection Date 11-30-10	
Collected By CSC+TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1204	1208	4	10.02			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
Sample collected for 4 minutes → 1204-1208
5 templates (100 cm²) used → 500 cm² total
↳ 3 on metal ledge associated with filters, 1 on floor on N. End of Room, + 1 on floor on S. End of Room
Pump 1 post-cal to 2.50 L/min on 11-30-10

Pictures 101-8995 + 6

Field Sample ID	General Sample Location
B15B-V19-Be/U/4-Dust ISO	Mechanical Room 3B Air Intake
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1211	1215	4	10.02			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 4 minutes → 1211-1215
5 templates (100cm²) used → 500 cm² total
↳ 3 on metal ledge associated with filters, 1 on floor on N. End of Room, + 1 on floor on S. End of Room
Pump 1 post-cal to 2.50 L/min on 11-30-10

Pictures 101-8995+6

Field Sample ID	General Sample Location
B1F1-Q19-Be/U/4-Dust	FEMA Warehouse Near Fire Doors To DOE-controlled Area
Collection Date: 11-30-10	
Collected By: CSC+TEE	**Facility**: Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☑ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☑ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
1226	1229	3	7.52			
Total Runtime / Volume						

Sampling Equipment: MSA Pump 1

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.5 L/min on 11-30-10
sample collected for 3 minutes → 1226-1229
4 templates (100cm²) used → 400 cm² total
↳ 2 by fire doors, 2 by fire suppressant system piping
Pump 1 post-cal to 2.5 L/min on 11-30-10

Pictures 101-8997+8

Field Sample ID	General Sample Location
B1F1-Q19-Be/U/Y-DustIso	FEMA Warehouse Near Fire Doors to DOE-controlled Area
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1231	1234	3	7.52			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre cal to 2.51 L/min on 11-30-10
sample ~~collected~~ collected for 3 minutes → 1231-1234
4 templates used (100cm²) → 400cm² total
↳ 2 by fire doors, 2 by fire suppressant system piping
Pump 1 post cal to 2.5 L/min on 11-30-10

Pictures 101-8997 + 8

Field Sample ID	General Sample Location
B1F1-R18-Bel u/4-Dust	Hallway Near Fire Doors to DOE-Controlled Area
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
Sample Runtimes and Volumes	1242	1250	8	20.04			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre cal to 2.51 L/min on 11-30-10
sample collected for 8 minutes → 1242-1250
5 templates (100 cm²) used → on floor
2.5 door handles used → 76cm x 6cm each } 1640 cm² total
Pump 1 post cal to 2.5 L/min on 11-30-10

Pictures 101-8999 + 9000

Field Sample ID	General Sample Location
B1F1-R18-Be/U/4-Dust-Iso	Hallway Near Fire Doors to DOE-controlled Area
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex
Sample Type (check one) ☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone
	Exposure Estimate Method (check one) ☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1252	1258	6	15.03 ~~1.50~~			
					Sampling Equipment MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 6 minutes → 1252-1258
5 templates (100cm²) used → on floor
2.5 door handles used → 76cm x 6cm each } 1640 cm² total
Pump 1 post cal to 2.5 L/min on 11-30-10

Pictures 101-8999 + 9000

Field Sample ID	General Sample Location
B1F1-Y10-Be/U/Y-Dust	Hallway Near Sliding Fire Door to DOE-controlled area
Collection Date 11-30-10	
Collected By CSC & TEE	**Facility** Bannister Complex
Sample Type (check one) ☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone
	Exposure Estimate Method (check one) ☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1311	1317	6	15.03			
					Sampling Equipment		
					MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 6 minutes → 1311-1317
3 templates (100 cm²) used → on floor
1/2 of bay door ledge used → 304 cm x 5 cm
1/2 of sliding door ledge used → 294 cm x 4.5 cm
} 1108.5 cm² total
Pump 1 post-cal to 2.5 L/min on 11-30-10 → full length of ledge

Pictures 101-9001 thru 101-9003

Field Sample ID	General Sample Location
B1F1-410-Be/U/4-Dust ISO	Hallway Near Sliding Fire Door to DOE-controlled Area
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex
Sample Type (check one) ☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone
	Exposure Estimate Method (check one) ☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1320	1326	6	15.03			
					Sampling Equipment		
	Total Runtime / Volume				MSA Pump 1		

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 6 minutes → 1320-1326
3 templates (100 cm²) used → on floor
½ of bay door ledge used → (30.4 cm × 5 cm)
½ of sliding door ledge used → (29.4 cm × 4.5 cm)
} 1108.5 cm² total
Pump 1 post cal to 2.5 L/min on 11-30-10 → full length of ledge

Pictures 101-9001 thru 101-9003

Field Sample ID	General Sample Location
B25B-BOCa6-Be/U/4-Dust	Hall/Entry By Elevator - Supply Duct In Ceiling
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1352	1401	9	22.55			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 9 minutes → 1352-1401
½ of Vent cover used → 23cm x 11cm → half recorded
½ of diffuser duct used → 29 cm x 58 cm minus ½ of a 20cm diameter circle
Pump 1 post cal to 2.5 L/min on 11-30-10 → half recorded

Total Area Sampled → 1777.92 cm²

Sample replaces Fan House 3 Supply Duct per Tetra Tech

Pictures 101-9004 +5

Field Sample ID	General Sample Location
B2SB-B0026-Be/U/4-DustIso	Hall/Entry By Elevator - Supply Duct in Ceiling
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex
Sample Type (check one) ☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone
	Exposure Estimate Method (check one) ☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1402	1411	9	22.55			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 9 minutes → 1402-1411
1/2 of vent cover used → 23 cm x 11 cm
1/2 of diffuser duct used → 29 cm x 58 cm minus 1/2 of a 20 cm diameter circle
Pump 1 post-cal to 2.5 L/min on 11-30-10

Total Area Sampled → 1177.92 cm²

Pictures 101-9004 + 5

Field Sample ID	General Sample Location
FH3-RAD-Be/U/4-Dust	Fan House 3 - Return Air Duct - Bottom of Air Handler Unit
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	2

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1423	1425	2	5.01			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.5 L/min on 11-30-10
sample collected for 2 minutes → 1423-1425
2 templates (100cm²) used → bottom floor of air handler → 200cm² total
Pump 1 post-cal to 2.5 L/min on 11-30-10

Photo 101-9006

Field Sample ID	General Sample Location
FH3-RAD-Be/U/Y-Dust ISO	Fan House 3- Return Air Duct - Bottom of Air Handler Unit
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex
Sample Type (check one) ☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 2
Exposure Type (check one) ☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone
	Exposure Estimate Method (check one) ☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1426	1428	2	5.01			
					Sampling Equipment MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 2 minutes → 1426-1428
2 templates (100 cm^2) used → bottom floor of air handler → 200 cm^2 total
Pump 1 post-cal to 2.5 L/min on 11-30-10

Photo 101-9006

Field Sample ID	General Sample Location
FH3-AI-Be/U/Y-Dust	Fan House 3 - Air Intake - On In-Take Louver
Collection Date: 11-30-10	
Collected By: CSC & TEE	**Facility**: Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	2

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1432	1434	2	5.01			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 2 minutes → 1432-1434
1 template used (100cm²) → on intake louver → 100cm² total
Pump 1 post-cal to 2.5 L/min on 11-30-10

Photo 101-9007

Field Sample ID	General Sample Location
FH3-AI-Be/U/Y-Dust Iso	Fan House 3 - Air Intake - On Intake Louver
Collection Date 11-30-10	
Collected By	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	2

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1437	1439	2	5.01			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 2 minutes → 1437-1439
1 template (100cm²) used → on intake louver → 100cm² total
Pump 1 post-cal to 2.5 L/min on 11-30-10

Photo 101-9007

Field Sample ID	General Sample Location
FH3-MC-Be/U/4-Dust	Fan House 3-Former Mixing Chamber-Metal Ledge on SW Corner of Room
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	2

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1448	1449	1	2.505			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 1 minute → Metal ledge in SW corner of Room
~~100 cm² area measured~~ ↳ 1448-1449
1 template (100 cm²) used → 100 cm² total
Pump 1 post-cal to 2.5 L/min on 11-30-10

Photo 101-9008

Field Sample ID	General Sample Location
FH3-MC-Be/U/Y-Dust ISO	Fan House 3-Former Mixing Chamber Metal Ledge in SW Corner of Room
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	2

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1450	1451	1	2.505			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 precal to 2.51 L/min on 11-30-10
sample collected for 1 minute → 1450-1451
1 template (100cm²) used → Metal ledge in SW Corner of Room
Pump 1 post-cal to 2.5 L/min on 11-30-10 ↳ 100cm² total

Photo 101-9008

Field Sample ID	General Sample Location
B1-Roof-ECAI-Be/U/Y-Dust	Roof - East Central Air Intake - Diagonal Slat ~~of~~ Before Filter Wall
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex
Sample Type (check one) ☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building ~~X~~ 1
Exposure Type (check one) ☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone
	Exposure Estimate Method (check one) ☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1506	1508	2	5.01			
					Sampling Equipment		
	Total Runtime / Volume				MSA Pump 1		

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 2 minutes → 1506-1508
1 template (100cm²) used → 100cm² total
Pump 1 post-cal to 2.5 L/min on 11-30-10

Photo 101-9009

Field Sample ID	General Sample Location
B1-Roof-ECAI-Be/U/Y-Dust Iso	Roof - East Central Air Intake - Diagonal Slat Before Filter Wall
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☑ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1508	1510	2	5.01			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 2 minutes → 1508-1510
1 template (100cm²) used → 100cm² total
Pump 1 post-cal to 2.5 L/min on 11-30-10

Photo 101-9009

Field Sample ID	General Sample Location
B1-Roof-NAI-Be/U/4-Dust	Roof-Northern Air Intake - Lower Ledge Before Roll Filter
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☑ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1523	1524	1	2.505			
					Sampling Equipment: MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 1 minute → 1523-1524
1 template (100cm²) used → 100cm² total
Pump 1 post-cal to 2.5 L/min on 11-30-10

Photo 101-9010

Field Sample ID	General Sample Location
B1-Roof-NAI-Be/U/4-DustIso	Roof-Northern Air Intake - Lower Ledge Before Filter
Collection Date: 11-30-10	
Collected By: CSC + TEE	**Facility**: Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	I

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes

Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
1525	1526	1	2.505			
Total Runtime / Volume						

Sampling Equipment: MSA Pump 1

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
sample collected for 1 minute → 1525-1526
1 template (100cm²) used → 100cm² total
Pump 1 post-cal to 2.5 L/min on 11-30-10

Photo 101-9010

Field Sample ID	General Sample Location
B1F1-A25-Be/U/Y-Dust	~~Building~~ East End of Carpeted Hallway Near Fire Doors to DOE-Controlled Area
Collection Date 11-30-10	
Collected By CSC+TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1546	1548	2	5.01			
					Sampling Equipment		
					MSA Pump 1		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 1 pre-cal to 2.51 L/min on 11-30-10
Sample collected for 2 minutes → 1546-1548
4 templates (100 cm²) used → on carpeted floor → 400 cm² total
Pump 1 post-cal to 2.5 L/min on 11-30-10

Photo 101-9011

Field Sample ID	General Sample Location
B1F1-A25-Be/U/4-Dust.Iso	East End of Carpeted Hallway Near Fire Doors to DOE-controlled Area
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex
Sample Type (check one) ☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	**Workload (check one)** ☐ Light ☒ Normal ☐ Heavy ☐ Unknown
	Building 1
Exposure Type (check one) ☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	**Sample Placement (check one)** ☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone
	Exposure Estimate Method (check one) ☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1551	1553	2	5.0			
					Sampling Equipment		
	Total Runtime / Volume				MSA Pump 2		

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 2 pre-cal to 2.49 L/min on 11-30-10
sample collected for 2 minutes → 1551 - 1553
4 templates (100cm²) used → on carpeted floor → 400cm² total
Pump 2 post-cal to 2.51 L/min on 11-30-10

Photo 101-9011

Field Sample ID	General Sample Location
B1F1-F25-Be/U/Y-Dust	GSA Warehouse-Northeast Corner
Collection Date 11-30-10	
Collected By CSC+TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1601	1604	3	7.5			
					Sampling Equipment: MSA Pump 2		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 2 pre-cal to 2.49 L/min on 11-30-10
sample collected for 3 minutes → 1601-1604
4 templates (100 cm²) used → concrete floor → 400 cm² total
Pump 2 post-cal to 2.51 L/min on 11-30-10

Photos 101-9012 & 13

Field Sample ID	General Sample Location
B1F1-F25-Be/U/4-DustIso	GSA Warehouse-Northeast Corner
Collection Date 11-30-10	
Collected By CSC + TEE	**Facility** Bannister Complex

Sample Type (check one)	Workload (check one)	Building
☐ Area ☐ Blank ☒ Bulk ☐ Personal ☐ Wipe	☐ Light ☒ Normal ☐ Heavy ☐ Unknown	1

Exposure Type (check one)	Sample Placement (check one)	Exposure Estimate Method (check one)
☐ Blank ☒ Bulk ☐ Ceiling ☐ Grab ☐ Peak ☐ STEL ☐ TWA	☐ Area ☐ Collar ☐ Inside helmet ☐ Wipe ☒ Bulk ☐ General breathing zone	☐ Use sample period TWA as exposure (assume constant exposure) ☐ Calculate TWA (assume no exposure outside sample period)

Sample Runtimes and Volumes	Sample Start	Sample Stop	Runtime (min)	Volume (L)	BP (mm Hg)	Avg. Temp (F)	RH (%)
	1604	1607	3	7.5			
					Sampling Equipment: MSA Pump 2		
	Total Runtime / Volume						

Work shift Information	Shift:	Shift Start	Shift End	Total Minutes

Factors that Could Modify Results of this Sample

Sample Comments

Pump 2 pre-cal to 2.49 L/min on 11-30-10
sample collected for 3 minutes → 1604-1607
4 templates (100cm²) used → concrete floor → 400cm² total
Pump 2 post-cal to 2.51 L/min on 11-30-10

Photos 101-9012+13

APPENDIX D

Analytical Tables

TABLE 1
Air Sampling Data Summary - Beryllium/Uranium/Yttrium
Bannister Complex - Building 1 and 2
Terracon Project No. 02107144

Sample Date	Sample I.D.	Beryllium (mg/m^3)	Uranium (mg/m^3)	Yttrium (mg/m^3)
11/23/2010	B1SB-AA16-Be/U/Y Air	< 0.0000047	< 0.000070	< 0.0000093
11/23/2010	B1SB-K17-Be/U/Y Air	< 0.0000047	< 0.000070	< 0.0000094
11/23/2010	B1SB-Q25-Be/U/Y Air	< 0.0000048	< 0.000073	< 0.0000097
11/23/2010	B1SB-V19-Be/U/Y Air	< 0.0000047	< 0.000070	< 0.0000093
11/23/2010	Bld 1-Roof-North Portion-Air	< 0.0000045	< 0.000068	< 0.0000090
11/23/2010	Bld 1-Roof-East Central Portion-Air	< 0.0000045	< 0.000068	< 0.0000091
11/23/2010	Bld 2-Roof-East End-Fan House 3- Air	< 0.0000047	< 0.000070	< 0.0000093
11/23/2010	West Ambient-Air	< 0.0000045	< 0.000067	< 0.0000090
11/23/2010	North Ambient-Air	< 0.0000046	< 0.000069	< 0.0000093
11/24/2010	B2F1-OB15.5-Be/U/Y Air	< 0.0000046	< 0.000070	< 0.0000093
11/24/2010	B2F1-OB6-Be/U/Y Air	< 0.0000048	< 0.000072	< 0.0000095
11/24/2010	B2F1-OA26-Be/U/Y Air	< 0.0000047	< 0.000070	< 0.0000093
11/24/2010	Bld 2-Fan House 3-Be/U/Y Air	< 0.0000046	< 0.000069	< 0.0000092
11/24/2010	B1F1-F25-Be/U/Y-Air	< 0.0000046	< 0.000069	< 0.0000092
11/24/2010	B1F1-A25-Be/U/Y Air	< 0.0000046	< 0.000068	< 0.0000091
11/24/2010	B1F1-Q19-Be/U/Y Air	< 0.0000047	< 0.000071	< 0.0000094
11/24/2010	B1F1-Y10-Be/U/Y Air	< 0.0000046	< 0.000069	< 0.0000092
11/24/2010	B1F1-R18-Be/U/Y Air	< 0.0000046	< 0.000069	< 0.0000092
11/23/2010	Be/U/Y- Dup 1 Air (Q25)	< 0.0000048	< 0.000072	< 0.0000096
11/24/2010	Dup 2-Be/U/Y Air (R18)	< 0.0000048	< 0.000072	< 0.0000096
11/23/2010	Blank 1-Air	< 0.020 µg/sample	< 0.30 µg/sample	< 0.040 µg/sample
11/24/2010	Bank 2 - Air	< 0.020 µg/sample	< 0.30 µg/sample	< 0.040 µg/sample
EPA Regional Screening Level (RSL) - Industrial Air (Carcinogenic)		**0.0000051**	**NE**	**NE**
EPA Regional Screening Level (RSL) - Industrial Air (Non-Carcinogenic)		**0.000088**	**0.0013**	**NE**

Source: ALS Environmental, 2011

EPA Regional Screening Levels (RSLs) - http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

Notes:

mg/m^3 = All air concentrations reported in milligrams per cubic meter.

<0.024 = Not detected above the laboratory reporting limit.

NE = Not Established by EPA

NA = Not analyzed/Not applicable

BOLD = Indicates analyte reported above the laboratory reporting limit

TABLE 2
Air Sampling Data Summary - Isotopic Uranium
Bannister Complex - Building 1 and 2
Terracon Project No. 02107144

Sample Date	Sample I.D.	U-234 (pCi/Sample)	U-235 (pCi/Sample)	U-238 (pCi/Sample)
11/23/2010	B1SB-AA16-Be/U/Y-Iso	<0.076	<0.064	<0.04
11/23/2010	B1SB-K17-Be/U/Y-Iso	**0.053 ± 0.037**	<0.044	<0.042
11/23/2010	B1SB-Q25-Be/U/Y-Iso	<0.057	<0.039	<0.045
11/23/2010	B1SB-V19-Be/U/Y-Iso	<0.038	<0.045	<0.038
11/23/2010	Bld 1-Roof-North Portion-Iso	<0.054	<0.056	<0.059
11/23/2010	Bld 1-Roof-East Central Portion-Iso	<0.046	<0.044	<0.046
11/23/2010	Bld 2-Roof-East End-Fan House 3-Iso	<0.064	<0.018	<0.06
11/23/2010	West Ambient-Iso	<0.077	<0.025	<0.077
11/23/2010	North Ambient-Iso	<0.058	<0.044	<0.037
11/24/2010	B2F1-OB15.5-Be/U/Y-Iso	<0.095	<0.063	<0.076
11/24/2010	B2F1-OB6-Be/U/Y-Iso	<0.06	<0.034	<0.06
11/24/2010	B2F1-OA26-Be/U/Y-Iso	<0.04	<0.035	<0.036
11/24/2010	Bld 2-Fan House 3-Be/U/Y-Iso	<0.062	<0.052	<0.033
11/24/2010	B1F1-F25-Be/U/Y-Iso	**0.043 ± 0.033**	<0.046	<0.044
11/24/2010	B1F1-A25-Be/U/Y-Iso	<0.05	<0.035	<0.04
11/24/2010	B1F1-Q19-Be/U/Y-Iso	<0.053	<0.044	<0.047
11/24/2010	B1F1-Y10-Be/U/Y-Iso	**0.041 ± 0.032**	<0.018	<0.035
11/24/2010	B1F1-R18-Be/U/Y-Iso	<0.051	<0.06	<0.054
11/23/2010	Be/U/Y- Dup 1-Iso (Q25)	<0.05	<0.037	<0.046
11/24/2010	Dup 2-Be/U/Y-Iso (R18)	<0.043	<0.05	<0.054
11/23/2010	Blank 1-Iso	<0.072	<0.051	<0.065
11/24/2010	Bank 2 - Iso	<0.04	<0.035	<0.036
EPA Regional Screening Level (RSL) - Industrial Soil		**NE**	**NE**	**NE**

Source: ALS Environmental, 2011
EPA Regional Screening Levels (RSLs) - http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm
Notes:

pCi/Sample = All air concentrations reported in picoCuries per sample
<0.024 = Not detected above the minimum detectable concentration
NE = Not Established by EPA
NA = Not analyzed/Not applicable
± = Total Propagated Uncertainty
BOLD = Indicates analyte reported above the laboratory reporting limit

TABLE 3
Dust Sampling Data Summary - Beryllium/Uranium/Yttrium
Bannister Complex - Building 1 and 2
Terracon Project No. 02107144

Sample Date	Sample I.D.	Beryllium (mg/kg)	Uranium (mg/kg)	Yttrium (mg/kg)
11/30/2010	B1SB-Q25-Be/U/Y-Dust	< 0.79	< 12	**3.8**
11/30/2010	B1SB-V19-Be/U/Y-Dust	< 2.8	< 42	< 5.60
11/30/2010	B1F1-Q19-Be/U/Y-Dust	< 2.5	< 38	**6.1**
11/30/2010	B1F1-R18-Be/U/Y-Dust	< 0.92	< 14	**5.7**
11/30/2010	B1F1-Y10-Be/U/Y/Dust	< 1.3	< 19	**2.7**
11/30/2010	B2SB-BOC26-Be/U/Y-Dust	< 1.2	< 18	**6.0**
11/30/2010	FH3-RAD-Be/U/Y-Dust	< 200	< 3,000	< 400
11/30/2010	FH3-AI-Be/U/Y-Dust	< 0.65	< 9.8	**4.0**
11/30/2010	FH3-MC-Be/U/Y-Dust	< 0.3	< 45	**4.2**
11/30/2010	B1-Roof-ECAI-Be/U/Y-Dust	**0.18**	< 9.2	**6.1**
11/30/2010	B1-Roof-NAI-Be/U/Y-Dust	< 1.5	< 23	< 3.1
11/30/2010	B1F1-A25-Be/U/Y-Dust	< 3.8	< 57	< 7.7
11/30/2010	B1F1-F25-Be/U/Y-Dust	**1.5**	< 13	**9.9**
11/30/2010	Blank 1 -Dust[1]	< 40	< 600	< 80
EPA Regional Screening Levels (RSLs) - Industrial Soil (Carcinogenic)		**6900**	**NE**	**NE**
EPA Regional Screening Levels (RSLs) - Industrial Soil (Non-Carcinogenic)		**2000**	**3100**	**NE**

Source: ALS Environmental, 2011

November 2010 EPA Regional Screening Levels (RSLs) - http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

Notes:

mg/kg = All dust concentrations reported in milligrams per kilogram.
<0.024 = Not detected above the laboratory reporting limit.
1 = Results in milligrams per sample
NE = Not Established by EPA
NA = Not analyzed/Not applicable
BOLD = Indicates analyte reported above the laboratory reporting limit

TABLE 4
Dust Sampling Data Summary - Isotopic Uranium
Bannister Complex - Building 1 and 2
Terracon Project No. 02107144

Sample Date	Sample I.D.	U-234 (pCi/Sample)	U-235 (pCi/Sample)	U-238 (pCi/Sample)
11/30/2010	B1SB-Q25-Be/U/Y-Dust Iso	**0.054 ± 0.037**	<0.048	<0.036
11/30/2010	B1SB-V19-Be/U/Y-Dust Iso	<0.049	<0.046	<0.029
11/30/2010	B1F1-Q19-Be/U/Y-Dust Iso	<0.055	<0.035	<0.029
11/30/2010	B1F1-R18-Be/U/Y-Dust Iso	**0.047 ± 0.033**	<0.033	<0.038
11/30/2010	B1F1-Y10-Be/U/Y-Dust Iso	<0.043	**0.019 ± 0.024**	<0.043
11/30/2010	B2SB-BOC26-Be/U/Y-Dust Iso	<0.054	<0.045	<0.047
11/30/2010	FH3-RAD-Be/U/Y-Dust Iso	<0.046	<0.036	<0.05
11/30/2010	FH3-AI-Be/U/Y-Dust Iso	<0.072	<0.02	<0.067
11/30/2010	FH3-MC-Be/U/Y-Dust Iso	**0.065 ± 0.046**	**0.027 ± 0.028**	**0.102 ± 0.055**
11/30/2010	B1-Roof-ECAI-Be/U/Y-Dust Iso	<0.055	<0.042	**0.047 ± 0.035**
11/30/2010	B1-Roof-NAI-Be/U/Y-Dust Iso	<0.073	<0.052	<0.066
11/30/2010	B1F1-A25-Be/U/Y-Dust Iso	<0.089	<0.06	<0.072
11/30/2010	B1F1-F25-Be/U/Y-Dust Iso	<0.06	<0.035	**0.073 ± 0.048**
11/30/2010	Blank 1 -Dust Iso	<0.044	<0.038	<0.039
EPA Regional Screening Level (RSL) - Industrial Soil		**NE**	**NE**	**NE**

Source: ALS Environmental, 2011

November 2010 EPA Regional Screening Levels (RSLs) - http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

Notes:

pCi/Sample = All dust concentrations reported in picoCuries per sample
<0.024 = Not detected above the minimum detectable concentration
± = Total Propagated Uncertainty
NE = Not Established by EPA
NA = Not analyzed/Not applicable
BOLD = Indicates analyte reported above the laboratory reporting limit

APPENDIX E

Laboratory Analytical Reports

28-Dec-2010

Wil King
Terracon
13910 W. 96th Terrace
Lenexa, KS 66215

Tel: (913) 492-7777
Fax: (913) 492-7443

Re: Bannister Complex Work Order: **1012250**

Dear Wil,

ALS Environmental received 11 samples on 10-Dec-2010 10:58 AM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Laboratory Group. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 10.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

Chris Gibson

Electronically approved by: Rob Nieman

Chris Gibson
Project Manager

ALS Environmental

Date: 28-Dec-10

Client: Terracon
Project: Bannister Complex
Work Order: **1012250**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
1012250-01	B15B-AA16-Be/U/Y Air	Air		11/23/2010	12/10/2010 10:58	☐
1012250-02	B15B-K17-Be/U/Y-Air	Air		11/23/2010	12/10/2010 10:58	☐
1012250-03	B15B-Q25:Be/U/Y-Air	Air		11/23/2010	12/10/2010 10:58	☐
1012250-04	Be/U/Y-Dupl Air	Air		11/23/2010	12/10/2010 10:58	☐
1012250-05	B15B-V19-Be/U/Y-Air	Air		11/23/2010	12/10/2010 10:58	☐
1012250-06	Bld1-Roof-North Portion- Air	Air		11/23/2010	12/10/2010 10:58	☐
1012250-07	Bld1-Roof-East Central Portion- Air	Air		11/23/2010	12/10/2010 10:58	☐
1012250-08	Bld2-Roof-East End-Fan House3-Air	Air		11/23/2010	12/10/2010 10:58	☐
1012250-09	West Ambient-Air	Air		11/23/2010	12/10/2010 10:58	☐
1012250-10	North Ambient-Air	Air		11/23/2010	12/10/2010 10:58	☐
1012250-11	Blank1-Air	Air		11/23/2010	12/10/2010 10:58	☐

ALS Environmental

Date: 28-Dec-10

Client: Terracon
Project: Bannister Complex
Work Order: 1012250

Case Narrative

The sample condition upon receipt was acceptable except where noted.

Results relate only to the items tested and are not blank corrected unless indicated.

ALS Environmental

Date: *28-Dec-10*

Client: Terracon
Project: Bannister Complex

Work Order: 1012250

Lab ID: 1012250-01A
Collection Date: 11/23/2010
Client Sample ID: B15B-AA16-Be/U/Y Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4292.7**	Analyst: **CEG**
Date Analyzed: 12/22/2010 15:02		Reporting Limit		
	µg/sample	µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000047	
Uranium	ND	0.30	<0.000070	
Yttrium	ND	0.040	<0.0000093	

Lab ID: 1012250-02A
Collection Date: 11/23/2010
Client Sample ID: B15B-K17-Be/U/Y-Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4268.16**	Analyst: **CEG**
Date Analyzed: 12/22/2010 15:07		Reporting Limit		
	µg/sample	µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000047	
Uranium	ND	0.30	<0.000070	
Yttrium	ND	0.040	<0.0000094	

Lab ID: 1012250-03A
Collection Date: 11/23/2010
Client Sample ID: B15B-Q25:Be/U/Y-Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4127.6**	Analyst: **CEG**
Date Analyzed: 12/22/2010 15:12		Reporting Limit		
	µg/sample	µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000048	
Uranium	ND	0.30	<0.000073	
Yttrium	ND	0.040	<0.0000097	

Note:

ALS Environmental

Date: *28-Dec-10*

Client: Terracon
Project: Bannister Complex

Work Order: 1012250

Lab ID: 1012250-04A
Client Sample ID: Be/U/Y-Dupl Air

Collection Date: 11/23/2010
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.	Method: **N7300**	Air Volume (L): **4177.53**	Analyst: **CEG**
Date Analyzed: 12/22/2010 15:17			
	µg/sample	Reporting Limit µg/sample	mg/m3
Beryllium	ND	0.020	<0.0000048
Uranium	ND	0.30	<0.000072
Yttrium	ND	0.040	<0.0000096

Lab ID: 1012250-05A
Client Sample ID: B15B-V19-Be/U/Y-Air

Collection Date: 11/23/2010
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.	Method: **N7300**	Air Volume (L): **4281.3**	Analyst: **CEG**
Date Analyzed: 12/22/2010 15:32			
	µg/sample	Reporting Limit µg/sample	mg/m3
Beryllium	ND	0.020	<0.0000047
Uranium	ND	0.30	<0.000070
Yttrium	ND	0.040	<0.0000093

Lab ID: 1012250-06A
Client Sample ID: Bld1-Roof-North Portion- Air

Collection Date: 11/23/2010
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.	Method: **N7300**	Air Volume (L): **4421.85**	Analyst: **CEG**
Date Analyzed: 12/22/2010 15:37			
	µg/sample	Reporting Limit µg/sample	mg/m3
Beryllium	ND	0.020	<0.0000045
Uranium	ND	0.30	<0.000068
Yttrium	ND	0.040	<0.0000090

Note:

ALS Environmental

Date: *28-Dec-10*

Client: Terracon
Project: Bannister Complex

Work Order: 1012250

Lab ID: 1012250-07A
Collection Date: 11/23/2010
Client Sample ID: Bld1-Roof-East Central Portion- Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD. Method: **N7300** Air Volume (L): **4397.25** Analyst: **CEG**

Date Analyzed: 12/22/2010 15:42

	µg/sample	Reporting Limit µg/sample	mg/m3
Beryllium	ND	0.020	<0.0000045
Uranium	ND	0.30	<0.000068
Yttrium	ND	0.040	<0.0000091

Lab ID: 1012250-08A
Collection Date: 11/23/2010
Client Sample ID: Bld2-Roof-East End-Fan House3-Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD. Method: **N7300** Air Volume (L): **4289.22** Analyst: **CEG**

Date Analyzed: 12/22/2010 15:47

	µg/sample	Reporting Limit µg/sample	mg/m3
Beryllium	ND	0.020	<0.0000047
Uranium	ND	0.30	<0.000070
Yttrium	ND	0.040	<0.0000093

Lab ID: 1012250-09A
Collection Date: 11/23/2010
Client Sample ID: West Ambient-Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD. Method: **N7300** Air Volume (L): **4457.64** Analyst: **CEG**

Date Analyzed: 12/22/2010 15:52

	µg/sample	Reporting Limit µg/sample	mg/m3
Beryllium	ND	0.020	<0.0000045
Uranium	ND	0.30	<0.000067
Yttrium	ND	0.040	<0.0000090

Note:

ALS Environmental

Date: *28-Dec-10*

Client: Terracon
Project: Bannister Complex

Work Order: 1012250

Lab ID: 1012250-10A
Client Sample ID: North Ambient-Air

Collection Date: 11/23/2010
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4324.32**	Analyst: **CEG**
Date Analyzed: 12/22/2010 15:57	µg/sample	Reporting Limit µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000046	
Uranium	ND	0.30	<0.000069	
Yttrium	ND	0.040	<0.0000093	

Lab ID: 1012250-11A
Client Sample ID: Blank1-Air

Collection Date: 11/23/2010
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **0**	Analyst: **CEG**
Date Analyzed: 12/22/2010 16:02	µg/sample	Reporting Limit µg/sample	mg/m3	
Beryllium	ND	0.020	NA	
Uranium	ND	0.30	NA	
Yttrium	ND	0.040	NA	

Note:

ALS Environmental

Date: 28-Dec-10

Client: Terracon

Work Order: 1012250

Project: Bannister Complex

QC BATCH REPORT

Batch ID: **4226** Instrument ID: **ICP1** Method: **N7300**

MBLK Sample ID: **mblk-4226-4226** Units: **µg/sample** Analysis Date: **12/22/2010 02:47 PM**

Client ID: Run ID: **ICP1_101222A** SeqNo: **199498** Prep Date: **12/14/2010** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Beryllium	ND	0.020								
Uranium	ND	10								
Yttrium	0.002	1.0								J

LCS Sample ID: **lcs-4226-4226** Units: **µg/sample** Analysis Date: **12/22/2010 02:52 PM**

Client ID: Run ID: **ICP1_101222A** SeqNo: **199499** Prep Date: **12/14/2010** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Beryllium	19.6	0.020	20	0	98	80-120	0			
Uranium	19.82	10	20	0	99.1	80-120	0			
Yttrium	20.36	1.0	20	0	102	80-120	0			

LCSD Sample ID: **lcsd-4226-4226** Units: **µg/sample** Analysis Date: **12/22/2010 02:57 PM**

Client ID: Run ID: **ICP1_101222A** SeqNo: **199500** Prep Date: **12/14/2010** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Beryllium	19.67	0.020	20	0	98.3	80-120	19.6	0.357		
Uranium	19.74	10	20	0	98.7	80-120	19.82	0.384		
Yttrium	20.24	1.0	20	0	101	80-120	20.36	0.591		

The following samples were analyzed in this batch:

1012250-01A	1012250-02A	1012250-03A
1012250-04A	1012250-05A	1012250-06A
1012250-07A	1012250-08A	1012250-09A
1012250-10A	1012250-11A	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

ALS Environmental

Date: 28-Dec-10

Client: Terracon
Project: Bannister Complex
WorkOrder: **1012250**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SDL	Sample Detection Limit

Units Reported	Description
µg/sample	

ALS Environmental

Sample Receipt Checklist

Client Name: **TERRACON-LENEXA** Date/Time Received: **10-Dec-10 10:58**

Work Order: **1012250** Received by: **EJS**

Checklist completed by: Kelsey Kennedy 13-Dec-10 Reviewed by: Kelly Hagen 13-Dec-10

eSignature | Date | eSignature | Date

Matrices:

Carrier name: FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):			
Cooler(s)/Kit(s):			
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☐
pH adjusted?	Yes ☐	No ☐	N/A ☐
pH adjusted by:			

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012250

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11/23/10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa City Kansas State 66215 Zip

Person to Contact Will King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-23-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-01	B1SB-AA16-Be/U/Y Air	0.8 MCE	4292.70	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-AA16-Be/U/Y Iso		4298.85	ASTM D3971-90M(U)
-02	B1SB-K17-Be/U/Y-Air		4268.16	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-K17-Be/U/Y-Iso		4219.52	ASTM D3971-90M(U)
-03	B1SB-Q25-Be/U/Y Air		4127.60	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-Q25-Be/U/Y Iso		4273.28	ASTM D3971-90M(U)
-04	Be/U/Y-Dup1 Air		4177.53	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Be/U/Y-Dup1 Iso		4184.82	ASTM D3971-90M(U)
-05	B1SB-V19-Be/U/Y Air		4281.30	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-V19-Be/U/Y Iso		4275.27	ASTM D3971-90M(U)
-06	B1B1-Roof-North Portion-Air		4421.85	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1B1-Roof-North Portion-Iso		4415.70	ASTM D3971-90M(U)
-07	B1B1-Roof-East Central Portion Air		4397.25	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1B1-Roof-East Central Portion-Iso		4397.25	ASTM D3971-90M(U)
-08	B1B2-Roof-East End-Fan House 3-Air		4289.22	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1B2-Roof East End Fan House 3-Iso		4270.89	ASTM D3971-90M(U)

Be - Beryllium Y - Yttrium
U - Uranium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
	12-9-10/1500	ALS-CN	12/9/10 1058
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012250

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11/23/10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa (City) KS (State) 66215 (Zip)

Person to Contact Will King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-23-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-09	West Ambient-Air	0.8 MCE	4457.64	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	West Ambient-ISO		4402.38	ASTM D3971-90M(U)
-10	North Ambient-Air		4324.32	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	North Ambient-ISO		4380.70	ASTM D3971-90M(U)
-11	Blank-Air		—	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Blank-ISO		—	ASTM D3971-90M(U)

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
[signature]	12-9-10/800	[signature] ALS-CN	12/10/10 12:58
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time

Fed Ex

January 20, 2011

Mr. Wil King
Terracon Consultants, Inc.
13910 West 96th Terrace
Lenexa KS 66215

Re: ALS Workorder: 10-12-143
Project Name: Bannister Complex
Project Number: None Submitted

Dear Mr. King:

Eleven filter samples were received from Terracon Consultants, Inc. on December 14, 2010. The samples were scheduled for the following analysis:

Isotopic Uranium pages 1-113

The results for this analysis are contained in the enclosed reports.

Thank you for your confidence in ALS Laboratory Group. Should you have any questions, please call.

Sincerely,

ALS Laboratory Group
Jeff Kujawa
Project Manager

JRK/km
Enclosure (s): Report

ALS is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

Accreditation Body	License or Certification Number
Washington	C1280
Utah	CO00078
Arizona	AZ0742
Alaska	UST-086
Alaska	CO00078
Florida	E87914
Missouri	175
North Dakota	R-057
New Jersey	CO003
Nevada	CO000782008A
California	06251CA
Kansas	E-10381
Maryland	285
Pennsylvania	68-03116
Texas	T104704241-09-1
Colorado	CO00078
Connecticut	PH-0232
Idaho	CO00078
Tennessee	2976
Kentucky	90137
L-A-B (DoD ELAP/ISO 17025)	L2257

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1012143
Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B1SB-AA16-Be/U/Y-Iso	1012143-1		FILTER	23-Nov-10	
B1SB-K17-Be/U/Y-Iso	1012143-2		FILTER	23-Nov-10	
B1SB-Q25-Be/U/Y-Iso	1012143-3		FILTER	23-Nov-10	
Be/U/Y-Dup1-Iso	1012143-4		FILTER	23-Nov-10	
B1SB-U19-Be/U/Y-Iso	1012143-5		FILTER	23-Nov-10	
B101-Roof-North Portion-Iso	1012143-6		FILTER	23-Nov-10	
B1O1-Roof-East Central Portion-	1012143-7		FILTER	23-Nov-10	
B1O2-Roof-East End FanHouse	1012143-8		FILTER	23-Nov-10	
West Ambient-Iso	1012143-9		FILTER	23-Nov-10	
North Ambient-Iso	1012143-10		FILTER	23-Nov-10	
Blank1-Iso	1012143-11		FILTER	23-Nov-10	

1012143

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012250

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11/23/10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa City Kansas State 66215 Zip

Person to Contact Will King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-23-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
01	B1SB-AA16-Be/U/Y Air	0.8 MCE	4292.70	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-AA16-Be/U/Y Iso		4298.85	ASTM D3971-90M(U)
02	B1SB-K17-Be/U/Y-Air		4268.16	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-K17-Be/U/Y-Iso		4219.52	ASTM D3971-90M(U)
03	B1SB-Q25-Be/U/Y Air		4127.60	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-Q25-Be/U/Y Iso		4273.28	ASTM D3971-90M(U)
04	Be/U/Y-Dup1 Air		4177.53	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Be/U/Y-Dup1 Iso		4184.82	ASTM D3971-90M(U)
05	B1SB-V19-Be/U/Y Air		4281.30	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-V19-Be/U/Y Iso		4275.27	ASTM D3971-90M(U)
06	B1B1-Roof-North Portion-Air		4421.85	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1B1-Roof-North Portion-Iso		4415.70	ASTM D3971-90M(U)
07	B1B1-Roof-East Central Portion Air		4397.25	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1B1-Roof-East Central Portion-Iso		4397.25	ASTM D3971-90M(U)
08	B1B2-Roof-East End-Fan House 3-Air		4289.22	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1B2-Roof East End Fan House 3-Iso		4270.89	ASTM D3971-90M(U)

Be - Beryllium Y - Yttrium U - Uranium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
	12-9-10/1500		12/15/10 0658
Relinquished by: (Signature)	Date / Time 12/13/10 1330	Received by: (Signature) C Trumble	Date / Time 12/14/10 1020

1012143

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012250

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11/23/10 Purchase Order No. 02657144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa City KS State 66215 Zip

Person to Contact Will King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-23-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-09	West Ambient-Air	0.8 MCE	4457.64	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	West Ambient-Iso		4402.38	ASTM D3971-90M(U)
-10	North Ambient-Air		4324.32	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	North Ambient-Iso		4380.70	ASTM D3971-90M(U)
-11	Blank-Air		—	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Blank-Iso		—	ASTM D3971-90M(U)

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
	12-9-10/1000	ALS CN	12/10/10 10:55
ACS	12/13/10 1330	C Trumble	12/14/10 1020

FedEx

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ~~ALS OFT~~ COT 12-14-10 1012143 Workorder No: 1012143

Project Manager: JK Initials: COT Date: 12-14-10

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3. Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		(YES)	NO
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		(YES)	NO
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble:** ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17. Were the samples **shipped on ice**?		YES	(NO)
18. Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 #4	(RAD ONLY)	YES	(NO)

Cooler #:	1							
Temperature (°C):	Amb							
No. of custody seals on cooler:	0							
DOT Survey/ Acceptance Information — External µR/hr reading:	11							
Background µR/hr reading:	10							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

If applicable, was the client contacted? YES / NO / (NA) Contact: _____ Date/Time: _____

Project Manager Signature / Date: [signature] 12/15/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

1012143

From: Origin ID: OXDA (513) 733-5336
Sample Receiving
ALS LABORATORY GROUP
4388 GLENDALE-MILFORD RD

CINCINNATI, OH 45242

FedEx Express

J1030101604022S

Ship Date: 13DEC10
ActWgt: 5.0 LB
CAD: 5634838/INET3090

Delivery Address Bar Code

SHIP TO: (800) 443-1511 BILL SENDER

Sample Receiving
ALS Laboratory Group- Ft. Collins
225 COMMERCE DR

FORT COLLINS, CO 80524

Ref #
Invoice #
PO #
Dept #

10-

TRK# 0201 7965 4645 9493

TUE - 14 DEC A2
STANDARD OVERNIGHT

NR FTCA

80524
CO-US
DEN

ALS Environmental

Isotopic Uranium

Case Narrative

Terracon Consultants Inc.

Bannister Complex

Work Order Number: 1012143

1. This report consists of the analytical results and supporting documentation for 11 filter samples received by ALS on 12/14/10.

2. These samples were prepared according to procedures SOP773R10 and SOP778R13.

3. The samples were analyzed for the presence of isotopic uranium according to procedure SOP714R12. The analyses were completed on 01/07/11.

4. The isotopic analysis results for these samples are reported on an 'As Received' basis in units of pCi/sample.

5. Due to insufficient sample volume, a laboratory control sample duplicate (LCSD) was prepared in lieu of a prep batch duplicate for both batches.

6. This analytical method quantifies U-235 alpha activity in a specific region of interest corresponding to emission energies between those of U-234 and U-238. A potential limitation of this method is that measurable amounts of U-234 in the sample may cause a small amount of characteristic activity in the U-235 region of interest due to poorly resolved alpha activity at the boundary between the two regions. To minimize the potential for a high bias in the U-235 analytical results, the U-235 region of interest has been narrowed and limited to a lower energy region. An 85.1% abundance correction has been made to the final U-235 results.

7. ALS follows the convention outlined in ANSI N42.23 for reporting significant digits in the TPU and MDC results. ANSI N42.23 states that the TPU result should be rounded to two significant digits and that the MDC result should be rounded to the same decimal place as the TPU result. In practice, this could result in an MDC result with a reported value of 0 for samples with significant activity, including the batch laboratory control sample.

8. No anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Linda Arend
Radiochemistry Primary Data Reviewer

01/20/11
Date

Radiochemistry Final Data Reviewer

01/20/11
Date

Section 1

CHAIN OF CUSTODY

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1012143
Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Client PO Number: 02107144

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B1SB-AA16-Be/U/Y-Iso	1012143-1		FILTER	23-Nov-10	
B1SB-K17-Be/U/Y-Iso	1012143-2		FILTER	23-Nov-10	
B1SB-Q25-Be/U/Y-Iso	1012143-3		FILTER	23-Nov-10	
Be/U/Y-Dup1-Iso	1012143-4		FILTER	23-Nov-10	
B1SB-U19-Be/U/Y-Iso	1012143-5		FILTER	23-Nov-10	
B101-Roof-North Portion-Iso	1012143-6		FILTER	23-Nov-10	
B1O1-Roof-East Central Portion-I	1012143-7		FILTER	23-Nov-10	
B1O2-Roof-East End FanHouse3-	1012143-8		FILTER	23-Nov-10	
West Ambient-Iso	1012143-9		FILTER	23-Nov-10	
North Ambient-Iso	1012143-10		FILTER	23-Nov-10	
Blank1-Iso	1012143-11		FILTER	23-Nov-10	

1012143

ANALYTICAL REQUEST FORM

☒ **REGULAR** Status 1012250

☐ **RUSH** Status Required - ADDITIONAL CHARGE

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11/23/10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa (City) Kansas (State) 66215 (Zip)

Person to Contact Will King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-23-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
01	B1SB-AA16-Be/U/Y Air	0.8 MCE	4292.70	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-AA16-Be/U/Y Iso		4298.85	ASTM D3971-90M(U)
02	B1SB-K17-Be/U/Y-Air		4268.16	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-K17-Be/U/Y Iso		4219.52	ASTM D3971-90M(U)
03	B1SB-Q25-Be/U/Y Air		4127.60	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-Q25-Be/U/Y Iso		4273.28	ASTM D3971-90M(U)
04	Be/U/Y-Dup1 Air		4177.53	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Be/U/Y-Dup1 Iso		4184.82	ASTM D3971-90M(U)
05	B1SB-V19-Be/U/Y Air		4281.30	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1SB-V19-Be/U/Y Iso		4275.27	ASTM D3971-90M(U)
06	B1D1-Roof-North Portion-Air		4421.85	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1D1-Roof-North Portion-Iso		4415.70	ASTM D3971-90M(U)
07	B1D1-Roof-East Central Portion-Air		4397.25	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1D1-Roof-East Central Portion-Iso		4397.25	ASTM D3971-90M(U)
08	B1D2-Roof-East End-Fan House 3-Air		4289.22	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1D2-Roof East End Fan House 3-Iso		4270.89	ASTM D3971-90M(U)

Be - Beryllium Y - Yttrium U - Uranium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
	12-9-10/1500	ALS-CN	12/10/10 1058
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
	12/13/10 1330	C Tumble	12/14/10 1020

1012143

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012250

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11/23/10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa (City) KS (State) 66215 (Zip)

Person to Contact Will King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-23-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-09	West Ambient-Air	0.8 MCE	4457.64	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	West Ambient-Iso		4402.38	ASTM D3971-90M(U)
-10	North Ambient-Air		4324.32	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	North Ambient-Iso		4380.70	ASTM D3971-90M(U)
-11	Blank-Air		—	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Blank-Iso		—	ASTM D3971-90M(U)

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
[signature]	12-9-10/800	[signature] ALS-CN	12/10/10 1558
[signature] ALS	12/13/10 1330	C Trumble	12/14/10 1020

Fed Ex

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ~~ALS OFT~~ COT 12-14-10 1012143 Workorder No: 1012143

Project Manager: JK Initials: COT Date: 12-14-10

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3. Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		(YES)	NO
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		(YES)	NO
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble:** ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17. Were the samples **shipped on ice**?		YES	(NO)
18. Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 #4	(RAD ONLY)	YES	(NO)

Cooler #:	1
Temperature (°C):	Amb
No. of custody seals on cooler:	0
DOT Survey/ Acceptance Information — External µR/hr reading:	11
DOT Survey/ Acceptance Information — Background µR/hr reading:	10

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

If applicable, was the client contacted? YES / NO / (NA) Contact: _____ Date/Time: _____

Project Manager Signature / Date: 12/15/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r22.xls (6/1/09)

1012143

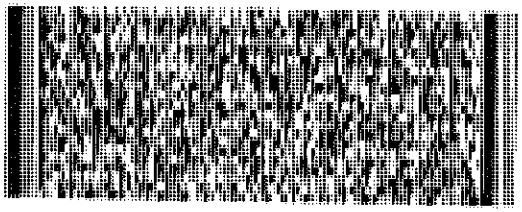
From: Origin ID: OXDA (513) 733-5336
Sample Receiving
ALS LABORATORY GROUP
4388 GLENDALE-MILFORD RD

CINCINNATI, OH 45242

FedEx Express

E

J19301010040226



Ship Date: 13DEC10
ActWgt: 5.0 LB
CAD: 5634838/INET3090

Delivery Address Bar Code

SHIP TO: (800) 443-1511 BILL SENDER

Sample Receiving
ALS Laboratory Group- Ft. Collins
225 COMMERCE DR

FORT COLLINS, CO 80524

Ref #
Invoice #
PO #
Dept #

11
0-

TRK# 0201 7965 4645 9493

TUE - 14 DEC A2
STANDARD OVERNIGHT

80524
CO-US
DEN

NR FTCA

Section 2

SAMPLE RESULTS SUMMARY

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Reported on: Wednesday, January 19, 2011 4:52:22 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012143-1	B1SB-AA16-Be/U/Y-Iso	Sample	U-234	0.005 +/- 0.029	0.076	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-1	B1SB-AA16-Be/U/Y-Iso	Sample	U-235	-0.008 +/- 0.033	0.064	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-1	B1SB-AA16-Be/U/Y-Iso	Sample	U-238	0.028 +/- 0.031	0.040	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-2	B1SB-K17-Be/U/Y-Iso	Sample	U-234	0.053 +/- 0.037	0.016	pCi/sample	FILTER	AS101228-1	1/7/2011	LT
1012143-2	B1SB-K17-Be/U/Y-Iso	Sample	U-235	0.003 +/- 0.025	0.044	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-2	B1SB-K17-Be/U/Y-Iso	Sample	U-238	-0.005 +/- 0.021	0.042	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-3	B1SB-Q25-Be/U/Y-Iso	Sample	U-234	0.052 +/- 0.042	0.057	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-3	B1SB-Q25-Be/U/Y-Iso	Sample	U-235	0.005 +/- 0.027	0.039	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-3	B1SB-Q25-Be/U/Y-Iso	Sample	U-238	0.039 +/- 0.035	0.045	pCi/sample	FILTER	AS101228-1	1/7/2011	U

Comments:

Data Package ID: *UR1012143-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than semple specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Reported on: Wednesday, January 19, 2011 4:52:22 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012143-4	Be/U/Y-Dup1-Iso	Sample	U-234	0.021 +/- 0.028	0.050	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-4	Be/U/Y-Dup1-Iso	Sample	U-235	-0.002 +/- 0.025	0.037	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-4	Be/U/Y-Dup1-Iso	Sample	U-238	0.017 +/- 0.025	0.046	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-5	B1SB-U19-Be/U/Y-Iso	Sample	U-234	0.033 +/- 0.030	0.038	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-5	B1SB-U19-Be/U/Y-Iso	Sample	U-235	0.017 +/- 0.026	0.045	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-5	B1SB-U19-Be/U/Y-Iso	Sample	U-238	0.002 +/- 0.022	0.038	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-6	B101-Roof-North Portion-Iso	Sample	U-234	-0.001 +/- 0.021	0.054	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-6	B101-Roof-North Portion-Iso	Sample	U-235	-0.003 +/- 0.024	0.056	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012143-6	B101-Roof-North Portion-Iso	Sample	U-238	0.007 +/- 0.025	0.059	pCi/sample	FILTER	AS101228-1	1/7/2011	U

Comments:

Data Package ID: *UR1012143-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Reported on: Wednesday, January 19, 2011 4:52:22 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012143-7	B1O1-Roof-East Central Portion-Iso	Sample	U-234	0.023 +/- 0.028	0.046	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-7	B1O1-Roof-East Central Portion-Iso	Sample	U-235	0.010 +/- 0.025	0.044	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-7	B1O1-Roof-East Central Portion-Iso	Sample	U-238	0.011 +/- 0.022	0.046	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-8	B1O2-Roof-East End FanHouse3-Iso	Sample	U-234	-0.002 +/- 0.023	0.064	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-8	B1O2-Roof-East End FanHouse3-Iso	Sample	U-235	0.014 +/- 0.025	0.018	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-8	B1O2-Roof-East End FanHouse3-Iso	Sample	U-238	0.002 +/- 0.023	0.060	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-9	West Ambient-Iso	Sample	U-234	0.043 +/- 0.046	0.077	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-9	West Ambient-Iso	Sample	U-235	0.009 +/- 0.033	0.025	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-9	West Ambient-Iso	Sample	U-238	-0.003 +/- 0.028	0.077	pCi/sample	FILTER	AS101228-2	1/6/2011	U

Comments:

Data Package ID: *UR1012143-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Reported on: Wednesday, January 19, 2011 4:52:22 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012143-10	North Ambient-Iso	Sample	U-234	0.021 +/- 0.031	0.056	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-10	North Ambient-Iso	Sample	U-235	0.003 +/- 0.025	0.044	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-10	North Ambient-Iso	Sample	U-238	0.008 +/- 0.021	0.037	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-11	Blank1-Iso	Sample	U-234	0.037 +/- 0.041	0.072	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-11	Blank1-Iso	Sample	U-235	-0.006 +/- 0.026	0.051	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012143-11	Blank1-Iso	Sample	U-238	-0.012 +/- 0.022	0.065	pCi/sample	FILTER	AS101228-2	1/6/2011	U

Comments:

Data Package ID: *UR1012143-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Section 3

QC RESULTS SUMMARY

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Method Blank Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-1MB

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.032 +/- 0.032	0.049	0.1	U
15117-96-1	U-235	0.026 +/- 0.032	0.054	0.1	U
7440-61-1	U-238	0.009 +/- 0.026	0.058	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	85.5	30 - 110 %	

Comments:

Qualifiers/Flags:
U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:
TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration
BDL - Below Detection Limit

M - Requested MDC not met.
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Method Blank Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-2MB

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.044 +/- 0.040	0.061	0.1	U
15117-96-1	U-235	-0.002 +/- 0.027	0.059	0.1	U
7440-61-1	U-238	0.027 +/- 0.033	0.057	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.1	pCi/sample	78.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-1LCS

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	8.8 +/- 1.5	0	8.681	101	82 - 122	P
7440-61-1	U-238	9.2 +/- 1.5	0	9.013	102	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.4	pCi/sample	82.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC wes not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-1LCSD

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	8.5 +/- 1.4	0.1	8.681	97.8	82 - 122	P
7440-61-1	U-238	9.0 +/- 1.5	0	9.013	99.6	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	8.4	pCi/sample	93.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-2LCS

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	8.4 +/- 1.4	0	8.681	97.3	82 - 122	P
7440-61-1	U-238	9.2 +/- 1.5	0	9.013	102	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.9	pCi/sample	88.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-2LCSD

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	9.4 +/- 1.6	0	8.681	109	82 - 122	P
7440-61-1	U-238	9.5 +/- 1.6	0	9.013	105	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	85.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:
Lab ID: AS101228-1LCSD

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2s TPU	MDC	Flags	Result +/- 2s TPU	MDC	Flags		
13966-29-5	U-234	8.8 +/- 1.5	0	P	8.5 +/- 1.4	0.1	P	0.148	2.13
7440-61-1	U-238	9.2 +/- 1.5	0	P	9.0 +/- 1.5	0	P	0.0823	2.13

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty
DER - Duplicate Error Ratio
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:
Lab ID: AS101228-2LCSD

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2s TPU	MDC	Flags	Result +/- 2s TPU	MDC	Flags		
13966-29-5	U-234	8.4 +/- 1.4	0	P	9.4 +/- 1.6	0	P	0.469	2.13
7440-61-1	U-238	9.2 +/- 1.5	0	P	9.5 +/- 1.6	0	P	0.151	2.13

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty
DER - Duplicate Error Ratio
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *UR1012143-1*

Section 4

INDIVIDUAL SAMPLE RESULTS

4

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1SB-AA16-Be/U/Y-Iso
Lab ID: 1012143-1

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.005 +/- 0.029	0.076	0.1	U
15117-96-1	U-235	-0.008 +/- 0.033	0.064	0.1	U
7440-61-1	U-238	0.028 +/- 0.031	0.040	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	6.18	pCi/sample	69.0	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside defeult limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1SB-K17-Be/U/Y-Iso
Lab ID: 1012143-2

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.053 +/- 0.037	0.016	0.1	LT
15117-96-1	U-235	0.003 +/- 0.025	0.044	0.1	U
7440-61-1	U-238	-0.005 +/- 0.021	0.042	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	8.0	pCi/sample	89.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1SB-Q25-Be/U/Y-Iso
Lab ID: 1012143-3

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.052 +/- 0.042	0.057	0.1	U
15117-96-1	U-235	0.005 +/- 0.027	0.039	0.1	U
7440-61-1	U-238	0.039 +/- 0.035	0.045	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.2	pCi/sample	79.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncerteinty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	Be/U/Y-Dup1-Iso
Lab ID:	1012143-4

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.021 +/- 0.028	0.050	0.1	U
15117-96-1	U-235	-0.002 +/- 0.025	0.037	0.1	U
7440-61-1	U-238	0.017 +/- 0.025	0.046	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.6	pCi/sample	85.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1SB-U19-Be/U/Y-Iso
Lab ID: 1012143-5

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.033 +/- 0.030	0.038	0.1	U
15117-96-1	U-235	0.017 +/- 0.026	0.045	0.1	U
7440-61-1	U-238	0.002 +/- 0.022	0.038	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.3	pCi/sample	81.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B101-Roof-North Portion-Iso
Lab ID: 1012143-6

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	-0.001 +/- 0.021	0.054	0.1	U
15117-96-1	U-235	-0.003 +/- 0.024	0.056	0.1	U
7440-61-1	U-238	0.007 +/- 0.025	0.059	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	85.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	B1O1-Roof-East Central Por
Lab ID:	1012143-7

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.023 +/- 0.028	0.046	0.1	U
15117-96-1	U-235	0.010 +/- 0.025	0.044	0.1	U
7440-61-1	U-238	0.011 +/- 0.022	0.046	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	86.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	B1O2-Roof-East End FanHo
Lab ID:	1012143-8

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	-0.002 +/- 0.023	0.064	0.1	U
15117-96-1	U-235	0.014 +/- 0.025	0.018	0.1	U
7440-61-1	U-238	0.002 +/- 0.023	0.060	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.5	pCi/sample	83.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: West Ambient-Iso
Lab ID: 1012143-9

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.043 +/- 0.046	0.077	0.1	U
15117-96-1	U-235	0.009 +/- 0.033	0.025	0.1	U
7440-61-1	U-238	-0.003 +/- 0.028	0.077	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	5.78	pCi/sample	64.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: North Ambient-Iso
Lab ID: 1012143-10

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.021 +/- 0.031	0.058	0.1	U
15117-96-1	U-235	0.003 +/- 0.025	0.044	0.1	U
7440-61-1	U-238	0.008 +/- 0.021	0.037	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.9	pCi/sample	87.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012143
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: Blank1-Iso
Lab ID: 1012143-11

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 23-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.037 +/- 0.041	0.072	0.1	U
15117-96-1	U-235	-0.006 +/- 0.026	0.051	0.1	U
7440-61-1	U-238	-0.012 +/- 0.022	0.065	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	85.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012143-1*

Section 5

RAW DATA

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Dat ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DacLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1012143-1	U-232	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1172.600	28.48%	300	6.18	0.07	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 S	29	Spectrum #1	11:09 AM	18.000	1000	69.0%	0.99	NA	As Received	NA	
1012143-1	U-234	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	0.600	28.48%	300	0.005	0.075	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	29	Spectrum #1	11:09 AM	8.000	1000	69.0%	0.029	NA	As Received	NA	U
1012143-1	U-235	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	-0.900	28.48%	300	-0.008	0.064	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	29	Spectrum #1	11:09 AM	3.000	1000	69.0%	0.033	NA	As Received	NA	U
1012143-1	U-238	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	3.700	28.48%	300	0.028	0.040	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	29	Spectrum #1	11:09 AM	1.000	1000	69.0%	0.031	NA	As Received	NA	U
1012143-2	U-232	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1509.200	28.36%	300	8.0	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 S	30	Spectrum #1	11:09 AM	16.000	1000	89.2%	1.3	NA	As Received	NA	
1012143-2	U-234	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	9.000	28.36%	300	0.053	0.016	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	30	Spectrum #1	11:09 AM	0.000	1000	89.2%	0.037	NA	As Received	NA	LT
1012143-2	U-235	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	0.400	28.36%	300	0.003	0.044	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	30	Spectrum #1	11:09 AM	2.000	1000	89.2%	0.025	NA	As Received	NA	U
1012143-2	U-238	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	-0.900	28.36%	300	-0.005	0.042	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	30	Spectrum #1	11:09 AM	3.000	1000	89.2%	0.021	NA	As Received	NA	U
1012143-3	U-232	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1407.500	29.55%	300	7.2	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 S	31	Spectrum #1	11:09 AM	45.000	1000	79.9%	1.1	NA	As Received	NA	
1012143-3	U-234	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	8.200	29.55%	300	0.052	0.057	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	31	Spectrum #1	11:09 AM	6.000	1000	79.9%	0.042	NA	As Received	NA	U
1012143-3	U-235	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	0.700	29.55%	300	0.005	0.039	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	31	Spectrum #1	11:09 AM	1.000	1000	79.9%	0.027	NA	As Received	NA	U

Comments:

Data Package ID: *UR1012143-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corracted (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1012143-3	U-238	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	6.100	29.55%	300	0.039	0.045	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	31	Spectrum #1	11:09 AM	3.000	1000	79.9%	0.035	NA	As Received	NA	U
1012143-4	U-232	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1509.000	29.72%	300	7.6	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 S	32	Spectrum #1	11:09 AM	10.000	1000	85.1%	1.2	NA	As Received	NA	
1012143-4	U-234	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	3.500	29.72%	300	0.021	0.050	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	32	Spectrum #1	11:09 AM	5.000	1000	85.1%	0.028	NA	As Received	NA	U
1012143-4	U-235	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	-0.300	29.72%	300	-0.002	0.037	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	32	Spectrum #1	11:09 AM	1.000	1000	85.1%	0.025	NA	As Received	NA	U
1012143-4	U-238	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	2.800	29.72%	300	0.017	0.046	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	32	Spectrum #1	11:09 AM	4.000	1000	85.1%	0.025	NA	As Received	NA	U
1012143-5	U-232	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1483.600	30.59%	300	7.3	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 S	58	Spectrum #1	11:09 AM	18.000	1000	81.3%	1.1	NA	As Received	NA	
1012143-5	U-234	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	5.400	30.59%	300	0.033	0.038	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	58	Spectrum #1	11:09 AM	2.000	1000	81.3%	0.030	NA	As Received	NA	U
1012143-5	U-235	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	2.400	30.59%	300	0.017	0.045	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	58	Spectrum #1	11:09 AM	2.000	1000	81.3%	0.026	NA	As Received	NA	U
1012143-5	U-238	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	0.400	30.59%	300	0.002	0.038	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	58	Spectrum #1	11:09 AM	2.000	1000	81.3%	0.022	NA	As Received	NA	U
1012143-6	U-232	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1574.400	30.80%	300	7.7	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 S	59	Spectrum #1	11:09 AM	22.000	1000	85.7%	1.2	NA	As Received	NA	
1012143-6	U-234	11/23/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	-0.100	30.80%	300	-0.001	0.054	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	59	Spectrum #1	11:09 AM	7.000	1000	85.7%	0.021	NA	As Received	NA	U

Comments:

Data Package ID: *UR1012143-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Besis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not availeble, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
1012143-6	U-235	11/23/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	-0.500	30.80%	300	-0.003	0.056	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	59	Spectrum#1	11:09 AM	5.000	1000	85.7%	0.024	NA	As Received	NA	U
1012143-6	U-238	11/23/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1.300	30.80%	300	0.007	0.059	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	59	Spectrum#1	11:09 AM	9.000	1000	85.7%	0.025	NA	As Received	NA	U
1012143-7	U-232	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1505.000	29.20%	300	7.7	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	16	Spectrum#1	10:35 AM	10.000	1000	86.4%	1.2	NA	As Received	NA	
1012143-7	U-234	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	3.800	29.20%	300	0.023	0.046	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	16	Spectrum#1	10:35 AM	4.000	1000	86.4%	0.028	NA	As Received	NA	U
1012143-7	U-235	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1.400	29.20%	300	0.010	0.044	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	16	Spectrum#1	10:35 AM	2.000	1000	86.4%	0.025	NA	As Received	NA	U
1012143-7	U-238	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1.800	29.20%	300	0.011	0.046	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	16	Spectrum#1	10:35 AM	4.000	1000	86.4%	0.022	NA	As Received	NA	U
1012143-8	U-232	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1550.400	31.08%	300	7.5	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	17a	Spectrum#1	10:35 AM	32.000	1000	83.6%	1.2	NA	As Received	NA	
1012143-8	U-234	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	-0.300	31.08%	300	-0.002	0.064	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	17a	Spectrum#1	10:35 AM	11.000	1000	83.6%	0.023	NA	As Received	NA	U
1012143-8	U-235	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	2.000	31.08%	300	0.014	0.018	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	17a	Spectrum#1	10:35 AM	0.000	1000	83.6%	0.025	NA	As Received	NA	U
1012143-8	U-238	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	0.300	31.08%	300	0.002	0.060	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	17a	Spectrum#1	10:35 AM	9.000	1000	83.6%	0.023	NA	As Received	NA	U
1012143-9	U-232	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1156.600	30.05%	300	5.78	0.09	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	18	Spectrum#1	10:35 AM	38.000	1000	64.5%	0.92	NA	As Received	NA	

Comments:

Data Package ID: *UR1012143-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitetive yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 5:40:07 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1012143-9	U-234	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	5.600	30.05%	300	0.043	0.077	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	18	Spectrum#1	10:35 AM	8.000	1000	64.5%	0.046	NA	As Received	NA	U
1012143-9	U-235	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1.000	30.05%	300	0.009	0.025	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	18	Spectrum#1	10:35 AM	0.000	1000	64.5%	0.033	NA	As Received	NA	U
1012143-9	U-238	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	-0.400	30.05%	300	-0.003	0.077	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	18	Spectrum#1	10:35 AM	8.000	1000	64.5%	0.028	NA	As Received	NA	U
1012143-10	U-232	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1518.400	29.00%	300	7.9	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	19	Spectrum#1	10:35 AM	32.000	1000	87.8%	1.2	NA	As Received	NA	
1012143-10	U-234	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	3.600	29.00%	300	0.021	0.058	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	19	Spectrum#1	10:35 AM	8.000	1000	87.8%	0.031	NA	As Received	NA	U
1012143-10	U-235	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	0.400	29.00%	300	0.003	0.044	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	19	Spectrum#1	10:35 AM	2.000	1000	87.8%	0.025	NA	As Received	NA	U
1012143-10	U-238	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1.400	29.00%	300	0.008	0.037	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	19	Spectrum#1	10:35 AM	2.000	1000	87.8%	0.021	NA	As Received	NA	U
1012143-11	U-232	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1483.500	29.05%	300	7.7	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	25	Spectrum#1	10:53 AM	35.000	1000	85.6%	1.2	NA	As Received	NA	
1012143-11	U-234	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	6.100	29.05%	300	0.037	0.072	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	25	Spectrum#1	10:53 AM	13.000	1000	85.6%	0.041	NA	As Received	NA	U
1012143-11	U-235	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	-0.900	29.05%	300	-0.006	0.051	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	25	Spectrum#1	10:53 AM	3.000	1000	85.6%	0.026	NA	As Received	NA	U
1012143-11	U-238	11/23/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	-2.000	29.05%	300	-0.012	0.065	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	25	Spectrum#1	10:53 AM	10.000	1000	85.6%	0.022	NA	As Received	NA	U

Comments:

Data Package ID: *UR1012143-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143
Prep SOP: PAI 778
Analytical SOP: PAI 714
Reported on: Saturday, January 15, 2011 6:20:34 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
AS101228-1	U-232	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1523.700	29.88%	300	7.7	0.1	pCi/sample	NA	
MB	Tracer	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	60	Spectrum#1	11:09 AM	21.000	1000	85.5%	1.2	NA	As Received	NA	
AS101228-1	U-234	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	5.500	29.88%	300	0.032	0.049	pCi/sample	NA	
MB	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	60	Spectrum#1	11:09 AM	5.000	1000	85.5%	0.032	NA	As Received	NA	U
AS101228-1	U-235	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	3.800	29.88%	300	0.026	0.054	pCi/sample	NA	
MB	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	60	Spectrum#1	11:09 AM	4.000	1000	85.5%	0.032	NA	As Received	NA	U
AS101228-1	U-238	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1.600	29.88%	300	0.009	0.058	pCi/sample	NA	
MB	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	60	Spectrum#1	11:09 AM	8.000	1000	85.5%	0.026	NA	As Received	NA	U
AS101228-1	U-232	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1547.700	31.49%	300	7.4	0.1	pCi/sample	NA	
LCS	Tracer	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	61	Spectrum#1	11:09 AM	11.000	1000	82.4%	1.2	NA	As Received	NA	
AS101228-1	U-234	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1519.100	31.49%	300	8.8	0	pCi/sample	NA	101
LCS	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	61	Spectrum#1	11:09 AM	3.000	1000	82.4%	1.5	NA	As Received	NA	P
AS101228-1	U-238	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1581.400	31.49%	300	9.2	0	pCi/sample	NA	102
LCS	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	61	Spectrum#1	11:09 AM	2.000	1000	82.4%	1.5	NA	As Received	NA	P
AS101228-1	U-232	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1652.200	29.69%	300	8.4	0.1	pCi/sample	NA	
LCSD	Tracer	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	62	Spectrum#1	11:09 AM	36.000	1000	93.3%	1.3	NA	As Received	NA	
AS101228-1	U-234	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1566.900	29.69%	300	8.5	0.1	pCi/sample	0.15	97.8
LCSD	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	62	Spectrum#1	11:09 AM	7.000	1000	93.3%	1.4	NA	As Received	NA	P
AS101228-1	U-238	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1656.200	29.69%	300	9.0	0	pCi/sample	0.08	99.6
LCSD	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	62	Spectrum#1	11:09 AM	6.000	1000	93.3%	1.5	NA	As Received	NA	P
AS101228-2	U-232	12/28/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1394.200	29.69%	300	7.1	0.1	pCi/sample	NA	
MB	Tracer	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 S	62	Spectrum#1	10:53 AM	36.000	1000	78.7%	1.1	NA	As Received	NA	

Comments:

Data Package ID: *UR1012143-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 5:40:07 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- / 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
AS101228-2	U-234	12/28/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	6.900	29.69%	300	0.044	0.061	pCi/sample	NA	
MB	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 S	62	Spectrum#1	10:53 AM	7.000	1000	78.7%	0.040	NA	As Received	NA	U
AS101228-2	U-235	12/28/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	-0.200	29.69%	300	-0.002	0.059	pCi/sample	NA	
MB	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 S	62	Spectrum#1	10:53 AM	4.000	1000	78.7%	0.027	NA	As Received	NA	U
AS101228-2	U-238	12/28/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	4.200	29.69%	300	0.027	0.057	pCi/sample	NA	
MB	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 S	62	Spectrum#1	10:53 AM	6.000	1000	78.7%	0.033	NA	As Received	NA	U
AS101228-2	U-232	12/28/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1658.700	31.42%	300	7.9	0.1	pCi/sample	NA	
LCS	Tracer	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 S	63	Spectrum#1	10:53 AM	11.000	1000	88.5%	1.2	NA	As Received	NA	
AS101228-2	U-234	12/28/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1564.100	31.42%	300	8.4	0	pCi/sample	NA	97.3
LCS	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 S	63	Spectrum#1	10:53 AM	3.000	1000	88.5%	1.4	NA	As Received	NA	P
AS101228-2	U-238	12/28/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1696.700	31.42%	300	9.2	0	pCi/sample	NA	102
LCS	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 S	63	Spectrum#1	10:53 AM	1.000	1000	88.5%	1.5	NA	As Received	NA	P
AS101228-2	U-232	12/28/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1520.100	29.80%	300	7.7	0.1	pCi/sample	NA	
LCSD	Tracer	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 S	64	Spectrum#1	10:53 AM	13.000	1000	85.5%	1.2	NA	As Received	NA	
AS101228-2	U-234	12/28/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1599.100	29.80%	300	9.4	0	pCi/sample	0.47	109
LCSD	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 S	64	Spectrum#1	10:53 AM	3.000	1000	85.5%	1.6	NA	As Received	NA	P
AS101228-2	U-238	12/28/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1610.400	29.80%	300	9.5	0	pCi/sample	0.15	105
LCSD	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 S	64	Spectrum#1	10:53 AM	2.000	1000	85.5%	1.6	NA	As Received	NA	P

Comments:

Data Package ID: *UR1012143-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-1
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 29
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:46AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010429; Det: 29; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:09:02PM

Efficiency Calibration: C11010429

Efficiency: 28.48% +/- 0.13% TPU(2 sigma)

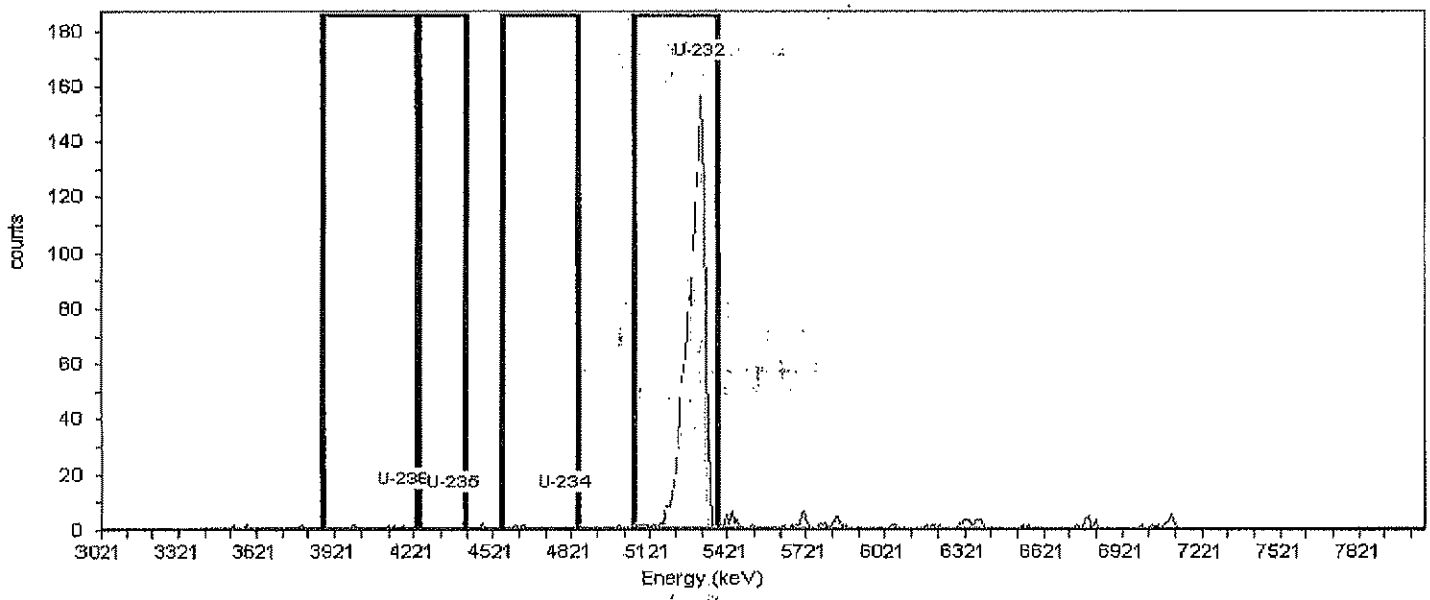
Energy Calibration: C11010429

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 69.21%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.6	3872.7	4229.1	12.6	100.2	4.00	0.30	3.70	2.8E-002	3.2E-002	7.8E-003	3.6E-002
U-235	4367.7	4239.0	4417.2	.0	99.7	0.00	0.90	-0.90	0.0E+000	2.1E-002	1.4E-002	4.8E-002
U-234	4793.4	4555.8	4842.9	.4	100.0	3.00	2.40	0.60	4.6E-003	3.5E-002	2.2E-002	6.5E-002
U-232	5318.1	5060.7	5377.5	51.2	100.1	1,178.00	5.40	1,172.60	6.2E+000	3.7E-001	3.3E-002	8.7E-002

Reviewed By: TS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-2
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 30
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:47AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010430; Det: 30; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:10:02PM

Efficiency Calibration: C11010430

Efficiency: 28.36% +/- 0.15% TPU(2 sigma)

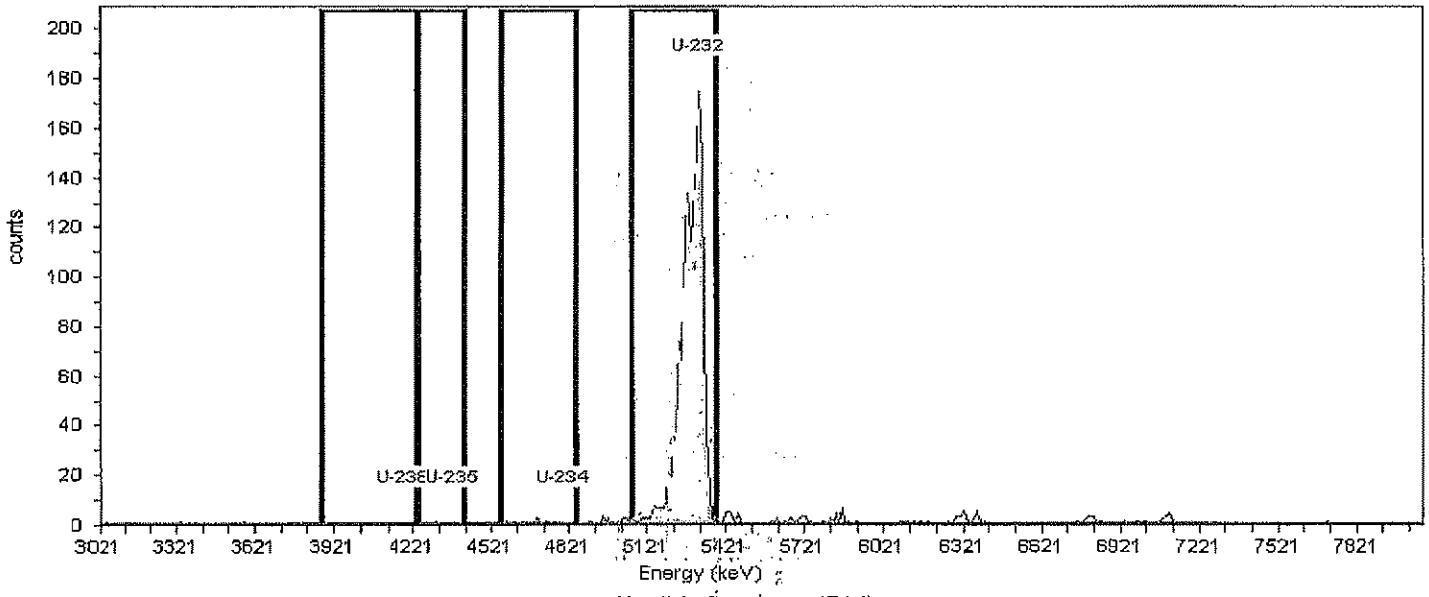
Energy Calibration: C11010430

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 89.46%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.6	3872.7	4229.1	.0	100.2	0.00	0.90	-0.90	0.0E+000	1.6E-002	1.1E-002	3.7E-002
U-235	4367.7	4239.0	4417.2	24.2	99.7	1.00	0.60	0.40	2.4E-003	1.5E-002	8.6E-003	3.3E-002
U-234	4793.4	4556.8	4842.9	22.9	100.0	9.00	0.00	9.00	5.3E-002	3.8E-002	0.0E+000	1.6E-002
U-232	5318.1	5060.7	5377.5	57.7	100.1	1,514.00	4.80	1,509.20	8.0E+000	4.2E-001	2.4E-002	6.5E-002

Reviewed By: JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-3
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 31
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:47AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010431; Det: 31; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:10:58PM

Efficiency Calibration: C11010431

Efficiency: 29.55% +/- 0.18% TPU(2 sigma)

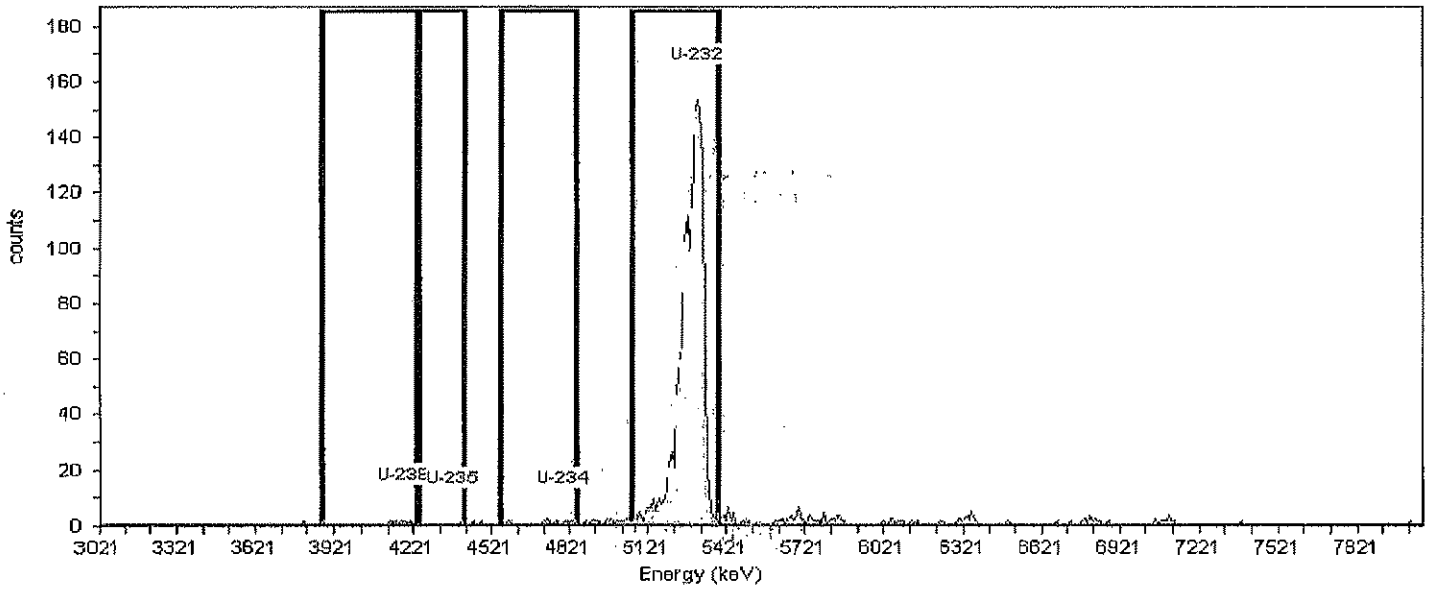
Energy Calibration: C11010431

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 80.09%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.6	3872.7	4229.1	23.0	100.2	7.00	0.90	6.10	3.9E-002	3.6E-002	1.1E-002	4.0E-002
U-235	4367.7	4239.0	4417.2	13.4	99.7	1.00	0.30	0.70	4.5E-003	1.5E-002	6.5E-003	3.0E-002
U-234	4793.4	4555.8	4842.9	114.5	100.0	10.00	1.80	8.20	5.2E-002	4.4E-002	1.6E-002	4.9E-002
U-232	5308.2	5060.7	5387.4	96.8	100.1	1,421.00	13.50	1,407.50	7.2E+000	3.9E-001	4.4E-002	1.1E-001

Reviewed By: TS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-4
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 32
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:48AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010432; Det: 32; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:12:22PM

Efficiency Calibration: C11010432

Efficiency: 29.72% +/- 0.12% TPU(2 sigma)

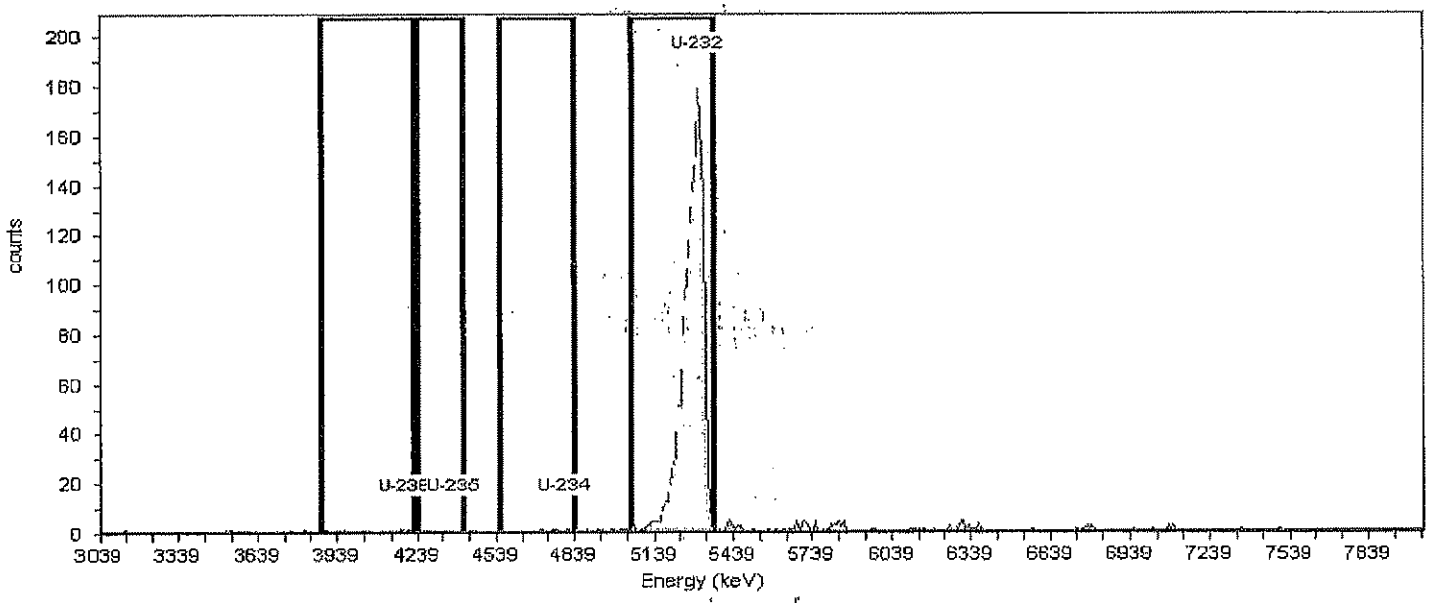
Energy Calibration: C11010432

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.36%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4188.4	3874.1	4227.7	42.1	100.2	4.00	1.20	2.80	1.7E-002	2.7E-002	1.2E-002	4.0E-002
U-235	4375.1	4237.6	4414.4	.0	99.7	0.00	0.30	-0.30	0.0E+000	1.4E-002	6.1E-003	2.8E-002
U-234	4797.4	4651.9	4836.7	23.2	100.0	5.00	1.50	3.50	2.1E-002	3.0E-002	1.4E-002	4.3E-002
U-232	5308.2	5052.8	5367.1	45.1	100.1	1,512.00	3.00	1,509.00	7.7E+000	4.0E-001	1.9E-002	5.5E-002

Reviewed By: RS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-5
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 58
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:48AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010458; Det: 58; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:29:06PM

Efficiency Calibration: C11010458

Efficiency: 30.59% +/- 0.15% TPU(2 sigma)

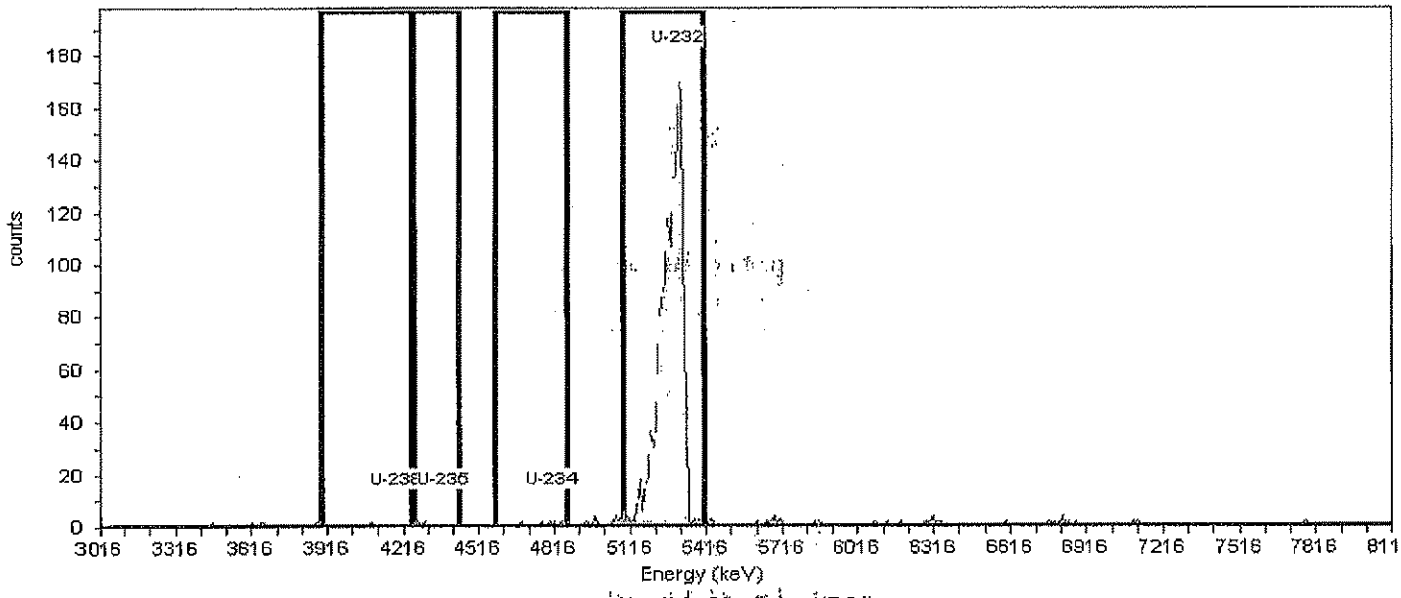
Energy Calibration: C11010458

Energy Cal: Gain = 9.9974 keV / Ch
Offset = 3,006.32 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 81.55%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4186.0	3886.1	4246.0	59.6	100.2	1.00	0.60	0.40	2.4E-003	1.5E-002	8.7E-003	3.4E-002
U-235	4376.0	4256.0	4435.9	16.9	99.7	3.00	0.60	2.40	1.4E-002	2.3E-002	8.8E-003	3.4E-002
U-234	4805.9	4575.9	4865.8	20.3	100.0	6.00	0.60	5.40	3.2E-002	3.1E-002	8.7E-003	3.4E-002
U-232	5305.7	5085.8	5405.7	95.1	100.1	1,489.00	5.40	1,483.60	7.3E+000	3.8E-001	2.6E-002	6.9E-002

Reviewed By: PS JP 9MF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-6
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 59
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:49AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010459; Det: 59; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:09:34PM

Energy Calibration: C11010459

Efficiency Calibration: C11010459

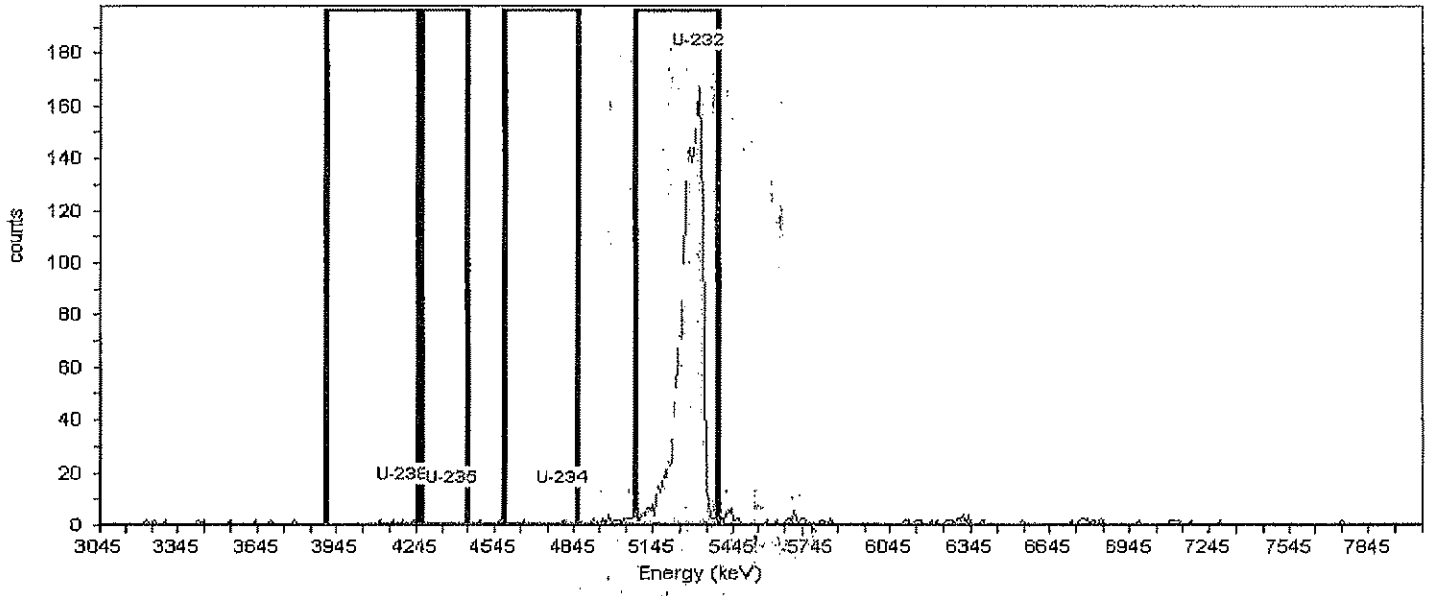
Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.80% +/- 0.16% TPU(2 sigma)

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.96%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3898.8	4251.8	14.9	100.2	4.00	2.70	1.30	7.4E-003	2.9E-002	1.7E-002	5.0E-002
U-235	4379.3	4261.6	4438.1	.0	99.7	1.00	1.50	-0.50	0.0E+000	1.8E-002	1.3E-002	4.2E-002
U-234	4800.9	4575.4	4859.7	24.0	100.0	2.00	2.10	-0.10	0.0E+000	2.3E-002	1.5E-002	4.6E-002
U-232	5320.5	5075.4	5389.1	98.8	100.1	1,581.00	6.60	1,574.40	7.7E+000	3.9E-001	2.7E-002	7.0E-002

Reviewed By: TJS JP BMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-7
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 16
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:35:46AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010416; Det: 16; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 11:33:37AM

Efficiency Calibration: C11010416

Efficiency: 29.20% +/- 0.12% TPU(2 sigma)

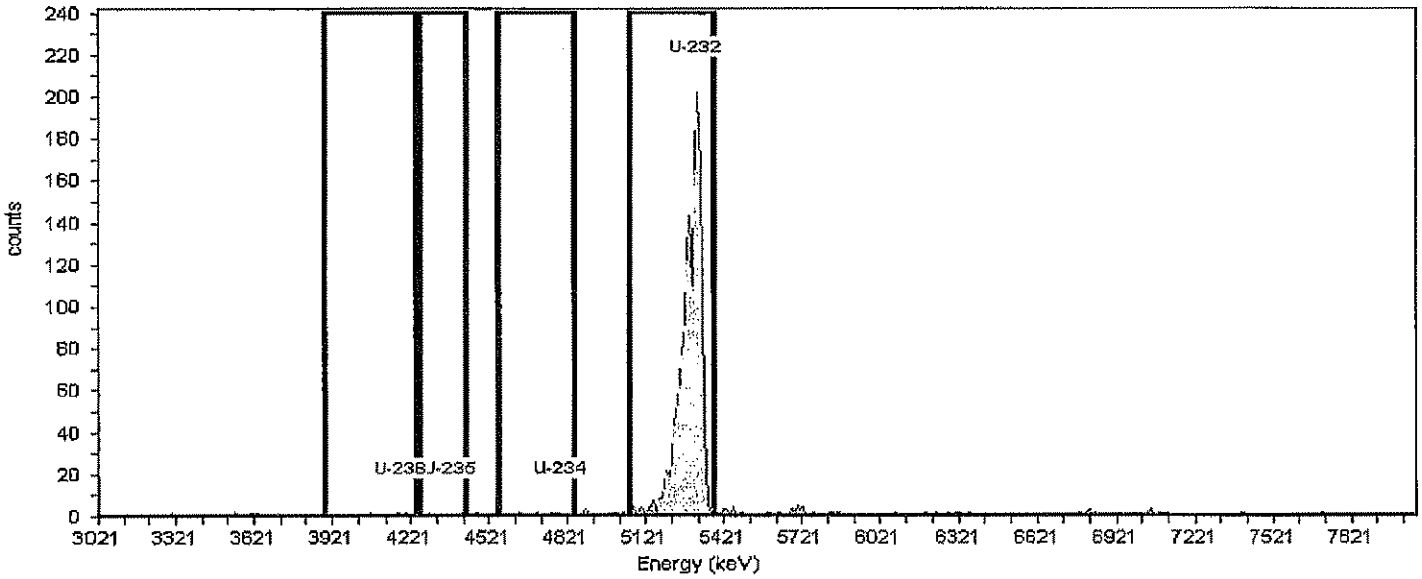
Energy Calibration: C11010416

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 86.65%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-235	4367.7	4248.9	4427.1	13.4	99.7	2.00	0.60	1.40	8.3E-003	1.9E-002	8.6E-003	3.3E-002
U-234	4793.4	4555.8	4842.9	25.7	100.0	5.00	1.20	3.80	2.3E-002	3.0E-002	1.2E-002	4.0E-002
U-232	5318.1	5060.7	5377.5	47.7	100.1	1,508.00	3.00	1,505.00	7.8E+000	4.0E-001	1.9E-002	5.5E-002
U-238	4179.6	3882.6	4239.0	13.4	100.2	3.00	1.20	1.80	1.1E-002	2.4E-002	1.2E-002	4.0E-002

Reviewed By: PS JP AK

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-8
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 17a
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:35:49AM
Live Time: 300.00 min.
Real Time: 300.00 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010417; Det: 17a; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 12:06:22PM

Efficiency Calibration: C11010417

Efficiency: 31.08% +/- 0.20% TPU(2 sigma)

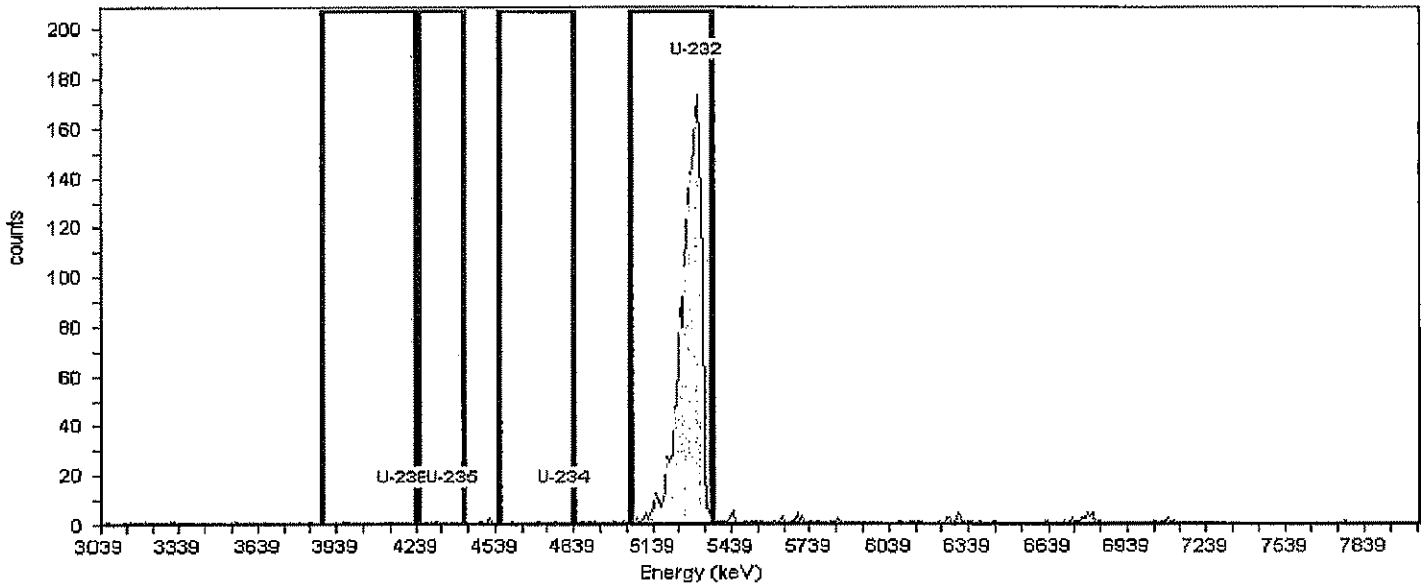
Energy Calibration: C11010417

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 83.86%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4188.4	3883.9	4237.6	57.6	100.2	3.00	2.70	0.30	1.7E-003	2.7E-002	1.8E-002	5.1E-002
U-235	4375.1	4247.4	4424.2	39.3	99.7	2.00	0.00	2.00	1.2E-002	2.0E-002	0.0E+000	1.6E-002
U-234	4797.4	4551.9	4836.7	24.1	100.0	3.00	3.30	-0.30	-1.7E-003	2.9E-002	2.0E-002	5.5E-002
U-232	5308.2	5052.8	5367.1	56.5	100.1	1,560.00	9.60	1,550.40	7.5E+000	3.9E-001	3.4E-002	8.3E-002

Reviewed By: RS JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-9
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 18
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:35:47AM
Live Time: 300.00 min.
Real Time: 300.00 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010418; Det: 18; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 12:17:28PM

Efficiency Calibration: C11010418

Efficiency: 30.05% +/- 0.15% TPU(2 sigma)

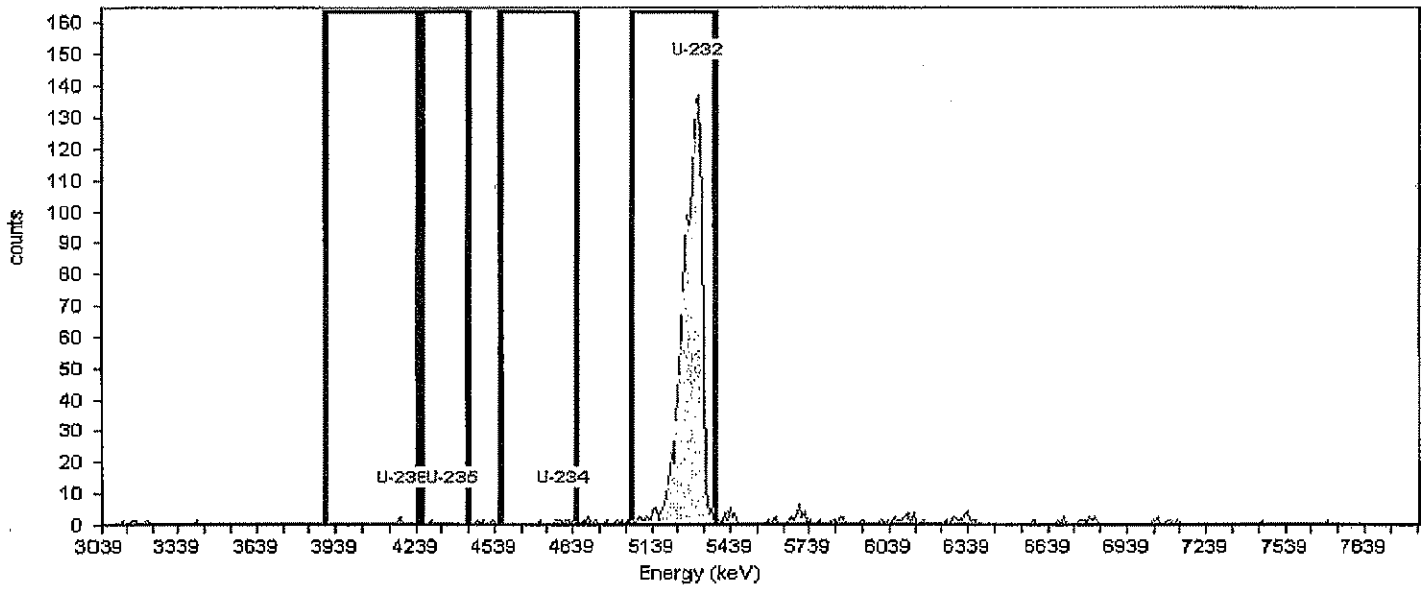
Energy Calibration: C11010418

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 64.71%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4188.4	3893.8	4247.4	55.8	100.2	2.00	2.40	-0.40	-3.1E-003	3.2E-002	2.2E-002	6.6E-002
U-235	4375.1	4257.2	4434.0	24.1	99.7	1.00	0.00	1.00	7.7E-003	2.2E-002	0.0E+000	2.1E-002
U-234	4797.4	4561.7	4846.5	27.9	100.0	8.00	2.40	5.60	4.3E-002	5.0E-002	2.2E-002	6.6E-002
U-232	5318.0	5062.6	5377.0	64.7	100.1	1,168.00	11.40	1,156.60	5.8E+000	3.5E-001	4.9E-002	1.2E-001

Reviewed By: JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-10
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 19
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:35:48AM
Live Time: 300.00 min.
Real Time: 300.00 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010419; Det: 19; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 12:07:43PM

Efficiency Calibration: C11010419

Efficiency: 29.00% +/- 0.16% TPU(2 sigma)

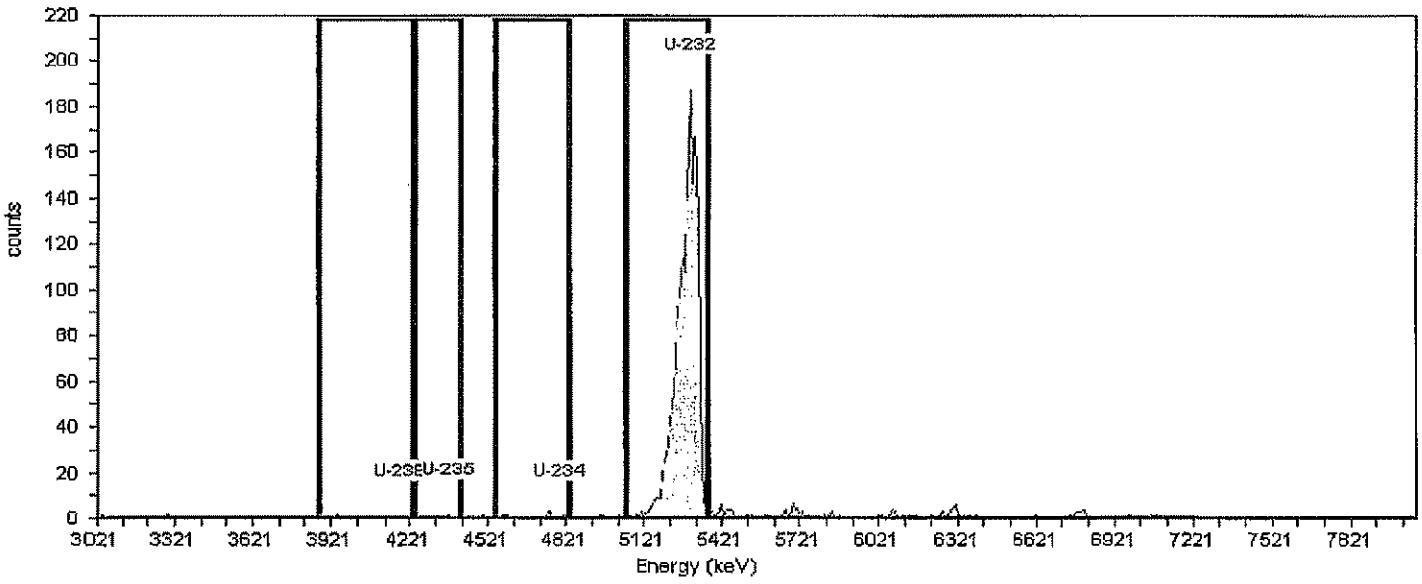
Energy Calibration: C11010419

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 88.02%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.6	3872.7	4229.1	.0	100.2	2.00	0.60	1.40	8.2E-003	1.9E-002	8.5E-003	3.3E-002
U-235	4367.7	4239.0	4417.2	24.2	99.7	1.00	0.60	0.40	2.4E-003	1.5E-002	8.6E-003	3.3E-002
U-234	4793.4	4545.9	4833.0	245.2	100.0	6.00	2.40	3.60	2.1E-002	3.4E-002	1.7E-002	5.0E-002
U-232	5298.3	5050.8	5367.6	44.4	100.1	1,528.00	9.60	1,518.40	7.9E+000	4.1E-001	3.4E-002	8.5E-002

Reviewed By: JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012143-11
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 25
Batch Name: UAS101226-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:09AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010425; Det: 25; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:04:20PM

Efficiency Calibration: C11010425

Efficiency: 29.05% +/- 0.20% TPU(2 sigma)

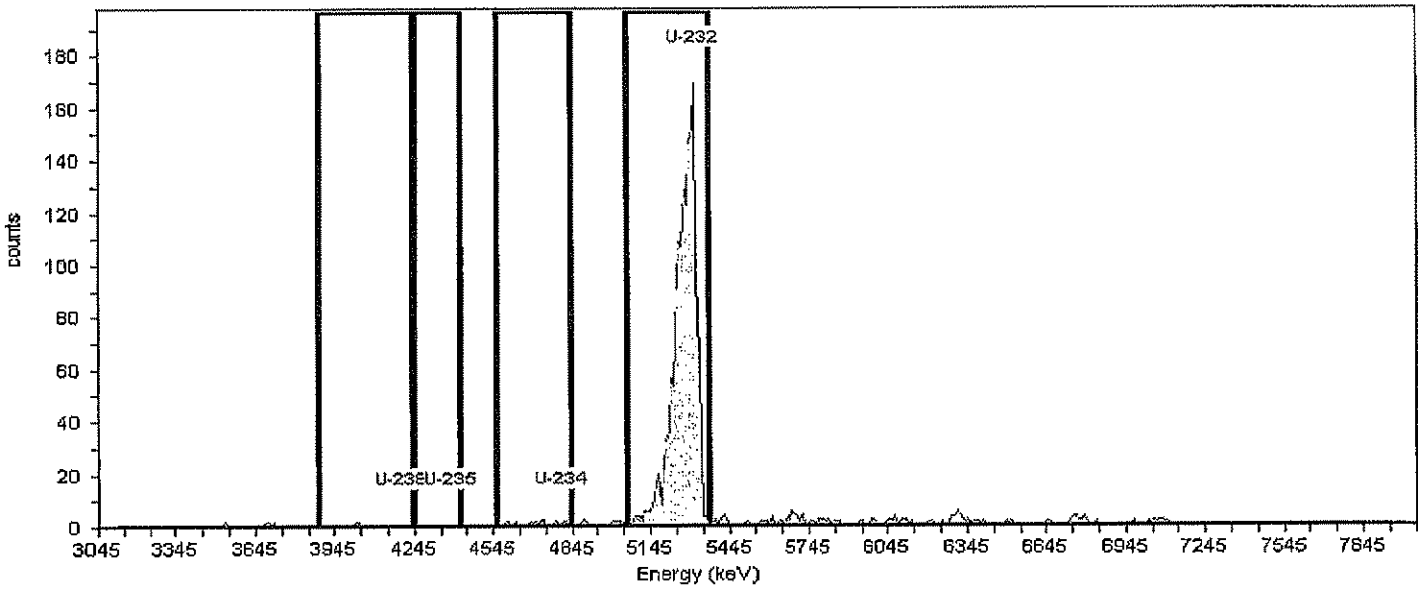
Energy Calibration: C11010425

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.86%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3879.2	4232.2	58.5	100.2	1.00	3.00	-2.00	0.0E+000	2.4E-002	2.0E-002	5.5E-002
U-235	4379.3	4242.0	4418.5	.0	99.7	0.00	0.90	-0.90	0.0E+000	1.7E-002	1.1E-002	3.8E-002
U-234	4800.9	4555.7	4840.1	120.5	100.0	10.00	3.90	6.10	3.7E-002	4.5E-002	2.2E-002	6.1E-002
U-232	5310.7	5055.8	5369.5	82.0	100.1	1,494.00	10.50	1,483.50	7.7E+000	4.1E-001	3.7E-002	9.0E-002

Reviewed By: TPS JP MR

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-1MB
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 60
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:50AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010460; Det: 60; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:11:39PM

Efficiency Calibration: C11010460

Efficiency: 29.88% +/- 0.21% TPU(2 sigma)

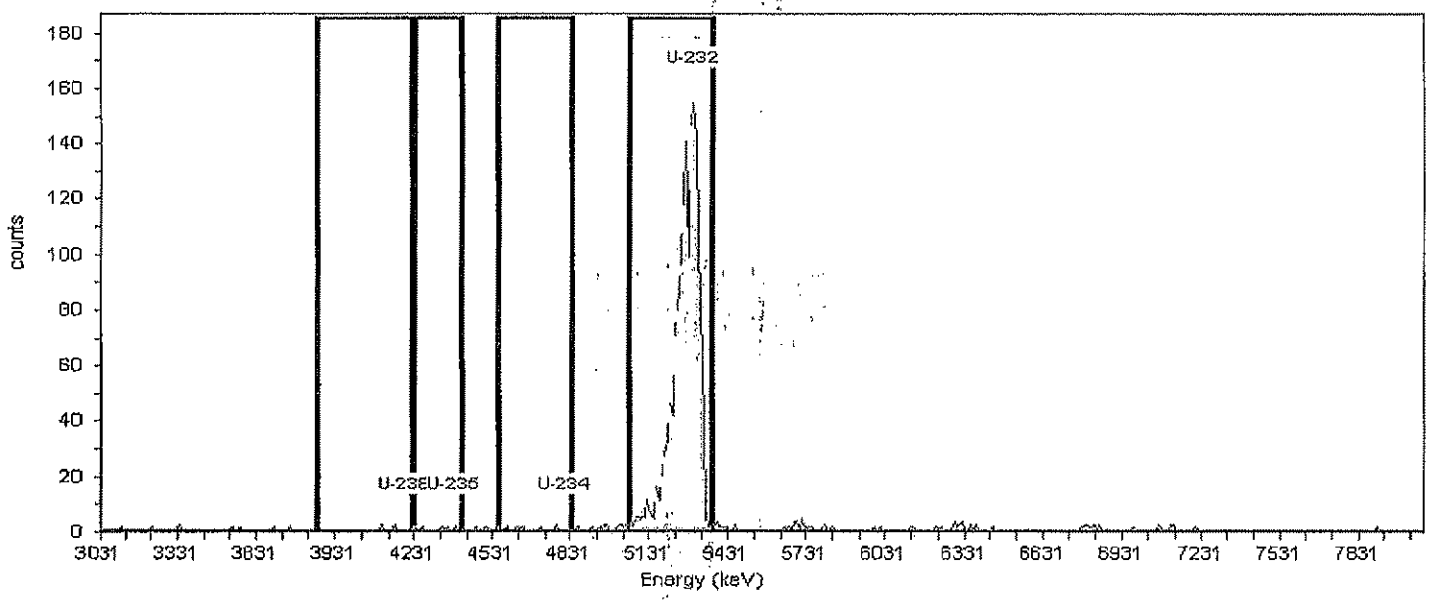
Energy Calibration: C11010460

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,021.28 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.73%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4189.5	3862.8	4219.2	71.4	100.2	4.00	2.40	1.60	9.4E-003	3.0E-002	1.7E-002	5.0E-002
U-235	4377.6	4229.1	4407.3	14.1	99.7	5.00	1.20	3.80	2.2E-002	2.9E-002	1.2E-002	4.0E-002
U-234	4803.3	4545.9	4833.0	.0	100.0	7.00	1.50	5.50	3.2E-002	3.4E-002	1.3E-002	4.3E-002
U-232	5298.3	5050.8	5367.6	79.6	100.1	1,530.00	6.30	1,523.70	7.7E+000	4.0E-001	2.8E-002	7.1E-002

Reviewed By: PS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-1LCS
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 61
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:50AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010461; Det: 61; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:13:53PM

Efficiency Calibration: C11010461

Efficiency: 31.49% +/- 0.13% TPU(2 sigma)

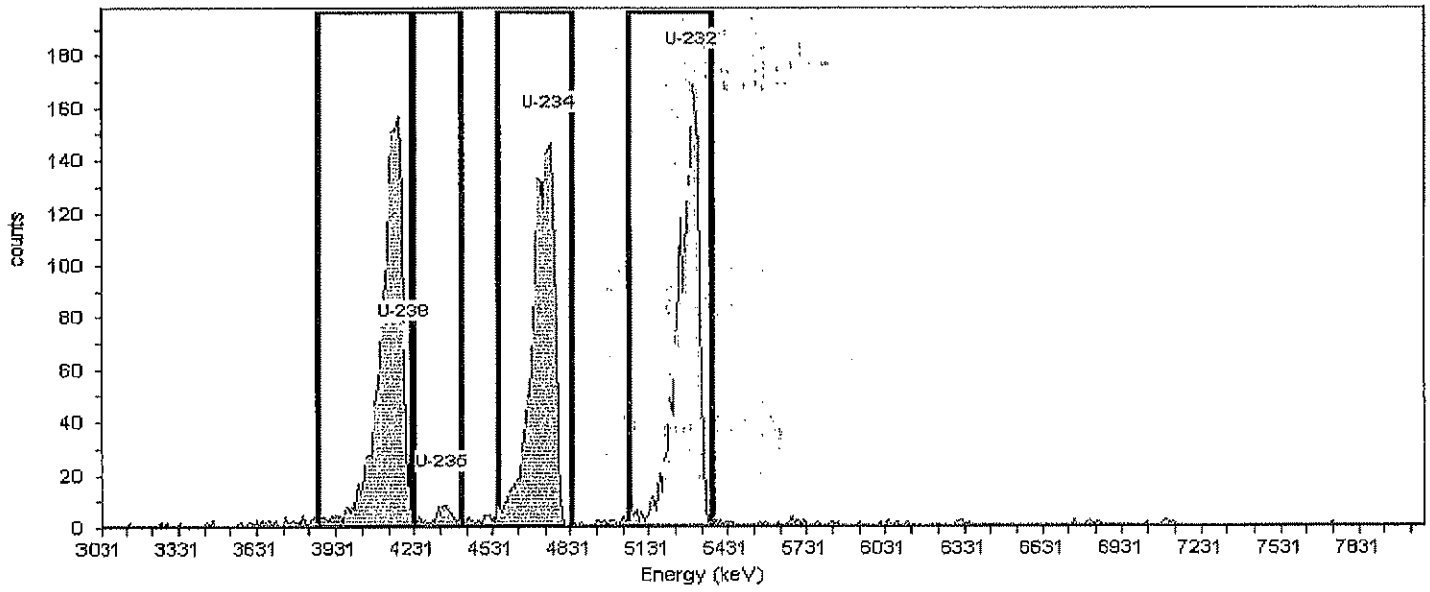
Energy Calibration: C11010461

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,021.28 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 82.64%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4189.5	3862.8	4219.2	47.4	100.2	1,582.00	0.60	1,581.40	9.1E+000	1.1E+000	8.4E-003	3.2E-002
U-235	4338.0	4229.1	4407.3	59.2	99.7	59.00	0.30	58.70	3.4E-001	9.7E-002	5.9E-003	2.8E-002
U-234	4743.9	4545.9	4833.0	88.1	100.0	1,520.00	0.90	1,519.10	8.8E+000	1.1E+000	1.0E-002	3.6E-002
U-232	5298.3	5050.8	5367.6	56.2	100.1	1,551.00	3.30	1,547.70	7.4E+000	3.8E-001	2.0E-002	5.5E-002

Reviewed By: TPS JP 9/MF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-1LCSD
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 62
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:51AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010462; Det: 62; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:33:17PM

Efficiency Calibration: C11010462

Efficiency: 29.69% +/- 0.15% TPU(2 sigma)

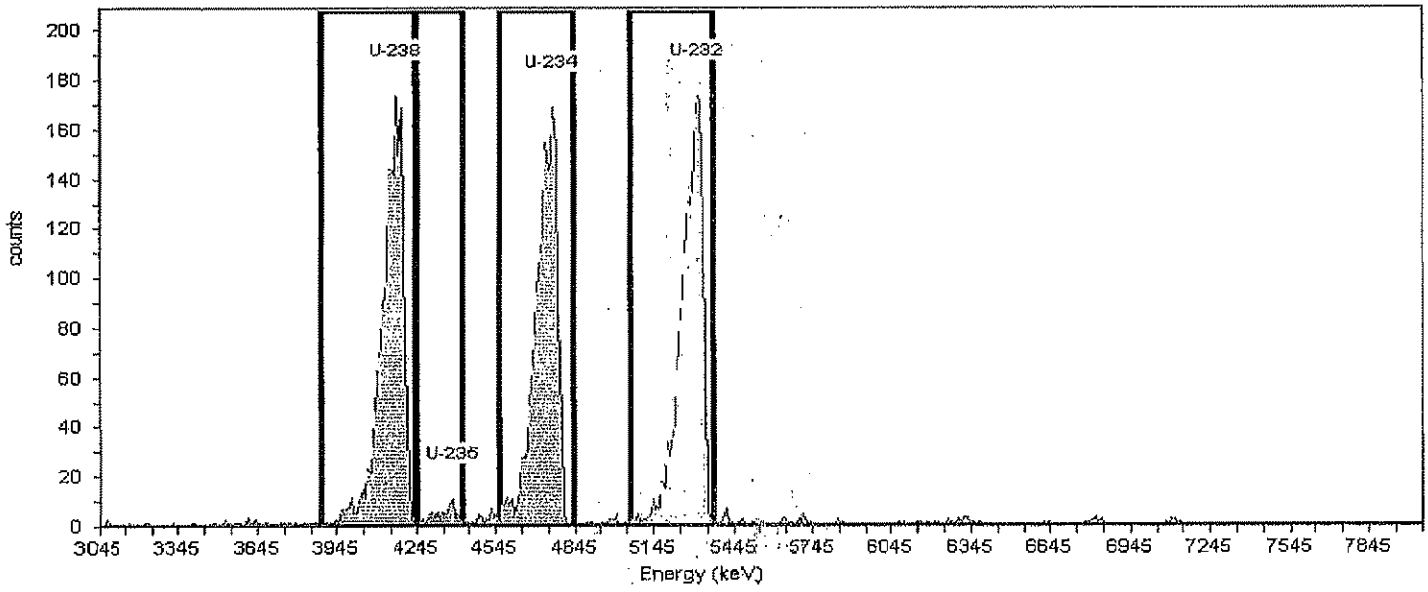
Energy Calibration: C11010462

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 93.57%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4163.6	3879.2	4232.2	51.8	100.2	1,658.00	1.80	1,656.20	8.9E+000	1.1E+000	1.4E-002	4.2E-002
U-235	4379.3	4242.0	4418.5	143.4	99.7	69.00	1.20	67.80	3.7E-001	1.0E-001	1.1E-002	3.7E-002
U-234	4761.6	4555.7	4840.1	87.6	100.0	1,569.00	2.10	1,566.90	8.5E+000	1.0E+000	1.5E-002	4.4E-002
U-232	5310.7	5055.8	5369.5	46.9	100.1	1,663.00	10.80	1,652.20	8.4E+000	4.2E-001	3.3E-002	8.2E-002

Reviewed By: JS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-2MB
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 62
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:07AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010462; Det: 62; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:33:17PM

Efficiency Calibration: C11010462

Efficiency: 29.69% +/- 0.15% TPU(2 sigma)

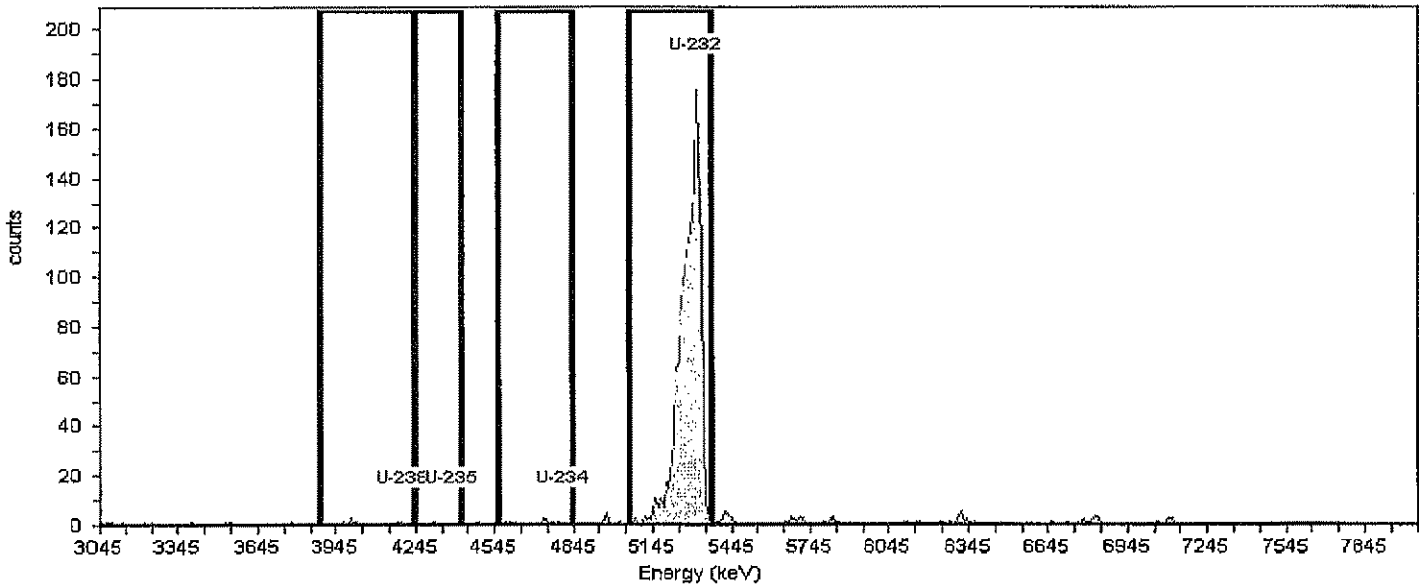
Energy Calibration: C11010462

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 78.96%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3879.2	4232.2	14.1	100.2	6.00	1.80	4.20	2.7E-002	3.6E-002	1.6E-002	4.9E-002
U-235	4379.3	4242.0	4418.5	24.0	99.7	1.00	1.20	-0.20	0.0E+000	1.9E-002	1.3E-002	4.4E-002
U-234	4800.9	4555.7	4840.1	177.2	100.0	9.00	2.10	6.90	4.4E-002	4.3E-002	1.7E-002	5.2E-002
U-232	5310.7	5055.8	5369.5	45.6	100.1	1,405.00	10.80	1,394.20	7.1E+000	3.8E-001	4.0E-002	9.7E-002

Reviewed By: TR JP MG

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-2LCS
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 63
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:07AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010463; Det: 63; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:15:40PM

Efficiency Calibration: C11010463

Efficiency: 31.42% +/- 0.18% TPU(2 sigma)

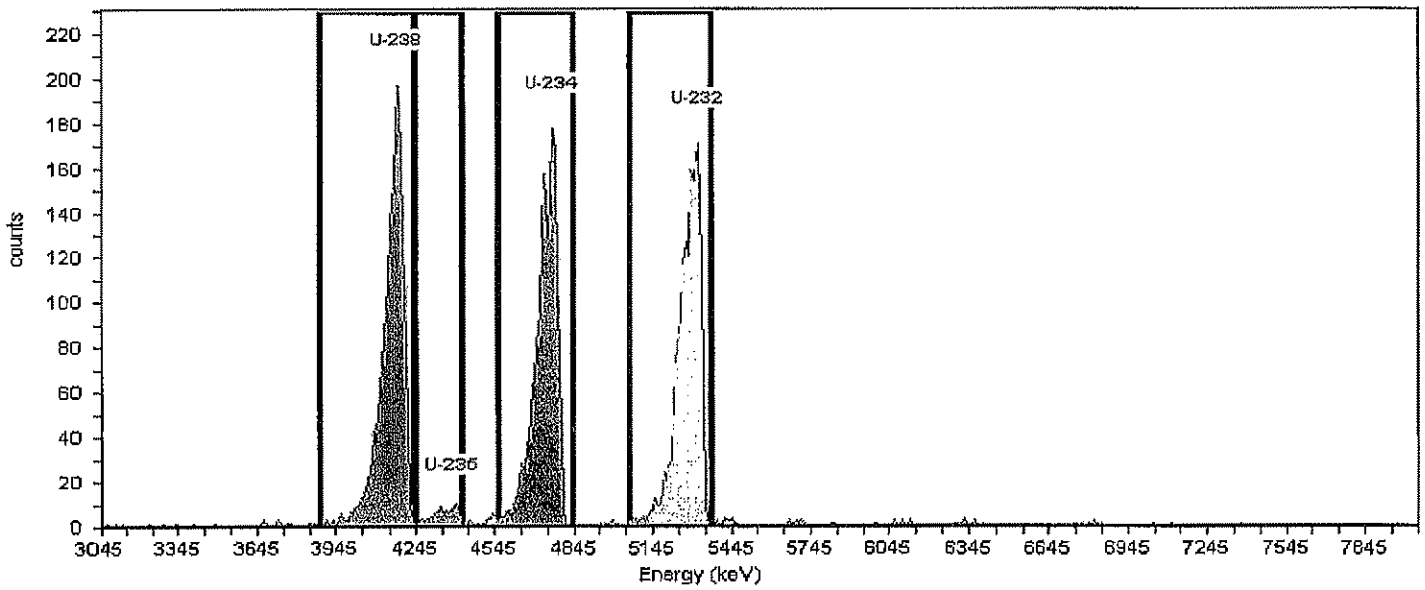
Energy Calibration: C11010463

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 88.76%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4173.4	3879.2	4232.2	50.4	100.2	1,697.00	0.30	1,696.70	9.1E+000	1.1E+000	5.5E-003	2.6E-002
U-235	4379.3	4242.0	4418.5	23.5	99.7	90.00	0.30	89.70	4.8E-001	1.2E-001	5.5E-003	2.6E-002
U-234	4761.6	4555.7	4840.1	75.3	100.0	1,565.00	0.90	1,564.10	8.4E+000	1.0E+000	9.6E-003	3.4E-002
U-232	5320.5	5055.8	5369.5	47.0	100.1	1,662.00	3.30	1,658.70	8.0E+000	3.9E-001	1.8E-002	5.2E-002

Reviewed By: KS JP MK

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-2LCSD
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 64
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:08AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010464; Det: 64; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:16:42PM

Efficiency Calibration: C11010464

Efficiency: 29.80% +/- 0.12% TPU(2 sigma)

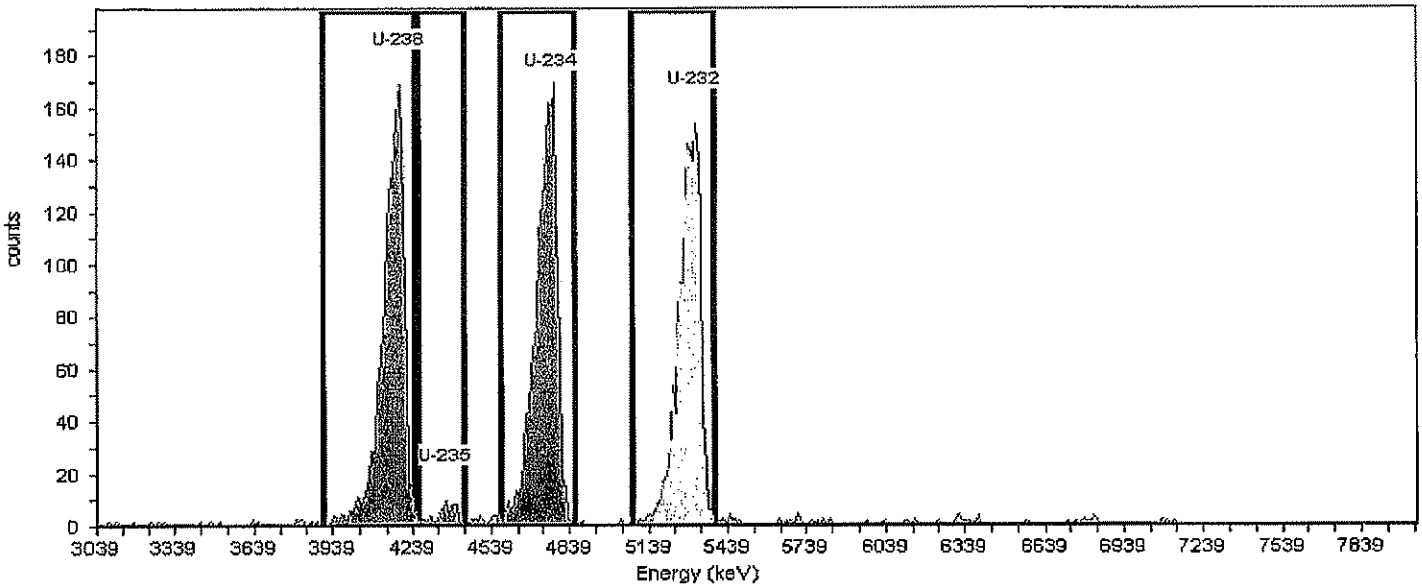
Energy Calibration: C11010464

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.76%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4188.4	3893.8	4247.4	62.3	100.2	1,611.00	0.60	1,610.40	9.4E+000	1.2E+000	8.5E-003	3.3E-002
U-235	4365.2	4257.2	4434.0	72.1	99.7	66.00	0.00	66.00	3.9E-001	1.1E-001	0.0E+000	1.6E-002
U-234	4768.0	4571.5	4856.4	83.6	100.0	1,600.00	0.90	1,599.10	9.4E+000	1.2E+000	1.0E-002	3.7E-002
U-232	5318.0	5072.5	5386.8	79.6	100.1	1,524.00	3.90	1,520.10	7.7E+000	4.0E-001	2.2E-002	6.0E-002

Reviewed By: TS JP MK

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS

FORM 746r8.xls (10/2/07)

Alpha Spectrometer Instrument Run Log

Date: 1-6-11

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
16	UAS101228-2-A	1012103-7	U/F	300	TS
17		8			
18		9			
19		10			
25		11			
26		1012144-1			
27		2			
28		3			
29		4			
30		5			
31		6			
32		7			
58		8			
59		9			
60		10			
61		11			
62		AS101228-2MB			
63		LCS			
64		LCSD			
11	TAS101220-2-A	1012153-15	~~Th/W~~	420	TS
12		AS101220-2MB	Th/W		
13		LCS			
14		LCSD			
		TS 1-6-11			

TS 1-6-11

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
9	UAS101220-3B	AS101220-3LCS	U/W	300	TS
10	↓	↓ LCSD	↓	↓	↓
7	NAS110103-2-A	1012224-2	Np/S	300	TS
8		2 SYS			
50*		3S*			
51*		3SYS			
52*		3D			
54		4			
55		↓ 4SYS			
56		AS110103-2SYS			
42		MB			
43	↓	↓ LCS	↓	↓	↓
1	~~1012224-1~~	~~NAS~~			
2	↓ 1SYS1S				
3	↓ 1D	TS 1-6-11			
4	~~AS101224-1SYS1S~~				
5	MB				
6	↓ LCS				
1	NAS110103-1-A	1012224-1	Np/W	300	TS
2		↓ 1SYS1S*			
3		1D			
4		AS110103-1SYS			
5		MB			
6	↓	↓ LCS	↓	↓	↓

Notes:

Reviewed by: TS

Date: 1-6-11

ALS

FORM 746r8_xls (10/2/07)

Alpha Spectrometer Instrument Run Log

Date: 1-7-11

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
9	UAS101228-1_A	1012142-1	U/F	300	PS
10	↓	2	↓	↓	↓
11		3			
12		4			
13		5			
14		6			
16		7			
17		8			
18		9			
19		10			
25		11			
26		12			
27		13			
28		14			
29		1012143-1			
30		2			
31		3			
32		4			
58		5			
59		6			
60		AS101228-1MB			
61		LCS			
62	↓	LCSD	↓	↓	↓
		PS 1-7-11			

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
63	UAS101229-1_B	1012229-1	U/S	300	PS
64	↓	↓ ID	↓	↓	↓
1	AAS101209-3_B	1012058-62	Am/F	1000	PS
2		63			
3		64			
4		65			
5		66			
6		↓ 67			
7		AS101209-3MMB			
8		DMB			
50		LCS			
51	↓	↓ LCSD	↓	↓	↓
52	AAS101209-4_A	1012058-31	Am/F	1000	PS
54		33			
55		34			
56		41			
~~43~~ 57		42			
~~43~~ ~~43~~		49			
~~45~~ ~~45~~		51			
~~46~~ ~~46~~		AS101209-4MMB			
~~47~~ ~~46~~	↓	DMB	↓	↓	↓
~~47~~	↓	PS 1-7-11 LCS			
		PS 1-7-11			

* PS 1-7-11

Notes:

Reviewed by: PS

Date: 1-7-11

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

No *NON-CONFORMANCE REPORTS* or *QUALITY ASSURANCE SUMMARY SHEETS* are included in this data package.

Section 7

LABORATORY BENCH SHEETS

1-7

Radiochemistry Instrument Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-1

Prep Procedure: UISO Default 300min (6.1)

Analytical QASS / NCR? Y / (N) NA

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Report Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	1012142-1	SMP	1	1	sample	pCi/sample	_C1421	9	PS	_C1421			_C1421		A	
1	1012142-2	SMP	1	1	sample	pCi/sample	_C1422	10		_C1422			_C1422			
1	1012142-3	SMP	1	1	sample	pCi/sample	_C1423	11		_C1423			_C1423			
1	1012142-4	SMP	1	1	sample	pCi/sample	_C1424	12		_C1424			_C1424			
1	1012142-5	SMP	1	1	sample	pCi/sample	_C1425	13		_C1425			_C1425			
1	1012142-6	SMP	1	1	sample	pCi/sample	_C1426	14		_C1426			_C1426			
1	1012142-7	SMP	1	1	sample	pCi/sample	_C1427	16		_C1427			_C1427			
1	1012142-8	SMP	1	1	sample	pCi/sample	_C1428	17		_C1428			_C1428	PS		
1	1012142-9	SMP	1	1	sample	pCi/sample	_C1429	18		_C1429			_C1429	1-15-11		
1	1012142-10	SMP	1	1	sample	pCi/sample	_C14210	19		_C14210			_C14210			
1	1012142-11	SMP	1	1	sample	pCi/sample	_C14211	25		_C14211	PS		_C14211			
1	1012142-12	SMP	1	1	sample	pCi/sample	_C14212	26		_C14212	1-15-11		_C14212			
1	1012142-13	SMP	1	1	sample	pCi/sample	_C14213	27		_C14213			_C14213			
1	1012142-14	SMP	1	1	sample	pCi/sample	_C14214	28		_C14214			_C14214			
1	1012143-1	SMP	1	1	sample	pCi/sample	_C1431	29		_C1431			_C1431			
1	1012143-2	SMP	1	1	sample	pCi/sample	_C1432	30		_C1432			_C1432			
1	1012143-3	SMP	1	1	sample	pCi/sample	_C1433	31		_C1433			_C1433			
1	1012143-4	SMP	1	1	sample	pCi/sample	_C1434	32		_C1434			_C1434			
1	1012143-5	SMP	1	1	sample	pCi/sample	_C1435	58		_C1435			_C1435			
1	1012143-6	SMP	1	1	sample	pCi/sample	_C1436	59		_C1436			_C1436			
1	AS101228-1	MB	1	1	sample	pCi/sample	_C281B	60		_C281B			_C281B			
1	AS101228-1	LCS	1	1	sample	pCi/sample	_C281L	61		_C281L			_C281L			
1	AS101228-1	LCSD	1	1	sample	pCi/sample	_C281LD	62		_C281LD			_C281LD			

Tracer/Carrier/Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.888	DPM/ml	12/28/10	1	ml	AW019

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

Reporting Units

LabID:	TstGrpName:	RptUnits:
1012143-1	IsoU_Wipe/sample	pCi/samp
1012142-1	IsoU_Wipe/sample	pCi/samp
1012142-2	IsoU_Wipe/sample	pCi/samp
1012143-2	IsoU_Wipe/sample	pCi/samp
1012143-3	IsoU_Wipe/sample	pCi/samp
1012142-3	IsoU_Wipe/sample	pCi/samp
1012142-4	IsoU_Wipe/sample	pCi/samp
1012143-4	IsoU_Wipe/sample	pCi/samp
1012142-5	IsoU_Wipe/sample	pCi/samp
1012143-5	IsoU_Wipe/sample	pCi/samp
1012143-6	IsoU_Wipe/sample	pCi/samp
1012142-6	IsoU_Wipe/sample	pCi/samp
1012142-7	IsoU_Wipe/sample	pCi/samp
1012142-8	IsoU_Wipe/sample	pCi/samp
1012142-9	IsoU_Wipe/sample	pCi/samp
1012142-10	IsoU_Wipe/sample	pCi/samp
1012142-11	IsoU_Wipe/sample	pCi/samp
1012142-12	IsoU_Wipe/sample	pCi/samp
1012142-13	IsoU_Wipe/sample	pCi/samp
1012142-14	IsoU_Wipe/sample	pCi/samp

Sample Barcodes

1012142-1
AS101228-1PS1

1012142-2
AS101228-1PS2

1012142-3
AS101228-1PS3

1012142-4
AS101228-1PS4

1012142-5
AS101228-1PS5

1012142-6
AS101228-1PS6

1012142-7
AS101228-1PS7

1012142-8
AS101228-1PS8

1012142-9
AS101228-1PS9

1012142-10
AS101228-1PS10

1012142-11
AS101228-1PS11

1012142-12
AS101228-1PS12

1012142-13
AS101228-1PS13

1012142-14
AS101228-1PS14

1012143-1 AS101228-1PS15	1012143-2 AS101228-1PS16
1012143-3 AS101228-1PS17	1012143-4 AS101228-1PS18
1012143-5 AS101228-1PS19	1012143-6 AS101228-1PS20
AS101228-1MB AS101228-1PS21	AS101228-1LCS AS101228-1PS22
AS101228-1LCSD AS101228-1PS23	

Radiochemistry Prep Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-1

Prep Procedure: UISO

Reviewed By: cas CAS **Review Date:** 1/3/2011

Non-Routine Pre-Treatment? (Y) / N **Batch:** SeeComments **Re-Prep?** Y / (N) **Batch:** N/A **Prep QASS / NCR?** Y / (N) N/A

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq sample	Fin Alq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes
1	1	1012142-1	SMP		1	1	As Received				T1	
2	1	1012142-2	SMP		1	1	As Received				T1	
3	1	1012142-3	SMP		1	1	As Received				T1	
4	1	1012142-4	SMP		1	1	As Received				T1	
5	1	1012142-5	SMP		1	1	As Received				T1	
6	1	1012142-6	SMP		1	1	As Received				T1	
7	1	1012142-7	SMP		1	1	As Received				T1	
8	1	1012142-8	SMP		1	1	As Received				T1	
9	1	1012142-9	SMP		1	1	As Received				T1	
10	1	1012142-10	SMP		1	1	As Received				T1	
11	1	1012142-11	SMP		1	1	As Received				T1	
12	1	1012142-12	SMP		1	1	As Received				T1	
13	1	1012142-13	SMP		1	1	As Received				T1	
14	1	1012142-14	SMP		1	1	As Received				T1	
15	1	1012143-1	SMP		1	1	As Received				T1	
16	1	1012143-2	SMP		1	1	As Received				T1	
17	1	1012143-3	SMP		1	1	As Received				T1	
18	1	1012143-4	SMP		1	1	As Received				T1	
19	1	1012143-5	SMP		1	1	As Received				T1	
20	1	1012143-6	SMP		1	1	As Received				T1	
21	1	AS101228-1	MB		1	1	As Received				T1	
22	1	AS101228-1	LCS		1	1	As Received				S1,T1	
23	1	AS101228-1	LCSD		1	1	As Received				S1,T1	

CAS 1/3/11

CAS 1/3/11

67 of 116

Radiochemistry Prep Worksheet

ALS Environmental -- FC

Prep Batch: AS1012281

Prep Procedure: UISO

Reviewed By: cas **Review Date:** 1/3/2011

Non-Routine Pre-Treatment? (Y) N **Batch:** See Comments **Re-Prep?** Y / (N) **Batch:** N/A **Prep QASS / NCR?** Y / (N) N/A

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Aliq sample	Fin Aliq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes

Comments

The samples in WO 1012142 and 1012143 were placed into 100 ml glass beakers. Due to limited sample, a LCSD was created to meet laboratory requirements for a prep batch duplicate. Samples were spiked and traced then muffled overnight at 450 degrees C. Samples were digested per SOP 773/r10.

Spiked By: Crystal Shaeffer **Date:** 12/28/2010

Witnessed By: Gabriel D. Wagner **Date:** 12/28/2010

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.888	DPM/ml	12/28/10	1	ml	AW019

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

Radiochemistry Prep Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-1

Prep Procedure: UISO

Prep Batch Not Validated!!!

Reviewed By: **Review Date:**

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep?** Y / N **Batch:** _____ **Prep QASS / NCR?** Y / N _____

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Aliq sample	Fin Aliq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes
1	1	1012142-1	SMP		1	1	As Received				T1	562
2	1	1012142-2	SMP		1	1	As Received				T1	815
3	1	1012142-3	SMP		1	1	As Received				T1	698
4	1	1012142-4	SMP		1	1	As Received				T1	854
5	1	1012142-5	SMP		1	1	As Received				T1	849
6	1	1012142-6	SMP		1	1	As Received				T1	715
7	1	1012142-7	SMP		1	1	As Received				T1	493
8	1	1012142-8	SMP		1	1	As Received				T1	24X
9	1	1012142-9	SMP		1	1	As Received				T1	858
10	1	1012142-10	SMP		1	1	As Received				T1	521
11	1	1012142-11	SMP		1	1	As Received				T1	800
12	1	1012142-12	SMP		1	1	As Received				T1	528
13	1	1012142-13	SMP		1	1	As Received				T1	705
14	1	1012142-14	SMP		1	1	As Received				T1	692
15	1	1012143-1	SMP		1	1	As Received				T1	455
16	1	1012143-2	SMP		1	1	As Received				T1	829
17	1	1012143-3	SMP		1	1	As Received				T1	693
18	1	1012143-4	SMP		1	1	As Received				T1	727
19	1	1012143-5	SMP		1	1	As Received				T1	801
20	1	1012143-6	SMP		1	1	As Received				T1	859
21	1	AS101228-1	MB		1	1	As Received				T1	525
22	1	AS101228-1	LCS		1	1	As Received				S1,T1	800
23	1	AS101228-1	LCSD		1	1	As Received				S1,T1	837

69 of 111

Radiochemistry Prep Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-1

Prep Procedure: UISO

Prep Batch Not Validated!!!

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep?** Y / N **Batch:** _____ **Prep QASS / NCR?** Y / N _____

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010 CWS
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq sample	Fin Alq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes

Comments

Spiked By: CWS Date: 12/28/10

Witnessed By: GMH Date: 12/28/10

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.888	DPM/ml	12/28/10	1	ml	AW019

exp: 10/24/11

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

exp: 05/15/11

70 of 111

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: CLS

ANALYSIS DATE: 12/28/10 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
1012142	1	AS Recd	Wipe	filter-like, some debris, soiled
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			
1012143	1			filter-like, not soiled, no debris
	2			
	3			
	4			
	5			
	6			

1-7

Radiochemistry Instrument Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-2

Prep Procedure: UISO Default 300 min (6.1)

Analytical QASS / NCR? Y (N) NA

Prep Num	LabID	QC Type	Init Aliq	Fin Aliq	Units	Report Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	1012143-7	SMP	1	1	sample	pCi/sample	_C1437	16	PS	_C1437			_C1437		A	
1	1012143-8	SMP	1	1	sample	pCi/sample	_C1438	17		_C1438			_C1438			
1	1012143-9	SMP	1	1	sample	pCi/sample	_C1439	18		_C1439			_C1439			
1	1012143-10	SMP	1	1	sample	pCi/sample	_C14310	19		_C14310			_C14310			
1	1012143-11	SMP	1	1	sample	pCi/sample	_C14311	25		_C14311			_C14311			
1	1012144-1	SMP	1	1	sample	pCi/sample	_C1441	26		_C1441			_C1441			
1	1012144-2	SMP	1	1	sample	pCi/sample	_C1442	27		_C1442			_C1442			
1	1012144-3	SMP	1	1	sample	pCi/sample	_C1443	28		_C1443	PS		_C1443			PS
1	1012144-4	SMP	1	1	sample	pCi/sample	_C1444	29		_C1444	1-15-11		_C1444	PS 1-15-11		1-15-11
1	1012144-5	SMP	1	1	sample	pCi/sample	_C1445	30		_C1445			_C1445			
1	1012144-6	SMP	1	1	sample	pCi/sample	_C1446	31		_C1446			_C1446			
1	1012144-7	SMP	1	1	sample	pCi/sample	_C1447	32		_C1447			_C1447			
1	1012144-8	SMP	1	1	sample	pCi/sample	_C1448	58		_C1448			_C1448			
1	1012144-9	SMP	1	1	sample	pCi/sample	_C1449	59		_C1449			_C1449			
1	1012144-10	SMP	1	1	sample	pCi/sample	_C14410	60		_C14410			_C14410			
1	1012144-11	SMP	1	1	sample	pCi/sample	_C14411	C1		_C14411			_C14411			
1	AS101228-2	MB	1	1	sample	pCi/sample	_C282B	62		_C282B			_C282B			
1	AS101228-2	LCS	1	1	sample	pCi/sample	_C282L	63		_C282L			_C282L			
1	AS101228-2	LCSD	1	1	sample	pCi/sample	_C282LD	64		_C282LD			_C282LD			

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.866	DPM/ml	12/28/10	1	ml	AW019

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

72 of 11

Reporting Units

LabID:	TstGrpName:	RptUnits:
1012144-1	IsoU_Wipe/sample	pCi/samp
1012144-2	IsoU_Wipe/sample	pCi/samp
1012144-3	IsoU_Wipe/sample	pCi/samp
1012144-4	IsoU_Wipe/sample	pCi/samp
1012144-5	IsoU_Wipe/sample	pCi/samp
1012144-6	IsoU_Wipe/sample	pCi/samp
1012144-7	IsoU_Wipe/sample	pCi/samp
1012143-7	IsoU_Wipe/sample	pCi/samp
1012144-8	IsoU_Wipe/sample	pCi/samp
1012143-8	IsoU_Wipe/sample	pCi/samp
1012144-9	IsoU_Wipe/sample	pCi/samp
1012143-9	IsoU_Wipe/sample	pCi/samp
1012143-10	IsoU_Wipe/sample	pCi/samp
1012144-10	IsoU_Wipe/sample	pCi/samp
1012143-11	IsoU_Wipe/sample	pCi/samp
1012144-11	IsoU_Wipe/sample	pCi/samp

Sample Barcodes

1012143-7
AS101228-2PS1

1012143-8
AS101228-2PS2

1012143-9
AS101228-2PS3

1012143-10
AS101228-2PS4

1012143-11
AS101228-2PS5

1012144-1
AS101228-2PS6

1012144-2
AS101228-2PS7

1012144-3
AS101228-2PS8

1012144-4
AS101228-2PS9

1012144-5
AS101228-2PS10

1012144-6
AS101228-2PS11

1012144-7
AS101228-2PS12

1012144-8
AS101228-2PS13

1012144-9
AS101228-2PS14

1012144-10
AS101228-2PS15

1012144-11
AS101228-2PS16

AS101228-2MB
AS101228-2PS17

AS101228-2LCS
AS101228-2PS18

73 of 111

AS101228-2LCSD
AS101228-2PS19

Radiochemistry Prep Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-2

Prep Procedure: UISO

Reviewed By: cas CAS **Review Date:** 1/3/2011

Non-Routine Pre-Treatment? (Y) / N **Batch:** See comments **Re-Prep?** Y / (N) **Batch:** N/A **Prep QASS / NCR?** Y / (N) N/A

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq sample	Fin Alq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes
1	1	1012143-7	SMP		1	1	As Received				T1	
2	1	1012143-8	SMP		1	1	As Received				T1	
3	1	1012143-9	SMP		1	1	As Received				T1	
4	1	1012143-10	SMP		1	1	As Received				T1	
5	1	1012143-11	SMP		1	1	As Received				T1	
6	1	1012144-1	SMP		1	1	As Received				T1	
7	1	1012144-2	SMP		1	1	As Received				T1	
8	1	1012144-3	SMP		1	1	As Received				T1	
9	1	1012144-4	SMP		1	1	As Received				T1	
10	1	1012144-5	SMP		1	1	As Received				T1	
11	1	1012144-6	SMP		1	1	As Received				T1	
12	1	1012144-7	SMP		1	1	As Received				T1	
13	1	1012144-8	SMP		1	1	As Received				T1	
14	1	1012144-9	SMP		1	1	As Received				T1	
15	1	1012144-10	SMP		1	1	As Received				T1	
16	1	1012144-11	SMP		1	1	As Received				T1	
17	1	AS101228-2	MB		1	1	As Received				T1	
18	1	AS101228-2	LCS		1	1	As Received				S1,T1	
19	1	AS101228-2	LCSD		1	1	As Received				S1,T1	

CAS 12/28/10

CAS 12/28/10

Comments

The samples in WO 1012143 and 1012144 were placed into 100 ml glass beakers. Due to limited sample, a LCSD was created to meet laboratory requirements for a prep batch duplicate. Samples were spiked and traced then muffled overnight at 450 degrees C. Samples were digested per SOP 773/r10.

Spiked By: Crystal Shaeffer **Date:** 12/28/2010

Witnessed By: Gabriel D. Wagner **Date:** 12/28/2010

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.888	DPM/ml	12/28/10	1	ml	AW019

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

75 of 111

Radiochemistry Prep Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-2

Prep Procedure: UISO

Prep Batch Not Validated!!!

Reviewed By: **Review Date:**

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep? Y / N** **Batch:** _____ **Prep QASS / NCR? Y / N** _____

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010 CWS
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq sample	Fin Alq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes
1	1	1012143-7	SMP		1	1	As Received				T1	16X
2	1	1012143-8	SMP		1	1	As Received				T1	840
3	1	1012143-9	SMP		1	1	As Received				T1	CWS 820 ~~514~~
4	1	1012143-10	SMP		1	1	As Received				T1	12/28/10 ~~500~~ 850
5	1	1012143-11	SMP		1	1	As Received				T1	705
6	1	1012144-1	SMP		1	1	As Received				T1	326
7	1	1012144-2	SMP		1	1	As Received				T1	714
8	1	1012144-3	SMP		1	1	As Received				T1	735
9	1	1012144-4	SMP		1	1	As Received				T1	661
10	1	1012144-5	SMP		1	1	As Received				T1	718
11	1	1012144-6	SMP		1	1	As Received				T1	696
12	1	1012144-7	SMP		1	1	As Received				T1	519
13	1	1012144-8	SMP		1	1	As Received				T1	805
14	1	1012144-9	SMP		1	1	As Received				T1	CWS 514 ~~820~~
15	1	1012144-10	SMP		1	1	As Received				T1	12/28/10 ~~850~~ 500
16	1	1012144-11	SMP		1	1	As Received				T1	1163
17	1	AS101228-2	MB		1	1	As Received				T1	573
18	1	AS101228-2	LCS		1	1	As Received				S1,T1	691
19	1	AS101228-2	LCSD		1	1	As Received				S1,T1	804

Comments

Spiked By: CWS **Date:** 12/28/10
Witnessed By: GAW **Date:** 12/28/10

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.888	DPM/ml	12/28/10	1	ml	AW019

exp: 10/24/11

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

exp: 01/15/11

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: CLS

ANALYSIS DATE: 12/28/10 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
1012143	7	As Recd	Wipe	Filter-like, not soiled
	8			
	9			
	10			
	11			
1012144	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
	11			

CLS 1/3/11

Section 8

STANDARDS TRACEABILITY DOCUMENTS

8

Notebook No. 3610

PROJECT 644.3610.02 U-238/Nat Continued From Page

Prepare a working dilution of ~20.0 dpm/mL U-238 from 644.3020.53.

1) Determine Density of 1M HNO_3 lot# 073371 Bal# 12 L
Mass of volumetric flask (100 mL) 68.2980 g
Mass of flask and 100 ml Acid 171.0125 g
Net Mass of Acid 102.7145 g
$\rho = 1.027145$ g/mL

2) Transfer 644.3020.53 12 L
Mass of Empty (No lid) 1000 ml Nalgene 74.7135 g
Mass of Nalgene and Std. Transferred 76.1629 g
Net Mass of Std. Transferred 1.4494 g

3) Dilute to final Vol. 26
Mass of Std, Nalgene, and diluent 1155.1 g
Mass of Nalgene 74.7135 g
Net Mass of Nat Std Dilution 1080.3865 g

Final Activity Calculation

$$\left(242.0 \frac{Bq}{g}\right)\left(\frac{60\ dpm}{1\ Bq}\right)\left(1.4494\ g\right)\left(1.027145 \frac{g}{mL}\right) \div \left(1080.3865\ g\right) = 20.01\ dpm/mL$$

MC 7/13/08

Stnd ID: 644.3610.02

Description: U-234/238
Expiration: 4/8/2009
Activity: 20.01 dpm/mL
Density of 1.0 gram/mL assumed
2s Uncertainty: 0.12 dpm/mL
Ref. Date: 8/1/1997
Ref Time: N/A
Prep Date: 4/7/2008 Prep by: jdd
Matrix/Comp: 1 M HNO3
Half Life (y): 4.47E+09

MC 7/13/08

MC 7/13/08

Reverification Log		
Analysis Date	Initials	Expiration Date
2/23/09	RG	2/23/2010
1/15/2010	RG	1/15/2011

MC 7/13/08

MC 7/13/08

Continued on Page

Read and Understood By

4/7/08 Date

Signed

7/13/08 Date

Direct transfer of RSO 644 to 40 mL VOA vial

Mass of VOA vial w/o lid: 20.9455 g
Mass of vial + standard: 24.6612 g
Net mass of std transferred: 3.7157 g

Bal 12

RSO 644
U-238: 242.0 Bq/g
U-235: 11.14 Bq/g
U-234: 233.1 Bq/g

11/28/06

Continued on Page

Read and Understood By

Signed	Date	Signed	Date
	11/28/06		7/13/08

National Institute of Standards & Technology

Certificate

PAF FO 0644
rec'd 10-18-02

Standard Reference Material 4321C
Natural Uranium Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive natural uranium nitrate and nitric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of alpha-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains uranium-238, uranium-235, and uranium-234 with a total activity of approximately 2600 Bq. Uranium decays by alpha-particle emission. The progeny of uranium-238, uranium-235, and uranium-234 have a total activity of approximately 2600 Bq and decay by alpha- and beta-particle emission. None of the alpha or beta particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 11 keV to 2.0 MeV are also emitted. Most of these photons escape from the SRM ampoule but their intensities are so small that they do not represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains nitric acid (HNO_3) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least August 2007.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
November 1997

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

PROPERTIES OF SRM 4321C
(Certified values are shown in bold type)

Source identification number	NIST SRM 4321C		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.053 ± 0.001) $g \cdot mL^{-1}$ at 21.4 °C** [b]*		
Solution mass	**(5.258 ± 0.002) g** [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration ($mol \cdot L^{-1}$)	Mass Fraction ($g \cdot g^{-1}$)
	H_2O	53	0.91
	HNO_3	1.0	0.06
	$UO_2(NO_3)_2$	0.09	0.03
Radiological Properties:			
Radionuclide	**Natural Uranium (Mixture of U-238, U-235, and U-234)**		
Reference time	**1200 EST, 1 August 1997**		
Massic activity of the solution [c]	**U-238: 242.0 $Bq \cdot g^{-1}$** **U-235: 11.14 $Bq \cdot g^{-1}$** **U-234: 233.1 $Bq \cdot g^{-1}$**		
Relative expanded uncertainty (k=2)	**U-238: 0.60%** [d] [e] **U-235: 0.62%** [d] [e] **U-234: 0.98%** [d] [e]		
Mass fraction of uranium	**(0.01960 ± 0.00010) $g \cdot g^{-1}$** [b]		
Photon-emitting impurities	None detected [f]		
Half lives used	Uranium-238: $(4.468 \pm 0.003) \times 10^9$ a [g] Uranium-235: $(7.038 \pm 0.005) \times 10^8$ a [g] Uranium-234: $(2.455 \pm 0.006) \times 10^5$ a [g]		
Measuring instruments	Mass spectrometer, silicon surface-barrier detector, and $4\pi(\alpha+\beta)$ liquid-scintillation counting systems.		

*Notes and references are on pages 5 and 6.

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [h]	Relative Sensitivity Factor, $\lvert \partial y/\partial x_i \rvert \cdot (x_i/y)$ [i]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [i]
Isotopic uranium atom fraction in SRM 960	Standard deviation of the mean for repeated mass-spectrometric measurements (A)	U-238: 0.001 U-235: 0.07 U-234: 0.31	1.0 1.0 1.0	0.001 0.07 0.31
Half life	Standard uncertainty of the half life (A)	U-238: 0.07 U-235: 0.07 U-234: 0.25	1.0 1.0 1.0	0.07 0.07 0.25
Uranium mass fraction in SRM 960	Certificate value (B)	0.003	1.0	0.003
Quantitative dissolution	Estimated (B)	0.25	1.0	0.25
Gravimetric measurements	Estimated (B)	0.10	1.0	0.10
Photon-emitting impurities	Limit of detection (B) [k]	100.	0.001	0.10
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)			U-238: U-235: U-234:	0.30 0.31 0.49
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)			U-238: U-235: U-234:	0.60 0.62 0.98

*Notes and references are on pages 5 and 6.

NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	<0.1	-	-

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) = |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y.

The **combined standard uncertainty** of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U, the **expanded uncertainty** of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic count rate is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[f] Estimated limits of detection for photon-emitting impurities are:
1.4 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 8 and 59 keV,
1.1 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 67 and 88 keV,
0.5 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 102 and 197 keV,
0.3 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 205 and 762 keV,
0.2 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 770 and 996 keV, and
0.1 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 1006 and 1900 keV,
provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of uranium-238, uranium-235, uranium-234, or their progeny.

[g] The stated uncertainty is the standard uncertainty. See reference [5].

[h] Relative standard uncertainty of the input quantity x_i.

[i] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[j] Relative component of combined standard uncertainty of output quantity y, rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y = |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

[k] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y)$ = {(response per Bq of impurity)/(response per Bq of U-238)}·{(Bq of impurity)/(Bq of U-238)}. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), August 1997.

74
PROJECT 914 3610 74 U-232

Notebook No. 3610
Continued From Page N/A

Prepare a Working dilution of ~20 dpm/ml from 914.3610.62

Note * *

Density of 1.M HNO_3 lot #'s J71044 + J02033

			balance #
Mass of 100 ml Vol flask	JDD 8/13/10 ~~66.4334 g~~	56.4413 g	12
Mass of flask + Acid	~~166.5111 g~~	159.3439 g	1
Net:	~~100.0777 g~~	102.9026 g	

ρ = 1.0290 g/ml

Mass of Parent transferred	JDD 8/13	
Mass of 1000 ml Nalgene	74.6~~8~~439 g	12
Mass of Nalgene + Std	77.0507 g	1
Net:	2.4068 g	

Dilute to final mass		
Gross mass: Nalgene, Std, + Diluent	973.6 g	26
Mass of Nalgene	74.6439 g	12
Net:	898.9561 g	

Activity

$$\left(7261.8 \frac{dpm}{g}\right)\left(\frac{2.4068\,g}{898.9561\,g}\right)\left(1.0290\,g/ml\right) = \boxed{20.01\ dpm/ml}$$

Note: Density of Acid lot # J02033 was different than historical amount and was not used. JDD 8/13/10

RG 12/10/10

Stnd ID: 914.3610.74

RG 12/10/10

Description: U-232
Expiration: 10/24/2011
Activity: 20.01 dpm/mL

2s Uncertainty: 0.98 dpm/mL
Ref. Date: 5/27/2010
Ref Time: N/A
Prep Date: 8/13/2010 Prep by: JD
Matrix/Comp. 1M HNO3
Half Life (y): 6.89E+01

Reverification Log		
Analysis Date	Initials	Expiration Date

RG 12/10/10

Continued on Page

RG 12/10/10

Read and Understood By

Signed 8/13/10 Date Signed 10/22/10 Date

62
PROJECT 914.3610-62 U-232

Notebook No. 3610
Continued From Page

Prepare a Intermediate dilution of RCO # 814

Diluent is 1M HNO_3 Acid lot # J11044

Mass of parent transferred.		bal #
Mass of Open foil Ampule + Beaker	38.0690 g	12
Mass of Empty Ampule + Beaker	32.9311 g	4
Net mass transferred	5.1379 g	

Dilute to final Mass		
Mass of Vial, Std, + Diluent	58.6555 g	12
Mass of Vial	21.5981 g	1
Net Mass of New dilution	37.0574 g	

Final Activity

$$\left(4.552 \times 10^3 \text{ Bq}\right)\left(\frac{60 \text{ dpm}}{1 \text{ Bq}}\right)\left(\frac{5.1379 \text{ g}}{5.21459 \text{ g}}\right)\left(\frac{1}{37.0574 \text{ g}}\right) = 7261.8 \frac{\text{dpm}}{\text{g}}$$

Continued on Page

Read and Understood By

Signed

6/4/10
Date

Signed

06-17-2010
Date

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

Rec 6-1-10 RSO# 914

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

82306-307

U-232 5 mL Liquid in Flame Sealed Vial

Customer: ALS Laboratory Group / Fort Collins
P.O. No.: 73625 04-29-10, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty* , % Type u_A	u_B	U	Reference Date (12:00 PM EST)
U-232	2.617E+04	4.552E+03	0.5	2.4	4.9	05/27/2010

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities (other than decay products) <0.1%. 6.21459 g 1M HNO3 solution, carrier free.

Source Prepared by: _____
W. Mao, Radiochemist

QA Approved: _____ Date: 5/27/10
J. D. McCorvey, QA Manager Alternate

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

ANA Form005 Rev. ---

Single Isotope Certificate, Rev 1 9/28/2009

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

Alpha Spectroscopy

Quality Control Data

Weekly Background, Energy, and Efficiency Calibrations

Calibration Data Summary

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011
6:20:34 PM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
1012143-1	SMP	AS101228-1	UISO	29	C11010429	1/4/2011	28.48	Pass	27.50	27.99	29.92	30.40
Spectrum #1		AS101228-1U			B11010429	1/4/2011	0.3670	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010429	1/4/2011	5545.9	Pass	5486.0	5496.0	5576.0	5586.0
1012143-2	SMP	AS101228-1	UISO	30	C11010430	1/4/2011	28.36	Pass	26.99	27.45	29.36	29.83
Spectrum #1		AS101228-1U			B11010430	1/4/2011	0.3400	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010430	1/4/2011	5545.9	Pass	5514.0	5524.0	5604.0	5614.0
1012143-3	SMP	AS101228-1	UISO	31	C11010431	1/4/2011	29.55	Pass	28.09	28.58	30.56	31.05
Spectrum #1		AS101228-1U			B11010431	1/4/2011	0.3960	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010431	1/4/2011	5545.9	Pass	5496.0	5506.0	5586.0	5596.0
1012143-4	SMP	AS101228-1	UISO	32	C11010432	1/4/2011	29.72	Pass	27.99	28.48	30.44	30.93
Spectrum #1		AS101228-1U			B11010432	1/4/2011	0.3950	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010432	1/4/2011	5543.9	Pass	5488.0	5498.0	5578.0	5588.0
1012143-5	SMP	AS101228-1	UISO	58	C11010458	1/4/2011	30.59	Pass	29.55	30.06	32.14	32.66
Spectrum #1		AS101228-1U			B11010458	1/4/2011	0.0964	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010458	1/4/2011	5565.7	Pass	5496.0	5506.0	5586.0	5596.0
1012143-6	SMP	AS101228-1	UISO	59	C11010459	1/4/2011	30.80	Warning	28.17	28.66	30.64	31.13
Spectrum #1		AS101228-1U			B11010459	1/4/2011	0.3774	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010459	1/4/2011	5546.0	Pass	5515.6	5525.6	5605.6	5615.6
1012143-7	SMP	AS101228-2	UISO	16	C11010416	1/4/2011	29.20	Pass	27.91	28.41	30.35	30.85
Spectrum #1		AS101228-2U			B11010416	1/4/2011	0.2400	Pass	0.0000	0.0498	0.4980	0.7500
1/6/2011					C11010416	1/4/2011	5545.9	Pass	5497.9	5507.9	5587.9	5597.9
1012143-8	SMP	AS101228-2	UISO	17a	C11010417	1/4/2011	31.08	Pass	28.99	29.50	31.54	32.05
Spectrum #1		AS101228-2U			B11010417	1/4/2011	0.3970	Pass	0.0000	0.0498	0.4980	0.7500
1/6/2011					C11010417	1/4/2011	5543.9	Pass	5486.5	5496.5	5576.5	5586.5
1012143-9	SMP	AS101228-2	UISO	18	C11010418	1/4/2011	30.05	Pass	28.65	29.15	31.17	31.67
Spectrum #1		AS101228-2U			B11010418	1/4/2011	0.3880	Pass	0.0000	0.0498	0.4980	0.7500
1/6/2011					C11010418	1/4/2011	5543.9	Pass	5496.0	5506.0	5586.0	5596.0

Data Package ID: *UR1012143-1*

Abbreviations:
Eff - Efficiency; Bkg - Background; LCL - Lower Control Limit; UWL - Upper Warning Limit
Egy - Energy; CPM - Counts per Minute; LWL - Lower Warning Limit; UCL - Upper Control Limit; CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Calibration Data Summary

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012143

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011
5:40:07 PM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	**RESULTS** %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	**LCL** %Efficiency Bkg CPM Energy keV	**LWL** %Efficiency Bkg CPM Energy keV	**UWL** %Efficiency Bkg CPM Energy keV	**UCL** %Efficiency Bkg CPM Energy keV
1012143-10	SMP	AS101228-2	UISO	19	C11010419	1/4/2011	29.00	Pass	27.99	28.48	30.44	30.93
Spectrum #1		AS101228-2U			B11010419	1/4/2011	0.3750	Pass	0.0000	0.0498	0.4980	0.7500
1/6/2011					C11010419	1/4/2011	5545.9	Pass	5496.0	5506.0	5586.0	5596.0
1012143-11	SMP	AS101228-2	UISO	25	C11010425	1/4/2011	29.05	Pass	26.95	27.42	29.32	29.79
Spectrum #1		AS101228-2U			B11010425	1/4/2011	0.4420	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010425	1/4/2011	5546.0	Pass	5496.0	5506.0	5586.0	5596.0
AS101228-1	MB	AS101228-1	UISO	60	C11010460	1/4/2011	29.88	Pass	28.15	28.64	30.62	31.11
Spectrum #1		AS101228-1U			B11010460	1/4/2011	0.2636	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010460	1/4/2011	5555.8	Pass	5492.0	5502.0	5582.0	5592.0
AS101228-1	LCS	AS101228-1	UISO	61	C11010461	1/4/2011	31.49	Warning	28.67	29.17	31.18	31.69
Spectrum #1		AS101228-1U			B11010461	1/4/2011	0.2277	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010461	1/4/2011	5555.8	Pass	5513.6	5523.6	5603.6	5613.6
AS101228-1	LCSD	AS101228-1	UISO	62	C11010462	1/4/2011	29.70	Warning	27.06	27.53	29.43	29.91
Spectrum #1		AS101228-1U			B11010462	1/4/2011	0.3426	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010462	1/4/2011	5527.1	Pass	5513.6	5523.6	5603.6	5613.6
AS101228-2	MB	AS101228-2	UISO	62	C11010462	1/4/2011	29.70	Warning	27.06	27.53	29.43	29.91
Spectrum #1		AS101228-2U			B11010462	1/4/2011	0.3426	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010462	1/4/2011	5527.1	Pass	5513.6	5523.6	5603.6	5613.6
AS101228-2	LCS	AS101228-2	UISO	63	C11010463	1/4/2011	31.42	Pass	29.41	29.93	31.99	32.51
Spectrum #1		AS101228-2U			B11010463	1/4/2011	0.2441	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010463	1/4/2011	5546.0	Pass	5496.5	5506.2	5586.2	5596.2
AS101228-2	LCSD	AS101228-2	UISO	64	C11010464	1/4/2011	29.80	Pass	28.41	28.90	30.90	31.40
Spectrum #1		AS101228-2U			B11010464	1/4/2011	0.2226	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010464	1/4/2011	5543.9	Pass	5496.0	5506.0	5586.0	5596.0

Data Package ID: *UR1012143-1*

Abbreviations:					
	Eff - Efficiency	Bkg - Background	LCL - Lower Control Limit	UWL - Upper Warning Limit	
	Egy - Energy	CPM - Counts per Minute	LWL - Lower Warning Limit	UCL - Upper Control Limit	CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Alpha Spec Calibration Source Re-Certification

Recalibration performed by Isotope Products Laboratories
Primary Certified Source
Source ALS ID: 190
Planchet Label: 9
Recalibrated on: 7/1/2010
Received by ALS on: 6/21/2010

Values from certificate	
Source ID:	92MIX223027
Total Activity:	3741 dpm
Ref. Date:	7/1/10

Nuclide	Act (Bq)	Act (dpm)	Half-Life (yrs)	Decay Corrected
U-234:	49.40	2965.8	2.48E+05	2965.80 dpm
U-235:	1.09	65.34	7.04E+08	65.34 dpm
Am-241:	11.80	709.6	432.17	709.59 dpm
			TOTAL	3740.73 dpm

Efficiency Determination for Detector: 13

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Total cpm	Known dpm	Detector efficiency
92MIX223027	190	97-19-103-09	9/7/10	7489	32217	1072	2100	1165.09	3740.73	31.15%

Sources 1 through 8 activity determination

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Detector Efficiency	Am-241 dpm	U-234 dpm	U-235 dpm	Combined dpm
92MIX2203026	182	97-19-103-01	9/7/10	13260	80178	2247	2100	31.15%	1215.39	7355.04	206.13	8777.56
92MIX2203028	183	97-19-103-02	9/7/10	16216	158469	4008	2100	31.15%	1487.56	14538.89	367.67	16392.12
92MIX2203024	184	97-19-103-03	9/7/10	72679	75317	1928	2100	31.15%	6667.13	6909.13	176.86	13753.12
92MIX2203021	185	97-19-103-04	9/7/10	23210	64459	2048	2100	31.15%	2129.14	5913.08	187.87	8230.09
92MIX2203025	186	97-19-103-05	9/7/10	101866	124700	3398	2100	31.15%	9344.57	11439.22	311.71	21095.50
92MIX2203022	187	97-19-103-06	9/7/10	78536	69360	2162	2100	31.15%	7204.42	7557.12	198.33	15959.87
92MIX2203023	188	97-19-103-07	9/7/10	46086	71046	1885	2100	31.15%	4227.65	6517.33	172.92	10917.90
92MIX2203029	189	97-19-103-08	9/10/10	34718	219846	6354	2100	31.15%	3184.82	20167.34	582.68	23935.04

Efficiency Verification

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	Count dur (s)	Total cpm	Known dpm	Detector efficiency	RPD	FLAG
92MIX223027	190	97-19-103-09	9/7/10	7710	32190	1055	2100	1170.46	3740.73	31.29%	-0.46%	PASS

Sources 1 through 8 activity re-verification

Source Serial#	PA ID	Sequential #	Combined Observed dpm	Combined Certified dpm*	Percent Difference %	Within 5% of Certified value?
92MIX2203026	182	97-19-103-01	8777.56	8862.31	-0.96%	Yes
92MIX2203028	183	97-19-103-02	16392.12	16005.14	2.41%	Yes
92MIX2203024	184	97-19-103-03	13753.12	13564.84	1.39%	Yes
92MIX2203021	185	97-19-103-04	8230.09	8181.17	0.60%	Yes
92MIX2203025	186	97-19-103-05	21095.50	21064.32	0.15%	Yes
92MIX2203022	187	97-19-103-06	15959.87	15355.51	-1.86%	Yes
92MIX2203023	188	97-19-103-07	10917.90	10765.61	1.41%	Yes
92MIX2203029	189	97-19-103-08	23935.04	23624.62	1.31%	Yes

* Certificate values decay corrected to the count date

Data from certificates

Reference Date	U-234 (Bq)	U-234 (dpm)	U-235 (Bq)	U-235 (dpm)	Am-241 (Bq)	Am-241 (dpm)
5/1/2003	124.10	7446.00	2.43	145.74	21.43	1285.80
5/1/2003	239.30	14358.00	4.20	252.00	23.55	1413.00
5/1/2003	119.40	7164.00	1.93	115.56	106.00	6360.00
4/1/2003	101.00	6060.00	1.26	75.64	34.50	2070.00
4/1/2003	203.00	12180.00	3.41	204.72	146.40	8784.00
4/1/2003	132.90	7974.00	3.17	189.96	121.30	7278.00
4/1/2003	107.10	6426.00	0.93	55.54	72.25	4335.60
5/1/2003	334.80	20088.00	6.55	393.18	53.02	3181.20

Ok JP
9/22/10

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
11:58:48AM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 190(#9)
Description:

Analysis Date: 9/7/2010 11:58:29AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

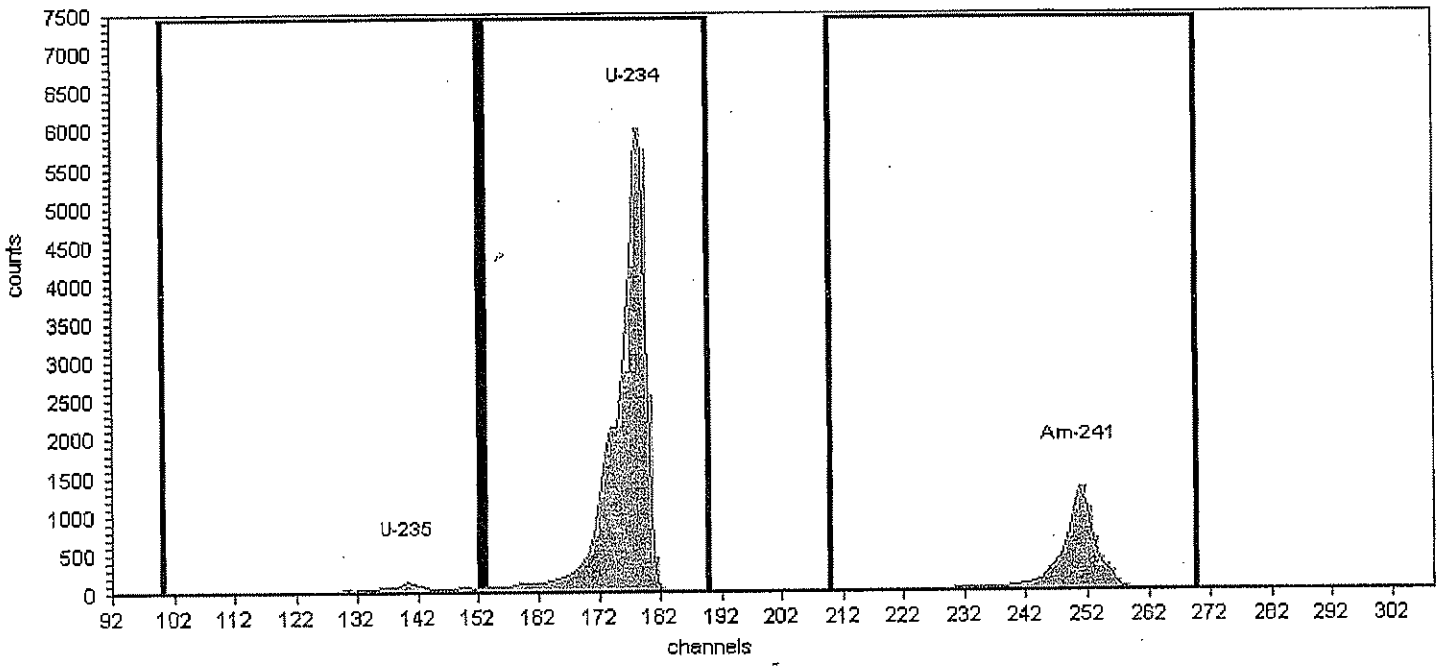
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 11:06:07AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190(#9)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.63% +/- 0.31% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,072.00	30.63
U-234	178	4.78	153	190	32,217.00	920.49
Am-241	251	5.49	210	270	7,489.00	213.97

MR 9-8-10

JP 9/22/10

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
12:43:42PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 182(#1)
Description:

Analysis Date: 9/7/2010 12:43:35PM
Calibration Type: Energy

Source Info

Certificate ID: A1 RSO#182
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:24PM

Acquisition

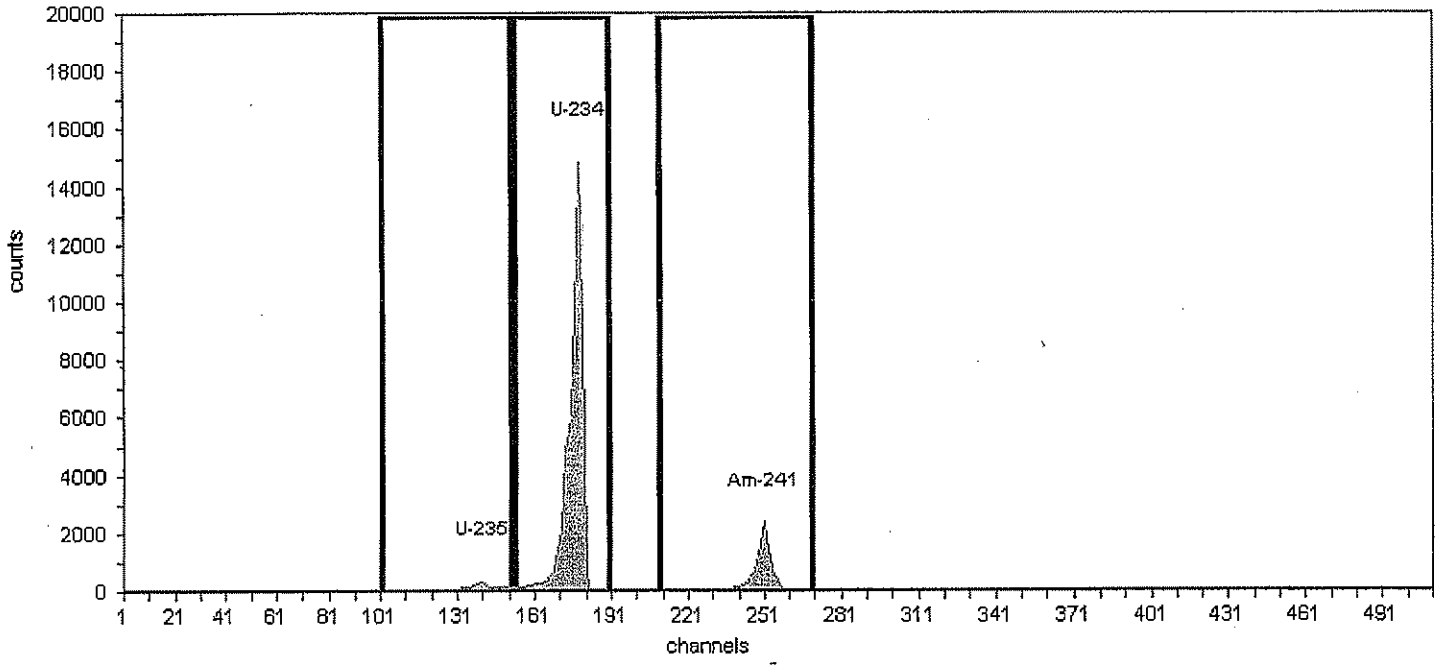
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 12:06:25PM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 182(#1)

Energy Calibration Equation:
Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.62% +/- 0.20% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	101	152	2,247.00	64.20
U-234	178	4.78	153	190	80,178.00	2,290.80
Am-241	250	5.49	210	270	13,260.00	378.86

CC 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
1:27:44PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 183(#2)
Description:

Analysis Date: 9/7/2010 1:27:38PM
Calibration Type: Energy

Source Info

Certificate ID: A2 RSO#183
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

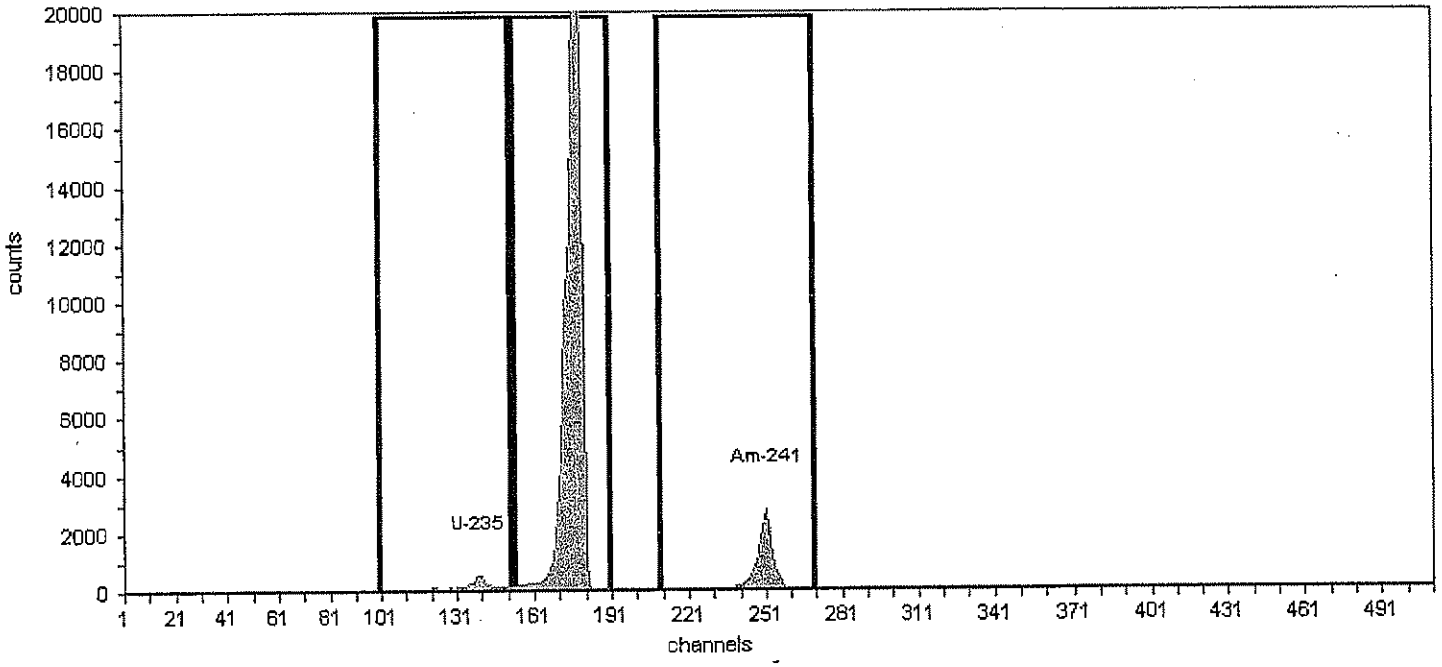
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 12:45:24PM

Live Time: 35.00 min.
Real Time: 35.06 min.

Efficiency Calibration Name: RSO 183(#2)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch
Offset = 3,043.84 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.77% +/- 0.15% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	4,008.00	114.51
U-234	178	4.78	153	190	158,468.00	4,527.66
Am-241	251	5.49	210	270	16,216.00	463.31

MC 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 13
2:09:31PM 9/7/2010

Calibration

Energy Calibration: RSO 184(#3)
Description:

Analysis Date: 9/7/2010 2:09:24PM
Calibration Type: Energy

Source Info

Certificate ID: A3 RSO#184
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

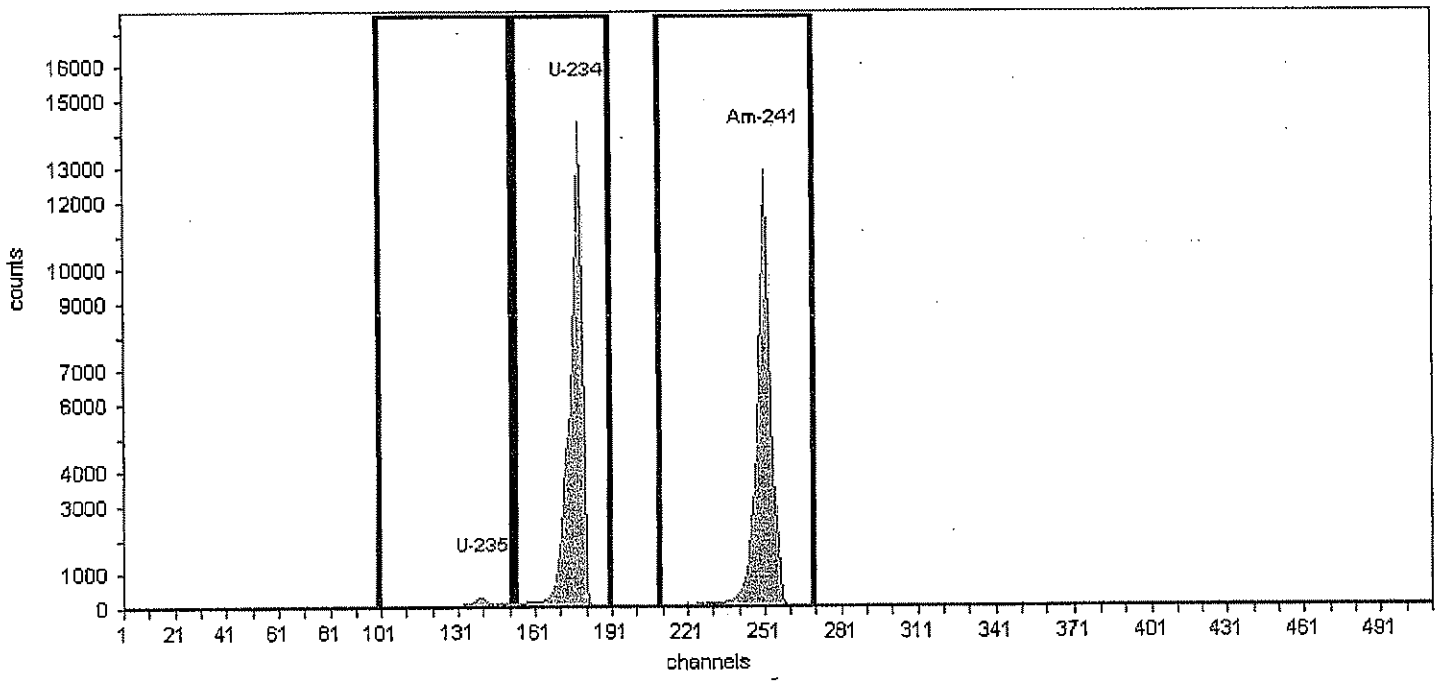
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 1:29:06PM

Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 184(#3)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.40% +/- 0.16% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,928.00	55.09
U-234	178	4.78	153	190	75,317.00	2,151.91
Am-241	251	5.49	210	270	72,679.00	2,076.54

LL 9-8-10
JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
2:54:34PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 185(#4)
Description:

Analysis Date: 9/7/2010 2:53:55PM
Calibration Type: Energy

Source Info

Certificate ID: A4 RSO#185
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

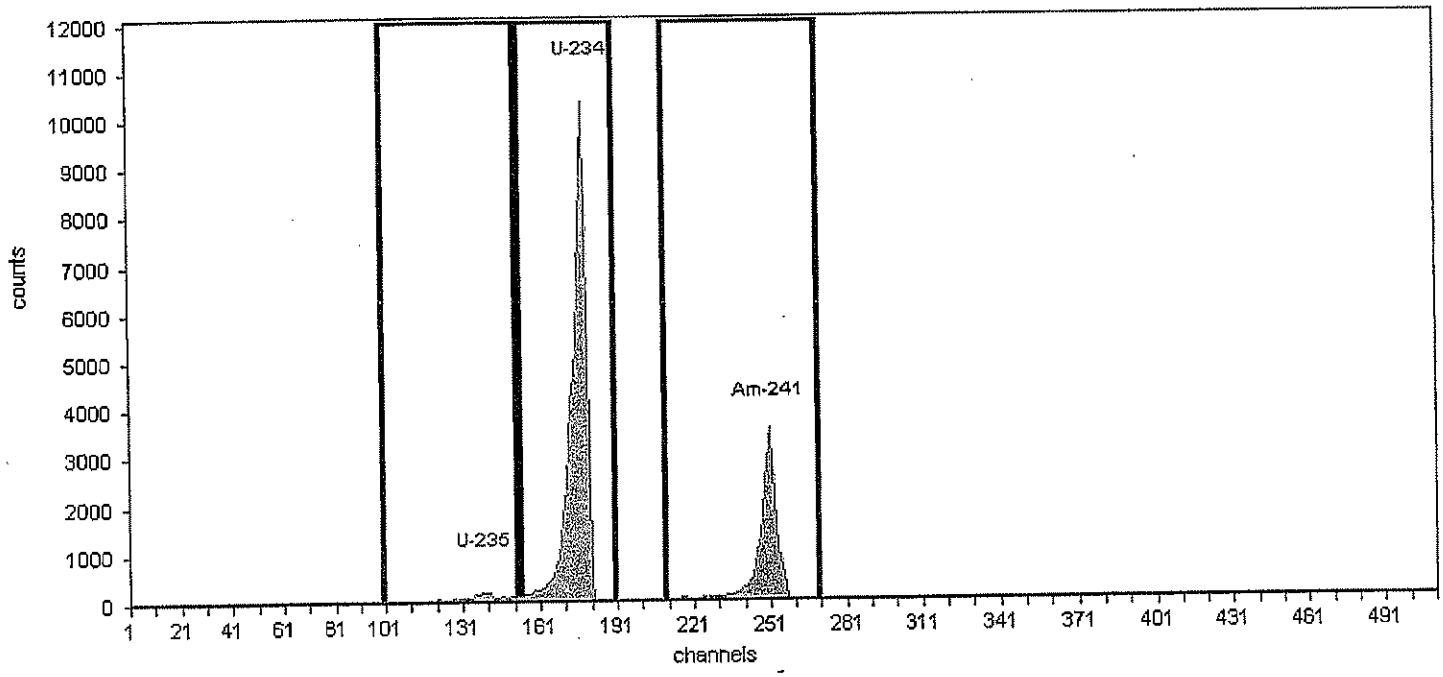
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 2:13:33PM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 185(#4)

Energy Calibration Equation:
Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.90% +/- 0.21% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	2,048.00	58.51
U-234	178	4.78	153	190	64,459.00	1,841.69
Am-241	250	5.49	210	270	23,210.00	663.14

WL 9-8-10

JP 9/22/10

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

3:40:07PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 186(#5)
Description:

Analysis Date: 9/7/2010 3:39:59PM
Calibration Type: Energy

Source Info

Certificate ID: A5 RSO#186
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

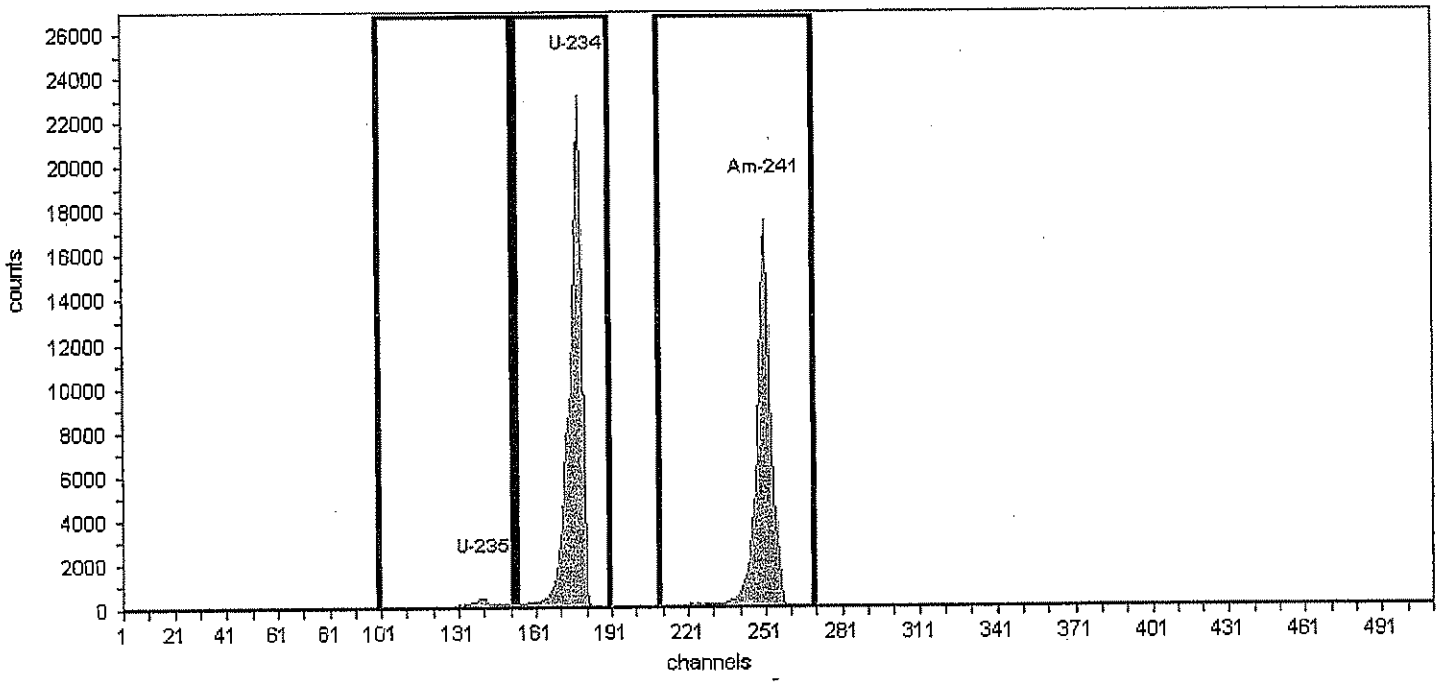
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 2:56:37PM

Live Time: 35.00 min.
Real Time: 35.08 min.

Efficiency Calibration Name: RSO 186(#5)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.95% +/- 0.13% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	3,398.00	97.09
U-234	178	4.78	153	190	124,700.00	3,562.86
Am-241	251	5.49	210	270	101,856.00	2,910.46

CC 9-8-10

JP 9/22/10

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 13

4:19:19PM 9/7/2010

Calibration

Energy Calibration: RSO 187(#6)
Description:

Analysis Date: 9/7/2010 4:19:10PM
Calibration Type: Energy

Source Info

Certificate ID: A6 RSO#187
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

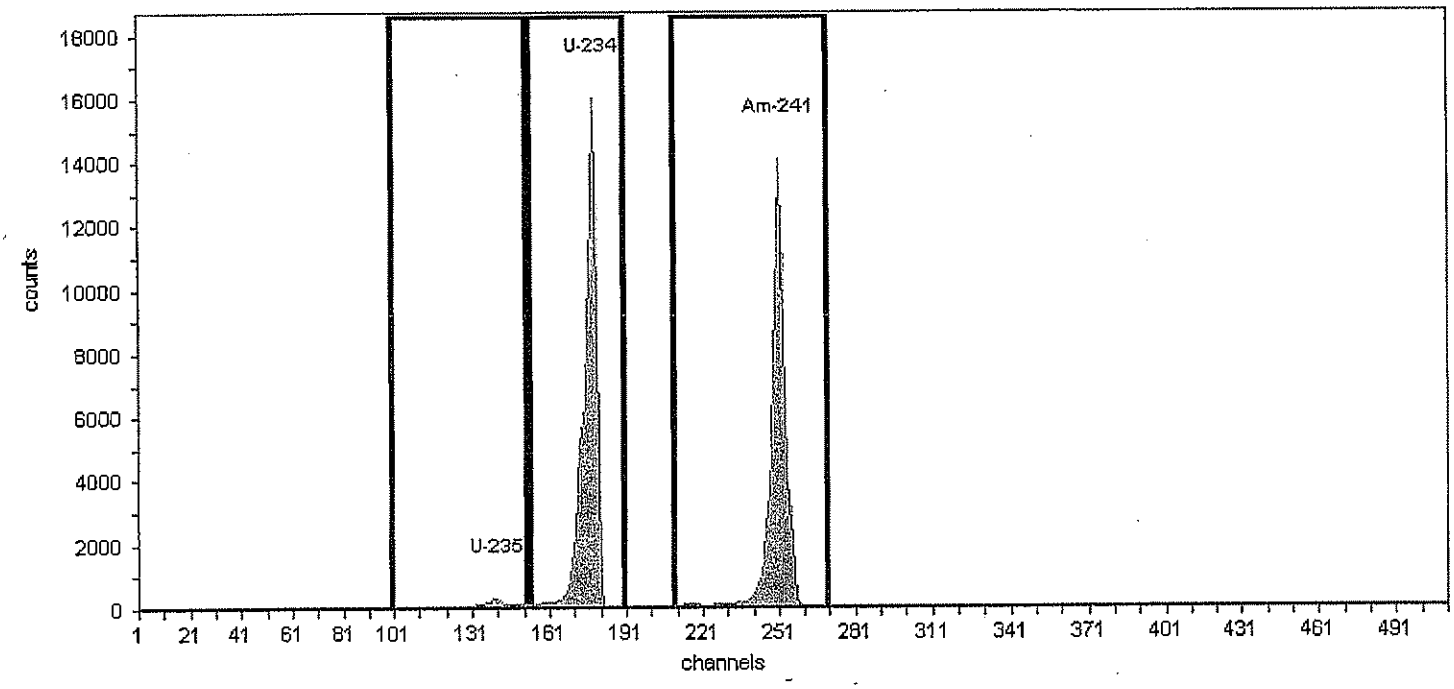
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 3:43:11PM

Live Time: 35.00 min.
Real Time: 35.06 min.

Efficiency Calibration Name: RSO 187(#6)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.54% +/- 0.15% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	2,162.00	61.77
U-234	178	4.78	153	190	83,580.00	2,388.00
Am-241	251	5.49	210	270	78,536.00	2,243.89

WL 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
4:58:15PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 188(#7)
Description:

Analysis Date: 9/7/2010 4:58:08PM
Calibration Type: Energy

Source Info

Certificate ID: A7 RSO#188
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

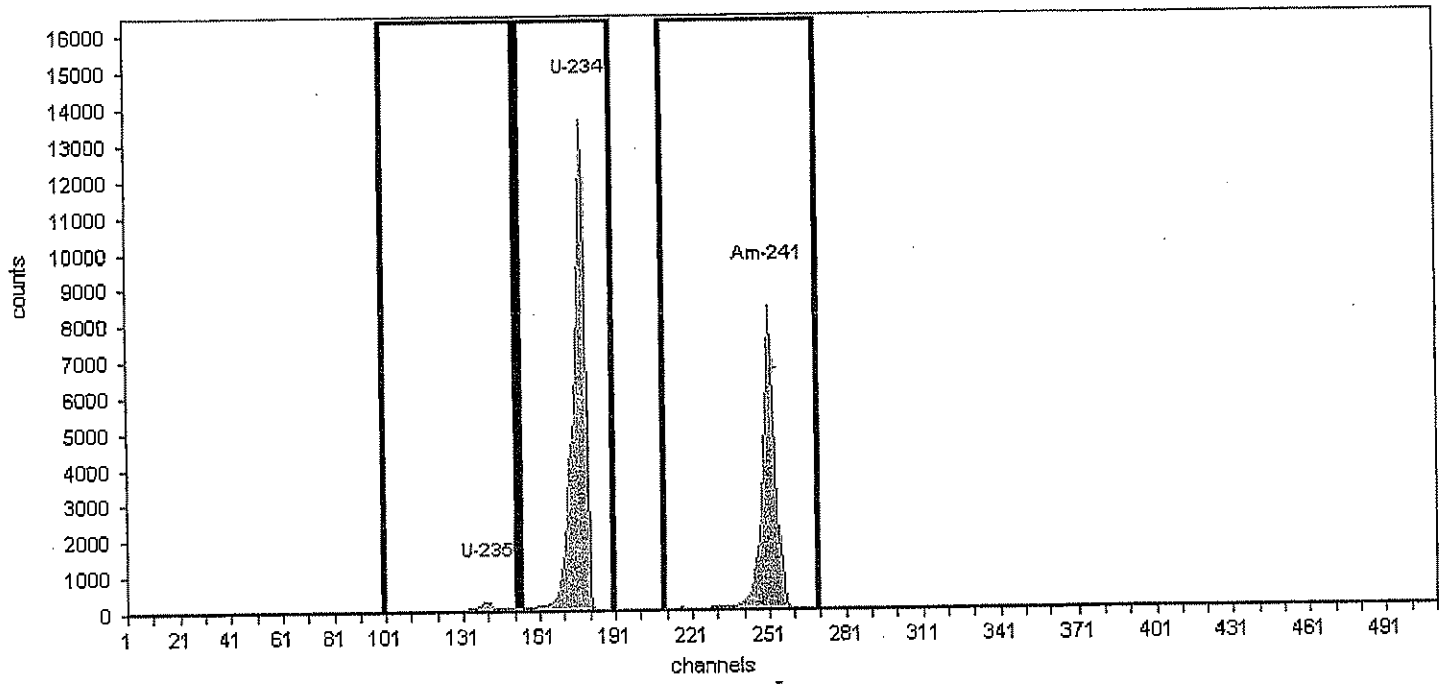
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 4:21:32PM

Live Time: 35.00 min.
Real Time: 35.04 min.

Efficiency Calibration Name: RSO 188(#7)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.26% +/- 0.18% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,885.00	53.86
U-234	178	4.78	153	190	71,046.00	2,029.89
Am-241	251	5.49	210	270	46,086.00	1,316.74

LL 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
10:29:59AM 9/10/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 189(#8)A
Description:

Analysis Date: 9/10/2010 10:29:52AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A8 RSO#189
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

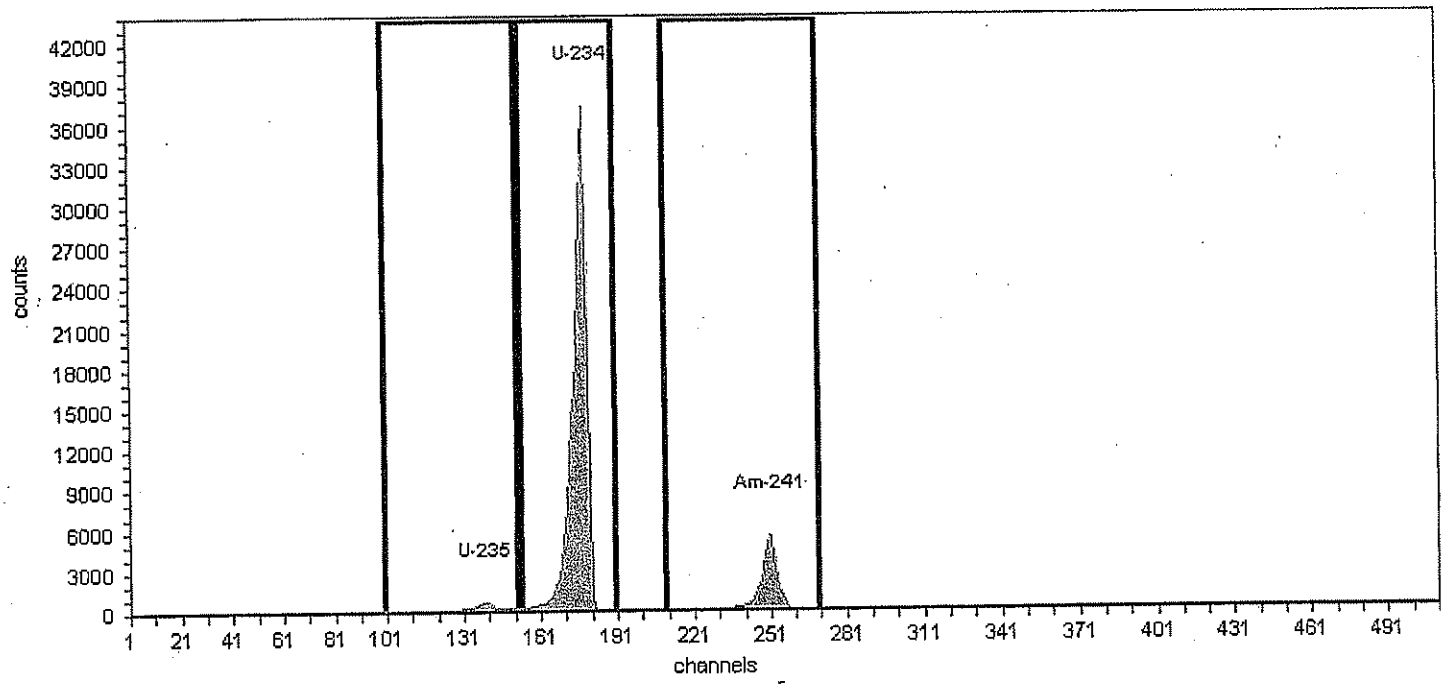
Detector: 13 , SN:
Acquisition Start Date: 9/10/2010 9:51:03AM

Live Time: 35.00 min.
Real Time: 35.09 min.

Efficiency Calibration Name: RSO 189(#8)A

Energy Calibration Equation:
Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.43% +/- 0.12% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	6,354.00	181.54
U-234	178	4.78	153	190	219,846.00	6,281.32
Am-241	250	5.49	210	270	34,718.00	991.94

MA 9-10-10

JP 9/22/10

AlphaVision v5.3 **Alpha Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
6:16:25PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 190(#9)A
Description:

Analysis Date: 9/7/2010 6:16:17PM
Calibration Type: Energy

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

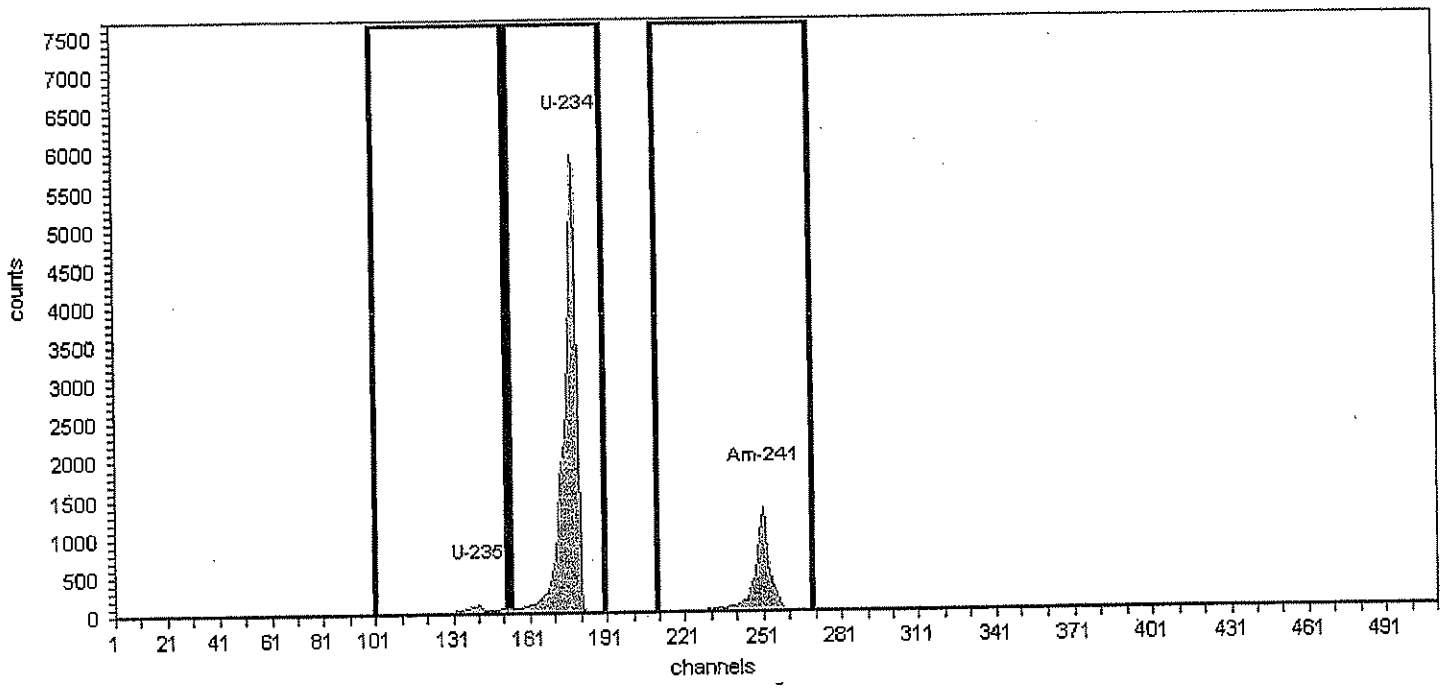
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 5:39:50PM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190(#9)A

Energy Calibration Equation:
Gain = 9.8810 keV / Ch
Offset = 3,008.45 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.78% +/- 0.31% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	141	4.40	100	152	1,066.00	30.46
U-234	178	4.78	153	190	32,190.00	919.71
Am-241	251	5.49	210	270	7,710.00	220.29

cc 9-8-10

JP 9/22/10

Eckert & Ziegler
Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

Rec'd 4/21/10 email
#190

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide:	U-234	**Customer:**	ALS LABORATORY GROUP, FORT COLLINS
Radionuclide:	U-235	**P.O. No.:**	FC 1750/R4703
Radionuclide:	Am-241	**Catalog No.:**	MISC-STD
Half-life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Jul-10 12:00 PST
Half-life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX223027
Half-life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	1.336	**nCi,**	49.43	**Bq**	Am-241:	0.3197	**nCi,**	11.83	**Bq**
U-235:	0.02942	**nCi,**	1.089	**Bq**	Total Activity:	1.685	**nCi,**	62.35	**Bq**

Physical Description:

A. Capsule type:	Disk (47 mm OD x 0.76 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxide
C. Active diameter/volume:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in May 2001.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	±	0.6	%
B. Type B (systematic) uncertainty:	±	3.0	%
C. Uncertainty in aliquot weighing:	±	0.0	%
D. Total uncertainty at the 99% confidence level:	±	3.1	%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11889 α/min in 2π on 10-Jun-10.

Quality Control

15 Jun 10
Date

IPL Ref. No.: 1143-48

Re-Verified 9/18/2010
Exp 9/18/2011
JP 9/22/10

PAI 187
recalibrate 4-1505

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203026
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.354 nCi	(124.1 Bq)	Am-241:	0.5793 nCi	(21.43 Bq)
U-235:	0.06566 nCi	(2.429 Bq)	Total Activity:	3.999 nCi	(148.0 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.7%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4483 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10
PAI 183
Recalibrated 4-15-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203028

Contained Radioactivity:

U-234:	6.467	nCi	(239.3 Bq)	Am-241:	0.6366	nCi	(23.55 Bq)
U-235:	0.1135	nCi	(4.200 Bq)	Total Activity:	7.217	nCi	(267.1 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.7%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:
- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 8091 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10
PAT I.D 184
recalibrated 4-1503

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203024
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.227	nCi (119.4 Bq)	Am-241:	2.866	nCi (106.0 Bq)
U-235:	0.05205	nCi (1.926 Bq)	Total Activity:	6.145	nCi (227.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 6889 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10
PAI ID 00185
rec'd from recalibrator
3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203021

Contained Radioactivity:

U-234:	2.731	nCi	(101.0 Bq)	Am-241:	0.9325	nCi (34.50 Bq)
U-235:	0.03416	nCi	(1.264 Bq)	Total Activity:	3.698	nCi (136.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:
- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4145 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10
PAI ID 00186
Recalibration received 3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203025

Contained Radioactivity:

U-234:	5.486	nCi	(203.0 Bq)	Am-241:	3.958	nCi	(146.4 Bq)
U-235:	0.09221	nCi	(3.412 Bq)	Total Activity:	9.536	nCi	(352.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 10690 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsen
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/8/2010
Exp. 9/8/2011
JP 9/22/10

RAID 00187
recd from recalibration
3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203022
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.592 nCi	(132.9 Bq)	Am-241:	3.279 nCi	(121.3 Bq)
U-235:	0.08556 nCi	(3.166 Bq)	Total Activity:	6.957 nCi	(257.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 7799 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10

PAIP 188
rec'd for recalibration
3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203023

Contained Radioactivity:

U-234:	2.895	nCi (107.1 Bq)	Am-241:	1.953	nCi (72.26 Bq)
U-235:	0.02502	nCi (0.9257 Bq)	Total Activity:	4.873	nCi (180.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:
- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 5463 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/10/2010
Exp 9/8/2011
JP 9/22/11

PAI IO 189
recd 9-2-03
recalibrated 4-15-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203029

Contained Radioactivity:

U-234:	9.048	nCi	(334.8 Bq)	Am-241:	1.433	nCi	(53.02 Bq)
U-235:	0.1771	nCi	(6.553 Bq)	Total Activity:	10.66	nCi	(394.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.0%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11950 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

28-Dec-2010

Wil King
Terracon
13910 W. 96th Terrace
Lenexa, KS 66215

Tel: (913) 492-7777
Fax: (913) 492-7443

Re: Bannister Complex Work Order: **1012251**

Dear Wil,

ALS Environmental received 11 samples on 10-Dec-2010 10:54 AM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Laboratory Group. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 10.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

Chris Gibson

Electronically approved by: Rob Nieman

Chris Gibson
Project Manager

ALS Environmental

Date: 28-Dec-10

Client: Terracon
Project: Bannister Complex
Work Order: **1012251**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
1012251-01	B2F1-OB15:5-Be/U/Y-Air	Air		11/24/2010	12/10/2010 10:54	☐
1012251-02	B2F1-OB6-Be/U/Y-Air	Air		11/24/2010	12/10/2010 10:54	☐
1012251-03	B2F1-OA26-Be/U/Y-Air	Air		11/24/2010	12/10/2010 10:54	☐
1012251-04	Bld2-Fan House3-Be/U/Y-Air	Air		11/24/2010	12/10/2010 10:54	☐
1012251-05	B1F1-F25-Be/U/Y-Air	Air		11/24/2010	12/10/2010 10:54	☐
1012251-06	B1F1-A25-Be/U/Y-Air	Air		11/24/2010	12/10/2010 10:54	☐
1012251-07	B1F1-Q19-Be/U/Y-Air	Air		11/24/2010	12/10/2010 10:54	☐
1012251-08	B1F1-410-Be/U/Y-Air	Air		11/24/2010	12/10/2010 10:54	☐
1012251-09	B1F1-R18-Be/U/Y-Air	Air		11/24/2010	12/10/2010 10:54	☐
1012251-10	Dup2-Be/U/Y-Air	Air		11/24/2010	12/10/2010 10:54	☐
1012251-11	Blank2 Air	Air		11/24/2010	12/10/2010 10:54	☐

ALS Environmental

Date: 28-Dec-10

Client: Terracon
Project: Bannister Complex
Work Order: 1012251

Case Narrative

The sample condition upon receipt was acceptable except where noted.

Results relate only to the items tested and are not blank corrected unless indicated.

ALS Environmental

Date: *28-Dec-10*

Client: Terracon
Project: Bannister Complex

Work Order: 1012251

Lab ID: 1012251-01A
Collection Date: 11/24/2010
Client Sample ID: B2F1-OB15:5-Be/U/Y-Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4302**	Analyst: **CEG**
Date Analyzed: 12/22/2010 16:37	µg/sample	Reporting Limit µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000046	
Uranium	ND	0.30	<0.000070	
Yttrium	ND	0.040	<0.0000093	

Lab ID: 1012251-02A
Collection Date: 11/24/2010
Client Sample ID: B2F1-OB6-Be/U/Y-Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4194**	Analyst: **CEG**
Date Analyzed: 12/22/2010 16:42	µg/sample	Reporting Limit µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000048	
Uranium	ND	0.30	<0.000072	
Yttrium	ND	0.040	<0.0000095	

Lab ID: 1012251-03A
Collection Date: 11/24/2010
Client Sample ID: B2F1-OA26-Be/U/Y-Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4278.74**	Analyst: **CEG**
Date Analyzed: 12/22/2010 16:47	µg/sample	Reporting Limit µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000047	
Uranium	ND	0.30	<0.000070	
Yttrium	ND	0.040	<0.0000093	

Note:

ALS Environmental

Date: *28-Dec-10*

Client: Terracon
Project: Bannister Complex

Work Order: 1012251

Lab ID: 1012251-04A
Collection Date: 11/24/2010
Client Sample ID: Bld2-Fan House3-Be/U/Y-Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4324.9**	Analyst: **CEG**
Date Analyzed: 12/22/2010 16:52	µg/sample	Reporting Limit µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000046	
Uranium	ND	0.30	<0.000069	
Yttrium	ND	0.040	<0.0000092	

Lab ID: 1012251-05A
Collection Date: 11/24/2010
Client Sample ID: B1F1-F25-Be/U/Y-Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4352.4**	Analyst: **CEG**
Date Analyzed: 12/22/2010 16:57	µg/sample	Reporting Limit µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000046	
Uranium	ND	0.30	<0.000069	
Yttrium	ND	0.040	<0.0000092	

Lab ID: 1012251-06A
Collection Date: 11/24/2010
Client Sample ID: B1F1-A25-Be/U/Y-Air
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4383.44**	Analyst: **CEG**
Date Analyzed: 12/22/2010 17:02	µg/sample	Reporting Limit µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000046	
Uranium	ND	0.30	<0.000068	
Yttrium	ND	0.040	<0.0000091	

Note:

ALS Environmental

Date: *28-Dec-10*

Client: Terracon
Project: Bannister Complex

Work Order: 1012251

Lab ID: 1012251-07A
Client Sample ID: B1F1-Q19-Be/U/Y-Air

Collection Date: 11/24/2010
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4244.1**	Analyst: **CEG**
Date Analyzed: 12/22/2010 17:07		Reporting Limit		
	µg/sample	µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000047	
Uranium	ND	0.30	<0.000071	
Yttrium	ND	0.040	<0.0000094	

Lab ID: 1012251-08A
Client Sample ID: B1F1-410-Be/U/Y-Air

Collection Date: 11/24/2010
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4349.3**	Analyst: **CEG**
Date Analyzed: 12/22/2010 17:12		Reporting Limit		
	µg/sample	µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000046	
Uranium	ND	0.30	<0.000069	
Yttrium	ND	0.040	<0.0000092	

Lab ID: 1012251-09A
Client Sample ID: B1F1-R18-Be/U/Y-Air

Collection Date: 11/24/2010
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.		Method: **N7300**	Air Volume (L): **4362**	Analyst: **CEG**
Date Analyzed: 12/22/2010 17:17		Reporting Limit		
	µg/sample	µg/sample	mg/m3	
Beryllium	ND	0.020	<0.0000046	
Uranium	ND	0.30	<0.000069	
Yttrium	ND	0.040	<0.0000092	

Note:

ALS Environmental

Date: *28-Dec-10*

Client: Terracon
Project: Bannister Complex

Work Order: 1012251

Lab ID: 1012251-10A
Client Sample ID: Dup2-Be/U/Y-Air

Collection Date: 11/24/2010
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.	Method: **N7300**	Air Volume (L): **4188**	Analyst: **CEG**
Date Analyzed: 12/22/2010 17:33		Reporting Limit	
	µg/sample	µg/sample	mg/m3
Beryllium	ND	0.020	<0.0000048
Uranium	ND	0.30	<0.000072
Yttrium	ND	0.040	<0.0000096

Lab ID: 1012251-11A
Client Sample ID: Blank2 Air

Collection Date: 11/24/2010
Matrix: AIR

Analyses

METALS BY NIOSH 7300 MOD.	Method: **N7300**	Air Volume (L): **0**	Analyst: **CEG**
Date Analyzed: 12/22/2010 17:38		Reporting Limit	
	µg/sample	µg/sample	mg/m3
Beryllium	ND	0.020	NA
Uranium	ND	0.30	NA
Yttrium	ND	0.040	NA

Note:

ALS Environmental

Date: 28-Dec-10

Client: Terracon

Work Order: 1012251

Project: Bannister Complex

QC BATCH REPORT

Batch ID: **4227** Instrument ID: **ICP1** Method: **N7300**

MBLK Sample ID: **MBLK-4227-4227** Units: **µg/sample** Analysis Date: **12/22/2010 04:12 PM**

Client ID: Run ID: **ICP1_101222A** SeqNo: **199513** Prep Date: **12/14/2010** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Beryllium	ND	0.020								
Uranium	0.08	10								J
Yttrium	0.002	1.0								J

LCS Sample ID: **LCS-4227-4227** Units: **µg/sample** Analysis Date: **12/22/2010 04:17 PM**

Client ID: Run ID: **ICP1_101222A** SeqNo: **199514** Prep Date: **12/14/2010** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Beryllium	19.8	0.020	20	0	99	80-120	0			
Uranium	20.48	10	20	0	102	80-120	0			
Yttrium	20.52	1.0	20	0	103	80-120	0			

LCSD Sample ID: **LCSD-4227-4227** Units: **µg/sample** Analysis Date: **12/22/2010 04:32 PM**

Client ID: Run ID: **ICP1_101222A** SeqNo: **199515** Prep Date: **12/14/2010** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Beryllium	19.73	0.020	20	0	98.6	80-120	19.8	0.385		
Uranium	20.5	10	20	0	102	80-120	20.48	0.0976		
Yttrium	20.42	1.0	20	0	102	80-120	20.52	0.489		

The following samples were analyzed in this batch:

1012251-01A	1012251-02A	1012251-03A
1012251-04A	1012251-05A	1012251-06A
1012251-07A	1012251-08A	1012251-09A
1012251-10A	1012251-11A	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

ALS Environmental

Date: 28-Dec-10

Client: Terracon
Project: Bannister Complex
WorkOrder: **1012251**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SDL	Sample Detection Limit

Units Reported	Description
µg/sample	

ALS Environmental

Sample Receipt Checklist

Client Name: **TERRACON-LENEXA** Date/Time Received: **10-Dec-10 10:54**

Work Order: **1012251** Received by: **EJS**

Checklist completed by: Kelsey Kennedy 13-Dec-10 Reviewed by: Jim Baxter 14-Dec-10

eSignature | Date | eSignature | Date

Matrices:

Carrier name: FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):			
Cooler(s)/Kit(s):			
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☐
pH adjusted?	Yes ☐	No ☐	N/A ☐
pH adjusted by:			

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012251

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11-24-10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa (City) Kansas (State) 66215 (Zip)

Person to Contact Will King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-24-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-01	B2F1-0B15.5-Be/U/Y-Air	0.8 MCE	4302.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B2F1-0B15.5-Be/U/Y-Iso		4272.00	ASTM D3971-90M (U)
-02	B2F1-0B6-Be/U/Y-Air		4194.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B2F1-0B6-Be/U/Y-Iso		4170.00	ASTM D3971-90M (U)
-03	B2F1-0A26-Be/U/Y-Air		4278.74	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B2F1-0A26-Be/U/Y-Iso		4104.00	ASTM D3971-90M (U)
-04	B102-FanHouse3-Be/U/Y-Air		4324.90	NIOSH 7300/ICP-MS(Be,Y); ICP-MS (U)
	B102-FanHouse3-Be/U/Y-Iso		4385.90	ASTM D3971-90M(U)
-05	B1F1-F25-Be/U/Y-Air		4352.40	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-F25-Be/U/Y-Iso		4408.20	ASTM D3971-90M(U)
-06	B1F1-A25-Be/U/Y-Air		4383.44	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-A25-Be/U/Y-Iso		4352.04	ASTM D3971-90M(U)
-07	B1F1-Q19-Be/U/Y-Air		4244.10	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-Q19-Be/U/Y-Iso		4298.28	ASTM D3971-90M(U)
-08	B1F1-Y10-Be/U/Y-Air		4349.30	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-Y10-Be/U/Y-~~Air~~ Iso		4251.70	ASTM D3971-90M(U)

Be - Beryllium U - Uranium Y - Yttrium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
[signature]	12-9-10/1500	[signature] ALS-CN	12/10/10 10:59
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012251

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11/24/10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa City Kansas State 66215 Zip

Person to Contact Will King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-24-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-09	B1F1-B1B-Be/U/Y-Air	0.8 MCE	4362.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-B1B-Be/U/Y-Iso		3687.15	ASTM D3971-90M (U)
-10	Dup 2-Be/U/Y-Air		4188.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Dup 2-Be/U/Y-Iso		4206.00	ASTM D3971-90M(U)
-11	Blank 2-Air		—	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Blank 2-Iso		—	ASTM D3971-90M(U)

Be-Beryllium Y-Yttrium U-Uranium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
[signature]	12-9-10 1600	[signature] ALS-CH	12/10/10 10:59
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time

January 20, 2011

Mr. Wil King
Terracon Consultants, Inc.
13910 West 96th Terrace
Lenexa KS 66215

Re:		
	ALS Workorder:	10-12-144
	Project Name:	Bannister Complex
	Project Number:	None Submitted

Dear Mr. King:

Eleven filter samples were received from Terracon Consultants, Inc. on December 14, 2010. The samples were scheduled for the following analysis:

Isotopic Uranium	pages 1-96

The results for this analysis are contained in the enclosed reports.

Thank you for your confidence in ALS Laboratory Group. Should you have any questions, please call.

Sincerely,

ALS Laboratory Group
Jeff Kujawa
Project Manager

JRK/km
Enclosure (s): Report

ALS is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

Accreditation Body	License or Certification Number
Washington	C1280
Utah	CO00078
Arizona	AZ0742
Alaska	UST-086
Alaska	CO00078
Florida	E87914
Missouri	175
North Dakota	R-057
New Jersey	CO003
Nevada	CO000782008A
California	06251CA
Kansas	E-10381
Maryland	285
Pennsylvania	68-03116
Texas	T104704241-09-1
Colorado	CO00078
Connecticut	PH-0232
Idaho	CO00078
Tennessee	2976
Kentucky	90137
L-A-B (DoD ELAP/ISO 17025)	L2257

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1012144
Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B2F1-OB15.5-Be/U/Y-Iso	1012144-1		FILTER	24-Nov-10	
B2F1-OB6-Be/U/Y-Iso	1012144-2		FILTER	24-Nov-10	
B2F1-OA26-Be/U/Y-Iso	1012144-3		FILTER	24-Nov-10	
B1O2-FanHouse3-Be/U/Y-Iso	1012144-4		FILTER	24-Nov-10	
B1F1-F25-Be/U/Y-Iso	1012144-5		FILTER	24-Nov-10	
B1F1-A25-Be/U/Y-Iso	1012144-6		FILTER	24-Nov-10	
B1F1-Q19-Be/U/Y-Iso	1012144-7		FILTER	24-Nov-10	
B1F1-Y10-Be/U/Y-Iso	1012144-8		FILTER	24-Nov-10	
B1F1-R18-Be/U/Y-Iso	1012144-9		FILTER	24-Nov-10	
DUP2-Be/U/Y-Iso	1012144-10		FILTER	24-Nov-10	
Blank2-Iso	1012144-11		FILTER	24-Nov-10	

1012144

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012251

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11-24-10 Purchase Order No. 0810571144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa City Kansas State 66215 Zip

Person to Contact Will King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No. _____

Sampling Site Bannister Complex

Date/Time of Collection 11-24-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-01	B2F1-0815.5-Be/U/Y-Air	0.8 MCE	4302.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B2F1-0815.5-Be/U/Y-Iso		4272.00	ASTM D3971-90M (U)
-02	B2F1-0836-Be/U/Y-Air		4194.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B2F1-0836-Be/U/Y-Iso		4170.00	ASTM D3971-90M (U)
-03	B2F1-0926-Be/U/Y-Air		4278.74	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B2F1-0926-Be/U/Y-Iso		4104.00	ASTM D3971-90M (U)
-04	BB2 Farmhouse 3-Be/U/Y-Air		4324.90	NIOSH 7300/ICP-MS(Be,Y); ICP-MS (U)
	BB2 Farmhouse 3-Be/U/Y-Iso		4385.90	ASTM D3971-90M(U)
-05	B1F1-F25-Be/U/Y-Air		4352.40	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-F25-Be/U/Y-Iso		4408.20	ASTM D3971-90M(U)
-06	B1F1-A25-Be/U/Y-Air		4383.44	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-A25-Be/U/Y-Iso		4352.04	ASTM D3971-90M(U)
-07	B1F1-019-Be/U/Y-Air		4244.10	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-019-Be/U/Y-Iso		4298.28	ASTM D3971-90M(U)
-08	B1F1-410-Be/U/Y-Air		4349.30	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-410-Be/U/Y-Iso Air		4251.70	ASTM D3971-90M(U)

Be - Beryllium U - Uranium Y - Yttrium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time 12-9-10/800	Received by: (Signature) ALS-CW	Date / Time 12/10/10 10:59
Relinquished by: (Signature) ALS	Date / Time 12/13/10 1330	Received by: (Signature) C Trumble	Date / Time 12/14/10 1030

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 101225|

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11/24/10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa City Kansas State 66215 Zip

Person to Contact Will King

Email Address WWKing@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-24-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-09	B1F1-B1B-Be/U/Y-Air	0.8 MCE	4362.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-B1B-Be/U/Y-Iso		3687.15	ASTM D3971-90M (U)
-10	Dup2-Be/U/Y-Air		4188.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Dup2-Be/U/Y-Iso		4206.00	ASTM D3971-90M(U)
-11	Blank2-Air		—	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Blank2-Iso		—	ASTM D3971-90M(U)

Be-Beryllium Y-Yttrium U-Uranium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
	12-9-10 1200	ALS-CW	12/9/10 10:59
	12/13/10 1330	C Trumble	12/14/10 1020

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ~~ALS OH~~ CDT 12-14-10 Terracon Workorder No: 1012144

Project Manager: JK Initials: CDT Date: 12-14-10

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3. Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		(YES)	NO
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		(YES)	NO
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble:** ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17. Were the samples **shipped on ice**?		YES	(NO)
18. Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 #4	(RAD ONLY)	YES	(NO)

Cooler #: 1

Temperature (°C): Amb

No. of custody seals on cooler: 0

DOT Survey/ Acceptance Information

External µR/hr reading: 11

Background µR/hr reading: 10

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

If applicable, was the client contacted? YES / NO / (NA) Contact: _____ Date/Time: _____

Project Manager Signature / Date: 12/15/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

1012144

From: Origin ID: OXDA (513) 733-5336
Sample Receiving
ALS LABORATORY GROUP
4388 GLENDALE-MILFORD RD

CINCINNATI, OH 45242

FedEx Express

J10301010040225

Ship Date: 13DEC10
ActWgt: 5.0 LB
CAD: 5634838/INET3090

Delivery Address Bar Code

SHIP TO: (800) 443-1511 BILL SENDER

Sample Receiving
ALS Laboratory Group- Ft. Collins
225 COMMERCE DR

FORT COLLINS, CO 80524

Ref #
Invoice #
PO #
Dept #

11
0 —

TRK# 0201 7965 4645 9493

TUE - 14 DEC A2
STANDARD OVERNIGHT

80524
CO-US
DEN

NR FTCA

ALS Environmental

Isotopic Uranium

Case Narrative

Terracon Consultants Inc.

Bannister Complex

Work Order Number: 1012144

1. This report consists of the analytical results and supporting documentation for 11 filter samples received by ALS on 12/14/10.

2. These samples were prepared according to procedures SOP773R10 and SOP778R13.

3. The samples were analyzed for the presence of isotopic uranium according to procedure SOP714R12. The analyses were completed on 01/06/11.

4. The isotopic analysis results for these samples are reported on an 'As Received' basis in units of pCi/sample.

5. Due to insufficient sample volume, a laboratory control sample duplicate (LCSD) was prepared in lieu of a prep batch duplicate.

6. This analytical method quantifies U-235 alpha activity in a specific region of interest corresponding to emission energies between those of U-234 and U-238. A potential limitation of this method is that measurable amounts of U-234 in the sample may cause a small amount of characteristic activity in the U-235 region of interest due to poorly resolved alpha activity at the boundary between the two regions. To minimize the potential for a high bias in the U-235 analytical results, the U-235 region of interest has been narrowed and limited to a lower energy region. An 85.1% abundance correction has been made to the final U-235 results.

7. ALS follows the convention outlined in ANSI N42.23 for reporting significant digits in the TPU and MDC results. ANSI N42.23 states that the TPU result should be rounded to two significant digits and that the MDC result should be rounded to the same decimal place as the TPU result. In practice, this could result in an MDC result with a reported value of 0 for samples with significant activity, including the batch laboratory control sample.

8. No anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Linda Arend
Radiochemistry Primary Data Reviewer

01/20/11
Date

Radiochemistry Final Data Reviewer

01/20/11
Date

Section 1

CHAIN OF CUSTODY

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1012144
Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Client PO Number: 02107144

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B2F1-OB15.5-Be/U/Y-Iso	1012144-1		FILTER	24-Nov-10	
B2F1-OB6-Be/U/Y-Iso	1012144-2		FILTER	24-Nov-10	
B2F1-OA26-Be/U/Y-Iso	1012144-3		FILTER	24-Nov-10	
B1O2-FanHouse3-Be/U/Y-Iso	1012144-4		FILTER	24-Nov-10	
B1F1-F25-Be/U/Y-Iso	1012144-5		FILTER	24-Nov-10	
B1F1-A25-Be/U/Y-Iso	1012144-6		FILTER	24-Nov-10	
B1F1-Q19-Be/U/Y-Iso	1012144-7		FILTER	24-Nov-10	
B1F1-Y10-Be/U/Y-Iso	1012144-8		FILTER	24-Nov-10	
B1F1-R18-Be/U/Y-Iso	1012144-9		FILTER	24-Nov-10	
DUP2-Be/U/Y-Iso	1012144-10		FILTER	24-Nov-10	
Blank2-Iso	1012144-11		FILTER	24-Nov-10	

1012144

ANALYTICAL REQUEST FORM

☒ **REGULAR** Status 1012251

☐ **RUSH** Status Required - ADDITIONAL CHARGE

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11-24-10 Purchase Order No. 02K57144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa (City) Kansas (State) 66215 (Zip)

Person to Contact Will King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No. _____

Sampling Site Bannister Complex

Date/Time of Collection 11-24-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-01	B2F1-0815.5-Be/U/Y-Air	0.8 MCE	4302.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B2F1-0815.5-Be/U/Y-Iso		4272.00	ASTM D3971-90M (U)
-02	B2F1-0836-Be/U/Y-Air		4194.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B2F1-0836-Be/U/Y-Iso		4170.00	ASTM D3971-90M (U)
-03	B2F1-0826-Be/U/Y-Air		4278.74	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B2F1-0826-Be/U/Y-Iso		4104.00	ASTM D3971-90M (U)
-04	B2 Fan House 3-Be/U/Y-Air		4324.90	NIOSH 7300/ICP-MS(Be,Y); ICP-MS (U)
	B2 Fan House 3-Be/U/Y-Iso		4385.90	ASTM D3971-90M(U)
-05	B1F1-F25-Be/U/Y-Air		4352.48	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-F25-Be/U/Y-Iso		4406.20	ASTM D3971-90M(U)
-06	B1F1-A25-Be/U/Y-Air		4383.44	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-A25-Be/U/Y-Iso		4352.04	ASTM D3971-90M(U)
-07	B1F1-019-Be/U/Y-Air		4244.10	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-019-Be/U/Y-Iso		4298.28	ASTM D3971-90M(U)
-08	B1F1-910-Be/U/Y-Air		4349.30	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-910-Be/U/Y-Iso Air		4251.70	ASTM D3971-90M(U)

Be - Beryllium U - Uranium Y - Yttrium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
	12-9-10/800	G Allen ALS-CW	12/10/10 10:57
Relinquished by: (Signature) ALS	Date / Time 12/13/10 1330	Received by: (Signature) C Trumble	Date / Time 12/14/10 1030

ANALYTICAL REQUEST FORM

☒ **REGULAR** Status 10,2251

☐ **RUSH** Status Required - ADDITIONAL CHARGE

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 11/24/10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa City Kansas State 66215 Zip

Person to Contact Will King

Email Address WWKing@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-24-10

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-09	B1F1-BS-Be/U/Y-Air	0.8 MCE	4362.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	B1F1-BS-Be/U/Y-Iso		3687.15	ASTM D3971-90M (U)
-10	Dup2-Be/U/Y-Air		4188.00	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Dup2-Be/U/Y-Iso		4206.00	ASTM D3971-90M(U)
-11	Blank2-Air		—	NIOSH 7300/ICP-MS(Be,Y); ICP-MS(U)
	Blank2-Iso		—	ASTM D3971-90M(U)

Be-Beryllium Y-Yttrium U-Uranium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
	12-9-10	ALS-CW	12/10/10 10:59
	12/13/10 1330	C Trumble	12/14/10 1020

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ~~ALS OH~~ CDT 12-14-10 TERRACON Workorder No: 1012144

Project Manager: JK Initials: CDT Date: 12-14-10

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3. Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		(YES)	NO
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		(YES)	NO
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17. Were the samples **shipped on ice**?		YES	(NO)
18. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	(RAD ONLY)	YES	(NO)

Cooler #:	1
Temperature (°C):	Amb
No. of custody seals on cooler:	0
DOT Survey/ Acceptance Information — External µR/hr reading:	11
DOT Survey/ Acceptance Information — Background µR/hr reading:	10

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

If applicable, was the client contacted? YES / NO / (NA) Contact: _____ Date/Time: _____

Project Manager Signature / Date: [signature] 12/15/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

1012144

From: Origin ID: OXDA (513) 733-5336
Sample Receiving
ALS LABORATORY GROUP
4388 GLENDALE-MILFORD RD

CINCINNATI, OH 45242

FedEx Express

Ship Date: 13DEC10
Act Wgt: 5.0 LB
CAD: 5634838/INET3090

Delivery Address Bar Code

SHIP TO: (800) 443-1511 BILL SENDER
Sample Receiving
ALS Laboratory Group- Ft. Collins
225 COMMERCE DR

FORT COLLINS, CO 80524

Ref #
Invoice #
PO #
Dept #

11
0 —

TRK# 0201 7965 4645 9493

TUE - 14 DEC A2
STANDARD OVERNIGHT

80524
CO-US
DEN

NR FTCA

Section 2

SAMPLE RESULTS SUMMARY

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: **ALS Environmental -- FC**
PAI Work Order: 1012144

Reported on: Wednesday, January 19, 2011 4:56:01 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012144-1	B2F1-OB15.5-Be/U/Y-Iso	Sample	U-234	0.007 +/- 0.041	0.095	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-1	B2F1-OB15.5-Be/U/Y-Iso	Sample	U-235	0.001 +/- 0.026	0.063	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-1	B2F1-OB15.5-Be/U/Y-Iso	Sample	U-238	0.009 +/- 0.033	0.076	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-2	B2F1-OB6-Be/U/Y-Iso	Sample	U-234	0.017 +/- 0.029	0.060	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-2	B2F1-OB6-Be/U/Y-Iso	Sample	U-235	0.024 +/- 0.027	0.034	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-2	B2F1-OB6-Be/U/Y-Iso	Sample	U-238	-0.011 +/- 0.020	0.060	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-3	B2F1-OA26-Be/U/Y-Iso	Sample	U-234	0.040 +/- 0.033	0.040	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-3	B2F1-OA26-Be/U/Y-Iso	Sample	U-235	-0.002 +/- 0.024	0.035	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-3	B2F1-OA26-Be/U/Y-Iso	Sample	U-238	0.014 +/- 0.021	0.036	pCi/sample	FILTER	AS101228-2	1/6/2011	U

Comments:

Data Package ID: *UR1012144-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012144

Reported on: Wednesday, January 19, 2011 4:56:01 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012144-4	B1O2-FanHouse3-Be/U/Y-Iso	Sample	U-234	-0.009 +/- 0.023	0.062	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-4	B1O2-FanHouse3-Be/U/Y-Iso	Sample	U-235	-0.007 +/- 0.027	0.052	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-4	B1O2-FanHouse3-Be/U/Y-Iso	Sample	U-238	0.004 +/- 0.023	0.033	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-5	B1F1-F25-Be/U/Y-Iso	Sample	U-234	0.043 +/- 0.033	0.017	pCi/sample	FILTER	AS101228-2	1/6/2011	LT
1012144-5	B1F1-F25-Be/U/Y-Iso	Sample	U-235	0.010 +/- 0.026	0.046	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-5	B1F1-F25-Be/U/Y-Iso	Sample	U-238	0.007 +/- 0.022	0.044	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-6	B1F1-A25-Be/U/Y-Iso	Sample	U-234	0.035 +/- 0.033	0.050	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-6	B1F1-A25-Be/U/Y-Iso	Sample	U-235	0.005 +/- 0.024	0.035	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-6	B1F1-A25-Be/U/Y-Iso	Sample	U-238	0.012 +/- 0.020	0.040	pCi/sample	FILTER	AS101228-2	1/6/2011	U

Comments:

Data Package ID: *UR1012144-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greatar than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012144

Reported on: Wednesday, January 19, 2011 4:56:01 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012144-7	B1F1-Q19-Be/U/Y-Iso	Sample	U-234	0.019 +/- 0.028	0.053	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-7	B1F1-Q19-Be/U/Y-Iso	Sample	U-235	0.010 +/- 0.025	0.044	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-7	B1F1-Q19-Be/U/Y-Iso	Sample	U-238	0.005 +/- 0.022	0.047	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-8	B1F1-Y10-Be/U/Y-Iso	Sample	U-234	0.041 +/- 0.032	0.035	pCi/sample	FILTER	AS101228-2	1/6/2011	LT
1012144-8	B1F1-Y10-Be/U/Y-Iso	Sample	U-235	0.013 +/- 0.024	0.018	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-8	B1F1-Y10-Be/U/Y-Iso	Sample	U-238	0.030 +/- 0.028	0.035	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-9	B1F1-R18-Be/U/Y-Iso	Sample	U-234	0.018 +/- 0.027	0.051	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-9	B1F1-R18-Be/U/Y-Iso	Sample	U-235	0.015 +/- 0.028	0.060	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-9	B1F1-R18-Be/U/Y-Iso	Sample	U-238	0.011 +/- 0.024	0.054	pCi/sample	FILTER	AS101228-2	1/6/2011	U

Comments:

Data Package ID: *UR1012144-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012144

Reported on: Wednesday, January 19, 2011 4:56:01 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012144-10	DUP2-Be/U/Y-Iso	Sample	U-234	0.010 +/- 0.020	0.043	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-10	DUP2-Be/U/Y-Iso	Sample	U-235	-0.001 +/- 0.023	0.050	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-10	DUP2-Be/U/Y-Iso	Sample	U-238	0.031 +/- 0.033	0.054	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-11	Blank2-Iso	Sample	U-234	0.029 +/- 0.029	0.040	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-11	Blank2-Iso	Sample	U-235	-0.002 +/- 0.024	0.035	pCi/sample	FILTER	AS101228-2	1/6/2011	U
1012144-11	Blank2-Iso	Sample	U-238	0.019 +/- 0.023	0.036	pCi/sample	FILTER	AS101228-2	1/6/2011	U

Comments:

Data Package ID: *UR1012144-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Section 3

QC RESULTS SUMMARY

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Method Blank Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-2MB

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.044 +/- 0.040	0.061	0.1	U
15117-96-1	U-235	-0.002 +/- 0.027	0.059	0.1	U
7440-61-1	U-238	0.027 +/- 0.033	0.057	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.1	pCi/sample	78.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-2LCS

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	8.4 +/- 1.4	0	8.681	97.3	82 - 122	P
7440-61-1	U-238	9.2 +/- 1.5	0	9.013	102	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.9	pCi/sample	88.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-2LCSD

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	9.4 +/- 1.6	0	8.681	109	82 - 122	P
7440-61-1	U-238	9.5 +/- 1.6	0	9.013	105	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	85.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:
Lab ID: AS101228-2LCSD

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2s TPU	MDC	Flags	Result +/- 2s TPU	MDC	Flags		
13966-29-5	U-234	8.4 +/- 1.4	0	P	9.4 +/- 1.6	0	P	0.469	2.13
7440-61-1	U-238	9.2 +/- 1.5	0	P	9.5 +/- 1.6	0	P	0.151	2.13

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty
DER - Duplicate Error Ratio
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *UR1012144-1*

Section 4

INDIVIDUAL SAMPLE RESULTS

4

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	B2F1-OB15.5-Be/U/Y-iso
Lab ID:	1012144-1

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.007 +/- 0.041	0.095	0.1	U
15117-96-1	U-235	0.001 +/- 0.026	0.063	0.1	U
7440-61-1	U-238	0.009 +/- 0.033	0.076	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.1	pCi/sample	79.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	B2F1-OB6-Be/U/Y-Iso
Lab ID:	1012144-2

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.017 +/- 0.029	0.060	0.1	U
15117-96-1	U-235	0.024 +/- 0.027	0.034	0.1	U
7440-61-1	U-238	-0.011 +/- 0.020	0.060	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	8.2	pCi/sample	91.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greeter than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B2F1-OA26-Be/U/Y-Iso
Lab ID: 1012144-3

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.040 +/- 0.033	0.040	0.1	U
15117-96-1	U-235	-0.002 +/- 0.024	0.035	0.1	U
7440-61-1	U-238	0.014 +/- 0.021	0.036	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	8.3	pCi/sample	92.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1O2-FanHouse3-Be/U/Y-Is
Lab ID: 1012144-4

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	-0.009 +/- 0.023	0.062	0.1	U
15117-96-1	U-235	-0.007 +/- 0.027	0.052	0.1	U
7440-61-1	U-238	0.004 +/- 0.023	0.033	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.6	pCi/sample	84.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	B1F1-F25-Be/U/Y-Iso
Lab ID:	1012144-5

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.043 +/- 0.033	0.017	0.1	LT
15117-96-1	U-235	0.010 +/- 0.026	0.046	0.1	U
7440-61-1	U-238	0.007 +/- 0.022	0.044	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	86.0	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	B1F1-A25-Be/U/Y-Iso
Lab ID:	1012144-6

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.035 +/- 0.033	0.050	0.1	U
15117-96-1	U-235	0.005 +/- 0.024	0.035	0.1	U
7440-61-1	U-238	0.012 +/- 0.020	0.040	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	8.1	pCi/sample	90.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	B1F1-Q19-Be/U/Y-iso
Lab ID:	1012144-7

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.019 +/- 0.028	0.053	0.1	U
15117-96-1	U-235	0.010 +/- 0.025	0.044	0.1	U
7440-61-1	U-238	0.005 +/- 0.022	0.047	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.6	pCi/sample	84.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1F1-Y10-Be/U/Y-Iso
Lab ID: 1012144-8

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.041 +/- 0.032	0.035	0.1	LT
15117-96-1	U-235	0.013 +/- 0.024	0.018	0.1	U
7440-61-1	U-238	0.030 +/- 0.028	0.035	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.9	pCi/sample	88.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1F1-R18-Be/U/Y-Iso
Lab ID: 1012144-9

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.018 +/- 0.027	0.051	0.1	U
15117-96-1	U-235	0.015 +/- 0.028	0.060	0.1	U
7440-61-1	U-238	0.011 +/- 0.024	0.054	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	86.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitetive Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: DUP2-Be/U/Y-Iso
Lab ID: 1012144-10

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.010 +/- 0.020	0.043	0.1	U
15117-96-1	U-235	-0.001 +/- 0.023	0.050	0.1	U
7440-61-1	U-238	0.031 +/- 0.033	0.054	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	8.2	pCi/sample	91.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012144
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: Blank2-Iso
Lab ID: 1012144-11

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 24-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 06-Jan-11

Prep Batch: AS101228-2
QCBatchID: AS101228-2-1
Run ID: AS101228-2U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.029 +/- 0.029	0.040	0.1	U
15117-96-1	U-235	-0.002 +/- 0.024	0.035	0.1	U
7440-61-1	U-238	0.019 +/- 0.023	0.036	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.5	pCi/sample	84.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC wes not met, but the reported activity is greater than the reported MDC.

M - The requested MDC wes not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012144-1*

Section 5

RAW DATA

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012144

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 5:40:07 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / RaportBasis	DER / RPD	%Spk. Recov / Flags
1012144-1	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1486.100	31.48%	300	7.1	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	26	Spectrum#1	10:53 AM	33.000	1000	79.1%	1.1	NA	As Received	NA	
1012144-1	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1.200	31.48%	300	0.007	0.095	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	26	Spectrum#1	10:53 AM	26.000	1000	79.1%	0.041	NA	As Received	NA	U
1012144-1	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	0.200	31.48%	300	0.001	0.063	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	26	Spectrum#1	10:53 AM	6.000	1000	79.1%	0.026	NA	As Received	NA	U
1012144-1	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1.500	31.48%	300	0.009	0.076	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	26	Spectrum#1	10:53 AM	15.000	1000	79.1%	0.033	NA	As Received	NA	U
1012144-2	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1611.500	29.42%	300	8.2	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	27	Spectrum#1	10:53 AM	25.000	1000	91.8%	1.3	NA	As Received	NA	
1012144-2	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	3.000	29.42%	300	0.017	0.060	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	27	Spectrum#1	10:53 AM	10.000	1000	91.8%	0.029	NA	As Received	NA	U
1012144-2	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	3.700	29.42%	300	0.024	0.034	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	27	Spectrum#1	10:53 AM	1.000	1000	91.8%	0.027	NA	As Received	NA	U
1012144-2	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	-2.000	29.42%	300	-0.011	0.060	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	27	Spectrum#1	10:53 AM	10.000	1000	91.8%	0.020	NA	As Received	NA	U
1012144-3	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1584.400	28.65%	300	8.3	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	28	Spectrum#1	10:53 AM	22.000	1000	92.7%	1.3	NA	As Received	NA	
1012144-3	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	7.100	28.65%	300	0.040	0.040	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	28	Spectrum#1	10:53 AM	3.000	1000	92.7%	0.033	NA	As Received	NA	U
1012144-3	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	-0.300	28.65%	300	-0.002	0.035	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	28	Spectrum#1	10:53 AM	1.000	1000	92.7%	0.024	NA	As Received	NA	U

Comments:

Data Package ID: *UR1012144-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less then 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012144

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 5:40:07 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- / 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1012144-3	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	2.400	28.65%	300	0.014	0.036	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 S	28	Spectrum#1	10:53 AM	2.000	1000	92.7%	0.021	NA	As Received	NA	U
1012144-4	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1438.600	28.48%	300	7.6	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 S	29	Spectrum#1	10:53 AM	18.000	1000	84.7%	1.2	NA	As Received	NA	
1012144-4	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	-1.400	28.48%	300	-0.009	0.062	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 S	29	Spectrum#1	10:53 AM	8.000	1000	84.7%	0.023	NA	As Received	NA	U
1012144-4	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	-0.900	28.48%	300	-0.007	0.052	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 S	29	Spectrum#1	10:53 AM	3.000	1000	84.7%	0.027	NA	As Received	NA	U
1012144-4	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	0.700	28.48%	300	0.004	0.033	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 S	29	Spectrum#1	10:53 AM	1.000	1000	84.7%	0.023	NA	As Received	NA	U
1012144-5	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1455.200	28.36%	300	7.7	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 S	30	Spectrum#1	10:53 AM	16.000	1000	86.0%	1.2	NA	As Received	NA	
1012144-5	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	7.000	28.36%	300	0.043	0.017	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 S	30	Spectrum#1	10:53 AM	0.000	1000	86.0%	0.033	NA	As Received	NA	LT
1012144-5	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1.400	28.36%	300	0.010	0.046	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 S	30	Spectrum#1	10:53 AM	2.000	1000	86.0%	0.026	NA	As Received	NA	U
1012144-5	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1.100	28.36%	300	0.007	0.044	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 S	30	Spectrum#1	10:53 AM	3.000	1000	86.0%	0.022	NA	As Received	NA	U
1012144-6	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	1590.700	29.55%	300	8.1	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 S	31	Spectrum#1	10:53 AM	41.000	1000	90.3%	1.3	NA	As Received	NA	
1012144-6	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-2U	1/6/2011	6.200	29.55%	300	0.035	0.050	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 S	31	Spectrum#1	10:53 AM	6.000	1000	90.3%	0.033	NA	As Received	NA	U

Comments:

Data Package ID: *UR1012144-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitetive yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater then sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater then MDC.

B3 - Analyte concentration greeter than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not aveilable, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncerteinty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012144

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 5:40:07 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- / 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1012144-6	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	0.700	29.55%	300	0.005	0.035	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	31	Spectrum#1	10:53 AM	1.000	1000	90.3%	0.024	NA	As Received	NA	U
1012144-6	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	2.100	29.55%	300	0.012	0.040	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	31	Spectrum#1	10:53 AM	3.000	1000	90.3%	0.020	NA	As Received	NA	U
1012144-7	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1498.400	29.72%	300	7.6	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	32	Spectrum#1	10:53 AM	12.000	1000	84.5%	1.2	NA	As Received	NA	
1012144-7	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	3.200	29.72%	300	0.019	0.053	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	32	Spectrum#1	10:53 AM	6.000	1000	84.5%	0.028	NA	As Received	NA	U
1012144-7	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1.400	29.72%	300	0.010	0.044	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	32	Spectrum#1	10:53 AM	2.000	1000	84.5%	0.025	NA	As Received	NA	U
1012144-7	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	0.800	29.72%	300	0.005	0.047	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	32	Spectrum#1	10:53 AM	4.000	1000	84.5%	0.022	NA	As Received	NA	U
1012144-8	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1611.800	30.59%	300	7.9	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	58	Spectrum#1	10:53 AM	14.000	1000	88.3%	1.2	NA	As Received	NA	
1012144-8	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	7.400	30.59%	300	0.041	0.035	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	58	Spectrum#1	10:53 AM	2.000	1000	88.3%	0.032	NA	As Received	NA	LT
1012144-8	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	2.000	30.59%	300	0.013	0.018	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	58	Spectrum#1	10:53 AM	0.000	1000	88.3%	0.024	NA	As Received	NA	U
1012144-8	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	5.400	30.59%	300	0.030	0.035	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	58	Spectrum#1	10:53 AM	2.000	1000	88.3%	0.028	NA	As Received	NA	U
1012144-9	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1580.900	30.80%	300	7.7	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	59	Spectrum#1	10:53 AM	17.000	1000	86.1%	1.2	NA	As Received	NA	

Comments:

Data Package ID: *UR1012144-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012144

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 5:40:07 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Aliq / Analy Aliq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- / 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1012144-9	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	3.200	30.80%	300	0.018	0.051	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	59	Spectrum#1	10:53 AM	6.000	1000	86.1%	0.027	NA	As Received	NA	U
1012144-9	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	2.200	30.80%	300	0.015	0.060	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	59	Spectrum#1	10:53 AM	6.000	1000	86.1%	0.028	NA	As Received	NA	U
1012144-9	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1.900	30.80%	300	0.011	0.054	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	59	Spectrum#1	10:53 AM	7.000	1000	86.1%	0.024	NA	As Received	NA	U
1012144-10	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1633.700	29.88%	300	8.2	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	60	Spectrum#1	10:53 AM	21.000	1000	91.7%	1.3	NA	As Received	NA	
1012144-10	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1.800	29.88%	300	0.010	0.043	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	60	Spectrum#1	10:53 AM	4.000	1000	91.7%	0.020	NA	As Received	NA	U
1012144-10	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	-0.200	29.88%	300	-0.001	0.050	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	60	Spectrum#1	10:53 AM	4.000	1000	91.7%	0.023	NA	As Received	NA	U
1012144-10	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	5.600	29.88%	300	0.031	0.054	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	60	Spectrum#1	10:53 AM	8.000	1000	91.7%	0.033	NA	As Received	NA	U
1012144-11	U-232	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1579.700	31.49%	300	7.5	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-2-1	NA	NA	NA	1 s	61	Spectrum#1	10:53 AM	11.000	1000	84.1%	1.2	NA	As Received	NA	
1012144-11	U-234	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	5.100	31.49%	300	0.029	0.040	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	61	Spectrum#1	10:53 AM	3.000	1000	84.1%	0.029	NA	As Received	NA	U
1012144-11	U-235	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	-0.300	31.49%	300	-0.002	0.035	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	61	Spectrum#1	10:53 AM	1.000	1000	84.1%	0.024	NA	As Received	NA	U
1012144-11	U-238	11/24/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	3.400	31.49%	300	0.019	0.036	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-2-1	NA	NA	NA	1 s	61	Spectrum#1	10:53 AM	2.000	1000	84.1%	0.023	NA	As Received	NA	U

Comments:

Data Package ID: *UR1012144-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater then MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Totel Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012144

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 5:40:07 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
AS101228-2	U-232	12/28/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1394.200	29.69%	300	7.1	0.1	pCi/sample	NA	
MB	Tracer	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 s	e2	Spectrum #1	10:53 AM	36.000	1000	78.7%	1.1	NA	As Received	NA	
AS101228-2	U-234	12/28/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	6.900	29.69%	300	0.044	0.061	pCi/sample	NA	
MB	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 s	62	Spectrum #1	10:53 AM	7.000	1000	78.7%	0.040	NA	As Received	NA	U
AS101228-2	U-235	12/28/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	-0.200	29.69%	300	-0.002	0.059	pCi/sample	NA	
MB	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 s	62	Spectrum #1	10:53 AM	4.000	1000	78.7%	0.027	NA	As Received	NA	U
AS101228-2	U-238	12/28/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	4.200	29.69%	300	0.027	0.057	pCi/sample	NA	
MB	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 s	62	Spectrum #1	10:53 AM	6.000	1000	78.7%	0.033	NA	As Received	NA	U
AS101228-2	U-232	12/28/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1658.700	31.42%	300	7.9	0.1	pCi/sample	NA	
LCS	Tracer	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 s	63	Spectrum #1	10:53 AM	11.000	1000	88.5%	1.2	NA	As Received	NA	
AS101228-2	U-234	12/28/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1564.100	31.42%	300	8.4	0	pCi/sample	NA	97.3
LCS	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 s	63	Spectrum #1	10:53 AM	3.000	1000	88.5%	1.4	NA	As Received	NA	P
AS101228-2	U-238	12/28/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1696.700	31.42%	300	9.2	0	pCi/sample	NA	102
LCS	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 s	63	Spectrum #1	10:53 AM	1.000	1000	88.5%	1.5	NA	As Received	NA	P
AS101228-2	U-232	12/28/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1520.100	29.80%	300	7.7	0.1	pCi/sample	NA	
LCSD	Tracer	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 s	64	Spectrum #1	10:53 AM	13.000	1000	85.5%	1.2	NA	As Received	NA	
AS101228-2	U-234	12/28/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1599.100	29.80%	300	9.4	0	pCi/sample	0.47	109
LCSD	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 s	64	Spectrum #1	10:53 AM	3.000	1000	85.5%	1.6	NA	As Received	NA	P
AS101228-2	U-238	12/28/2010	AS101228-2	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-2U	1/6/2011	1610.400	29.80%	300	9.5	0	pCi/sample	0.15	105
LCSD	Trg. Analyte	12:16:15 PM	AS101228-2-1	NA	NA	NA	1 s	64	Spectrum #1	10:53 AM	2.000	1000	85.5%	1.6	NA	As Received	NA	P

Comments:

Data Package ID: *UR1012144-1*

Qualifiers/Flags:

U - Result is less than the sample spacific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicete RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-1
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 26
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:10AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010426; Det: 26; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:05:14PM

Efficiency Calibration: C11010426

Efficiency: 31.48% +/- 0.15% TPU(2 sigma)

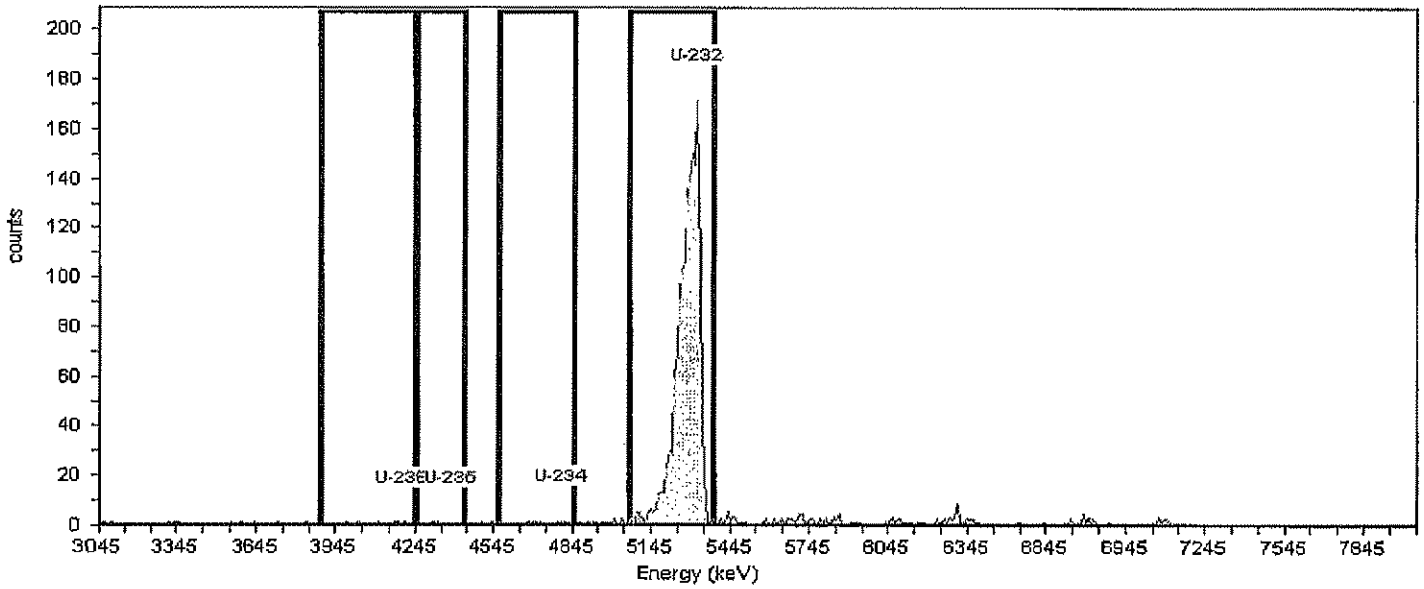
Energy Calibration: C11010426

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 79.36%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3889.0	4242.0	13.9	100.2	6.00	4.50	1.50	9.0E-003	3.9E-002	2.4E-002	6.4E-002
U-235	4379.3	4251.8	4428.3	39.2	99.7	2.00	1.80	0.20	1.2E-003	2.4E-002	1.5E-002	4.7E-002
U-234	4800.9	4565.5	4849.9	14.9	100.0	9.00	7.80	1.20	7.2E-003	4.9E-002	3.1E-002	7.9E-002
U-232	5320.5	5065.6	5379.3	80.1	100.1	1,496.00	9.90	1,486.10	7.1E+000	3.7E-001	3.6E-002	8.8E-002

Reviewed By: TPS JP WK

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-2
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 27
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:10AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010427; Det: 27; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:06:06PM

Efficiency Calibration: C11010427

Efficiency: 29.42% +/- 0.16% TPU(2 sigma)

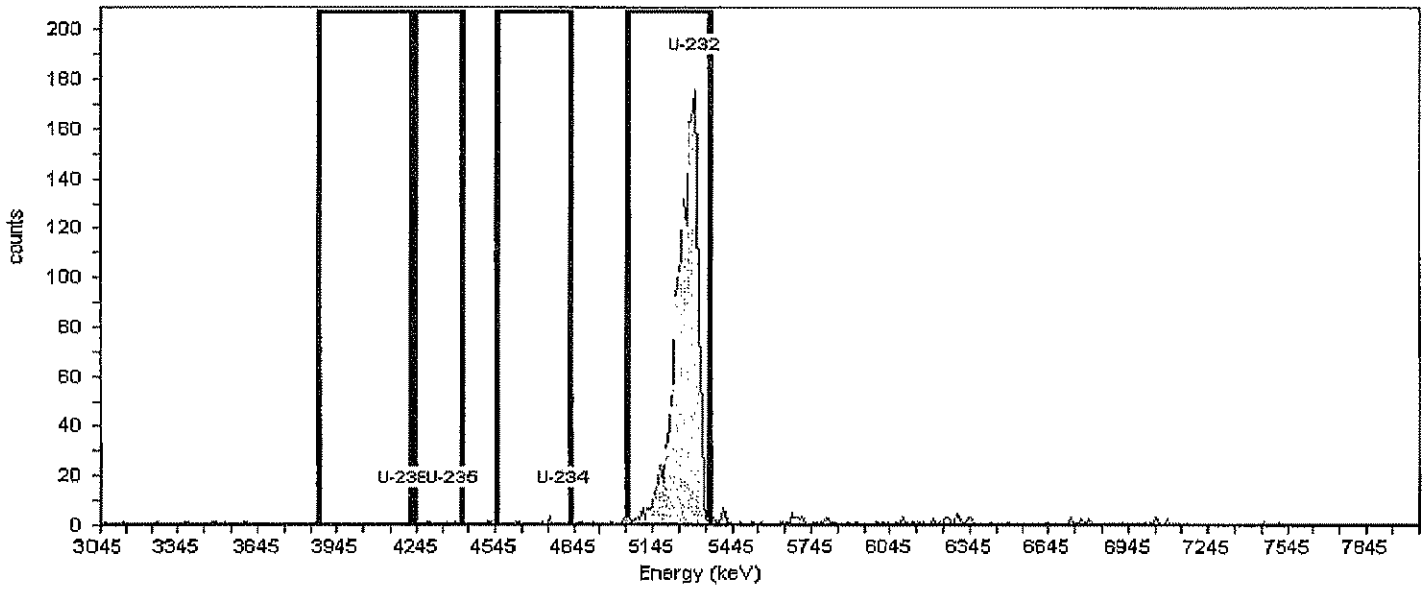
Energy Calibration: C11010427

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 92.09%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-234	4800.9	4545.9	4830.3	141.5	100.0	6.00	3.00	3.00	1.7E-002	3.3E-002	1.8E-002	5.1E-002
U-232	5300.9	5046.0	5359.7	61.9	100.1	1,619.00	7.50	1,611.50	8.3E+000	4.2E-001	2.9E-002	7.2E-002
U-238	4193.0	3869.4	4222.4	.0	100.2	1.00	3.00	-2.00	0.0E+000	2.2E-002	1.8E-002	5.1E-002
U-235	4379.3	4232.2	4418.5	16.9	99.7	4.00	0.30	3.70	2.1E-002	2.3E-002	5.7E-003	2.6E-002

Reviewed By: TPS JP CWK

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-3
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 28
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:11AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010428; Det: 28; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:07:13PM

Efficiency Calibration: C11010428

Efficiency: 28.65% +/- 0.20% TPU(2 sigma)

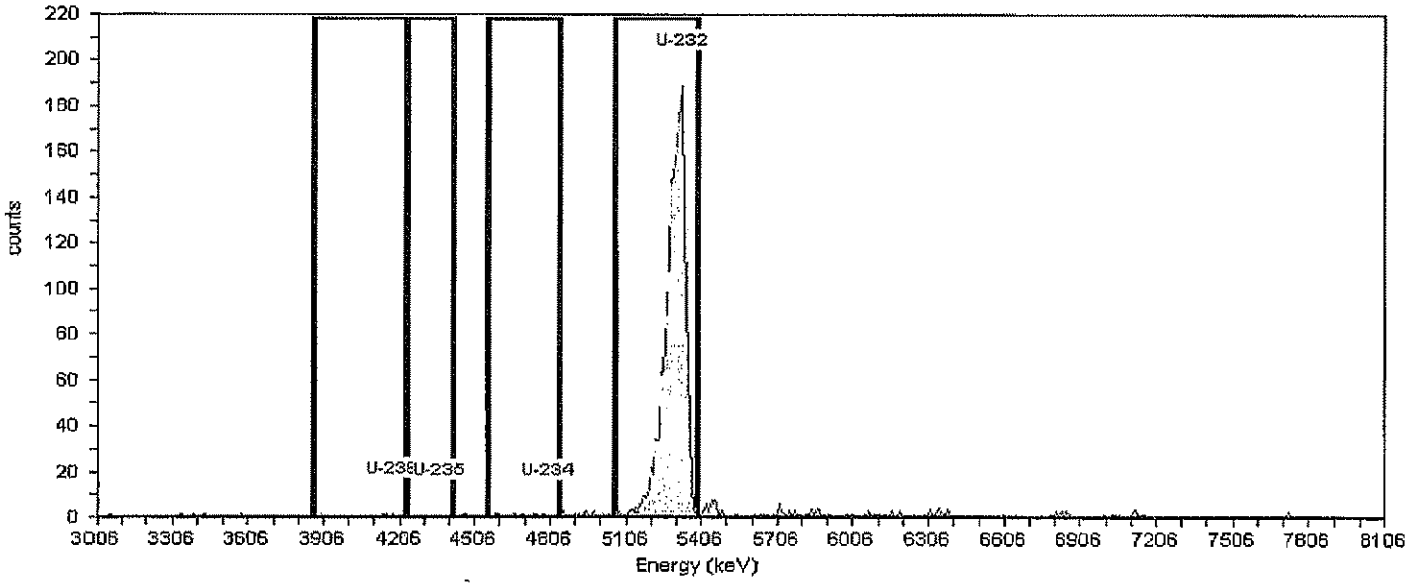
Energy Calibration: C11010428

Energy Cal: Gain = 9.9974 keV / Ch
Offset = 2,996.32 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 92.98%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4176.0	3866.1	4226.0	14.0	100.2	3.00	0.60	2.40	1.3E-002	2.1E-002	8.2E-003	3.2E-002
U-235	4366.0	4236.0	4416.0	.0	99.7	0.00	0.30	-0.30	0.0E+000	1.3E-002	5.8E-003	2.7E-002
U-234	4795.9	4555.9	4845.8	257.6	100.0	8.00	0.90	7.10	4.0E-002	3.4E-002	1.0E-002	3.5E-002
U-232	5325.7	5065.8	5385.7	70.1	100.1	1,591.00	6.60	1,584.40	8.3E+000	4.3E-001	2.7E-002	7.0E-002

Reviewed By: [signature] JP [signature]

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-4
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 29
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:11AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010429; Det: 29; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:09:02PM

Efficiency Calibration: C11010429

Efficiency: 28.48% +/- 0.13% TPU(2 sigma)

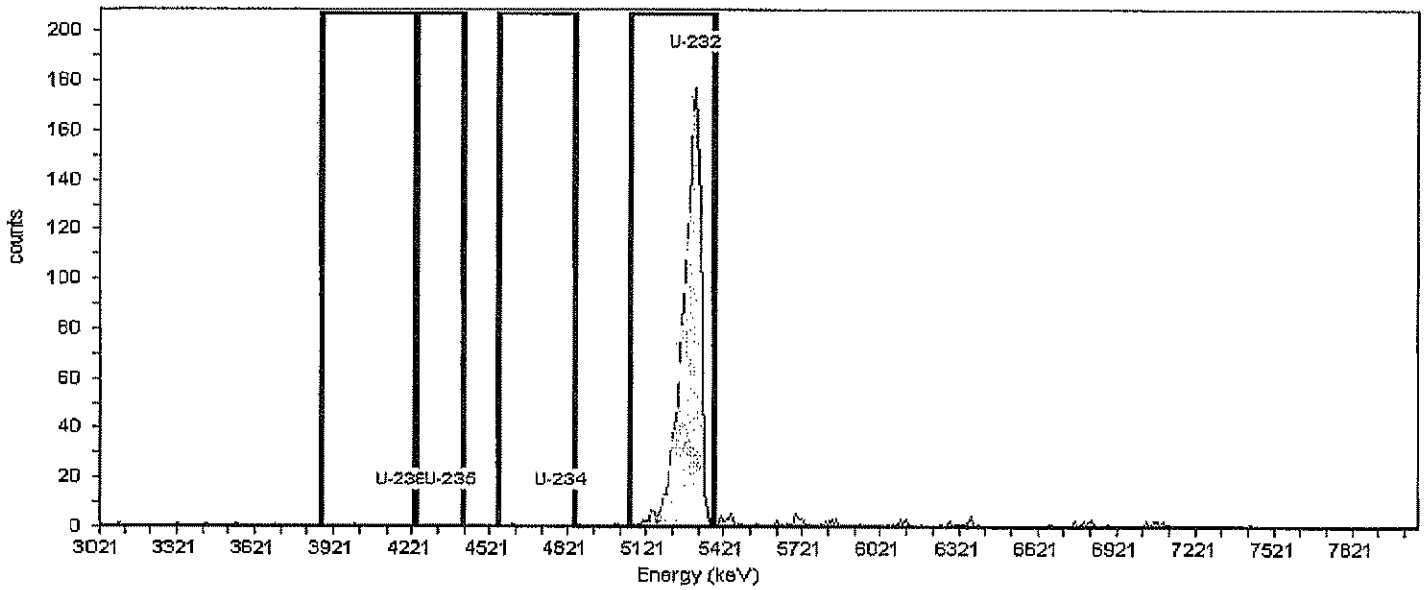
Energy Calibration: C11010429

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

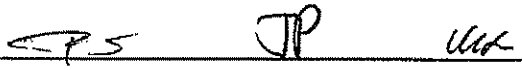
Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 84.91%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.6	3872.7	4229.1	59.0	100.2	1.00	0.30	0.70	4.3E-003	1.4E-002	6.4E-003	2.9E-002
U-235	4367.7	4239.0	4417.2	.0	99.7	0.00	0.90	-0.90	0.0E+000	1.7E-002	1.1E-002	3.9E-002
U-234	4793.4	4555.8	4842.9	24.2	100.0	1.00	2.40	-1.40	0.0E+000	2.3E-002	1.8E-002	5.3E-002
U-232	5308.2	5060.7	5377.5	62.1	100.1	1,444.00	5.40	1,438.60	7.6E+000	4.0E-001	2.7E-002	7.1E-002

Reviewed By: 

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-5
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 30
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:04AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010430; Det: 30; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:10:02PM

Efficiency Calibration: C11010430

Efficiency: 28.36% +/- 0.15% TPU(2 sigma)

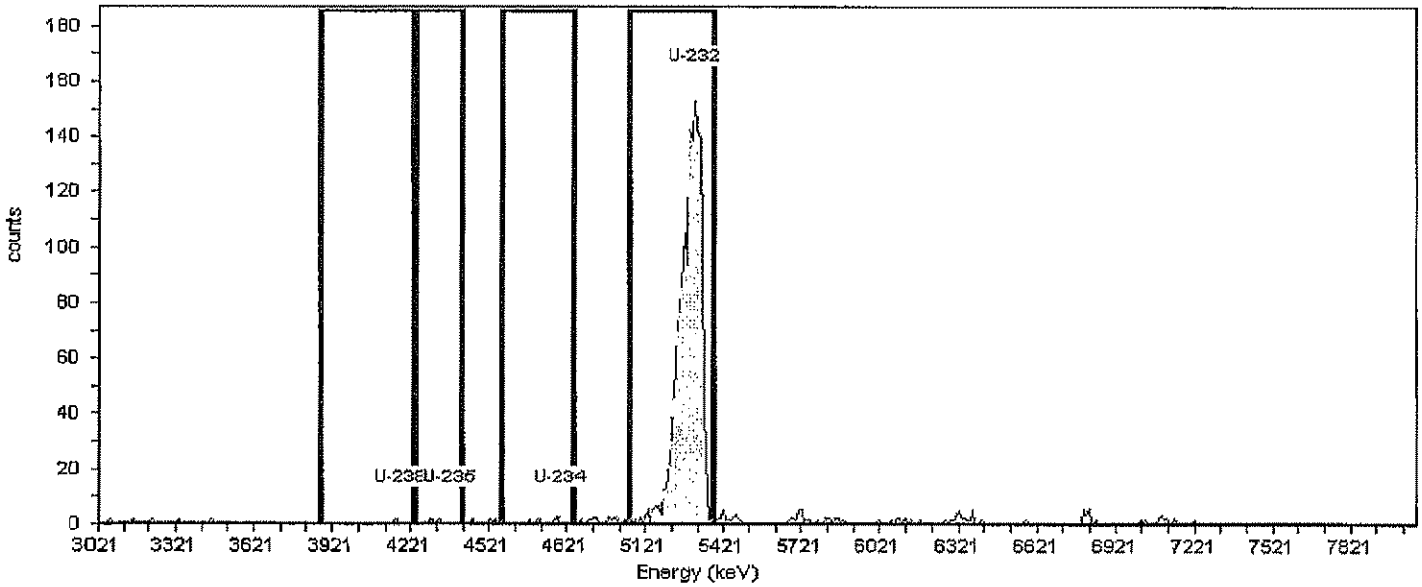
Energy Calibration: C11010430

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 86.26%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.6	3872.7	4229.1	.5	100.2	2.00	0.90	1.10	6.7E-003	2.1E-002	1.1E-002	3.8E-002
U-235	4367.7	4239.0	4417.2	53.5	99.7	2.00	0.60	1.40	8.6E-003	2.0E-002	8.9E-003	3.5E-002
U-234	4793.4	4565.7	4842.9	90.3	100.0	7.00	0.00	7.00	4.3E-002	3.5E-002	0.0E+000	1.7E-002
U-232	5308.2	5060.7	5377.5	55.8	100.1	1,460.00	4.80	1,455.20	7.7E+000	4.1E-001	2.5E-002	6.7E-002

Reviewed By: JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-6
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 31
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:05AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010431; Det: 31; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:10:58PM

Efficiency Calibration: C11010431

Efficiency: 29.55% +/- 0.18% TPU(2 sigma)

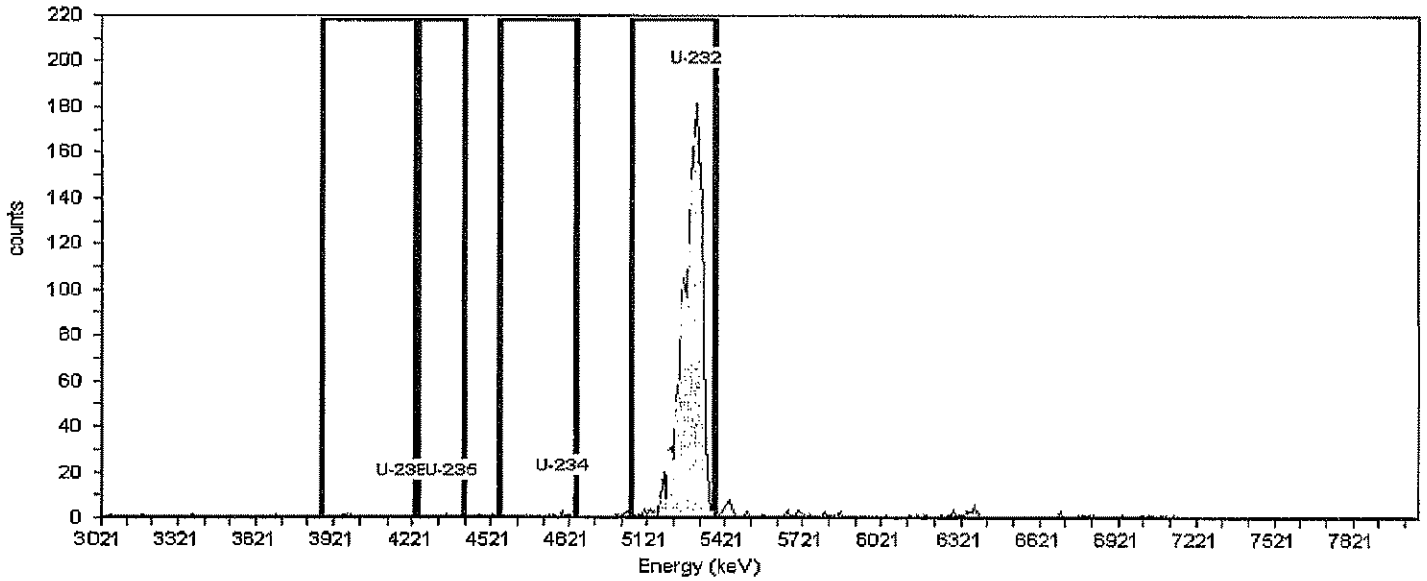
Energy Calibration: C11010431

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 90.51%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.6	3872.7	4229.1	55.3	100.2	3.00	0.90	2.10	1.2E-002	2.2E-002	1.0E-002	3.5E-002
U-235	4367.7	4239.0	4417.2	24.2	99.7	1.00	0.30	0.70	3.9E-003	1.3E-002	5.8E-003	2.7E-002
U-234	4793.4	4555.8	4842.9	35.1	100.0	8.00	1.80	6.20	3.5E-002	3.5E-002	1.4E-002	4.3E-002
U-232	5308.2	5060.7	5377.5	65.2	100.1	1,603.00	12.30	1,590.70	8.1E+000	4.1E-001	3.7E-002	9.0E-002

Reviewed By:

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-7
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 32
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:06AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010432; Det: 32; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:12:22PM

Efficiency Calibration: C11010432

Efficiency: 29.72% +/- 0.12% TPU(2 sigma)

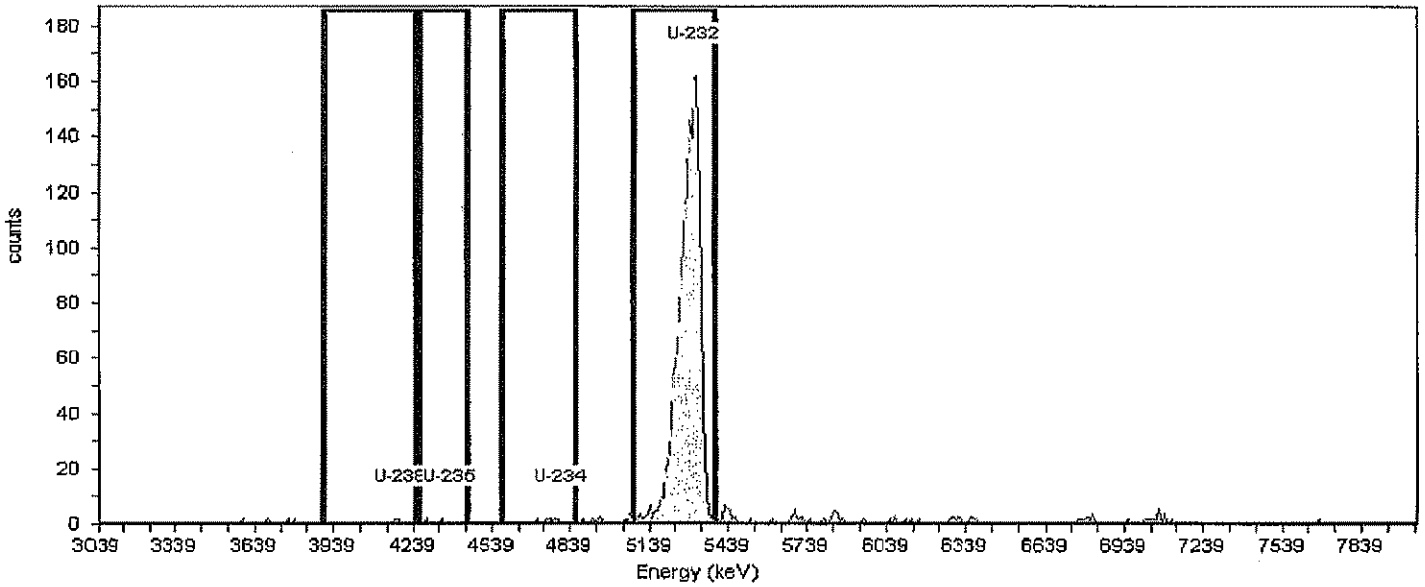
Energy Calibration: C11010432

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 84.76%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4188.4	3893.8	4247.4	57.1	100.2	2.00	1.20	0.80	4.8E-003	2.1E-002	1.2E-002	4.1E-002
U-235	4375.1	4257.2	4443.8	23.8	99.7	2.00	0.60	1.40	8.4E-003	1.9E-002	8.7E-003	3.4E-002
U-234	4797.4	4571.5	4856.4	91.9	100.0	5.00	1.80	3.20	1.9E-002	3.1E-002	1.5E-002	4.6E-002
U-232	5308.2	5072.5	5386.8	95.3	100.1	1,502.00	3.60	1,498.40	7.6E+000	4.0E-001	2.1E-002	5.9E-002

Reviewed By: TPS JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-8
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 58
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:15AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010458; Det: 58; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:29:06PM

Efficiency Calibration: C11010458

Efficiency: 30.59% +/- 0.15% TPU(2 sigma)

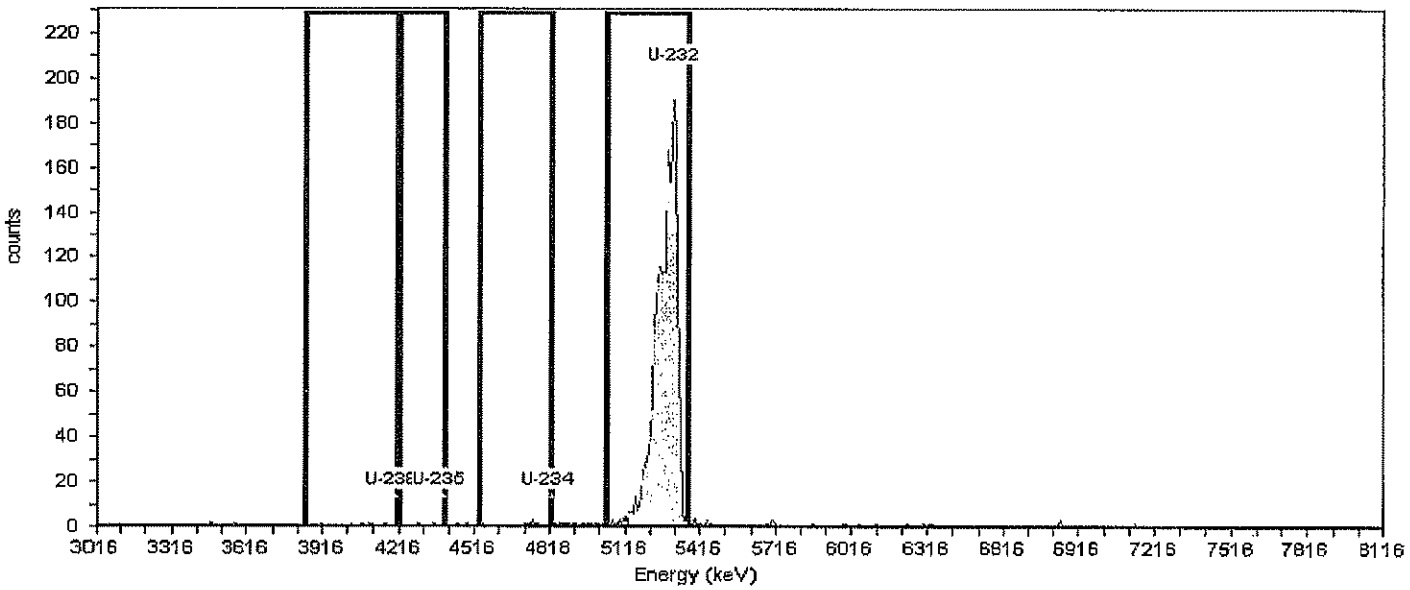
Energy Calibration: C11010458

Energy Cal: Gain = 9.9974 keV / Ch
Offset = 3,006.32 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 88.59%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4186.0	3846.1	4206.0	12.8	100.2	6.00	0.60	5.40	3.0E-002	2.9E-002	8.0E-003	3.1E-002
U-235	4376.0	4216.0	4396.0	24.4	99.7	2.00	0.00	2.00	1.1E-002	1.9E-002	0.0E+000	1.5E-002
U-234	4805.9	4535.9	4825.8	47.8	100.0	8.00	0.60	7.40	4.1E-002	3.3E-002	8.0E-003	3.1E-002
U-232	5305.7	5045.8	5365.7	46.7	100.1	1,616.00	4.20	1,611.80	8.0E+000	4.0E-001	2.1E-002	5.8E-002

Reviewed By: CTS JP MK

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-9
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 59
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:05AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010459; Det: 59; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:09:34PM

Efficiency Calibration: C11010459

Efficiency: 30.80% +/- 0.16% TPU(2 sigma)

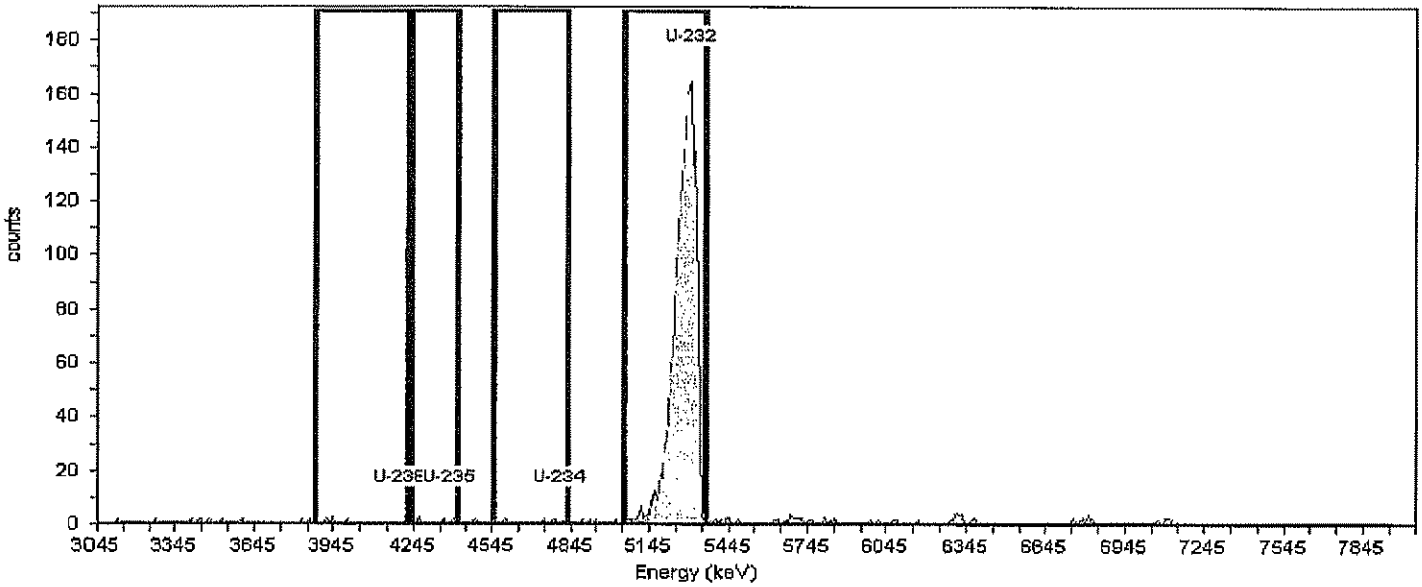
Energy Calibration: C11010459

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 86.31%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3869.4	4222.4	54.2	100.2	4.00	2.10	1.90	1.1E-002	2.8E-002	1.5E-002	4.6E-002
U-235	4379.3	4232.2	4408.7	152.1	99.7	4.00	1.80	2.20	1.2E-002	2.7E-002	1.4E-002	4.4E-002
U-234	4800.9	4545.9	4830.3	13.4	100.0	5.00	1.80	3.20	1.8E-002	3.0E-002	1.4E-002	4.4E-002
U-232	5300.9	5046.0	5359.7	57.6	100.1	1,586.00	5.10	1,580.90	7.7E+000	3.9E-001	2.4E-002	6.3E-002

Reviewed By: TPS JP WK

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-10
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 60
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:06AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010460; Det: 60; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:11:39PM

Efficiency Calibration: C11010460

Efficiency: 29.88% +/- 0.21% TPU(2 sigma)

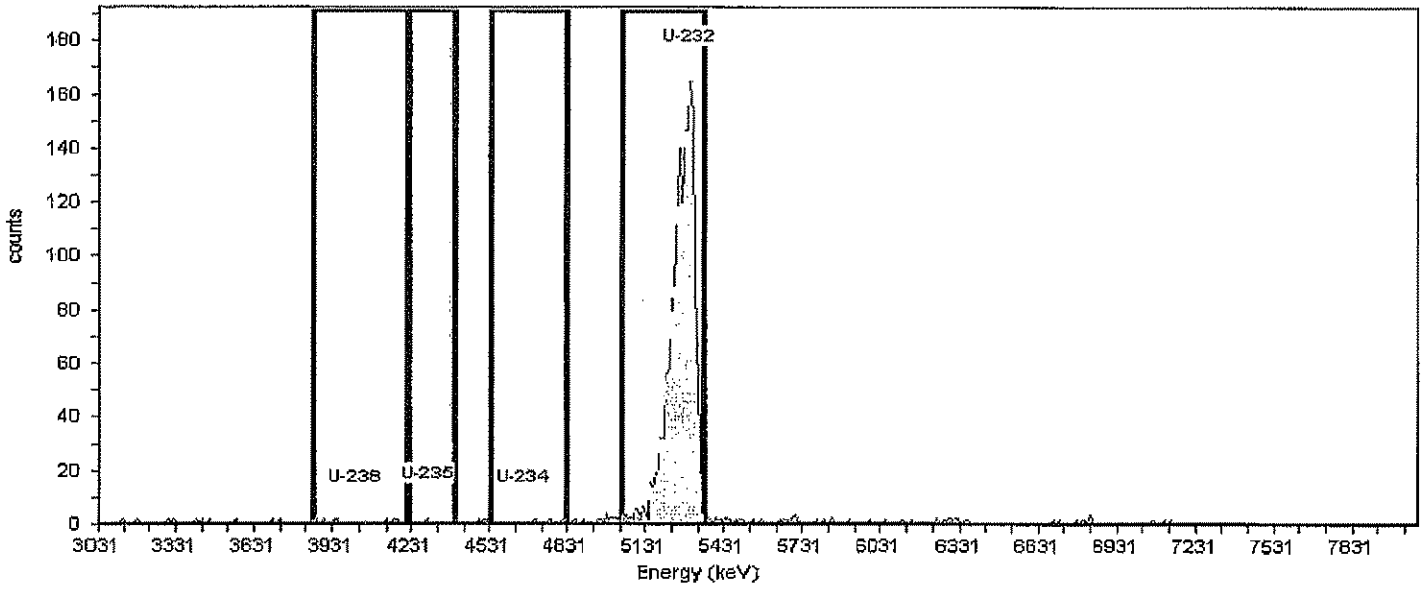
Energy Calibration: C11010460

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,021.28 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 91.92%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-234	4659.8	4536.0	4823.1	13.4	100.0	3.00	1.20	1.80	9.8E-003	2.2E-002	1.1E-002	3.7E-002
U-232	5298.3	5040.9	5357.7	60.4	100.1	1,640.00	6.30	1,633.70	8.3E+000	4.1E-001	2.6E-002	6.7E-002
U-238	4011.3	3852.9	4209.3	21.6	100.2	8.00	2.40	5.60	3.1E-002	3.5E-002	1.6E-002	4.6E-002
U-235	4288.5	4219.2	4397.4	24.2	99.7	1.00	1.20	-0.20	0.0E+000	1.6E-002	1.1E-002	3.7E-002

Reviewed By: RS JP CMR

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012144-11
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 61
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:06AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010461; Det: 61; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:13:53PM

Efficiency Calibration: C11010461

Efficiency: 31.49% +/- 0.13% TPU(2 sigma)

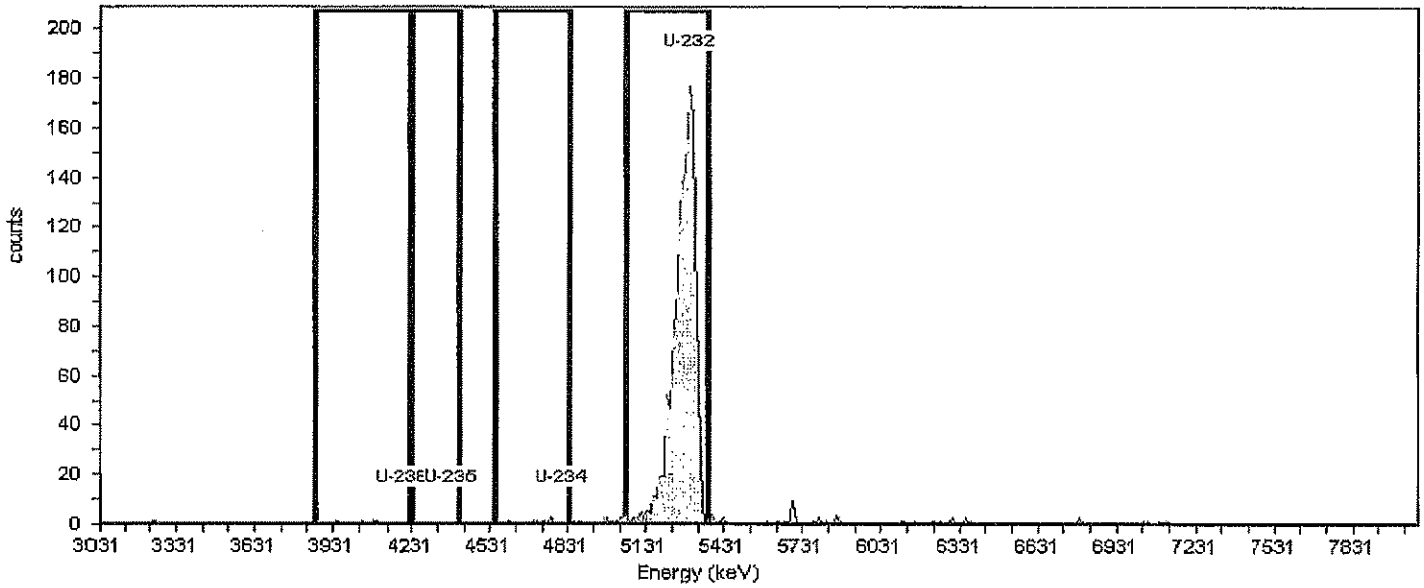
Energy Calibration: C11010461

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,021.28 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 84.35%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4189.5	3862.8	4219.2	66.8	100.2	4.00	0.60	3.40	1.9E-002	2.4E-002	8.2E-003	3.2E-002
U-235	4377.6	4229.1	4407.3	.0	99.7	0.00	0.30	-0.30	0.0E+000	1.3E-002	5.8E-003	2.7E-002
U-234	4803.3	4545.9	4833.0	87.4	100.0	6.00	0.90	5.10	2.9E-002	3.0E-002	1.0E-002	3.5E-002
U-232	5298.3	5050.8	5367.6	74.1	100.1	1,583.00	3.30	1,579.70	7.6E+000	3.8E-001	1.9E-002	5.4E-002

Reviewed By: TS JP AK

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-2MB
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 62
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:07AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010462; Det: 62; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:33:17PM

Efficiency Calibration: C11010462

Efficiency: 29.69% +/- 0.15% TPU(2 sigma)

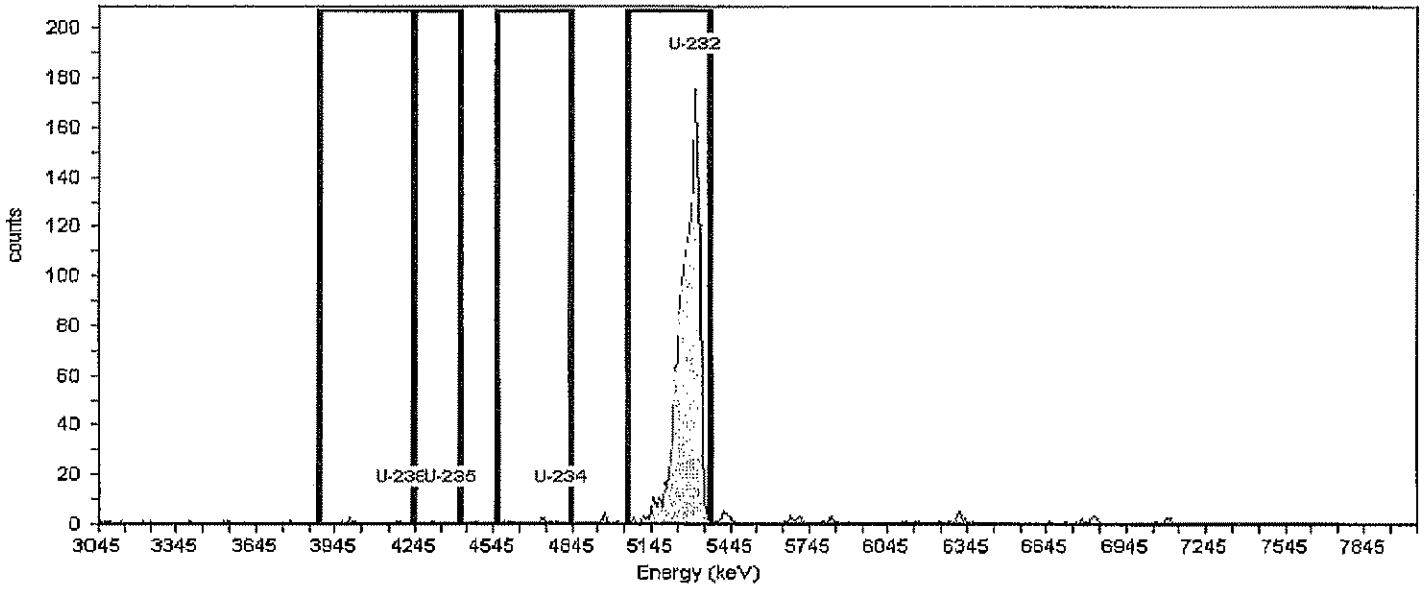
Energy Calibration: C11010462

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 78.96%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3879.2	4232.2	14.1	100.2	6.00	1.80	4.20	2.7E-002	3.6E-002	1.6E-002	4.9E-002
U-235	4379.3	4242.0	4418.5	24.0	99.7	1.00	1.20	-0.20	0.0E+000	1.9E-002	1.3E-002	4.4E-002
U-234	4800.9	4555.7	4840.1	177.2	100.0	9.00	2.10	6.90	4.4E-002	4.3E-002	1.7E-002	5.2E-002
U-232	5310.7	5055.8	5369.5	45.6	100.1	1,405.00	10.80	1,394.20	7.1E+000	3.8E-001	4.0E-002	9.7E-002

Reviewed By:

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-2LCS
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 63
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:07AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010463; Det: 63; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:15:40PM

Efficiency Calibration: C11010463

Efficiency: 31.42% +/- 0.18% TPU(2 sigma)

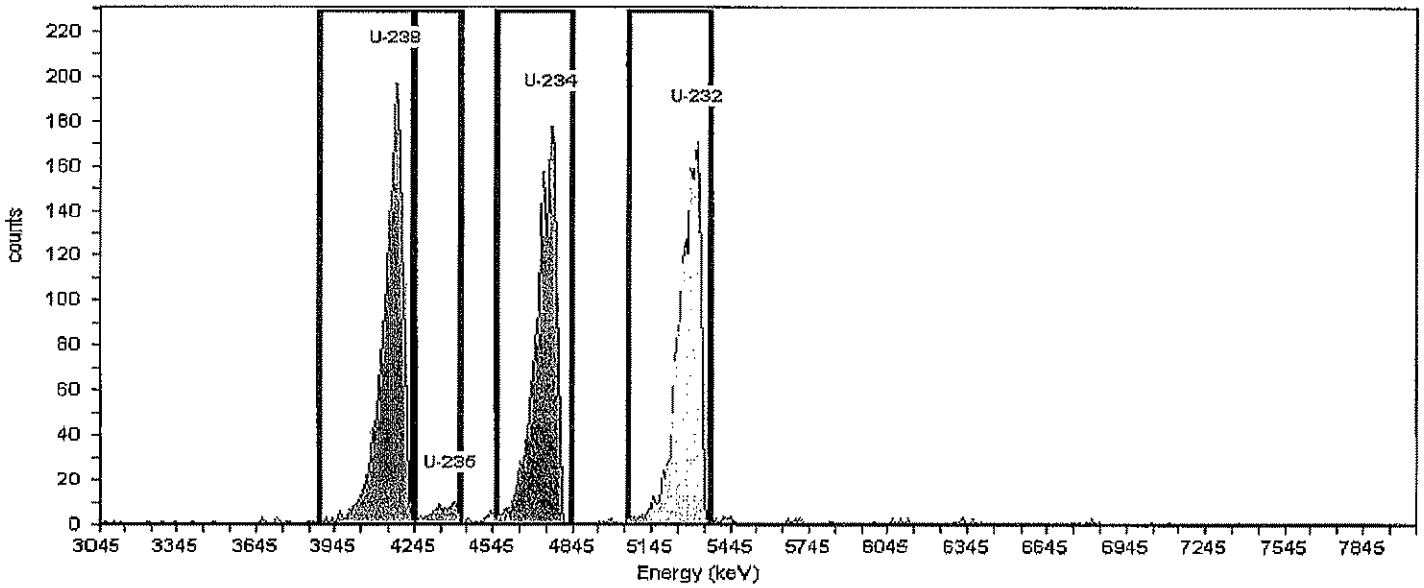
Energy Calibration: C11010463

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 88.76%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4173.4	3879.2	4232.2	50.4	100.2	1,697.00	0.30	1,696.70	9.1E+000	1.1E+000	5.5E-003	2.6E-002
U-235	4379.3	4242.0	4418.5	23.5	99.7	90.00	0.30	89.70	4.8E-001	1.2E-001	5.5E-003	2.6E-002
U-234	4761.6	4555.7	4840.1	75.3	100.0	1,565.00	0.90	1,564.10	8.4E+000	1.0E+000	9.6E-003	3.4E-002
U-232	5320.5	5055.8	5369.5	47.0	100.1	1,662.00	3.30	1,658.70	8.0E+000	3.9E-001	1.8E-002	5.2E-002

Reviewed By: TR JP MK

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-2LCSD
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 64
Batch Name: UAS101228-2_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/6/2011 10:53:08AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010464; Det: 64; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:16:42PM

Efficiency Calibration: C11010464

Efficiency: 29.80% +/- 0.12% TPU(2 sigma)

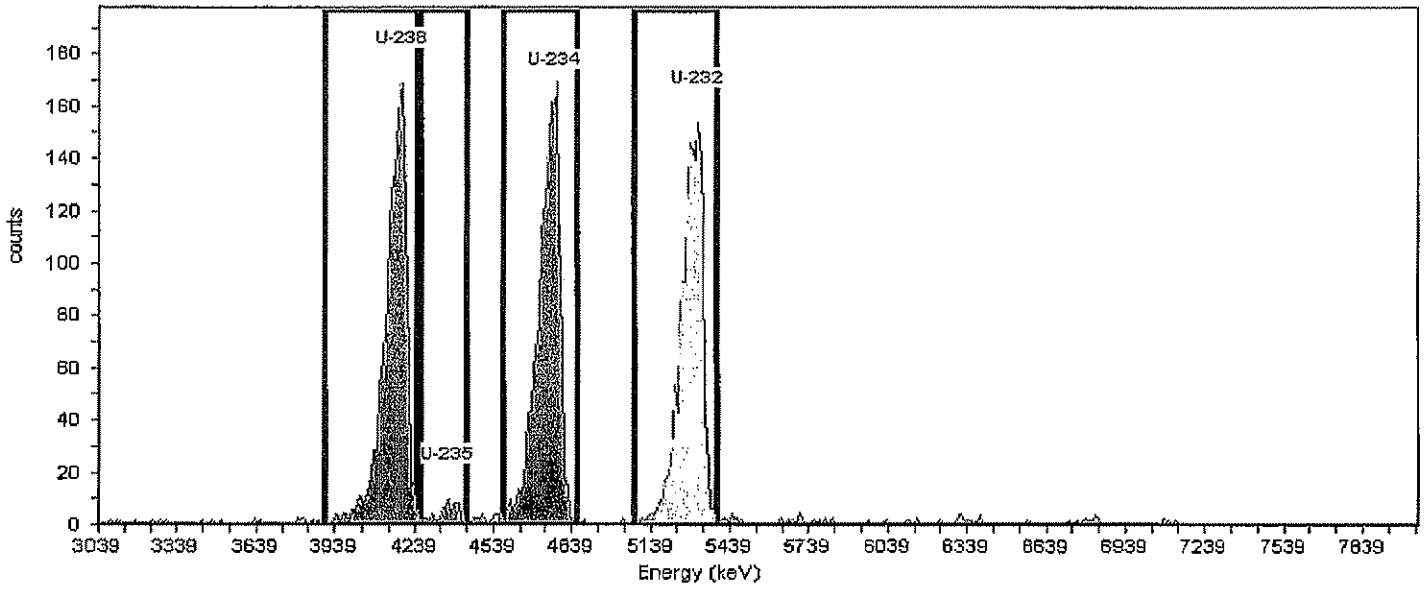
Energy Calibration: C11010464

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.76%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4188.4	3893.8	4247.4	62.3	100.2	1,611.00	0.60	1,610.40	9.4E+000	1.2E+000	8.5E-003	3.3E-002
U-235	4365.2	4257.2	4434.0	72.1	99.7	66.00	0.00	66.00	3.9E-001	1.1E-001	0.0E+000	1.6E-002
U-234	4768.0	4571.5	4856.4	83.6	100.0	1,600.00	0.90	1,599.10	9.4E+000	1.2E+000	1.0E-002	3.7E-002
U-232	5318.0	5072.5	5388.8	79.6	100.1	1,524.00	3.90	1,520.10	7.7E+000	4.0E-001	2.2E-002	6.0E-002

Reviewed By: TS JP MK

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS

FORM 746r8.xls (10/2/07)

Alpha Spectrometer Instrument Run Log

Date: 1-6-11

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
16	UAS1012228-2-A	1012103-7	U/F	300	TDS
17		8			
18		9			
19		10			
25		11			
26		1012144-1			
27		2			
28		3			
29		4			
30		5			
31		6			
32		7			
58		8			
59		9			
60		10			
61		11			
62		AS1012228-2MB			
63		LCS			
64		LCSD			
11	TAS1012202-A	1012153-15	~~Th~~	420	TDS
12		AS1012202-2MB	Th/W		
13		LCS			
14		LCSD			
		TDS 1-6-11			

TDS 1-6-11

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
9	UAS1012203-3B	AS1012203-3LCS	U/W	300	TDS
10		LCSD			
7	NAS1101103-2-A	1012224-2	Np/S	300	TDS
8		2SYS			
50*		3B*			
51*		3SYS			
52*		3D			
54		4			
55		4SYS			
56		AS1101103-2SYS			
42		MB			
43		LCS			
1	1012229-1	NAS			
2	1SYSIS				
3	1D	TDS 1-6-11			
4	AS1012229-1SYSIS				
5	MB				
6	LCS				
1	NAS1101103-1-A	1012224-1	Np/W	300	TDS
2		1SYS*			
3		1D			
4		AS1101103-1SYS			
5		MB			
6		LCS			

Notes:

Reviewed by: TDS

Date: 1-6-11

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

No *NON-CONFORMANCE REPORTS* or *QUALITY ASSURANCE SUMMARY SHEETS* are included in this data package.

Section 7

LABORATORY BENCH SHEETS

1-7

Radiochemistry Instrument Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-2

Prep Procedure: UISO Default 300 min (6.1)

Analytical QASS / NCR? Y (N) NA

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Report Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	1012143-7	SMP	1	1	sample	pCi/sample	_C1437	16	PS	_C1437			_C1437		A	
1	1012143-8	SMP	1	1	sample	pCi/sample	_C1438	17		_C1438			_C1438			
1	1012143-9	SMP	1	1	sample	pCi/sample	_C1439	18		_C1439			_C1439			
1	1012143-10	SMP	1	1	sample	pCi/sample	_C14310	19		_C14310			_C14310			
1	1012143-11	SMP	1	1	sample	pCi/sample	_C14311	25		_C14311			_C14311			
1	1012144-1	SMP	1	1	sample	pCi/sample	_C1441	26		_C1441			_C1441			
1	1012144-2	SMP	1	1	sample	pCi/sample	_C1442	27		_C1442			_C1442			
1	1012144-3	SMP	1	1	sample	pCi/sample	_C1443	28		_C1443	PS		_C1443			PS
1	1012144-4	SMP	1	1	sample	pCi/sample	_C1444	29		_C1444	1-15-11		_C1444	PS 1-15-11		1-15-11
1	1012144-5	SMP	1	1	sample	pCi/sample	_C1445	30		_C1445			_C1445			
1	1012144-6	SMP	1	1	sample	pCi/sample	_C1446	31		_C1446			_C1446			
1	1012144-7	SMP	1	1	sample	pCi/sample	_C1447	32		_C1447			_C1447			
1	1012144-8	SMP	1	1	sample	pCi/sample	_C1448	58		_C1448			_C1448			
1	1012144-9	SMP	1	1	sample	pCi/sample	_C1449	59		_C1449			_C1449			
1	1012144-10	SMP	1	1	sample	pCi/sample	_C14410	60		_C14410			_C14410			
1	1012144-11	SMP	1	1	sample	pCi/sample	_C14411	61		_C14411			_C14411			
1	AS101228-2	MB	1	1	sample	pCi/sample	_C282B	62		_C282B			_C282B			
1	AS101228-2	LCS	1	1	sample	pCi/sample	_C282L	63		_C282L			_C282L			
1	AS101228-2	LCSD	1	1	sample	pCi/sample	_C282LD	64		_C282LD			_C282LD			

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.868	DPM/ml	12/28/10	1	ml	AW019

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

55 of 96

Reporting Units

LabID:	TstGrpName:	RptUnits:
1012144-1	IsoU_Wipe/sample	pCi/samp
1012144-2	IsoU_Wipe/sample	pCi/samp
1012144-3	IsoU_Wipe/sample	pCi/samp
1012144-4	IsoU_Wipe/sample	pCi/samp
1012144-5	IsoU_Wipe/sample	pCi/samp
1012144-6	IsoU_Wipe/sample	pCi/samp
1012144-7	IsoU_Wipe/sample	pCi/samp
1012143-7	IsoU_Wipe/sample	pCi/samp
1012144-8	IsoU_Wipe/sample	pCi/samp
1012143-8	IsoU_Wipe/sample	pCi/samp
1012144-9	IsoU_Wipe/sample	pCi/samp
1012143-9	IsoU_Wipe/sample	pCi/samp
1012143-10	IsoU_Wipe/sample	pCi/samp
1012144-10	IsoU_Wipe/sample	pCi/samp
1012143-11	IsoU_Wipe/sample	pCi/samp
1012144-11	IsoU_Wipe/sample	pCi/samp

Sample Barcodes

1012143-7
AS101228-2PS1

1012143-8
AS101228-2PS2

1012143-9
AS101228-2PS3

1012143-10
AS101228-2PS4

1012143-11
AS101228-2PS5

1012144-1
AS101228-2PS6

1012144-2
AS101228-2PS7

1012144-3
AS101228-2PS8

1012144-4
AS101228-2PS9

1012144-5
AS101228-2PS10

1012144-6
AS101228-2PS11

1012144-7
AS101228-2PS12

1012144-8
AS101228-2PS13

1012144-9
AS101228-2PS14

1012144-10
AS101228-2PS15

1012144-11
AS101228-2PS16

AS101228-2MB
AS101228-2PS17

AS101228-2LCS
AS101228-2PS18

AS101228-2LCSD
AS101228-2PS19

Radiochemistry Prep Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-2

Prep Procedure: UISO

Reviewed By: cas cas **Review Date:** 1/3/2011

Non-Routine Pre-Treatment? (Y) / N **Batch:** See comments **Re-Prep?** Y / (N) **Batch:** N/A **Prep QASS / NCR?** Y / (N) N/A

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq sample	Fin Alq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes
1	1	1012143-7	SMP		1	1	As Received				T1	
2	1	1012143-8	SMP		1	1	As Received				T1	
3	1	1012143-9	SMP		1	1	As Received				T1	
4	1	1012143-10	SMP		1	1	As Received				T1	
5	1	1012143-11	SMP		1	1	As Received				T1	
6	1	1012144-1	SMP		1	1	As Received				T1	
7	1	1012144-2	SMP		1	1	As Received				T1	
8	1	1012144-3	SMP		1	1	As Received				T1	
9	1	1012144-4	SMP		1	1	As Received				T1	
10	1	1012144-5	SMP		1	1	As Received				T1	
11	1	1012144-6	SMP		1	1	As Received				T1	
12	1	1012144-7	SMP		1	1	As Received				T1	
13	1	1012144-8	SMP		1	1	As Received				T1	
14	1	1012144-9	SMP		1	1	As Received				T1	
15	1	1012144-10	SMP		1	1	As Received				T1	
16	1	1012144-11	SMP		1	1	As Received				T1	
17	1	AS101228-2	MB		1	1	As Received				T1	
18	1	AS101228-2	LCS		1	1	As Received				S1,T1	
19	1	AS101228-2	LCSD		1	1	As Received				S1,T1	

cas 1/3/11

cas 1/3/11

Comments

The samples in WO 1012143 and 1012144 were placed into 100 ml glass beakers. Due to limited sample, a LCSD was created to meet laboratory requirements for a prep batch duplicate. Samples were spiked and traced then muffled overnight at 450 degrees C. Samples were digested per SOP 773/r10.

Spiked By: Crystal Shaeffer **Date:** 12/28/2010

Witnessed By: Gabriel D. Wagner **Date:** 12/28/2010

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.888	DPM/ml	12/28/10	1	ml	AW019

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

Page 1 of 1 UISO Bench Sheet
Date Printed: 1/3/2011 12:20

ALS Environmental -- FC
LIMS Version: 6.441A

Supersedes: 12/28/10 12:21

58 of 96

Radiochemistry Prep Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-2

Prep Procedure: UISO

Prep Batch Not Validated!!!

Reviewed By: **Review Date:**

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep?** Y / N **Batch:** _____ **Prep QASS / NCR?** Y / N _____

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010 CWS
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq sample	Fin Alq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes
1	1	1012143-7	SMP		1	1	As Received				T1	16X
2	1	1012143-8	SMP		1	1	As Received				T1	840
3	1	1012143-9	SMP		1	1	As Received				T1	CWS 820 ~~514~~
4	1	1012143-10	SMP		1	1	As Received				T1	12/28/10 ~~500~~ 850
5	1	1012143-11	SMP		1	1	As Received				T1	705
6	1	1012144-1	SMP		1	1	As Received				T1	326
7	1	1012144-2	SMP		1	1	As Received				T1	714
8	1	1012144-3	SMP		1	1	As Received				T1	735
9	1	1012144-4	SMP		1	1	As Received				T1	L61
10	1	1012144-5	SMP		1	1	As Received				T1	718
11	1	1012144-6	SMP		1	1	As Received				T1	696
12	1	1012144-7	SMP		1	1	As Received				T1	519
13	1	1012144-8	SMP		1	1	As Received				T1	805
14	1	1012144-9	SMP		1	1	As Received				T1	514 ~~820~~
15	1	1012144-10	SMP		1	1	As Received				T1	CWS 12/28/10 ~~850~~ 500
16	1	1012144-11	SMP		1	1	As Received				T1	1163
17	1	AS101228-2	MB		1	1	As Received				T1	573
18	1	AS101228-2	LCS		1	1	As Received				S1,T1	691
19	1	AS101228-2	LCSD		1	1	As Received				S1,T1	804

Comments

Spiked By: CWS **Date:** 12/28/10
Witnessed By: GDW **Date:** 12/28/10

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.888	DPM/ml	12/28/10	1	ml	AW019

exp: 10/24/11

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

exp: 01/15/11

59 of 98

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: CWS

ANALYSIS DATE: 12/28/10 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
1012143	7	As Recd	Wipe	filter-like, not soiled
	8			
	9			
	10			
	11			
1012144	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
	11			

CWS 1/3/11

Section 8

STANDARDS TRACEABILITY DOCUMENTS

8

Notebook No. 3610

PROJECT 644.3610.02 U-238/Nat

Continued From Page

Prepare a working dilution of ~ 20.0 dpm/mL U-238 from 644.3020.53.

1) Determine Density of 1M HNO_3 lot# 073371 Ba/# 12 I

Mass of volumetric flask (100 mL)	68.2980 g
Mass of flask and 100 ml Acid	171.0125 g
Net Mass of Acid	102.7145 g

$\rho = 1.027145$ g/mL

2) Transfer 644.3020.53 12 I

Mass of Empty (No lid) 1000 ml Nalgene	74.7135 g
Mass of Nalgene and Std Transferred	76.1629 g
Net Mass of Std Transferred	1.4494 g

3) Dilute to final Vol. 26

Mass of Std, Nalgene, and diluent	1155.1 g
Mass of Nalgene	74.7135 g
Net Mass of New Std Dilution	1080.3865 g

Final Activity Calculation

$$\frac{\left(242.0 \frac{Bq}{g}\right)\left(\frac{60 \text{ dpm}}{1 Bq}\right)\left(1.4494 g\right)\left(1.027145 \frac{g}{mL}\right)}{\left(1080.3865 g\right)} = 20.01 \text{ dpm/mL}$$

MC 7/13/08

Stnd ID: 644.3610.02

Description: U-234/238
Expiration: 4/8/2009
Activity: 20.01 dpm/mL
Density of 1.0 gram/mL assumed
2s Uncertainty: 0.12 dpm/mL
Ref. Date: 8/1/1997
Ref Time: N/A
Prep Date: 4/7/2008 Prep by: jdd
Matrix/Comp. 1 M HNO3
Half Life (y): 4.47E+09

MC 7/13/08

MC 7/13/08

Reverification Log		
Analysis Date	Initials	Expiration Date
2/23/09	RG	2/23/2010
1/15/2010	RG	1/15/2011

MC 7/13/08

MC 7/13/08

Continued on Page

Read and Understood By

4/7/08
Date

Signed

7/13/08
Date

Direct transfer of RSD 644 to 40 mL VOA vial

Mass of VOA vial w/o lid: 20.9455 g
Mass of vial + standard: 24.6612 g
Net mass of std transferred: 3.7157 g

Bal 12

RSD 644
U-238: 242.0 Bq/g
U-235: 11.14 Bq/g
U-234: 233.1 Bq/g

11/28/06

Continued on Page

Read and Understood By

Signed	Date	Signed	Date
	11/28/06		7/13/08

National Institute of Standards & Technology

Certificate

PAF ID 0644
rec'd 10-18-02

Standard Reference Material 4321C
Natural Uranium Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive natural uranium nitrate and nitric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of alpha-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains uranium-238, uranium-235, and uranium-234 with a total activity of approximately 2600 Bq. Uranium decays by alpha-particle emission. The progeny of uranium-238, uranium-235, and uranium-234 have a total activity of approximately 2600 Bq and decay by alpha- and beta-particle emission. None of the alpha or beta particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 11 keV to 2.0 MeV are also emitted. Most of these photons escape from the SRM ampoule but their intensities are so small that they do not represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains nitric acid (HNO_3) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least August 2007.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
November 1997

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

PROPERTIES OF SRM 4321C
(Certified values are shown in bold type)

Source identification number	NIST SRM 4321C		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.053 ± 0.001) g·mL^{-1} at 21.4 °C** [b]*		
Solution mass	**(5.258 ± 0.002) g** [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol·L^{-1})	Mass Fraction (g·g^{-1})
	H_2O	53	0.91
	HNO_3	1.0	0.06
	$UO_2(NO_3)_2$	0.09	0.03
Radiological Properties:			
Radionuclide	**Natural Uranium (Mixture of U-238, U-235, and U-234)**		
Reference time	**1200 EST, 1 August 1997**		
Massic activity of the solution [c]	**U-238: 242.0 Bq·g^{-1}** **U-235: 11.14 Bq·g^{-1}** **U-234: 233.1 Bq·g^{-1}**		
Relative expanded uncertainty (k=2)	**U-238: 0.60%** [d] [e] **U-235: 0.62%** [d] [e] **U-234: 0.98%** [d] [e]		
Mass fraction of uranium	**(0.01960 ± 0.00010) g·g^{-1}** [b]		
Photon-emitting impurities	None detected [f]		
Half lives used	Uranium-238: (4.468 ± 0.003) × 10^9 a [g] Uranium-235: (7.038 ± 0.005) × 10^8 a [g] Uranium-234: (2.455 ± 0.006) × 10^5 a [g]		
Measuring instruments	Mass spectrometer, silicon surface-barrier detector, and 4π(α+β) liquid-scintillation counting systems.		

*Notes and references are on pages 5 and 6.

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [h]	Relative Sensitivity Factor, $\lvert \partial y/\partial x_i \rvert \cdot (x_i/y)$ [i]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [j]
Isotopic uranium atom fraction in SRM 960	Standard deviation of the mean for repeated mass-spectrometric measurements (A)	U-238: 0.001 U-235: 0.07 U-234: 0.31	1.0 1.0 1.0	0.001 0.07 0.31
Half life	Standard uncertainty of the half life (A)	U-238: 0.07 U-235: 0.07 U-234: 0.25	1.0 1.0 1.0	0.07 0.07 0.25
Uranium mass fraction in SRM 960	Certificate value (B)	0.003	1.0	0.003
Quantitative dissolution	Estimated (B)	0.25	1.0	0.25
Gravimetric measurements	Estimated (B)	0.10	1.0	0.10
Photon-emitting impurities	Limit of detection (B) [k]	100.	0.001	0.10
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)			U-238: U-235: U-234:	0.30 0.31 0.49
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)			U-238: U-235: U-234:	0.60 0.62 0.98

*Notes and references are on pages 5 and 6.

NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	<0.1	-	-

[b] The stated uncertainty is two times the standard uncertainty.

[c] Massic activity is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) = |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y.

The **combined standard uncertainty** of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U, the **expanded uncertainty** of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic count rate is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[f] Estimated limits of detection for photon-emitting impurities are:
1.4 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 8 and 59 keV,
1.1 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 67 and 88 keV,
0.5 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 102 and 197 keV,
0.3 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 205 and 762 keV,
0.2 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 770 and 996 keV, and
0.1 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 1006 and 1900 keV,
provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of uranium-238, uranium-235, uranium-234, or their progeny.

[g] The stated uncertainty is the standard uncertainty. See reference [5].

[h] Relative standard uncertainty of the input quantity x_i.

[i] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[j] Relative component of combined standard uncertainty of output quantity y, rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y = |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

[k] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y)$ = {(response per Bq of impurity)/(response per Bq of U-238)} • {(Bq of impurity)/(Bq of U-238)}. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), August 1997.

Prepare a Working dilution of ~20 dpm/ml from 914.3610.62

Note **

Density of 1.M HNO_3 lot #'s J71044 + J02033

			balance #
Mass of 100 ml Vol flask	JDD 8/13/10 ~~66.4334 g~~	56.4413 g	12
Mass of flask + Acid	~~166.5111 g~~	159.3439 g	1
Net:	~~100.0777 g~~	102.9026 g	

ρ = 1.0290 g/ml

Mass of Parent transferred	JDD 8/13	
Mass of 1000 ml Nalgene	74.6~~8~~439 g	12
Mass of Nalgene + Std	77.0507 g	1
Net:	2.4068 g	

Dilute to final mass		
Gross mass: Nalgene, Std, + Diluent	973.6 g	26
Mass of Nalgene	74.6439 g	12
Net:	898.9561 g	

Activity

$$\left(7261.8 \frac{dpm}{g}\right)\left(\frac{2.4068\,g}{898.9561\,g}\right)\left(\frac{1.0290\,g/ml}{}\right) = \boxed{20.01\ dpm/ml}$$

Note: Density of Acid lot # J02033 was different than historical amount and was not used. JDD 8/13/10

RG 12/10/10

Stnd ID: 914.3610.74

RG 12/10/10

Description: U-232
Expiration: 10/24/2011
Activity: 20.01 dpm/mL
2s Uncertainty: 0.98 dpm/mL
Ref. Date: 5/27/2010
Ref Time: N/A
Prep Date: 8/13/2010 Prep by: JD
Matrix/Comp. 1M HNO3
Half Life (y): 6.89E+01

Reverification Log		
Analysis Date	Initials	Expiration Date

RG 12/10/10

Continued on Page

RG 12/10/10

Read and Understood By

Signed 8/13/10 Date Signed 10/22/10 Date

62
PROJECT 914.3610.62 U-232

Notebook No. 3610
Continued From Page

Prepare a Intermediate dilution of RCO # 914

Diluent is 1M HNO_3 Acid lot # J11044

Mass of parent transferred. bal #

Mass of Open Vial Ampule + Beaker	38.0690 g	12
Mass of Empty Ampule + Beaker	32.9311 g	1
Net mass transferred	5.1379 g	

Dilute to final Mass

Mass of Vial Std, + Diluent	58.6555 g	12
Mass of Vial	21.5981 g	1
Net Mass of New dilution	37.0574 g	

Final Activity

$$\left(4.552 \times 10^3 \text{ Bq}\right)\left(\frac{60 \text{ dpm}}{1 \text{ Bq}}\right)\left(\frac{5.1379 \text{ g}}{5.21459 \text{ g}}\right)\left(\frac{1}{37.0574 \text{ g}}\right) = 7261.8 \frac{\text{dpm}}{\text{g}}$$

Continued on Page

Read and Understood By

Signed — 6/4/10 Date

Signed — 06-17-2010 Date

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

Rec 6-1-10 RSO# 914

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

82306-307

U-232 5 mL Liquid in Flame Sealed Vial

Customer: ALS Laboratory Group / Fort Collins
P.O. No.: 73625 04-29-10, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, % Type u_A	u_B	U	Reference Date (12:00 PM EST)
U-232	2.617E+04	4.552E+03	0.5	2.4	4.9	05/27/2010

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities (other than decay products) <0.1%. 5.21459 g 1M HNO3 solution, carrier free.

Source Prepared by: _____
W. Mao, Radiochemist

QA Approved: _____ Date: 5/27/10
J. D. McCorvey, QA Manager Alternate

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

ANA Form005 Rev. ---

Single Isotope Certificate, Rev 1 9/28/2009

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

9

Alpha Spectroscopy

Quality Control Data

Weekly Background, Energy, and Efficiency Calibrations

Calibration Data Summary

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012144

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011
5:40:07 PM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
1012144-1	SMP	AS101228-2	UISO	26	C11010426	1/4/2011	31.48	Pass	29.40	29.92	31.98	32.50
Spectrum #1		AS101228-2U			B11010426	1/4/2011	0.4720	Pass	0.0000	0.0498	0.4998	0.7500
1/6/2011					C11010426	1/4/2011	5546.0	Pass	5496.0	5506.0	5586.0	5596.0
1012144-2	SMP	AS101228-2	UISO	27	C11010427	1/4/2011	29.42	Pass	28.26	28.76	30.74	31.24
Spectrum #1		AS101228-2U			B11010427	1/4/2011	0.4020	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010427	1/4/2011	5546.0	Pass	5494.2	5504.2	5584.2	5594.2
1012144-3	SMP	AS101228-2	UISO	28	C11010428	1/4/2011	28.65	Pass	27.32	27.80	29.72	30.20
Spectrum #1		AS101228-2U			B11010428	1/4/2011	0.2950	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010428	1/4/2011	5555.7	Pass	5513.0	5523.0	5603.0	5613.0
1012144-4	SMP	AS101228-2	UISO	29	C11010429	1/4/2011	28.48	Pass	27.50	27.99	29.92	30.40
Spectrum #1		AS101228-2U			B11010429	1/4/2011	0.3670	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010429	1/4/2011	5545.9	Pass	5486.0	5496.0	5576.0	5586.0
1012144-5	SMP	AS101228-2	UISO	30	C11010430	1/4/2011	28.36	Pass	26.99	27.46	29.36	29.83
Spectrum #1		AS101228-2U			B11010430	1/4/2011	0.3400	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010430	1/4/2011	5545.9	Pass	5514.0	5524.0	5604.0	5614.0
1012144-6	SMP	AS101228-2	UISO	31	C11010431	1/4/2011	29.55	Pass	28.09	28.58	30.56	31.05
Spectrum #1		AS101228-2U			B11010431	1/4/2011	0.3960	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010431	1/4/2011	5545.9	Pass	5496.0	5506.0	5586.0	5596.0
1012144-7	SMP	AS101228-2	UISO	32	C11010432	1/4/2011	29.72	Pass	27.99	28.48	30.44	30.93
Spectrum #1		AS101228-2U			B11010432	1/4/2011	0.3950	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010432	1/4/2011	5543.9	Pass	5488.0	5498.0	5578.0	5588.0
1012144-8	SMP	AS101228-2	UISO	58	C11010458	1/4/2011	30.59	Pass	29.55	30.06	32.14	32.66
Spectrum #1		AS101228-2U			B11010458	1/4/2011	0.0964	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010458	1/4/2011	5565.7	Pass	5496.0	5506.0	5586.0	5596.0
1012144-9	SMP	AS101228-2	UISO	59	C11010459	1/4/2011	30.80	Warning	28.17	28.66	30.64	31.13
Spectrum #1		AS101228-2U			B11010459	1/4/2011	0.3774	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010459	1/4/2011	5546.0	Pass	5515.6	5525.6	5605.6	5615.6

Data Package ID: *UR1012144-1*

Abbreviations:					
	Eff - Efficiency	Bkg - Background	LCL - Lower Control Limit	UWL - Upper Warning Limit	
	Egy - Energy	CPM - Counts per Minute	LWL - Lower Warning Limit	UCL - Upper Control Limit	CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Calibration Data Summary

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012144

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011
5:40:07 PM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
1012144-10	SMP	AS101228-2	UISO	60	C11010460	1/4/2011	29.88	Pass	28.15	28.64	30.62	31.11
Spectrum #1		AS101228-2U			B11010460	1/4/2011	0.2636	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010460	1/4/2011	5555.8	Pass	5492.0	5502.0	5582.0	5592.0
1012144-11	SMP	AS101228-2	UISO	61	C11010461	1/4/2011	31.49	Warning	28.67	29.17	31.18	31.69
Spectrum #1		AS101228-2U			B11010461	1/4/2011	0.2277	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010461	1/4/2011	5555.8	Pass	5513.6	5523.6	5603.6	5613.6
AS101228-2	MB	AS101228-2	UISO	62	C11010462	1/4/2011	29.70	Warning	27.06	27.53	29.43	29.91
Spectrum #1		AS101228-2U			B11010462	1/4/2011	0.3426	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010462	1/4/2011	5527.1	Pass	5513.6	5523.6	5603.6	5613.6
AS101228-2	LCS	AS101228-2	UISO	63	C11010463	1/4/2011	31.42	Pass	29.41	29.93	31.99	32.51
Spectrum #1		AS101228-2U			B11010463	1/4/2011	0.2441	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010463	1/4/2011	5546.0	Pass	5486.5	5506.2	5586.2	5596.2
AS101228-2	LCSD	AS101228-2	UISO	64	C11010464	1/4/2011	29.80	Pass	28.41	28.90	30.90	31.40
Spectrum #1		AS101228-2U			B11010464	1/4/2011	0.2226	Pass	0.0000	0.0500	0.5000	0.7500
1/6/2011					C11010464	1/4/2011	5543.9	Pass	5496.0	5506.0	5586.0	5596.0

Data Package ID: *UR1012144-1*

Abbreviations:
Eff - Efficiency; Bkg - Background; LCL - Lower Control Limit; UWL - Upper Warning Limit
Egy - Energy; CPM - Counts per Minute; LWL - Lower Warning Limit; UCL - Upper Control Limit; CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Alpha Spec Calibration Source Re-Certification

Recalibration performed by Isotope Products Laboratories
Primary Certified Source
Source ALS ID: 190
Planchet Label: 9
Recalibrated on: 7/1/2010
Received by ALS on: 6/21/2010

Values from certificate	
Source ID:	92MIX223027
Total Activity:	3741 dpm
Ref. Date:	7/1/10

Nuclide	Act (Bq)	Act (dpm)	Half-Life (yrs)	Decay Corrected
U-234:	49.43	2965.8	2.48E+05	2965.80 dpm
U-235:	1.09	65.94	7.04E+08	65.94 dpm
Am-241:	11.83	709.8	432.17	709.59 dpm
			TOTAL	3740.73 dpm

Efficiency Determination for Detector: 13

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Total cpm	Known dpm	Detector efficiency
92MIX223027	190	97-19-103-09	9/7/10	7489	32217	1072	2100	1165.09	3740.73	31.15%

Sources 1 through 8 activity determination

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Detector Efficiency	Am-241 dpm	U-234 dpm	U-235 dpm	Combined dpm
92MIX2203026	182	97-19-103-01	9/7/10	13260	80178	2247	2100	31.15%	1215.39	7355.04	206.13	8777.56
92MIX2203028	183	97-19-103-02	9/7/10	16216	158468	4008	2100	31.15%	1487.56	14536.89	367.67	16392.12
92MIX2203024	184	97-19-103-03	9/7/10	72679	75317	1928	2100	31.15%	6667.13	6909.13	176.88	13753.12
92MIX2203021	185	97-19-103-04	9/7/10	23210	64459	2048	2100	31.15%	2129.14	5913.08	187.87	8230.09
92MIX2203025	186	97-19-103-05	9/7/10	101666	124700	3398	2100	31.15%	9344.57	11439.22	311.71	21095.50
92MIX2203022	187	97-19-103-06	9/7/10	78536	83580	2162	2100	31.15%	7204.42	7667.12	198.33	15069.87
92MIX2203023	188	97-19-103-07	9/7/10	46086	71046	1885	2100	31.15%	4227.65	6517.33	172.92	10917.90
92MIX2203029	189	97-19-103-08	9/10/10	34718	215846	6354	2100	31.15%	3184.82	20167.34	582.88	23935.04

Efficiency Verification

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	Count dur (s)	Total cpm	Known dpm	Detector efficiency	RPD	FLAG
92MIX223027	190	97-19-103-09	9/7/10	7710	32190	1066	2100	1170.46	3740.73	31.29%	-0.46%	PASS

Sources 1 through 8 activity re-verification

Source Serial#	PA ID	Sequential #	Combined Observed dpm	Combined Certified dpm*	Percent Difference %	Within 5% of Certified value?
92MIX2203026	182	97-19-103-01	8777.56	8862.31	-0.96%	Yes
92MIX2203028	183	97-19-103-02	16392.12	16005.14	2.41%	Yes
92MIX2203024	184	97-19-103-03	13753.12	13564.64	1.39%	Yes
92MIX2203021	185	97-19-103-04	8230.09	8181.17	0.60%	Yes
92MIX2203025	186	97-19-103-05	21095.50	21064.32	0.15%	Yes
92MIX2203022	187	97-19-103-06	15069.87	15355.51	-1.86%	Yes
92MIX2203023	188	97-19-103-07	10917.90	10765.61	1.41%	Yes
92MIX2203029	189	97-19-103-08	23935.04	23624.62	1.31%	Yes

* Certificate values decay corrected to the count date

Data from certificates

Reference Date	U-234 (Bq)	U-234 (dpm)	U-235 (Bq)	U-235 (dpm)	Am-241 (Bq)	Am-241 (dpm)
5/1/2003	124.10	7446.00	2.43	145.74	21.43	1285.80
5/1/2003	239.00	14358.00	4.20	252.00	23.55	1413.00
5/1/2003	119.40	7164.00	1.93	115.58	106.00	6360.00
4/1/2003	101.00	6060.00	1.26	75.84	34.50	2070.00
4/1/2003	203.00	12180.00	3.41	204.72	145.40	8784.00
4/1/2003	132.90	7974.00	3.17	189.96	121.30	7278.00
4/1/2003	107.10	6420.00	0.93	55.54	72.26	4335.60
5/1/2003	334.80	20088.00	6.55	393.18	53.02	3181.20

Ok JP
9/22/10

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
11:58:48AM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 190(#9)
Description:

Analysis Date: 9/7/2010 11:58:29AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

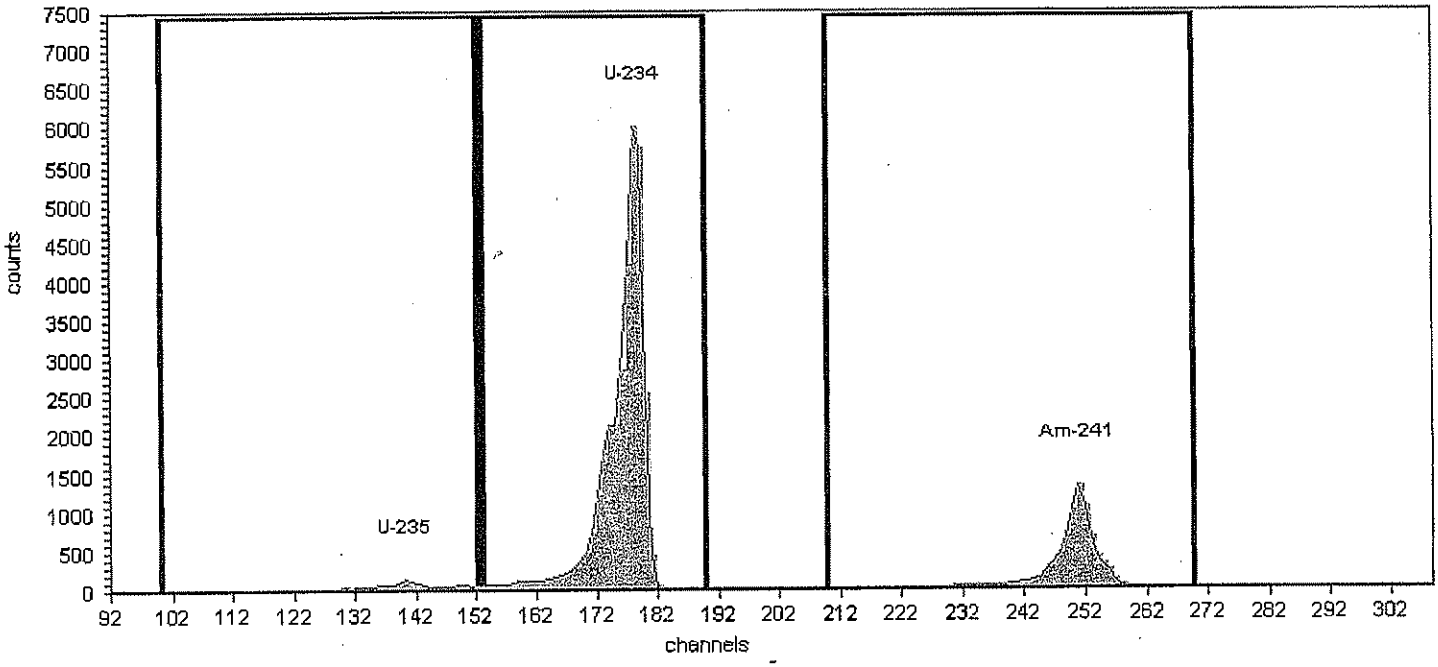
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 11:06:07AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190(#9)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.63% +/- 0.31% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,072.00	30.63
U-234	178	4.78	153	190	32,217.00	920.49
Am-241	251	5.49	210	270	7,489.00	213.97

MR 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 13
12:43:42PM 9/7/2010

Calibration

Energy Calibration: RSO 182(#1)
Description:

Analysis Date: 9/7/2010 12:43:35PM
Calibration Type: Energy

Source Info

Certificate ID: A1 RSO#182
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:24PM

Acquisition

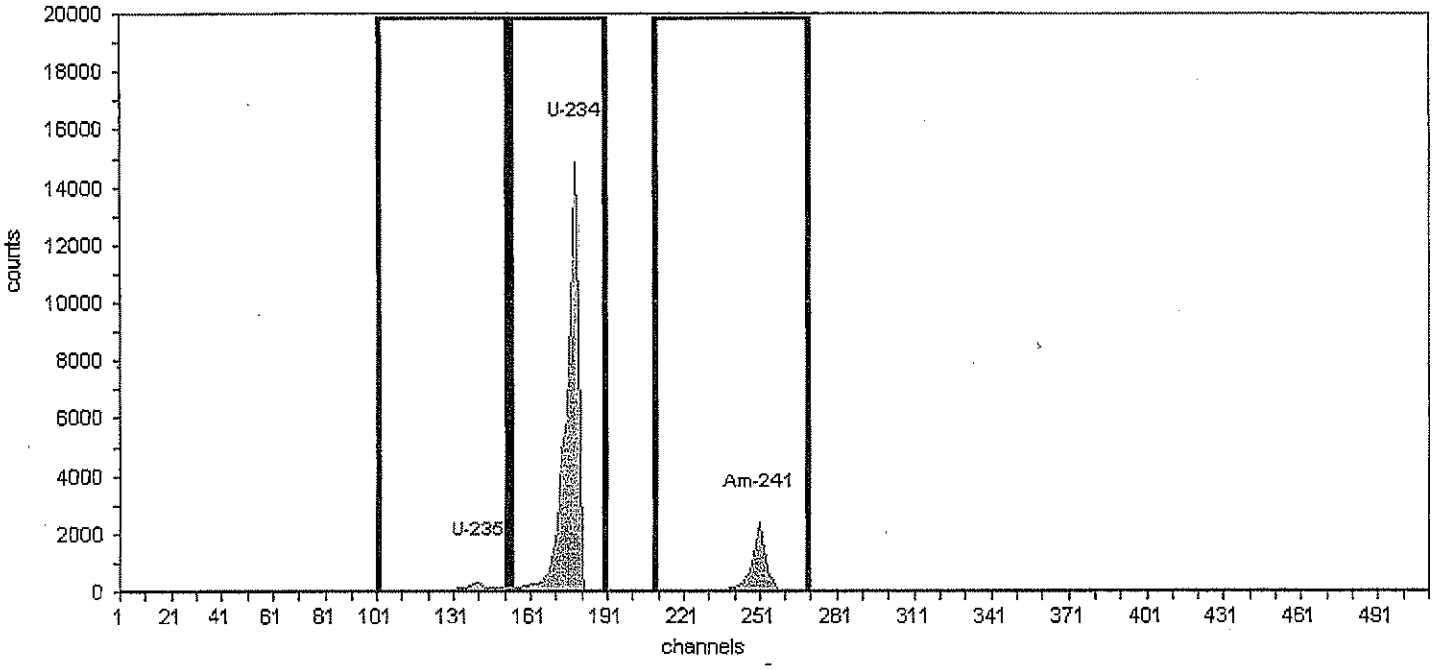
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 12:06:25PM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 182(#1)

Energy Calibration Equation:
Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.62% +/- 0.20% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	101	152	2,247.00	64.20
U-234	178	4.78	153	190	80,178.00	2,290.80
Am-241	250	5.49	210	270	13,260.00	378.86

CL 9-8-10

JP 9/22/10

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

1:27:44PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 183(#2)
Description:

Analysis Date: 9/7/2010 1:27:38PM
Calibration Type: Energy

Source Info

Certificate ID: A2 RSO#183
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

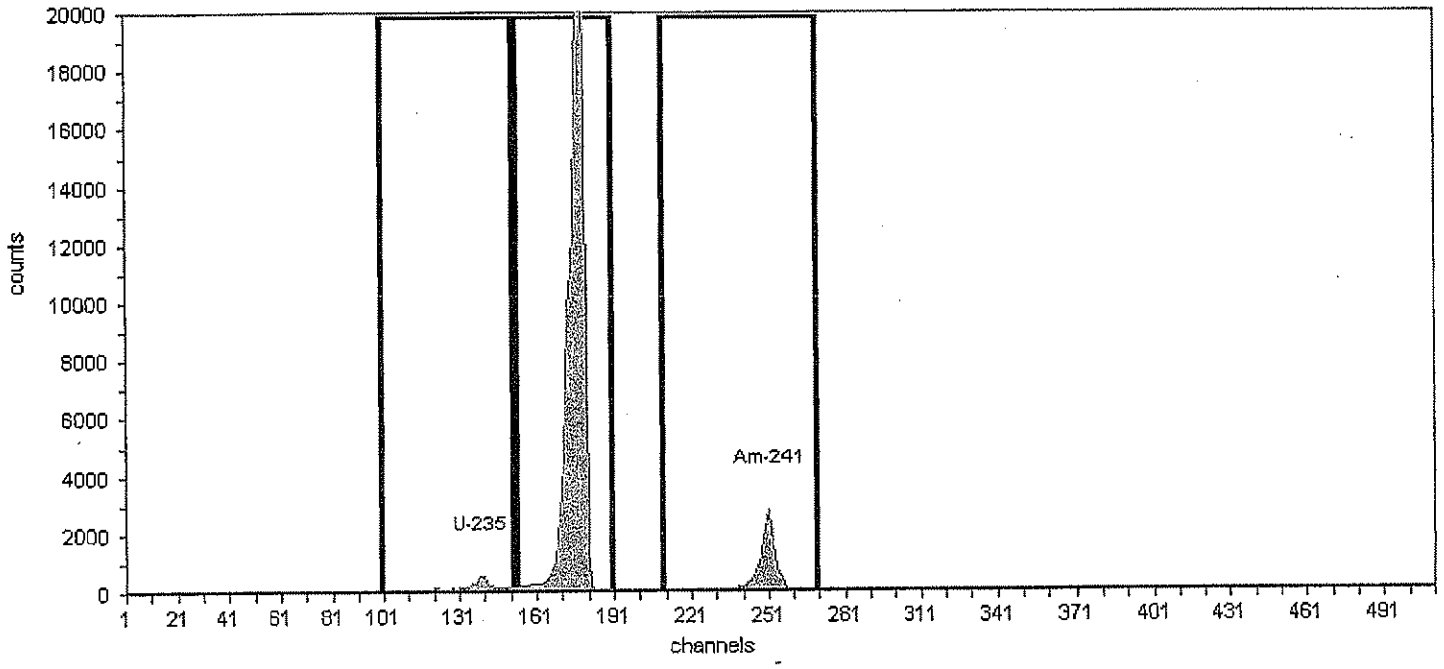
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 12:45:24PM

Live Time: 35.00 min.
Real Time: 35.06 min.

Efficiency Calibration Name: RSO 183(#2)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch
Offset = 3,043.84 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.77% +/- 0.15% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	4,008.00	114.51
U-234	178	4.78	153	190	158,468.00	4,527.66
Am-241	251	5.49	210	270	16,216.00	463.31

MC 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 13

2:09:31PM 9/7/2010

Calibration

Energy Calibration: RSO 184(#3)
Description:

Analysis Date: 9/7/2010 2:09:24PM
Calibration Type: Energy

Source Info

Certificate ID: A3 RSO#184
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

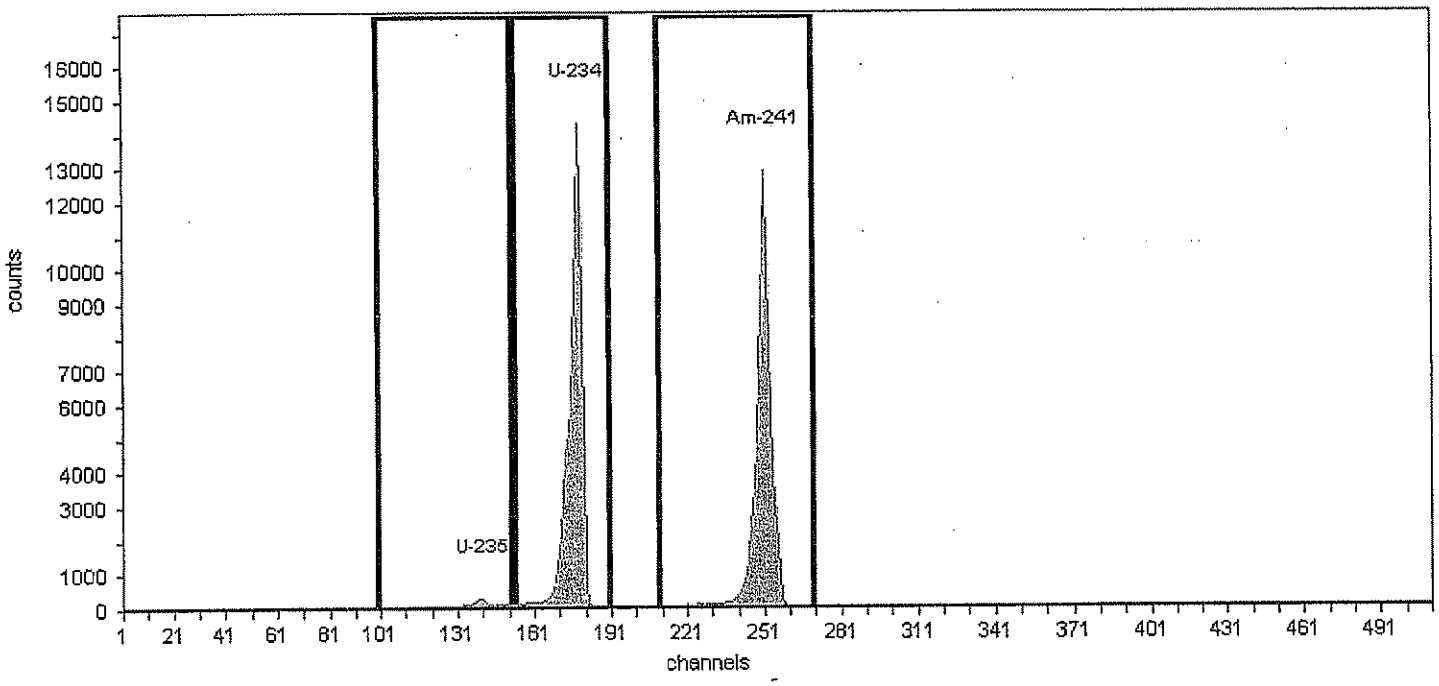
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 1:29:06PM

Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 184(#3)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.40% +/- 0.16% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,928.00	55.09
U-234	178	4.78	153	190	75,317.00	2,151.91
Am-241	251	5.49	210	270	72,679.00	2,076.54

cc 9-8-10
JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
2:54:34PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 185(#4)
Description:

Analysis Date: 9/7/2010 2:53:55PM
Calibration Type: Energy

Source Info

Certificate ID: A4 RSO#185
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

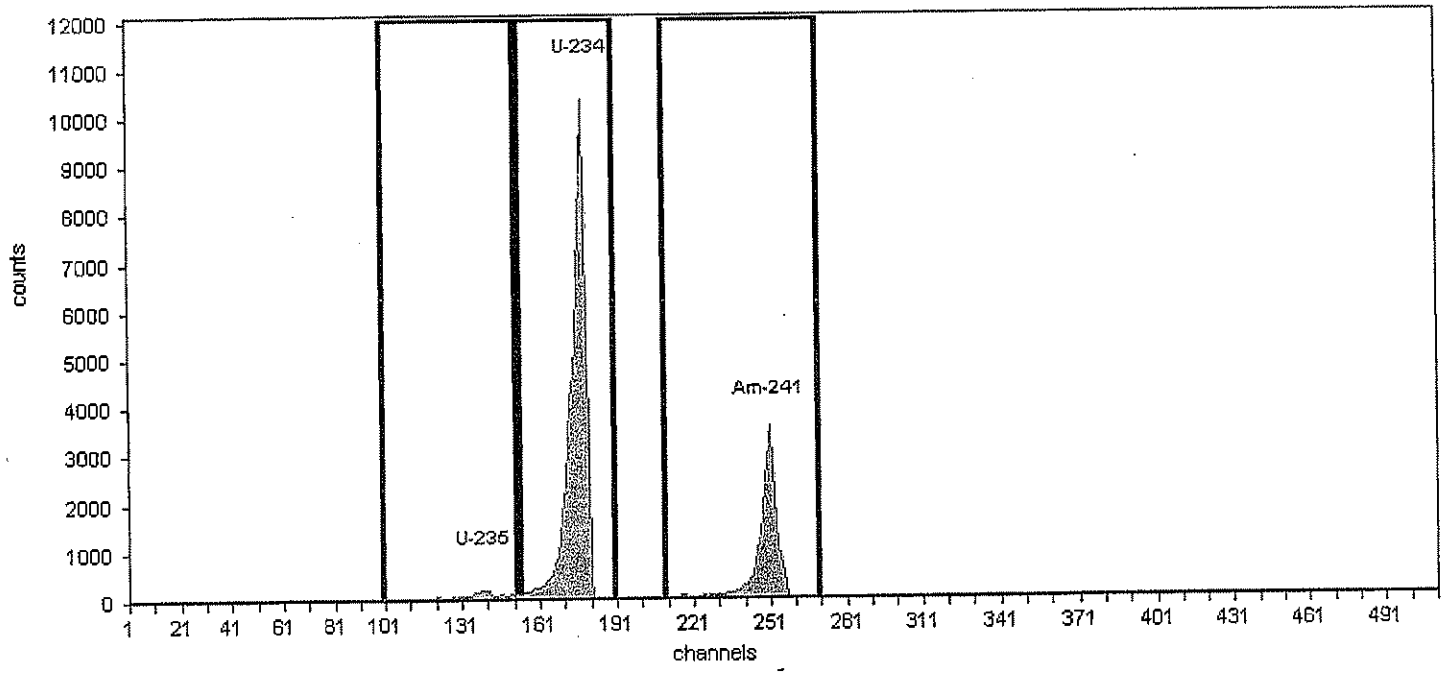
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 2:13:33PM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 185(#4)

Energy Calibration Equation:
Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.90% +/- 0.21% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	2,048.00	58.51
U-234	178	4.78	153	190	64,459.00	1,841.69
Am-241	250	5.49	210	270	23,210.00	663.14

LW 9-8-10
JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 13

3:40:07PM 9/7/2010

Calibration

Energy Calibration: RSO 186(#5)
Description:

Analysis Date: 9/7/2010 3:39:59PM
Calibration Type: Energy

Source Info

Certificate ID: A5 RSO#186
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

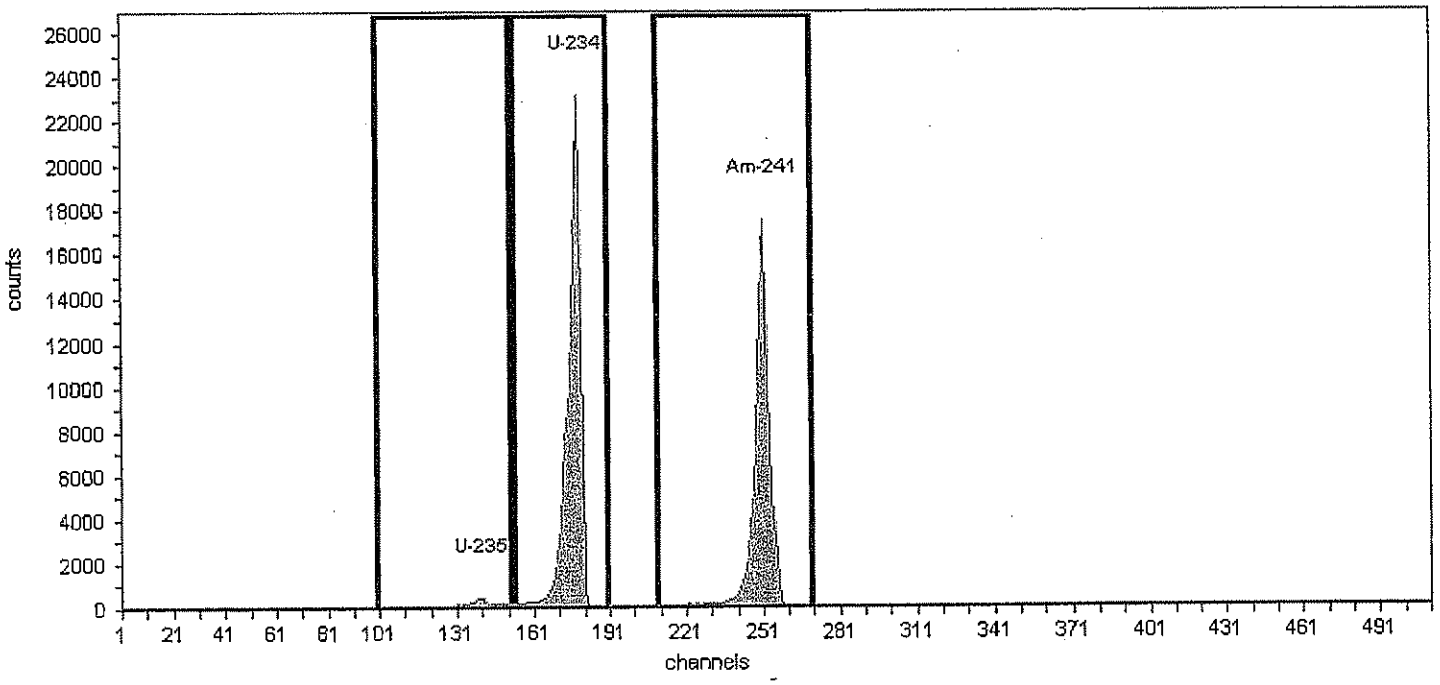
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 2:56:37PM

Live Time: 35.00 min.
Real Time: 35.08 min.

Efficiency Calibration Name: RSO 186(#5)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.95% +/- 0.13% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	3,398.00	97.09
U-234	178	4.78	153	190	124,700.00	3,562.86
Am-241	251	5.49	210	270	101,866.00	2,910.46

CC 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 13
4:19:19PM 9/7/2010

Calibration

Energy Calibration: RSO 187(#6)
Description:

Analysis Date: 9/7/2010 4:19:10PM
Calibration Type: Energy

Source Info

Certificate ID: A6 RSO#187
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

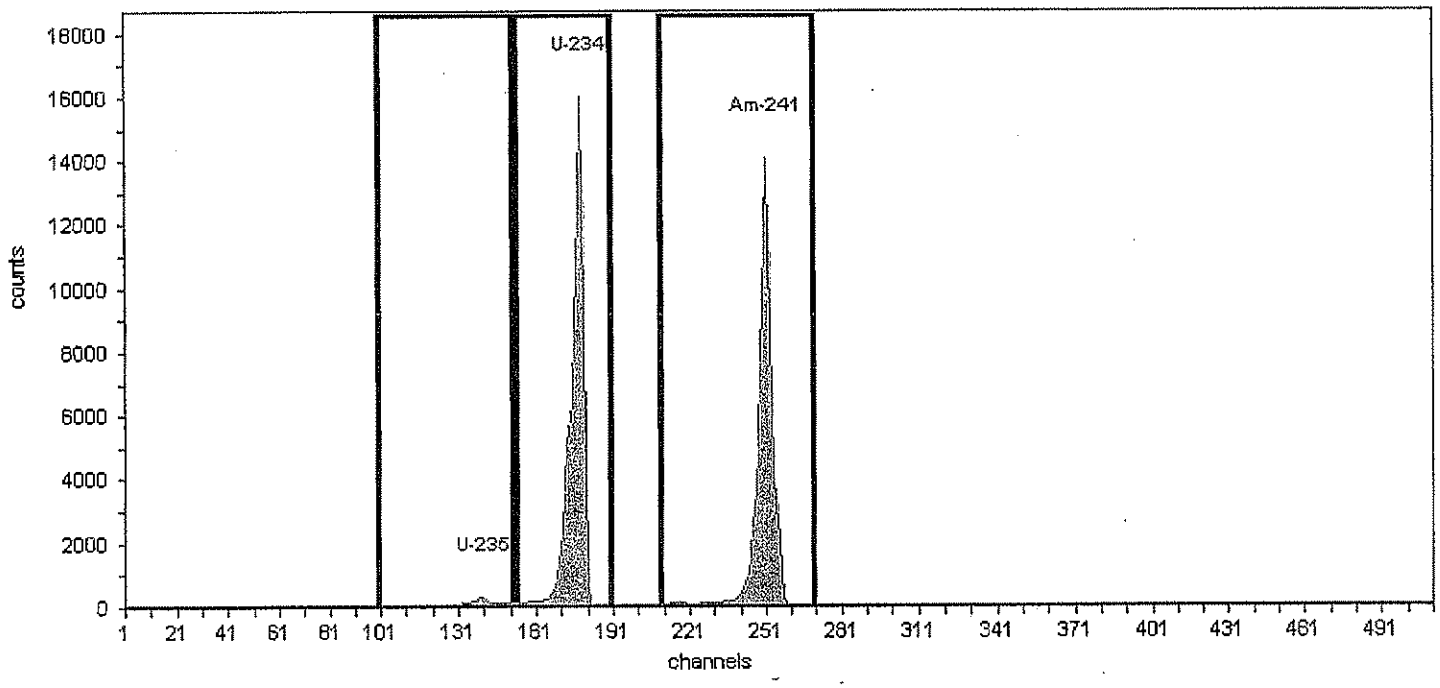
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 3:43:11PM

Live Time: 35.00 min.
Real Time: 35.06 min.

Efficiency Calibration Name: RSO 187(#6)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.54% +/- 0.15% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	2,162.00	61.77
U-234	178	4.78	153	190	83,580.00	2,388.00
Am-241	251	5.49	210	270	78,536.00	2,243.89

WL 9-8-10

JP 9/22/10

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
4:58:15PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 188(#7)
Description:

Analysis Date: 9/7/2010 4:58:08PM
Calibration Type: Energy

Source Info

Certificate ID: A7 RSO#188
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

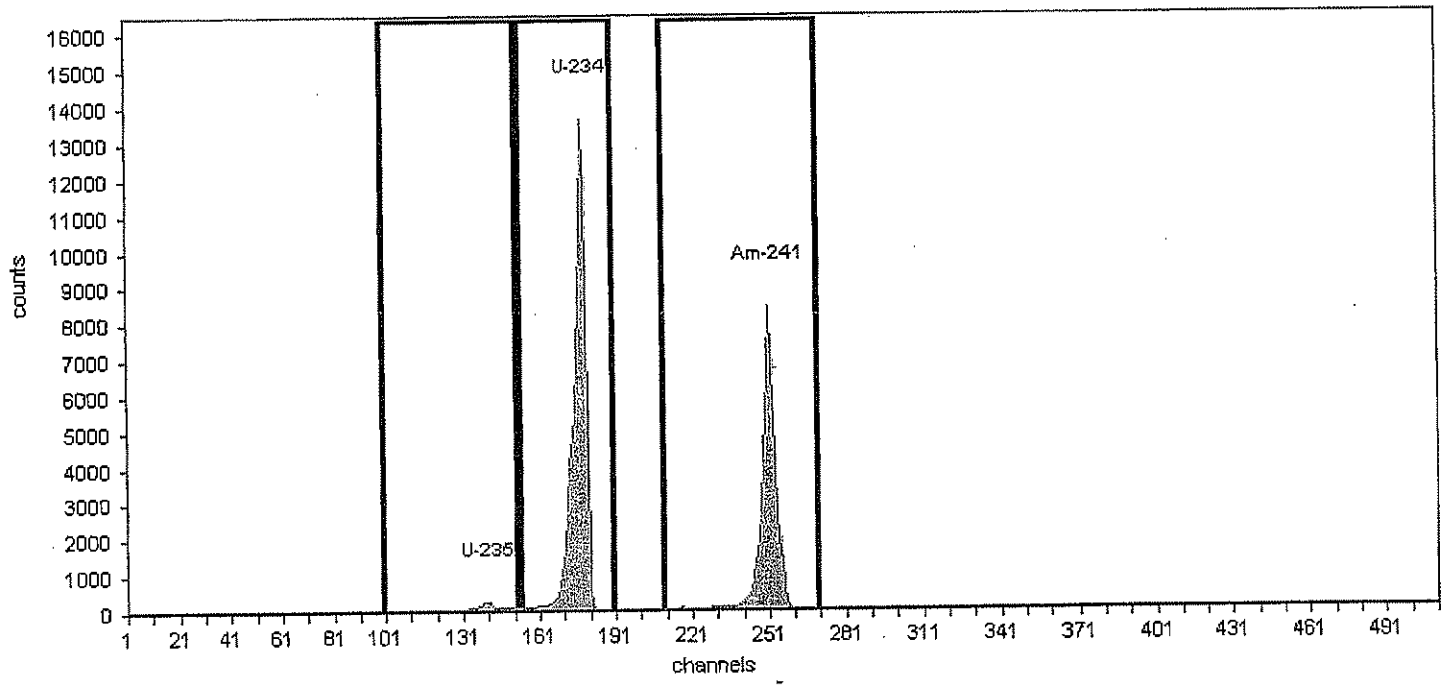
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 4:21:32PM

Live Time: 35.00 min.
Real Time: 35.04 min.

Efficiency Calibration Name: RSO 188(#7)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.26% +/- 0.18% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,885.00	53.86
U-234	178	4.78	153	190	71,046.00	2,029.89
Am-241	251	5.49	210	270	46,086.00	1,316.74

Ue 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
10:29:59AM 9/10/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 189(#8)A
Description:

Analysis Date: 9/10/2010 10:29:52AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A8 RSO#189
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

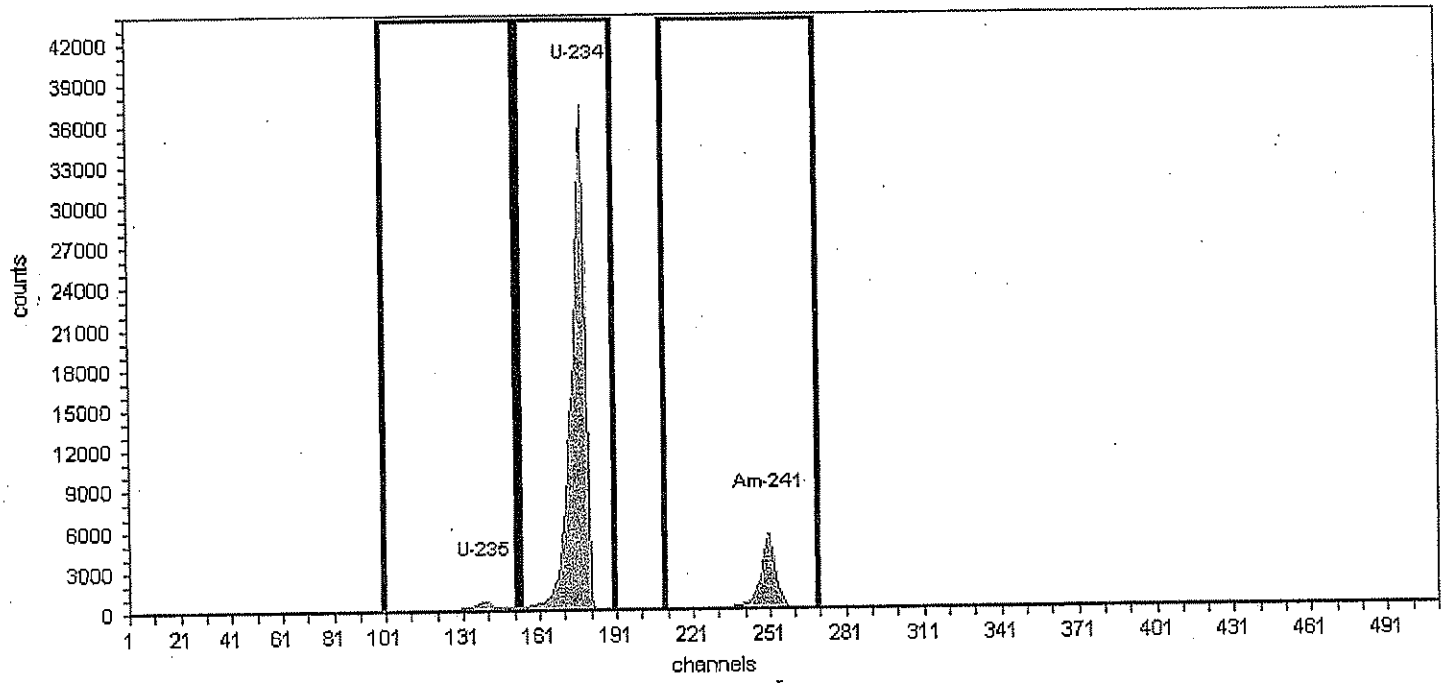
Detector: 13 , SN:
Acquisition Start Date: 9/10/2010 9:51:03AM

Live Time: 35.00 min.
Real Time: 35.09 min.

Efficiency Calibration Name: RSO 189(#8)A

Energy Calibration Equation:
Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.43% +/- 0.12% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	6,354.00	181.54
U-234	178	4.78	153	190	219,846.00	6,281.32
Am-241	250	5.49	210	270	34,718.00	991.94

MA 9-10-10

JP 9/22/10

AlphaVision v5.3 **Alpha Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
6:16:25PM 9/7/2010

Detector: 13

Calibration

Energy Calibration: RSO 190(#9)A
Description:

Analysis Date: 9/7/2010 6:16:17PM
Calibration Type: Energy

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

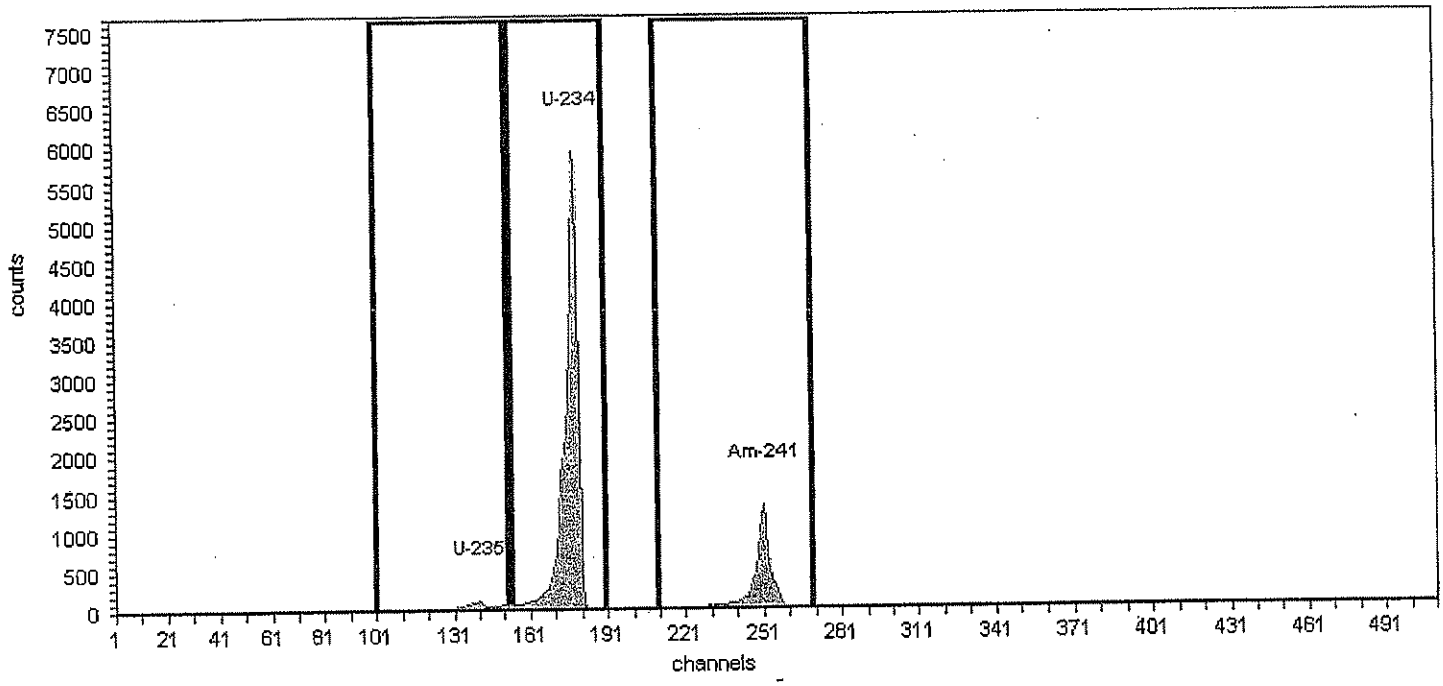
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 5:39:50PM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190(#9)A

Energy Calibration Equation:
Gain = 9.8810 keV / Ch
Offset = 3,008.45 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.78% +/- 0.31% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	141	4.40	100	152	1,066.00	30.46
U-234	178	4.78	153	190	32,190.00	919.71
Am-241	251	5.49	210	270	7,710.00	220.29

cw 9-8-10

JP 9/22/10

Rec'd 4/21/10 Emt
#190

Eckert & Ziegler
Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide:	U-234	**Customer:**	ALS LABORATORY GROUP, FORT COLLINS
Radionuclide:	U-235	**P.O. No.:**	FC 1750/R4703
Radionuclide:	Am-241	**Catalog No.:**	MISC-STD
Half-life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Jul-10 12:00 PST
Half-life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX223027
Half-life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	1.336	**nCi,**	49.43	**Bq**	Am-241:	0.3197	**nCi,**	11.83	**Bq**
U-235:	0.02942	**nCi,**	1.089	**Bq**	Total Activity:	1.685	**nCi,**	62.35	**Bq**

Physical Description:

A. Capsule type:	Disk (47 mm OD x 0.76 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxide
C. Active diameter/volume:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in May 2001.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11889 α/min in 2π on 10-Jun-10.

Quality Control

15 Jun 10
Date

IPL Ref. No.: 1143-48

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10

PAI 187
recalibrate 4-1503

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203026

Contained Radioactivity:

U-234:	3.354 nCi	(124.1 Bq)	Am-241:	0.5793 nCi	(21.43 Bq)
U-235:	0.06566 nCi	(2.429 Bq)	Total Activity:	3.999 nCi	(148.0 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.7%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4483 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10
PAI 483
Recalibrated 4-15-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203028

Contained Radioactivity:

U-234:	6.467	nCi (239.3 Bq)	Am-241:	0.6366	nCi (23.55 Bq)
U-235:	0.1135	nCi (4.200 Bq)	Total Activity:	7.217	nCi (267.1 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.7%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:
- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 8091 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10
PAT I.D 184
recalibrated 4-1503

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203024
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.227	nCi	(119.4 Bq)	Am-241:	2.866	nCi	(106.0 Bq)
U-235:	0.05205	nCi	(1.926 Bq)	Total Activity:	6.145	nCi	(227.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 6889 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Re-Verified 9/18/2010
Exp 9/18/2011
JP 9/22/10

PAI ID 00185
rec'd from recalibrator
3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203021

Contained Radioactivity:

U-234:	2.731	nCi (101.0 Bq)	Am-241:	0.9325	nCi (34.50 Bq)
U-235:	0.03416	nCi (1.264 Bq)	Total Activity:	3.698	nCi (136.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radiolmpurities: Not determined

Method of Calibration:
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:
- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4145 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10
PAI ID 00186
Recalibration
received 3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203025

Contained Radioactivity:

U-234:	5.486	nCi (203.0 Bq)	Am-241:	3.958	nCi (146.4 Bq)
U-235:	0.09221	nCi (3.412 Bq)	Total Activity:	9.536	nCi (352.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:
- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 10690 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/8/2010
Exp. 9/8/2011
JP 9/22/10

PAID 00187
recd from recalibration
3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203022
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.592	nCi	(132.9 Bq)	Am-241:	3.279	nCi	(121.3 Bq)
U-235:	0.08556	nCi	(3.166 Bq)	Total Activity:	6.957	nCi	(257.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 7799 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/7/2010
Exp 9/8/2011
JP 9/22/10

PAIP 188
recd for recalibration
3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203023
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	2.895 nCi	(107.1 Bq)	Am-241:	1.953 nCi	(72.26 Bq)
U-235:	0.02502 nCi	(0.9257 Bq)	Total Activity:	4.873 nCi	(180.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 5463 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/9/10/2010 ~~9/8/2010~~
Exp 9/8/2011 ~~9/8/2011~~ 9/10/2011
JP 9/22/10

PAI ID 189
recd 9-2-03
recalibrated 4-15-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203029

Contained Radioactivity:

U-234:	9.048	nCi	(334.8 Bq)	Am-241:	1.433	nCi	(53.02 Bq)
U-235:	0.1771	nCi	(6.553 Bq)	Total Activity:	10.66	nCi	(394.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.0%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11950 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

12-Jan-2011

Gary Ganson
Terracon
13910 W. 96th Terrace
Lenexa, KS 66215

Tel: (913) 492-7777
Fax: (913) 492-7443

Re: Bannister Complex Work Order: **1012247**

Dear Gary,

ALS Environmental received 14 samples on 10-Dec-2010 10:56 AM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Laboratory Group. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 12.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

Chris Gibson

Electronically approved by: Chris Gibson

Chris Gibson
Project Manager

ALS Environmental

Date: 12-Jan-11

Client: Terracon
Project: Bannister Complex
Work Order: **1012247**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
1012247-01	B15B-Q25-BC/U/Y-DUST	Air		11/30/2010	12/10/2010 10:56	☐
1012247-02	B15B-V19-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-03	B1F1-Q19-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-04	B1F1-R18-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-05	B1F1-Y10-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-06	B25B-BOC26-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-07	FH3-RAD-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-08	FH3-AI-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-09	FH3-MC-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-10	B1-ROOF-ECAI-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-11	B1-ROOF-NAI-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-12	B1F1-A25-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-13	B1F1-F25-Be/U/Y-Dust	Air		11/30/2010	12/10/2010 10:56	☐
1012247-14	BLANK 1-Dust	Air		11/30/2010	12/10/2010 10:56	☐

ALS Environmental

Date: 12-Jan-11

Client: Terracon
Project: Bannister Complex
Work Order: 1012247

Case Narrative

The sample condition upon receipt was acceptable except where noted.

Results relate only to the items tested and are not blank corrected unless indicated.

Elemental results are estimated due to low concentrations and small amount of material on filter.

ALS Environmental

Date: *12-Jan-11*

Client: Terracon
Project: Bannister Complex

Work Order: 1012247

Lab ID: 1012247-01A
Collection Date: 11/30/2010
Client Sample ID: B15B-Q25-BC/U/Y-DUST
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**25**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		0.79	mg/Kg	1	12/22/2010 12:51 PM
Uranium	ND		12	mg/Kg	1	12/22/2010 12:51 PM
Yttrium	**3.8**		**1.6**	**mg/Kg**	1	12/22/2010 12:51 PM

Lab ID: 1012247-02A
Collection Date: 11/30/2010
Client Sample ID: B15B-V19-Be/U/Y-Dust
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**7.2**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		2.8	mg/Kg	1	12/22/2010 12:56 PM
Uranium	ND		42	mg/Kg	1	12/22/2010 12:56 PM
Yttrium	ND		5.6	mg/Kg	1	12/22/2010 12:56 PM

Lab ID: 1012247-03A
Collection Date: 11/30/2010
Client Sample ID: B1F1-Q19-Be/U/Y-Dust
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**7.9**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		2.5	mg/Kg	1	12/22/2010 01:01 PM
Uranium	ND		38	mg/Kg	1	12/22/2010 01:01 PM
Yttrium	**6.1**		**5.1**	**mg/Kg**	1	12/22/2010 01:01 PM

Note:

ALS Environmental

Date: *12-Jan-11*

Client: Terracon
Project: Bannister Complex

Work Order: 1012247

Lab ID: 1012247-04A **Collection Date:** 11/30/2010
Client Sample ID: B1F1-R18-Be/U/Y-Dust **Matrix:** AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**22**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		0.92	mg/Kg	1	12/22/2010 01:06 PM
Uranium	ND		14	mg/Kg	1	12/22/2010 01:06 PM
Yttrium	**5.7**		**1.8**	**mg/Kg**	1	12/22/2010 01:06 PM

Lab ID: 1012247-05A **Collection Date:** 11/30/2010
Client Sample ID: B1F1-Y10-Be/U/Y-Dust **Matrix:** AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**15**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		1.3	mg/Kg	1	12/22/2010 01:11 PM
Uranium	ND		19	mg/Kg	1	12/22/2010 01:11 PM
Yttrium	**2.7**		**2.6**	**mg/Kg**	1	12/22/2010 01:11 PM

Lab ID: 1012247-06A **Collection Date:** 11/30/2010
Client Sample ID: B25B-BOC26-Be/U/Y-Dust **Matrix:** AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**16**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		1.2	mg/Kg	1	12/22/2010 01:16 PM
Uranium	ND		18	mg/Kg	1	12/22/2010 01:16 PM
Yttrium	**6.0**		**2.4**	**mg/Kg**	1	12/22/2010 01:16 PM

Note:

ALS Environmental

Date: *12-Jan-11*

Client: Terracon
Project: Bannister Complex

Work Order: 1012247

Lab ID: 1012247-07A
Collection Date: 11/30/2010
Client Sample ID: FH3-RAD-Be/U/Y-Dust
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**0.10**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		200	mg/Kg	1	12/22/2010 01:31 PM
Uranium	ND		3,000	mg/Kg	1	12/22/2010 01:31 PM
Yttrium	ND		400	mg/Kg	1	12/22/2010 01:31 PM

Lab ID: 1012247-08A
Collection Date: 11/30/2010
Client Sample ID: FH3-AI-Be/U/Y-Dust
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**31**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		0.65	mg/Kg	1	12/22/2010 01:36 PM
Uranium	ND		9.8	mg/Kg	1	12/22/2010 01:36 PM
Yttrium	**4.0**		**1.3**	**mg/Kg**	1	12/22/2010 01:36 PM

Lab ID: 1012247-09A
Collection Date: 11/30/2010
Client Sample ID: FH3-MC-Be/U/Y-Dust
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**66**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		0.30	mg/Kg	1	12/22/2010 01:41 PM
Uranium	ND		45	mg/Kg	10	12/22/2010 02:11 PM
Yttrium	**4.2**		**0.61**	**mg/Kg**	1	12/22/2010 01:41 PM

Note:

Client: Terracon
Project: Bannister Complex

Work Order: 1012247

Lab ID: 1012247-10A
Collection Date: 11/30/2010
Client Sample ID: B1-ROOF-ECAI-Be/U/Y-Dust
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**330**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	**0.18**		**0.061**	**mg/Kg**	1	12/22/2010 01:46 PM
Uranium	ND		9.2	mg/Kg	10	12/22/2010 02:17 PM
Yttrium	**6.1**		**0.12**	**mg/Kg**	1	12/22/2010 01:46 PM

Lab ID: 1012247-11A
Collection Date: 11/30/2010
Client Sample ID: B1-ROOF-NAI-Be/U/Y-Dust
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**13**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		1.5	mg/Kg	1	12/22/2010 01:51 PM
Uranium	ND		23	mg/Kg	1	12/22/2010 01:51 PM
Yttrium	ND		3.1	mg/Kg	1	12/22/2010 01:51 PM

Lab ID: 1012247-12A
Collection Date: 11/30/2010
Client Sample ID: B1F1-A25-Be/U/Y-Dust
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**5.2**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		3.8	mg/Kg	1	12/22/2010 01:56 PM
Uranium	ND		57	mg/Kg	1	12/22/2010 01:56 PM
Yttrium	ND		7.7	mg/Kg	1	12/22/2010 01:56 PM

Note:

ALS Environmental

Date: *12-Jan-11*

Client: Terracon
Project: Bannister Complex

Work Order: 1012247

Lab ID: 1012247-13A
Collection Date: 11/30/2010
Client Sample ID: B1F1-F25-Be/U/Y-Dust
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	**24**		**0.050**	**mg/sample**	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	**1.5**		**0.84**	**mg/Kg**	1	12/22/2010 02:01 PM
Uranium	ND		13	mg/Kg	1	12/22/2010 02:01 PM
Yttrium	**9.9**		**1.7**	**mg/Kg**	1	12/22/2010 02:01 PM

Lab ID: 1012247-14A
Collection Date: 11/30/2010
Client Sample ID: BLANK 1-Dust
Matrix: AIR

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
NIOSH 0500 PARTICULATES NOT REGULATED			**N0500**			Analyst: **RDN**
Dust	ND		0.050	mg/sample	1	12/15/2010
METALS BY ICP			**SW6010B**		Prep Date: **12/15/2010**	Analyst: **CEG**
Beryllium	ND		40	mg/Kg	1	12/22/2010 02:06 PM
Uranium	ND		600	mg/Kg	1	12/22/2010 02:06 PM
Yttrium	ND		80	mg/Kg	1	12/22/2010 02:06 PM

Note:

ALS Environmental

Date: *12-Jan-11*

Client: Terracon
Project: Bannister Complex
Work Order: 1012247

Analytical Comments

Method	Type:	SampID	SeqNo	Analysis	Comments
Batch R78685					
N0500	Analysis	1012247-01A	194290	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-02A	194291	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-03A	194292	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-04A	194293	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-05A	194294	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-06A	194295	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-08A	194297	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-09A	194298	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-10A	194299	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-11A	194300	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-12A	194301	NIOSH 0500 Particulates not regulated	Loose material
N0500	Analysis	1012247-13A	194302	NIOSH 0500 Particulates not regulated	Loose material
Batch 4384					
SW6010B	Analysis	1012247-09A	200590	Metals by ICP	Sample contains high level of spectral interference.
SW6010B	Analysis	1012247-10A	200591	Metals by ICP	Sample contains high level of spectral interference.
Batch 4384					
SW3050B	Prep	1012247-14A	0	Acid Digestion, Metals	weight is RPL for dust sample

ALS Environmental

Date: 12-Jan-11

Client: Terracon

Work Order: 1012247

Project: Bannister Complex

QC BATCH REPORT

Batch ID: **4384** Instrument ID: **ICP1** Method: **SW6010B**

MBLK Sample ID: **MBLK-4384-4384** Units: **mg/Kg** Analysis Date: **12/22/2010 12:36 PM**

Client ID: Run ID: **ICP1_101222B** SeqNo: **200579** Prep Date: **12/15/2010** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Beryllium	ND	0.0010	0	0	0		0			
Uranium	ND	0.015	0	0	0		0			
Yttrium	ND	0.0020	0	0	0		0			

LCS Sample ID: **LCS-4384-4384** Units: **mg/Kg** Analysis Date: **12/22/2010 12:41 PM**

Client ID: Run ID: **ICP1_101222B** SeqNo: **200580** Prep Date: **12/15/2010** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Beryllium	0.9815	0.0010	1	0	98.2	80-120	0			
Uranium	0.9888	0.015	1	0	98.9	80-120	0			
Yttrium	1.022	0.0020	1	0	102	80-120	0			

LCSD Sample ID: **LCSD-4384-4384** Units: **mg/Kg** Analysis Date: **12/22/2010 12:46 PM**

Client ID: Run ID: **ICP1_101222B** SeqNo: **200581** Prep Date: **12/15/2010** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Beryllium	0.9804	0.0010	1	0	98	80-120	0.9815	0.112	20	
Uranium	0.9952	0.015	1	0	99.5	80-120	0.9888	0.645	20	
Yttrium	1.013	0.0020	1	0	101	80-120	1.022	0.885	20	

The following samples were analyzed in this batch:

1012247-01A	1012247-02A	1012247-03A
1012247-04A	1012247-05A	1012247-06A
1012247-07A	1012247-08A	1012247-09A
1012247-10A	1012247-11A	1012247-12A
1012247-13A	1012247-14A	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

ALS Environmental

Date: 12-Jan-11

Client: Terracon
Project: Bannister Complex
WorkOrder: **1012247**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SDL	Sample Detection Limit

Units Reported	Description
mg/Kg	
mg/sample	

ALS Environmental

Sample Receipt Checklist

Client Name: **TERRACON-LENEXA** Date/Time Received: **10-Dec-10 10:56**

Work Order: **1012247** Received by: **EJS**

Checklist completed by: Kelsey Kennedy 13-Dec-10 Reviewed by: Kelly Hagen 13-Dec-10

eSignature | Date | eSignature | Date

Matrices:

Carrier name: FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):			
Cooler(s)/Kit(s):			
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☐
pH adjusted?	Yes ☐	No ☐	N/A ☐
pH adjusted by:			

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012247

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 12-8-10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa City Kansas State 66215 Zip

Person to Contact Wil King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No. _____

Sampling Site Bannister Complex

Date/Time of Collection 11-30-10

Report Results in mg/kg for elements

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-01	B1SB-025-Be/U/Y-Dust	5.0 um PVC	27.55	SW-846 Method 6010 (Be), ICP-AES (Y,U)
KL 2/3 -02	B1SB-025-Be/U/Y-Dust ISO		17.54	ASTM D3972-90M (modified) - Uranium
-03 -02	B1SB-V19-Be/U/Y-Dust		10.02	SW-846 Method 6010 (Be); ICP-AES (U,Y)
-04	B1SB-V19-Be/U/Y-Dust ISO		10.02	ASTM D3972-90M (modified) - Uranium
-05 -03	B1F1-G19-Be/U/Y-Dust		7.52	SW-846 Method 6010 (Be); ICP-AES (U,Y)
-06	B1F1-G19-Be/U/Y-Dust ISO		7.52	ASTM D3972-90M (modified) - Uranium
-07 -04	B1F1-R18-Be/U/Y-Dust		20.04	SW-846 Method 6010 (Be); ICP-AES (U,Y)
-08	B1F1-R18-Be/U/Y-Dust ISO		~~7515.03~~	ASTM D3972-90M (modified) - Uranium
-09 -05	B1F1-Y10-Be/U/Y-Dust		15.03	SW-846 Method 6010 (Be); ICP-AES (U,Y)
-10	B1F1-Y10-Be/U/Y-Dust ISO		15.03	ASTM D3972-90M (modified) - Uranium
-11 -06	B2SB-BOC26-Be/U/Y-Dust		22.55	SW-846 Method 6010 (Be); ICP-AES (U,Y)
-12	B2SB-BOC26-Be/U/Y-Dust ISO		22.55	ASTM D3972-90M (modified) - Uranium
-13 -07	FH3-RAD-Be/U/Y-Dust		5.01	SW-846 Method 6010 (Be); ICP-AES (U,Y)
-14	FH3-RAD-Be/U/Y-Dust ISO		5.01	ASTM D3972-90M (modified) - Uranium
-15 -08	FH3-AI-Be/U/Y-Dust		5.01	SW-846 Method 6010 (Be); ICPAES (U,Y)
-16	FH3-AI-Be/U/Y-Dust ISO		5.01	~~SW~~ ASTM D3972-90M (modified) - Uranium

CHAIN OF CUSTODY

Be - Beryllium U - Uranium Y - Yttrium

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
[signature]	12-9-10/1500	[signature] ALS-CN	12/10/10 10:56
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time

Fed Ex

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012247

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 12-8-10 Purchase Order No. 0910714

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa City Kansas State 66215 Zip

Person to Contact Wil King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-30-10

Report Results in mg/kg for elements

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
~~17~~ 09	FH3-MC-Be/U/Y-Dust	5.0 um PVC	~~27.55~~ 2.505	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~18~~	FH3-MC-Be/U/Y-Dust ISO		~~27.59~~ 2.505	ASTM D3972-90M (modified) - Uranium
~~19~~ 10	BI-Ref.-ECAI-Be/U/Y-Dust		~~10.02~~ 5.01	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~20~~	BI-Ref-ECAI-Be/U/Y-Dust ISO		5.01	ASTM D3972-90M (modified) - Uranium
~~21~~ 11	BI-Ref-NAI-Be/U/Y-Dust		2.505	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~22~~	BI-Ref-NAI-Be/U/Y-Dust ISO		2.505	ASTM D3972-90M (modified) - Uranium
~~23~~ 12	BIFI-A2S-Be/U/Y-Dust		5.01	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~24~~	BIFI-A2S-Be/U/Y-Dust ISO		5.0	ASTM D3972-90M (modified) - Uranium
~~25~~ 13	BIFI-F2S-Be/U/Y-Dust		7.5	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~26~~	BIFI-F2S-Be/U/Y-Dust ISO		7.5	ASTM D3972-90M (modified) - Uranium
~~27~~ 14	Blank1-Dust		—	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~28~~	Blank1-Dust ISO		—	ASTM D3972-90M (modified) - Uranium

Be - Beryllium Y - Yttrium
U - Uranium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
[signature]	12-9-10/1500	[signature] ALS-CO	12/10/10 10:56
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time

Fed Ex

January 20, 2011

Mr. Wil King
Terracon Consultants, Inc.
13910 West 96th Terrace
Lenexa KS 66215

Re:		
	ALS Workorder:	10-12-142
	Project Name:	Bannister Complex
	Project Number:	None Submitted

Dear Mr. King:

Fourteen filter samples were received from Terracon Consultants, Inc. on December 14, 2010. The samples were scheduled for the following analysis:

Isotopic Uranium	pages 1-106

The results for this analysis are contained in the enclosed reports.

Thank you for your confidence in ALS Laboratory Group. Should you have any questions, please call.

Sincerely,

ALS Laboratory Group
Jeff Kujawa
Project Manager

JRK/km
Enclosure (s): Report

ALS is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

Accreditation Body	License or Certification Number
Washington	C1280
Utah	CO00078
Arizona	AZ0742
Alaska	UST-086
Alaska	CO00078
Florida	E87914
Missouri	175
North Dakota	R-057
New Jersey	CO003
Nevada	CO000782008A
California	06251CA
Kansas	E-10381
Maryland	285
Pennsylvania	68-03116
Texas	T104704241-09-1
Colorado	CO00078
Connecticut	PH-0232
Idaho	CO00078
Tennessee	2976
Kentucky	90137
L-A-B (DoD ELAP/ISO 17025)	L2257

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1012142
Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B1SB-Q25-Be/U/Y-Dust-Iso	1012142-1		FILTER	30-Nov-10	
B1SB-V19-Be/U/Y-Dust-Iso	1012142-2		FILTER	30-Nov-10	
B1F1-Q19-Be/U/Y-Dust-Iso	1012142-3		FILTER	30-Nov-10	
B1F1-R18-Be/U/Y-Dust-Iso	1012142-4		FILTER	30-Nov-10	
B1F1-Y10-Be/U/Y-Dust-Iso	1012142-5		FILTER	30-Nov-10	
B2SB-BOC26-Be/U/Y-Dust-Iso	1012142-6		FILTER	30-Nov-10	
FH3-RAD-Be/U/Y-Dust-Iso	1012142-7		FILTER	30-Nov-10	
FH3-AI-Be/U/Y-Dust-Iso	1012142-8		FILTER	30-Nov-10	
FH3-MC-Be/U/Y-Dust-Iso	1012142-9		FILTER	30-Nov-10	
B1-Roof-ECAI-Be/U/Y-Dust-Iso	1012142-10		FILTER	30-Nov-10	
B1-Roof-NAI-Be/U/Y-Dust-Iso	1012142-11		FILTER	30-Nov-10	
B1F1-A25-Be/U/Y-Dust-Iso	1012142-12		FILTER	30-Nov-10	
B1F1-F25-Be/U/Y-Dust-Iso	1012142-13		FILTER	30-Nov-10	
Blank1-Dust-Iso	1012142-14		FILTER	30-Nov-10	

1012142

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012247

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 12-8-10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa (City) Kansas (State) 66215 (Zip)

Person to Contact Wil King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No. _____

Sampling Site Bannister Complex

Date/Time of Collection 11-30-10

Report Results in mg/kg for elements

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
01	B1SB-025-Be/U/Y-Dust	5.0 cm PVC	27.55	SW-846 Method 6010 (Be); ICP-AES (Y,U)
02	B1SB-025-Be/U/Y-Dust ISO		17.54	ASTM D3972-90M (modified)-Uranium
03 02	B1SB-V19-Be/U/Y-Dust		10.02	SW-846 Method 6010 (Be); ICP-AES (U,Y)
04	B1SB-V19-Be/U/Y-Dust ISO		10.02	ASTM D3972-90M (modified)-Uranium
05 03	B1F1-019-Be/U/Y-Dust		7.52	SW-846 Method 6010 (Be); ICP-AES (U,Y)
06	B1F1-019-Be/U/Y-Dust ISO		7.52	ASTM D3972-90M (modified)-Uranium
07 04	B1F1-R18-Be/U/Y-Dust		20.04	SW-846 Method 6010 (Be); ICP-AES (U,Y)
08	B1F1-R18-Be/U/Y-Dust ISO		15.03	ASTM D3972-90M (modified)-Uranium
09 05	B1F1-Y10-Be/U/Y-Dust		15.03	SW-846 Method 6010 (Be); ICP-AES (U,Y)
10	B1F1-Y10-Be/U/Y-Dust ISO		15.03	ASTM D3972-90M (modified)-Uranium
11 06	B2SB-B0026-Be/U/Y-Dust		22.55	SW-846 Method 6010 (Be); ICP-AES (U,Y)
12	B2SB-B0026-Be/U/Y-Dust ISO		22.55	ASTM D3972-90M (modified)-Uranium
13 07	FH3-RAD-Be/U/Y-Dust		5.01	SW-846 Method 6010 (Be); ICP-AES (U,Y)
14	FH3-RAD-Be/U/Y-Dust ISO		5.01	ASTM D3972-90M (modified)-Uranium
15 08	FH3-AI-Be/U/Y-Dust		5.01	SW-846 Method 6010 (Be); ICPAES (U,Y)
16	FH3-AI-Be/U/Y-Dust ISO		5.01	~~SW~~ ASTM D3972-90M (modified)-Uranium

KL 12/13

CHAIN OF CUSTODY

Be - Beryllium Y - Yttrium
U - Uranium

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
	12-9-10/1500	RLS-CN	12/9/10 10:56
	12-13-10	C Dimble	12/14/10 1020

Fed Ex

1012142

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012247

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 12-8-10 Purchase Order No. 0210T144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa (City) Kansas (State) 66215 (Zip)

Person to Contact Wil King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-30-10

Report Results in mg/kg for elements

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
~~17~~ (09)	FH3-MC-Be/U/Y-Dust	5.0 um PVC	~~27.55~~ 2.505	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~18~~	FH3-MC-Be/U/Y-Dust ISO		~~27.54~~ 2.505	ASTM D3972-90M (modified) - Uranium
~~19~~ (-10)	BI-Roof-ECAI-Be/U/Y-Dust		~~10.02~~ 5.01	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~20~~	BI-Roof-ECAI-Be/U/Y-Dust ISO		5.01	ASTM D3972-90M (modified) - Uranium
~~21~~ (-11)	BI-Roof-NAI-Be/U/Y-Dust		2.505	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~22~~	BI-Roof-NAI-Be/U/Y-Dust ISO		2.505	ASTM D3972-90M (modified) - Uranium
~~23~~ (-12)	BIF1-A2S-Be/U/Y-Dust		5.01	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~24~~	BIF1-A2S-Be/U/Y-Dust ISO		5.0	ASTM D3972-90M (modified) - Uranium
~~25~~ (-13)	BIF1-F2S-Be/U/Y-Dust		7.5	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~26~~	BIF1-F2S-Be/U/Y-Dust ISO		7.5	ASTM D3972-90M (modified) - Uranium
~~27~~ (-14)	Blank1-Dust		—	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~28~~	Blank1-Dust ISO		—	ASTM D3972-90M (modified) - Uranium

Be - Beryllium Y - Yttrium U - Uranium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
[signature]	12-9-10/1800	[signature] ALS-CH	12/10/10 0856
[signature]	12-13-10	C Trumble	12/14/10 1020

Fed Ex

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ~~ALS OH~~ CDT 12-14-10 TERRACON Workorder No: 1012142

Project Manager: JK Initials: CDT Date: 12-14-10

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3. Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		(YES)	NO
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		(YES)	NO
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble:** ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17. Were the samples **shipped on ice**?		YES	(NO)
18. Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 #4	(RAD ONLY)	YES	(NO)

Cooler #:	1
Temperature (°C):	Amb
No. of custody seals on cooler:	0
DOT Survey/ Acceptance Information — External µR/hr reading:	11
DOT Survey/ Acceptance Information — Background µR/hr reading:	10

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

If applicable, was the client contacted? YES / NO / (NA) Contact: _____ Date/Time: _____

Project Manager Signature / Date: 12/15/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

1012142

From: Origin ID: OXDA (513) 733-5336
Sample Receiving
ALS LABORATORY GROUP
4388 GLENDALE-MILFORD RD

CINCINNATI, OH 45242

FedEx Express

J1030101004022S

Ship Date: 13DEC10
ActWgt: 5.0 LB
CAD: 5634838/INET3090

Delivery Address Bar Code

SHIP TO: (800) 443-1511 BILL SENDER

Sample Receiving
ALS Laboratory Group- Ft. Collins
225 COMMERCE DR

FORT COLLINS, CO 80524

Ref #
Invoice #
PO #
Dept #

10-

TRK# 0201 7965 4645 9493

TUE - 14 DEC A2
STANDARD OVERNIGHT

80524
CO-US
DEN

NR FTCA

ALS Environmental

Isotopic Uranium

Case Narrative

Terracon Consultants Inc.

Bannister Complex

Work Order Number: 1012142

1. This report consists of the analytical results and supporting documentation for 14 filter samples received by ALS on 12/14/10.

2. These samples were prepared according to procedures SOP773R10 and SOP778R13.

3. The samples were analyzed for the presence of isotopic uranium according to procedure SOP714R12. The analyses were completed on 01/07/11.

4. The isotopic analysis results for these samples are reported on an 'As Received' basis in units of pCi/sample.

5. Due to insufficient sample volume, a laboratory control sample duplicate (LCSD) was prepared in lieu of a prep batch duplicate.

6. This analytical method quantifies U-235 alpha activity in a specific region of interest corresponding to emission energies between those of U-234 and U-238. A potential limitation of this method is that measurable amounts of U-234 in the sample may cause a small amount of characteristic activity in the U-235 region of interest due to poorly resolved alpha activity at the boundary between the two regions. To minimize the potential for a high bias in the U-235 analytical results, the U-235 region of interest has been narrowed and limited to a lower energy region. An 85.1% abundance correction has been made to the final U-235 results.

7. ALS follows the convention outlined in ANSI N42.23 for reporting significant digits in the TPU and MDC results. ANSI N42.23 states that the TPU result should be rounded to two significant digits and that the MDC result should be rounded to the same decimal place as the TPU result. In practice, this could result in an MDC result with a reported value of 0 for samples with significant activity, including the batch laboratory control sample.

8. No anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Linda Arend
Radiochemistry Primary Data Reviewer

01/20/11
Date

Radiochemistry Final Data Reviewer

01/20/11
Date

Section 1

CHAIN OF CUSTODY

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1012142
Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Client PO Number: 02107144

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B1SB-Q25-Be/U/Y-Dust-Iso	1012142-1		FILTER	30-Nov-10	
B1SB-V19-Be/U/Y-Dust-Iso	1012142-2		FILTER	30-Nov-10	
B1F1-Q19-Be/U/Y-Dust-Iso	1012142-3		FILTER	30-Nov-10	
B1F1-R18-Be/U/Y-Dust-Iso	1012142-4		FILTER	30-Nov-10	
B1F1-Y10-Be/U/Y-Dust-Iso	1012142-5		FILTER	30-Nov-10	
B2SB-BOC26-Be/U/Y-Dust-Iso	1012142-6		FILTER	30-Nov-10	
FH3-RAD-Be/U/Y-Dust-Iso	1012142-7		FILTER	30-Nov-10	
FH3-AI-Be/U/Y-Dust-Iso	1012142-8		FILTER	30-Nov-10	
FH3-MC-Be/U/Y-Dust-Iso	1012142-9		FILTER	30-Nov-10	
B1-Roof-ECAI-Be/U/Y-Dust-Iso	1012142-10		FILTER	30-Nov-10	
B1-Roof-NAI-Be/U/Y-Dust-Iso	1012142-11		FILTER	30-Nov-10	
B1F1-A25-Be/U/Y-Dust-Iso	1012142-12		FILTER	30-Nov-10	
B1F1-F25-Be/U/Y-Dust-Iso	1012142-13		FILTER	30-Nov-10	
Blank1-Dust-Iso	1012142-14		FILTER	30-Nov-10	

1012142

ANALYTICAL REQUEST FORM

☒ **REGULAR Status** 1012247

☐ **RUSH Status Required - ADDITIONAL CHARGE**

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 12-8-10 Purchase Order No. 02107144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa (City) Kansas (State) 66215 (Zip)

Person to Contact Wil King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-30-10

Report Results in mg/Kg for element

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
-01	B1SB-Q25-Be/U/Y-Dust	5.0 cm PVC	27.55	SW-846 Method 6010 (Be); ICP-AES (Y,U)
~~-02~~	B1SB-Q25-Be/U/Y-Dust ISO		17.54	ASTM D3972-90M (modified) - Uranium
~~-03~~ -02	B1SB-V19-Be/U/Y-Dust		10.02	SW-846 Method 6010 (Be); ICP-AES (U,Y)
~~-04~~	B1SB-V19-Be/U/Y-Dust ISO		10.02	ASTM D3972-90M (modified) - Uranium
~~-05~~ -03	B1F1-Q19-Be/U/Y-Dust		7.52	SW-846 Method 6010 (Be); ICP-AES (U,Y)
~~-06~~	B1F1-Q19-Be/U/Y-Dust ISO		7.52	ASTM D3972-90M (modified) - Uranium
~~-07~~ -04	B1F1-R18-Be/U/Y-Dust		20.04	SW-846 Method 6010 (Be); ICP-AES (U,Y)
~~-08~~	B1F1-R18-Be/U/Y-Dust ISO		~~7.5~~ 15.03	ASTM D3972-90M (modified) - Uranium
~~-09~~ -05	B1F1-Y10-Be/U/Y-Dust		15.03	SW-846 Method 6010 (Be); ICP-AES (U,Y)
~~-10~~	B1F1-Y10-Be/U/Y-Dust ISO		15.03	ASTM D3972-90M (modified) - Uranium
~~-11~~ -06	B2SB-BOC26-Be/U/Y-Dust		22.55	SW-846 Method 6010 (Be); ICP-AES (U,Y)
~~-12~~	B2SB-BOC26-Be/U/Y-Dust ISO		22.55	ASTM D3972-90M (modified) - Uranium
~~-13~~ -07	FH3-RAD-Be/U/Y-Dust		5.01	SW-846 Method 6010 (Be); ICP-AES (U,Y)
~~-14~~	FH3-RAD-Be/U/Y-Dust ISO		5.01	ASTM D3972-90M (modified) - Uranium
~~-15~~ -08	FH3-AI-Be/U/Y-Dust		5.01	SW-846 Method 6010 (Be); ICP-AES (U,Y)
~~-16~~	FH3-AI-Be/U/Y-Dust ISO		5.01	~~SW~~ ASTM D3972-90M (modified) - Uranium

KL 12/13

CHAIN OF CUSTODY

Be - Beryllium Y - Yttrium U - Uranium

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
[signature]	12-9-10/1500	[signature] ALS-CN	12/10/10 10:56
[signature]	12-13-10	C Trimble	12/14/10 1020

Fed Ex

1012142

ANALYTICAL REQUEST FORM

☒ **REGULAR** Status 1012247

☐ **RUSH** Status Required - ADDITIONAL CHARGE

RESULTS REQUIRED BY _____ DATE

CONTACT ALS LABORATORY GROUP PRIOR TO SENDING SAMPLES

Date 12-8-10 Purchase Order No. 0910144

Company Name Terracon Consultants Inc

Address 13910 West 96th Terrace

Lenexa City Kansas State 66215 Zip

Person to Contact Wil King

Email Address wwking@terracon.com

Telephone (913) 492-7777

Fax Telephone (913) 492-7443

Billing Address (if different)

Quote No.

Sampling Site Bannister Complex

Date/Time of Collection 11-30-10

Report Results in mg/kg for elements

Laboratory Use Only	Client Sample Number	Media Type	Sample Volume (Liters)	ANALYSES REQUESTED - Use Method Number if Known
~~17~~ (09)	FH3-MC-Be/U/Y-Dust	50um PVC	~~2.755~~ 2.505	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~18~~	FH3-MC-Be/U/Y-Dust ISO		~~1.754~~ 2.505	ASTM D3972-90M (modified) - Uranium
~~19~~ (10)	BI-Roof-ECAI-Be/U/Y-Dust		~~10.02~~ 5.01	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~20~~	BI-Roof-ECAI-Be/U/Y-Dust ISO		5.01	ASTM D3972-90M (modified) - Uranium
~~21~~ (11)	BI-Roof-NAEI-Be/U/Y-Dust		2.505	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~22~~	BI-Roof-NAEI-Be/U/Y-Dust ISO		2.505	ASTM D3972-90M (modified) - Uranium
~~23~~ (12)	BIFI-A2S-Be/U/Y-Dust		5.01	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~24~~	BIFI-A2S-Be/U/Y-Dust ISO		5.0	ASTM D3972-90M (modified) - Uranium
~~25~~ (13)	BIFI-F2S-Be/U/Y-Dust		7.5	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~26~~	BIFI-F2S-Be/U/Y-Dust ISO		7.5	ASTM D3972-90M (modified) - Uranium
~~27~~ (14)	Blank 1-Dust		—	SW-846 Method 6010(Be); ICP-AES(U,Y)
~~28~~	Blank 1-Dust ISO		—	ASTM D3972-90M (modified) - Uranium

Be - Beryllium Y - Yttrium
U - Uranium

CHAIN OF CUSTODY

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time
	12-9-10/1500	ALS-CH	12/10/10 1056
Relinquished by: (Signature)	Date / Time	Received by: (Signature) C Trumble	Date / Time
	12-13-10		12/14/10 1020

Fed Ex

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ~~COCA ALS OH~~ TERRACON Workorder No: 1012142

Project Manager: JK Initials: CDT Date: 12-14-10

1. Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2. Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3. Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4. Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5. Are the **COC and bottle labels complete and legible**?		(YES)	NO
6. Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8. Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous **non-preserved samples pH 4-9**?	(N/A)	YES	NO
10. Is there **sufficient sample** for the requested analyses?		(YES)	NO
11. Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12. Are all samples within **holding times** for the requested analyses?		(YES)	NO
13. Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring **no** headspace (**VOC, GRO, RSK/MEE, Rx CN/S, radon**) headspace free? **Size of bubble:** ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do perchlorate LCMS-MS samples **have** headspace? (at least 1/3 of container required)	(N/A)	YES	NO
16. Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
17. Were the samples **shipped on ice**?		YES	(NO)
18. Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 #4	(RAD ONLY)	YES	(NO)

Cooler #:	1
Temperature (°C):	Amb
No. of custody seals on cooler:	0
DOT Survey/ Acceptance Information — External µR/hr reading:	11
DOT Survey/ Acceptance Information — Background µR/hr reading:	10

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16

If applicable, was the client contacted? YES / NO / (NA) Contact: _____ Date/Time: _____

Project Manager Signature / Date: 12/15/10

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r22.xls (6/1/09)

1012142

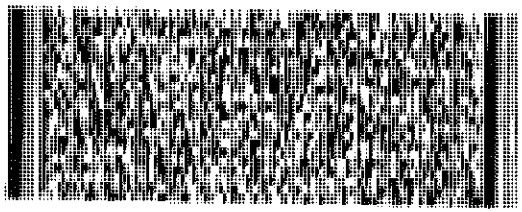
From: Origin ID: OXDA (513) 733-5336
Sample Receiving
ALS LABORATORY GROUP
4388 GLENDALE-MILFORD RD

CINCINNATI, OH 45242

FedEx Express

E

J10301018940225



Ship Date: 13DEC10
ActWgt: 5.0 LB
CAD: 5634838/INET3090

Delivery Address Bar Code

SHIP TO: (800) 443-1511 * BILL SENDER
Sample Receiving
ALS Laboratory Group- Ft. Collins
225 COMMERCE DR

FORT COLLINS, CO 80524

Ref #
Invoice #
PO #
Dept #

11
0-

TRK# 0201 7965 4645 9493

TUE - 14 DEC A2
STANDARD OVERNIGHT

80524
CO-US
DEN

NR FTCA

Section 2

SAMPLE RESULTS SUMMARY

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Reported on: Wednesday, January 19, 2011 4:46:12 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012142-1	B1SB-Q25-Be/U/Y-Dust-Iso	Sample	U-234	0.054 +/- 0.037	0.036	pCi/sample	FILTER	AS101228-1	1/7/2011	LT
1012142-1	B1SB-Q25-Be/U/Y-Dust-Iso	Sample	U-235	0.001 +/- 0.024	0.048	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-1	B1SB-Q25-Be/U/Y-Dust-Iso	Sample	U-238	0.025 +/- 0.026	0.036	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-2	B1SB-V19-Be/U/Y-Dust-Iso	Sample	U-234	0.012 +/- 0.023	0.049	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-2	B1SB-V19-Be/U/Y-Dust-Iso	Sample	U-235	0.020 +/- 0.027	0.046	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-2	B1SB-V19-Be/U/Y-Dust-Iso	Sample	U-238	0.015 +/- 0.020	0.029	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-3	B1F1-Q19-Be/U/Y-Dust-Iso	Sample	U-234	0.037 +/- 0.035	0.055	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-3	B1F1-Q19-Be/U/Y-Dust-Iso	Sample	U-235	0.005 +/- 0.024	0.035	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-3	B1F1-Q19-Be/U/Y-Dust-Iso	Sample	U-238	0.026 +/- 0.026	0.029	pCi/sample	FILTER	AS101228-1	1/7/2011	U

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Reported on: Wednesday, January 19, 2011 4:46:12 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012142-4	B1F1-R18-Be/U/Y-Dust-Iso	Sample	U-234	0.047 +/- 0.033	0.028	pCi/sample	FILTER	AS101228-1	1/7/2011	LT
1012142-4	B1F1-R18-Be/U/Y-Dust-Iso	Sample	U-235	0.023 +/- 0.026	0.033	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-4	B1F1-R18-Be/U/Y-Dust-Iso	Sample	U-238	0.033 +/- 0.030	0.038	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-5	B1F1-Y10-Be/U/Y-Dust-Iso	Sample	U-234	0.021 +/- 0.026	0.043	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-5	B1F1-Y10-Be/U/Y-Dust-Iso	Sample	U-235	0.019 +/- 0.024	0.018	pCi/sample	FILTER	AS101228-1	1/7/2011	LT
1012142-5	B1F1-Y10-Be/U/Y-Dust-Iso	Sample	U-238	0.026 +/- 0.028	0.043	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-6	B2SB-BOC26-Be/U/Y-Dust-Iso	Sample	U-234	0.019 +/- 0.028	0.054	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-6	B2SB-BOC26-Be/U/Y-Dust-Iso	Sample	U-235	-0.004 +/- 0.026	0.045	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-6	B2SB-BOC26-Be/U/Y-Dust-Iso	Sample	U-238	0.017 +/- 0.025	0.047	pCi/sample	FILTER	AS101228-1	1/7/2011	U

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Reported on: Wednesday, January 19, 2011 4:46:12 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012142-7	FH3-RAD-Be/U/Y-Dust-Iso	Sample	U-234	0.046 +/- 0.037	0.046	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-7	FH3-RAD-Be/U/Y-Dust-Iso	Sample	U-235	0.019 +/- 0.025	0.036	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-7	FH3-RAD-Be/U/Y-Dust-Iso	Sample	U-238	0.009 +/- 0.022	0.050	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-8	FH3-Al-Be/U/Y-Dust-Iso	Sample	U-234	0.024 +/- 0.037	0.072	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-8	FH3-Al-Be/U/Y-Dust-Iso	Sample	U-235	0 +/- 0.027	0.020	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-8	FH3-Al-Be/U/Y-Dust-Iso	Sample	U-238	0.028 +/- 0.036	0.067	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-9	FH3-MC-Be/U/Y-Dust-Iso	Sample	U-234	0.065 +/- 0.046	0.060	pCi/sample	FILTER	AS101228-1	1/7/2011	LT
1012142-9	FH3-MC-Be/U/Y-Dust-Iso	Sample	U-235	0.027 +/- 0.028	0.018	pCi/sample	FILTER	AS101228-1	1/7/2011	LT
1012142-9	FH3-MC-Be/U/Y-Dust-Iso	Sample	U-238	0.102 +/- 0.055	0.057	pCi/sample	FILTER	AS101228-1	1/7/2011	

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater then the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Reported on: Wednesday, January 19, 2011 4:46:12 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012142-10	B1-Roof-ECAI-Be/U/Y-Dust-Iso	Sample	U-234	0.048 +/- 0.039	0.055	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-10	B1-Roof-ECAI-Be/U/Y-Dust-Iso	Sample	U-235	0.003 +/- 0.024	0.042	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-10	B1-Roof-ECAI-Be/U/Y-Dust-Iso	Sample	U-238	0.047 +/- 0.035	0.035	pCi/sample	FILTER	AS101228-1	1/7/2011	LT
1012142-11	B1-Roof-NAI-Be/U/Y-Dust-Iso	Sample	U-234	0.025 +/- 0.037	0.073	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-11	B1-Roof-NAI-Be/U/Y-Dust-Iso	Sample	U-235	0.022 +/- 0.030	0.052	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-11	B1-Roof-NAI-Be/U/Y-Dust-Iso	Sample	U-238	0.018 +/- 0.032	0.066	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-12	B1F1-A25-Be/U/Y-Dust-Iso	Sample	U-234	-0.005 +/- 0.035	0.089	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-12	B1F1-A25-Be/U/Y-Dust-Iso	Sample	U-235	0.001 +/- 0.024	0.060	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-12	B1F1-A25-Be/U/Y-Dust-Iso	Sample	U-238	0.031 +/- 0.039	0.072	pCi/sample	FILTER	AS101228-1	1/7/2011	U

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Terracon Consultants Inc
Client Project Name: Bannister Complex
Client Project Number:
Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Reported on: Wednesday, January 19, 2011 4:46:12 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
1012142-13	B1F1-F25-Be/U/Y-Dust-Iso	Sample	U-234	0.034 +/- 0.036	0.060	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-13	B1F1-F25-Be/U/Y-Dust-Iso	Sample	U-235	0.011 +/- 0.024	0.035	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-13	B1F1-F25-Be/U/Y-Dust-Iso	Sample	U-238	0.073 +/- 0.048	0.060	pCi/sample	FILTER	AS101228-1	1/7/2011	LT
1012142-14	Blank1-Dust-Iso	Sample	U-234	0.032 +/- 0.031	0.044	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-14	Blank1-Dust-Iso	Sample	U-235	0.012 +/- 0.026	0.038	pCi/sample	FILTER	AS101228-1	1/7/2011	U
1012142-14	Blank1-Dust-Iso	Sample	U-238	0.021 +/- 0.026	0.039	pCi/sample	FILTER	AS101228-1	1/7/2011	U

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Section 3

QC RESULTS SUMMARY

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Method Blank Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-1MB

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.032 +/- 0.032	0.049	0.1	U
15117-96-1	U-235	0.026 +/- 0.032	0.054	0.1	U
7440-61-1	U-238	0.009 +/- 0.026	0.058	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	85.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less then Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-1LCS

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	8.8 +/- 1.5	0	8.681	101	82 - 122	P
7440-61-1	U-238	9.2 +/- 1.5	0	9.013	102	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.4	pCi/sample	82.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Lab ID: AS101228-1LCSD

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	8.5 +/- 1.4	0.1	8.681	97.8	82 - 122	P
7440-61-1	U-238	9.0 +/- 1.5	0	9.013	99.6	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	8.4	pCi/sample	93.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	
Lab ID:	AS101228-1LCSD

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 28-Dec-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		
13966-29-5	U-234	8.8 +/- 1.5	0	P	8.5 +/- 1.4	0.1	P	0.148	2.13
7440-61-1	U-238	9.2 +/- 1.5	0	P	9.0 +/- 1.5	0	P	0.0823	2.13

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery ebove upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty
DER - Duplicate Error Ratio
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *UR1012142-1*

Section 4

INDIVIDUAL SAMPLE RESULTS

4

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	B1SB-Q25-Be/U/Y-Dust-Iso
Lab ID:	1012142-1

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.054 +/- 0.037	0.036	0.1	LT
15117-96-1	U-235	0.001 +/- 0.024	0.048	0.1	U
7440-61-1	U-238	0.025 +/- 0.026	0.036	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.5	pCi/sample	83.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1SB-V19-Be/U/Y-Dust-Iso
Lab ID: 1012142-2

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.012 +/- 0.023	0.049	0.1	U
15117-96-1	U-235	0.020 +/- 0.027	0.046	0.1	U
7440-61-1	U-238	0.015 +/- 0.020	0.029	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	86.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1F1-Q19-Be/U/Y-Dust-Iso
Lab ID: 1012142-3

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.037 +/- 0.035	0.055	0.1	U
15117-96-1	U-235	0.005 +/- 0.024	0.035	0.1	U
7440-61-1	U-238	0.026 +/- 0.026	0.029	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	85.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1F1-R18-Be/U/Y-Dust-Iso
Lab ID: 1012142-4

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.047 +/- 0.033	0.028	0.1	LT
15117-96-1	U-235	0.023 +/- 0.026	0.033	0.1	U
7440-61-1	U-238	0.033 +/- 0.030	0.038	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	8.2	pCi/sample	91.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1F1-Y10-Be/U/Y-Dust-Iso
Lab ID: 1012142-5

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.021 +/- 0.026	0.043	0.1	U
15117-96-1	U-235	0.019 +/- 0.024	0.018	0.1	LT
7440-61-1	U-238	0.026 +/- 0.028	0.043	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.8	pCi/sample	86.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B2SB-BOC26-Be/U/Y-Dust-I
Lab ID: 1012142-6

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.019 +/- 0.028	0.054	0.1	U
15117-96-1	U-235	-0.004 +/- 0.026	0.045	0.1	U
7440-61-1	U-238	0.017 +/- 0.025	0.047	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.8	pCi/sample	86.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requestad MDC, greater than sample spacific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: FH3-RAD-Be/U/Y-Dust-Iso
Lab ID: 1012142-7

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.046 +/- 0.037	0.046	0.1	U
15117-96-1	U-235	0.019 +/- 0.025	0.036	0.1	U
7440-61-1	U-238	0.009 +/- 0.022	0.050	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.8	pCi/sample	87.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	FH3-Al-Be/U/Y-Dust-Iso
Lab ID:	1012142-8

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.024 +/- 0.037	0.072	0.1	U
15117-96-1	U-235	0 +/- 0.027	0.020	0.1	U
7440-61-1	U-238	0.028 +/- 0.036	0.067	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	6.7	pCi/sample	75.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	FH3-MC-Be/U/Y-Dust-Iso
Lab ID:	1012142-9

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.065 +/- 0.046	0.060	0.1	LT
15117-96-1	U-235	0.027 +/- 0.028	0.018	0.1	LT
7440-61-1	U-238	0.102 +/- 0.055	0.057	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.7	pCi/sample	86.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requestod MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	B1-Roof-ECAl-Be/U/Y-Dust-
Lab ID:	1012142-10

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.048 +/- 0.039	0.055	0.1	U
15117-96-1	U-235	0.003 +/- 0.024	0.042	0.1	U
7440-61-1	U-238	0.047 +/- 0.035	0.035	0.1	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	8.3	pCi/sample	92.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	B1-Roof-NAI-Be/U/Y-Dust-Is
Lab ID:	1012142-11

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.025 +/- 0.037	0.073	0.1	U
15117-96-1	U-235	0.022 +/- 0.030	0.052	0.1	U
7440-61-1	U-238	0.018 +/- 0.032	0.066	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.5	pCi/sample	84.0	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1F1-A25-Be/U/Y-Dust-Iso
Lab ID: 1012142-12

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	-0.005 +/- 0.035	0.089	0.1	U
15117-96-1	U-235	0.001 +/- 0.024	0.060	0.1	U
7440-61-1	U-238	0.031 +/- 0.039	0.072	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.5	pCi/sample	83.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID: B1F1-F25-Be/U/Y-Dust-Iso
Lab ID: 1012142-13

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.034 +/- 0.036	0.060	0.1	U
15117-96-1	U-235	0.011 +/- 0.024	0.035	0.1	U
7440-61-1	U-238	0.073 +/- 0.048	0.060	0.1	LT

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	8.1	pCi/sample	91.0	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 12

Sample Results

Lab Name: ALS Environmental -- FC
Work Order Number: 1012142
Client Name: Terracon Consultants Inc
ClientProject ID: Bannister Complex

Field ID:	Blank1-Dust-Iso
Lab ID:	1012142-14

Sample Matrix: FILTER
Prep SOP: PAI 778 Rev 13
Date Collected: 30-Nov-10
Date Prepared: 28-Dec-10
Date Analyzed: 07-Jan-11

Prep Batch: AS101228-1
QCBatchID: AS101228-1-1
Run ID: AS101228-1U
Count Time: 300 minutes
Report Basis: As Received

Final Aliquot: 1.00 sample
Prep Basis: As Received
Moisture(%): NA
Result Units: pCi/sample
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.032 +/- 0.031	0.044	0.1	U
15117-96-1	U-235	0.012 +/- 0.026	0.038	0.1	U
7440-61-1	U-238	0.021 +/- 0.026	0.039	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	8.956	7.6	pCi/sample	84.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentretion

BDL - Below Detection Limit

Data Package ID: *UR1012142-1*

Section 5

RAW DATA

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC

PAI Work Order: 1012142

Prep SOP: PAI 778

Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
1012142-1	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1569.100	31.36%	300	7.5	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	9	Spectrum#1	11:07 AM	13.000	1000	83.9%	1.2	NA	As Received	NA	
1012142-1	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	9.400	31.36%	300	0.054	0.036	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	9	Spectrum#1	11:07 AM	2.000	1000	83.9%	0.037	NA	As Received	NA	LT
1012142-1	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	0.100	31.36%	300	0.001	0.048	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	9	Spectrum#1	11:07 AM	3.000	1000	83.9%	0.024	NA	As Received	NA	U
1012142-1	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	4.400	31.36%	300	0.025	0.036	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	9	Spectrum#1	11:07 AM	2.000	1000	83.9%	0.026	NA	As Received	NA	U
1012142-2	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1631.700	31.79%	300	7.7	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	10a	Spectrum#1	11:07 AM	11.000	1000	86.1%	1.2	NA	As Received	NA	
1012142-2	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	2.200	31.79%	300	0.012	0.049	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	10a	Spectrum#1	11:07 AM	6.000	1000	86.1%	0.023	NA	As Received	NA	U
1012142-2	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	3.100	31.79%	300	0.020	0.046	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	10a	Spectrum#1	11:07 AM	3.000	1000	86.1%	0.027	NA	As Received	NA	U
1012142-2	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	2.700	31.79%	300	0.015	0.029	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	10a	Spectrum#1	11:07 AM	1.000	1000	86.1%	0.020	NA	As Received	NA	U
1012142-3	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1600.600	31.28%	300	7.7	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	11	Spectrum#1	11:07 AM	18.000	1000	85.8%	1.2	NA	As Received	NA	
1012142-3	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	6.600	31.28%	300	0.037	0.055	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	11	Spectrum#1	11:07 AM	8.000	1000	85.8%	0.035	NA	As Received	NA	U
1012142-3	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	0.700	31.28%	300	0.005	0.035	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	11	Spectrum#1	11:07 AM	1.000	1000	85.8%	0.024	NA	As Received	NA	U

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight',

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less then Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1012142-3	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	4.700	31.28%	300	0.026	0.029	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	11	Spectrum#1	11:07 AM	1.000	1000	85.8%	0.026	NA	As Received	NA	U
1012142-4	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1662.091	30.57%	300	8.2	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	12	Spectrum#1	11:07 AM	12.715	1000	91.2%	1.3	NA	As Received	NA	
1012142-4	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	8.700	30.57%	300	0.047	0.028	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	12	Spectrum#1	11:07 AM	1.000	1000	91.2%	0.033	NA	As Received	NA	LT
1012142-4	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	3.700	30.57%	300	0.023	0.033	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	12	Spectrum#1	11:07 AM	1.000	1000	91.2%	0.026	NA	As Received	NA	U
1012142-4	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	6.100	30.57%	300	0.033	0.038	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	12	Spectrum#1	11:07 AM	3.000	1000	91.2%	0.030	NA	As Received	NA	U
1012142-5	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1624.600	31.43%	300	7.8	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	13	Spectrum#1	11:07 AM	18.000	1000	86.7%	1.2	NA	As Received	NA	
1012142-5	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	3.800	31.43%	300	0.021	0.043	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	13	Spectrum#1	11:07 AM	4.000	1000	86.7%	0.026	NA	As Received	NA	U
1012142-5	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	3.000	31.43%	300	0.019	0.018	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	13	Spectrum#1	11:07 AM	0.000	1000	86.7%	0.024	NA	As Received	NA	LT
1012142-5	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	4.800	31.43%	300	0.026	0.043	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	13	Spectrum#1	11:07 AM	4.000	1000	86.7%	0.028	NA	As Received	NA	U
1012142-6	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1490.000	28.85%	300	7.8	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	14	Spectrum#1	11:07 AM	20.000	1000	86.6%	1.2	NA	As Received	NA	
1012142-6	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	3.200	28.85%	300	0.019	0.054	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	14	Spectrum#1	11:07 AM	6.000	1000	86.6%	0.028	NA	As Received	NA	U

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Metrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1012142-6	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	-0.600	28.85%	300	-0.004	0.045	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	14	Spectrum#1	11:07 AM	2.000	1000	86.6%	0.026	NA	As Received	NA	U
1012142-6	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	2.800	28.85%	300	0.017	0.047	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	14	Spectrum#1	11:07 AM	4.000	1000	86.6%	0.025	NA	As Received	NA	U
1012142-7	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1518.700	29.20%	300	7.8	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 S	16	Spectrum#1	11:07 AM	11.000	1000	87.2%	1.2	NA	As Received	NA	
1012142-7	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	7.800	29.20%	300	0.046	0.046	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	16	Spectrum#1	11:07 AM	4.000	1000	87.2%	0.037	NA	As Received	NA	U
1012142-7	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	2.700	29.20%	300	0.019	0.036	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	16	Spectrum#1	11:07 AM	1.000	1000	87.2%	0.025	NA	As Received	NA	U
1012142-7	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1.500	29.20%	300	0.009	0.050	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	16	Spectrum#1	11:07 AM	5.000	1000	87.2%	0.022	NA	As Received	NA	U
1012142-8	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1393.400	31.08%	300	6.7	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 S	17a	Spectrum#1	11:07 AM	32.000	1000	75.2%	1.1	NA	As Received	NA	
1012142-8	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	3.700	31.08%	300	0.024	0.072	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	17a	Spectrum#1	11:07 AM	11.000	1000	75.2%	0.037	NA	As Received	NA	U
1012142-8	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	0.000	31.08%	300	0	0.020	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	17a	Spectrum#1	11:07 AM	0.000	1000	75.2%	0.027	NA	As Received	NA	U
1012142-8	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	4.300	31.08%	300	0.028	0.067	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	17a	Spectrum#1	11:07 AM	9.000	1000	75.2%	0.036	NA	As Received	NA	U
1012142-9	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1546.100	30.05%	300	7.7	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 S	18	Spectrum#1	11:07 AM	33.000	1000	86.3%	1.2	NA	As Received	NA	

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) Tha Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1012142-9	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	11.300	30.05%	300	0.065	0.060	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	18	Spectrum #1	11:07 AM	9.000	1000	86.3%	0.046	NA	As Received	NA	LT
1012142-9	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	4.000	30.05%	300	0.027	0.018	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	18	Spectrum #1	11:07 AM	0.000	1000	86.3%	0.028	NA	As Received	NA	LT
1012142-9	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	17.600	30.05%	300	0.102	0.057	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	18	Spectrum #1	11:07 AM	8.000	1000	86.3%	0.055	NA	As Received	NA	
1012142-10	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1600.800	29.00%	300	8.3	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	19	Spectrum #1	11:07 AM	34.000	1000	92.5%	1.3	NA	As Received	NA	
1012142-10	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	8.600	29.00%	300	0.048	0.055	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	19	Spectrum #1	11:07 AM	8.000	1000	92.5%	0.039	NA	As Received	NA	U
1012142-10	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	0.400	29.00%	300	0.003	0.042	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	19	Spectrum #1	11:07 AM	2.000	1000	92.5%	0.024	NA	As Received	NA	U
1012142-10	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	8.400	29.00%	300	0.047	0.035	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	19	Spectrum #1	11:07 AM	2.000	1000	92.5%	0.035	NA	As Received	NA	LT
1012142-11	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1455.900	29.05%	300	7.5	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	25	Spectrum #1	11:09 AM	37.000	1000	84.0%	1.2	NA	As Received	NA	
1012142-11	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	4.100	29.05%	300	0.025	0.073	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	25	Spectrum #1	11:09 AM	13.000	1000	84.0%	0.037	NA	As Received	NA	U
1012142-11	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	3.100	29.05%	300	0.022	0.052	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	25	Spectrum #1	11:09 AM	3.000	1000	84.0%	0.030	NA	As Received	NA	U
1012142-11	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	3.000	29.05%	300	0.018	0.066	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	25	Spectrum #1	11:09 AM	10.000	1000	84.0%	0.032	NA	As Received	NA	U

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outsida default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
1012142-12	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1571.100	31.48%	300	7.5	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	26	Spectrum#1	11:09 AM	33.000	1000	83.7%	1.2	NA	As Received	NA	
1012142-12	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	-0.800	31.48%	300	-0.005	0.089	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	26	Spectrum#1	11:09 AM	26.000	1000	83.7%	0.035	NA	As Received	NA	U
1012142-12	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	0.200	31.48%	300	0.001	0.060	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	26	Spectrum#1	11:09 AM	6.000	1000	83.7%	0.024	NA	As Received	NA	U
1012142-12	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	5.500	31.48%	300	0.031	0.072	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	26	Spectrum#1	11:09 AM	15.000	1000	83.7%	0.039	NA	As Received	NA	U
1012142-13	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1596.300	29.42%	300	8.1	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	27	Spectrum#1	11:09 AM	28.000	1000	91.0%	1.3	NA	As Received	NA	
1012142-13	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	6.000	29.42%	300	0.034	0.060	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	27	Spectrum#1	11:09 AM	10.000	1000	91.0%	0.036	NA	As Received	NA	U
1012142-13	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1.700	29.42%	300	0.011	0.035	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	27	Spectrum#1	11:09 AM	1.000	1000	91.0%	0.024	NA	As Received	NA	U
1012142-13	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	13.000	29.42%	300	0.073	0.060	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	27	Spectrum#1	11:09 AM	10.000	1000	91.0%	0.048	NA	As Received	NA	LT
1012142-14	U-232	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1446.400	28.65%	300	7.6	0.1	pCi/sample	NA	
SMP	Tracer		AS101228-1-1	NA	NA	NA	1 s	28	Spectrum#1	11:09 AM	22.000	1000	84.6%	1.2	NA	As Received	NA	
1012142-14	U-234	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	5.100	28.65%	300	0.032	0.044	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	28	Spectrum#1	11:09 AM	3.000	1000	84.6%	0.031	NA	As Received	NA	U
1012142-14	U-235	11/30/2010	AS101228-1	NA	NA	FILTER	1 s	AlphaSpec2	AS101228-1U	1/7/2011	1.700	28.65%	300	0.012	0.038	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 s	28	Spectrum#1	11:09 AM	1.000	1000	84.6%	0.026	NA	As Received	NA	U

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Besis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	Net Cnts / Bkg Cnts	BaseEff / Bkg(min)	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
1012142-14	U-238	11/30/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	3.400	28.65%	300	0.021	0.039	pCi/sample	NA	
SMP	Trg. Analyte		AS101228-1-1	NA	NA	NA	1 S	28	Spectrum#1	11:09 AM	2.000	1000	84.6%	0.026	NA	As Received	NA	U
AS101228-1	U-232	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1523.700	29.88%	300	7.7	0.1	pCi/sample	NA	
MB	Tracer	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	60	Spectrum#1	11:09 AM	21.000	1000	85.5%	1.2	NA	As Received	NA	
AS101228-1	U-234	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	5.500	29.88%	300	0.032	0.049	pCi/sample	NA	
MB	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	60	Spectrum#1	11:09 AM	5.000	1000	85.5%	0.032	NA	As Received	NA	U
AS101228-1	U-235	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	3.800	29.88%	300	0.026	0.054	pCi/sample	NA	
MB	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	60	Spectrum#1	11:09 AM	4.000	1000	85.5%	0.032	NA	As Received	NA	U
AS101228-1	U-238	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1.600	29.88%	300	0.009	0.058	pCi/sample	NA	
MB	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	60	Spectrum#1	11:09 AM	8.000	1000	85.5%	0.026	NA	As Received	NA	U
AS101228-1	U-232	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1547.700	31.49%	300	7.4	0.1	pCi/sample	NA	
LCS	Tracer	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	61	Spectrum#1	11:09 AM	11.000	1000	82.4%	1.2	NA	As Received	NA	
AS101228-1	U-234	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1519.100	31.49%	300	8.8	0	pCi/sample	NA	101
LCS	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	61	Spectrum#1	11:09 AM	3.000	1000	82.4%	1.5	NA	As Received	NA	P
AS101228-1	U-238	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1581.400	31.49%	300	9.2	0	pCi/sample	NA	102
LCS	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	61	Spectrum#1	11:09 AM	2.000	1000	82.4%	1.5	NA	As Received	NA	P
AS101228-1	U-232	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1652.200	29.69%	300	8.4	0.1	pCi/sample	NA	
LCSD	Tracer	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	62	Spectrum#1	11:09 AM	36.000	1000	93.3%	1.3	NA	As Received	NA	
AS101228-1	U-234	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1566.900	29.69%	300	8.5	0.1	pCi/sample	0.15	97.8
LCSD	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	62	Spectrum#1	11:09 AM	7.000	1000	93.3%	1.4	NA	As Received	NA	P
AS101228-1	U-238	12/28/2010	AS101228-1	NA	NA	FILTER	1 S	AlphaSpec2	AS101228-1U	1/7/2011	1658.200	29.69%	300	9.0	0	pCi/sample	0.08	99.6
LCSD	Trg. Analyte	12:04:44 PM	AS101228-1-1	NA	NA	NA	1 S	62	Spectrum#1	11:09 AM	6.000	1000	93.3%	1.5	NA	As Received	NA	P

Comments:

Data Package ID: *UR1012142-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC wes not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovary within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

DER - Duplicate Error Ratio

BDL - Below Detection Limit

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-1
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 9
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:07:52AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010409; Det: 9; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 11:28:31AM

Efficiency Calibration: C11010409

Efficiency: 31.36% +/- 0.20% TPU(2 sigma)

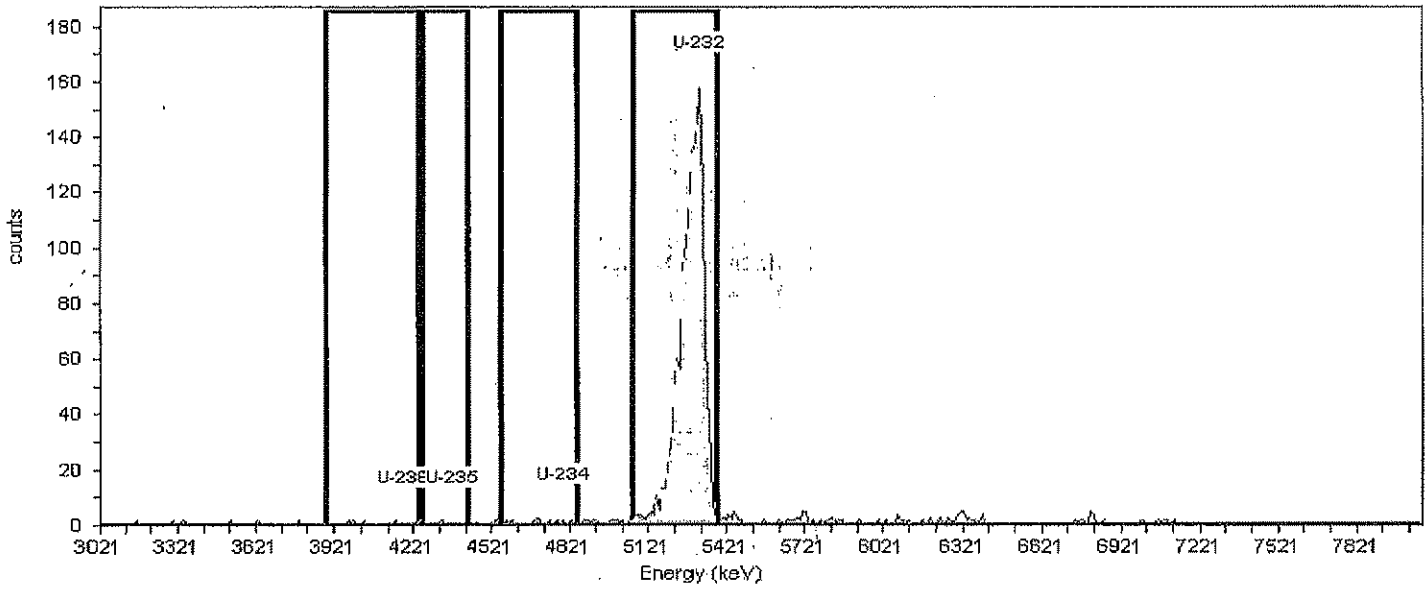
Energy Calibration: C11010409

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 84.12%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.6	3882.6	4239.0	.4	100.2	5.00	0.60	4.40	2.5E-002	2.7E-002	8.2E-003	3.2E-002
U-235	4367.7	4248.9	4427.1	24.2	99.7	1.00	0.90	0.10	5.7E-004	1.6E-002	1.0E-002	3.6E-002
U-234	4793.4	4555.8	4842.9	25.1	100.0	10.00	0.60	9.40	5.3E-002	3.8E-002	8.3E-003	3.2E-002
U-232	5318.1	5060.7	5377.5	69.9	100.1	1,573.00	3.90	1,569.10	7.6E+000	3.9E-001	2.1E-002	5.8E-002

Reviewed By: PS JP JMP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-2
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 10a
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:07:56AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010410; Det: 10a; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 11:29:23AM

Efficiency Calibration: C11010410

Efficiency: 31.79% +/- 0.15% TPU(2 sigma)

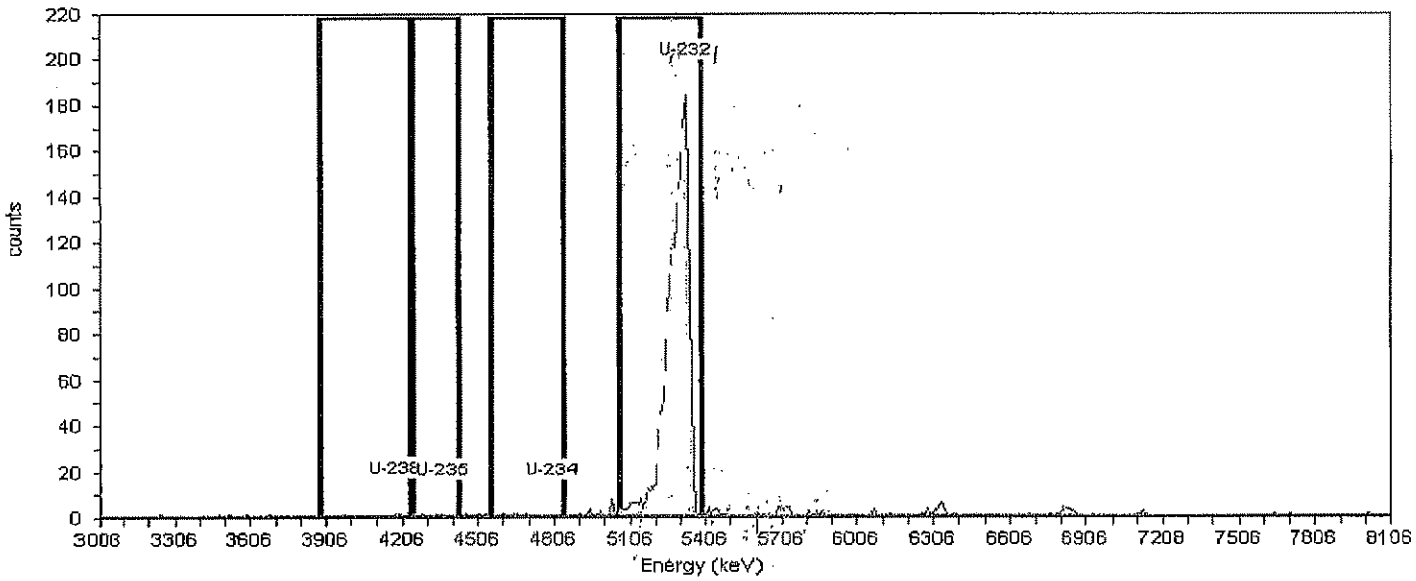
Energy Calibration: C11010410

Energy Cal: Gain = 9.9974 keV / Ch
Offset = 2,996.32 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 86.31%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4176.0	3876.1	4236.0	13.9	100.2	3.00	0.30	2.70	1.5E-002	2.0E-002	5.6E-003	2.6E-002
U-235	4366.0	4246.0	4426.0	.0	99.7	4.00	0.90	3.10	1.7E-002	2.4E-002	9.8E-003	3.4E-002
U-234	4795.9	4555.9	4845.8	62.1	100.0	4.00	1.80	2.20	1.2E-002	2.6E-002	1.4E-002	4.2E-002
U-232	5325.7	5065.8	5385.7	65.8	100.1	1,635.00	3.30	1,631.70	7.7E+000	3.9E-001	1.9E-002	5.2E-002

Reviewed By: JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-3
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 11
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:07:53AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010411; Det: 11; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 11:37:43AM

Energy Calibration: C11010411

Efficiency Calibration: C11010411

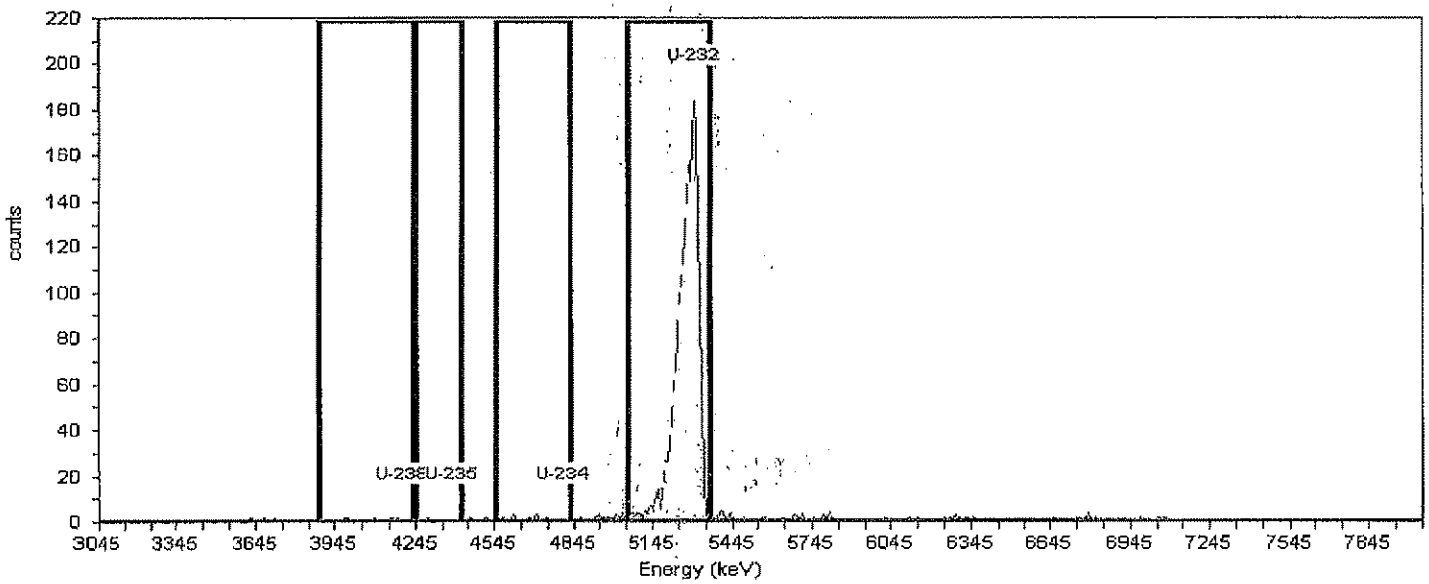
Efficiency: 31.28% +/- 0.16% TPU(2 sigma)

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 86.02%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3879.2	4232.2	58.4	100.2	5.00	0.30	4.70	2.6E-002	2.6E-002	5.7E-003	2.7E-002
U-235	4379.3	4242.0	4418.5	24.0	99.7	1.00	0.30	0.70	3.9E-003	1.3E-002	5.7E-003	2.7E-002
U-234	4800.9	4545.9	4830.3	219.4	100.0	9.00	2.40	6.60	3.7E-002	3.8E-002	1.6E-002	4.8E-002
U-232	5300.9	5046.0	5359.7	46.0	100.1	1,606.00	5.40	1,600.60	7.7E+000	3.9E-001	2.4E-002	6.4E-002

Reviewed By: PS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-4
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 12
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:07:54AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010412; Det: 12; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 11:30:59AM

Efficiency Calibration: C11010412

Efficiency: 30.57% +/- 0.21% TPU(2 sigma)

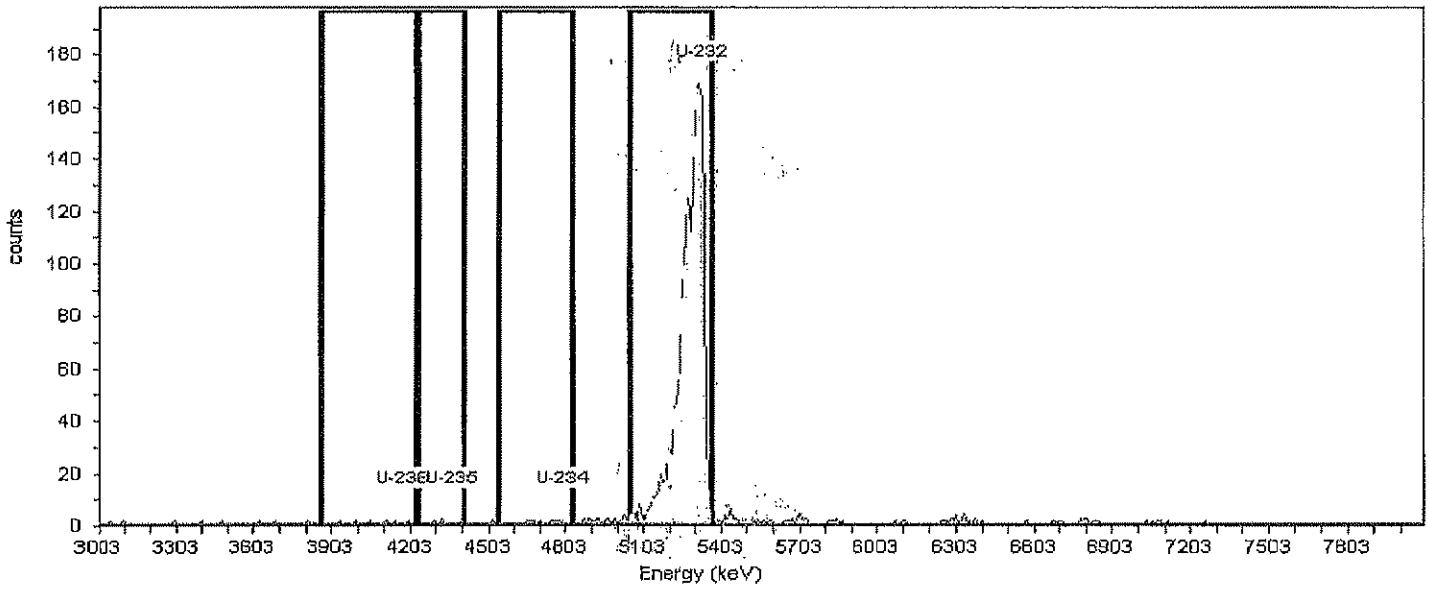
Energy Calibration: C11010412

Energy Cal: Gain = 9.9784 keV / Ch
Offset = 2,993.25 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 91.42%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4156.2	3866.8	4226.1	13.2	100.2	7.00	0.90	6.10	3.3E-002	3.0E-002	9.5E-003	3.4E-002
U-235	4345.8	4236.0	4415.7	47.4	99.7	4.00	0.30	3.70	2.0E-002	2.2E-002	5.5E-003	2.6E-002
U-234	4774.9	4545.4	4834.8	44.9	100.0	9.00	0.30	8.70	4.7E-002	3.3E-002	5.5E-003	2.6E-002
U-232	5313.7	5054.3	5373.6	83.2	100.1	1,665.91	3.81	1,662.09	8.2E+000	4.1E-001	2.0E-002	5.4E-002

Reviewed By: JP 9MF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-5
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 13
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:07:54AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010413; Det: 13; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 11:38:14AM

Efficiency Calibration: C11010413

Efficiency: 31.43% +/- 0.13% TPU(2 sigma)

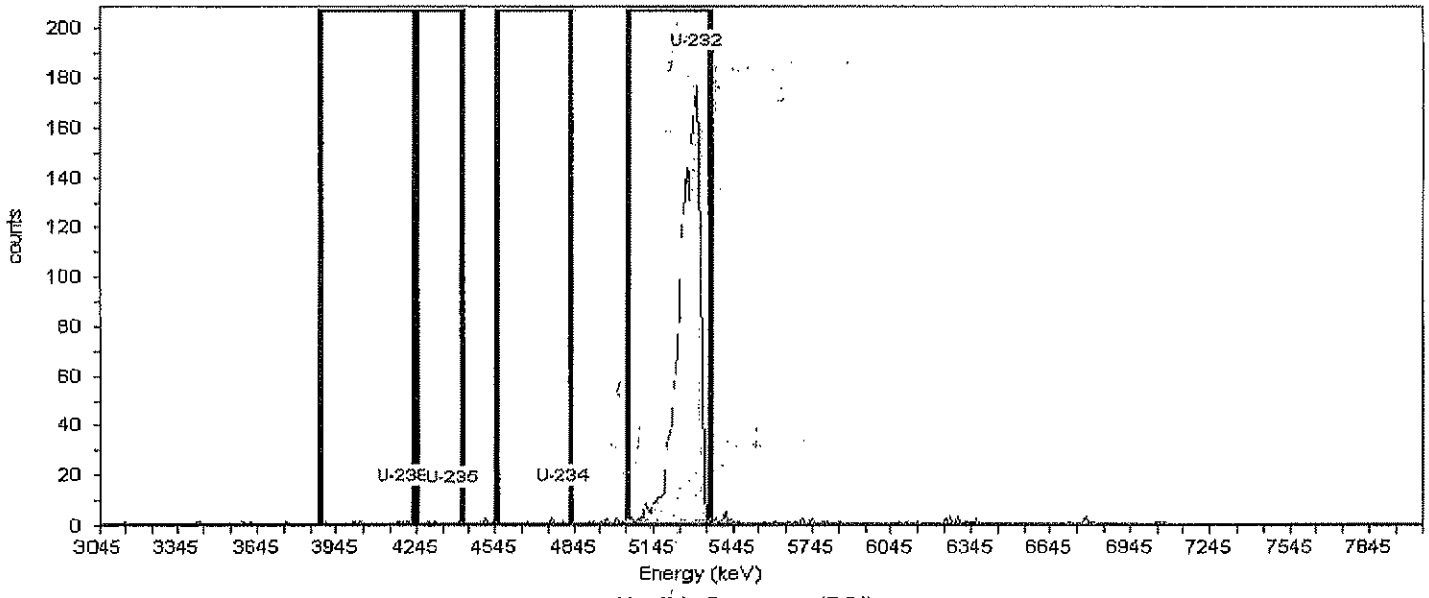
Energy Calibration: C11010413

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 86.91%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3879.2	4232.2	14.4	100.2	6.00	1.20	4.80	2.6E-002	3.0E-002	1.1E-002	3.7E-002
U-235	4379.3	4242.0	4418.5	13.3	99.7	3.00	0.00	3.00	1.7E-002	2.2E-002	0.0E+000	1.5E-002
U-234	4800.9	4545.9	4830.3	23.5	100.0	5.00	1.20	3.80	2.1E-002	2.7E-002	1.1E-002	3.7E-002
U-232	5310.7	5046.0	5359.7	44.3	100.1	1,630.00	5.40	1,624.60	7.8E+000	3.9E-001	2.4E-002	6.3E-002

Reviewed By: TPS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-6
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 14
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:07:55AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010414; Det: 14; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 11:32:31AM

Efficiency Calibration: C11010414A

Efficiency: 28.85% +/- 0.15% TPU(2 sigma)

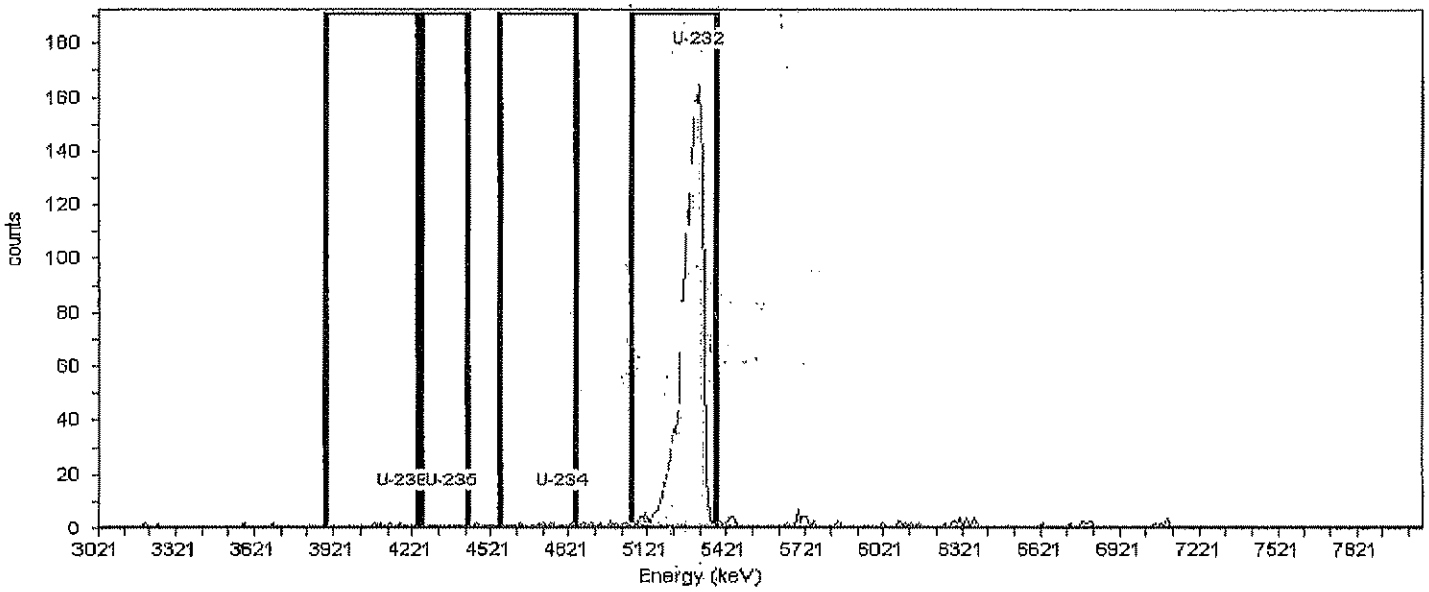
Energy Calibration: C11010414A

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 86.84%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.6	3882.6	4239.0	53.6	100.2	4.00	1.20	2.80	1.7E-002	2.7E-002	1.2E-002	4.1E-002
U-235	4367.7	4246.9	4427.1	.0	99.7	0.00	0.60	-0.60	-3.6E-003	1.5E-002	8.7E-003	3.4E-002
U-234	4793.4	4555.8	4842.9	13.4	100.0	5.00	1.80	3.20	1.9E-002	3.1E-002	1.5E-002	4.6E-002
U-232	5318.1	5060.7	5377.5	62.5	100.1	1,496.00	6.00	1,490.00	7.8E+000	4.1E-001	2.8E-002	7.2E-002

Reviewed By: TPS JP SMC

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

Print Date: 1/10/2011 11:15:41AM

AlphaVision v5.3
Custom Report Iteration: 05/21/09

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-7
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 16
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:07:56AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010416; Det: 16; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 11:33:37AM

Efficiency Calibration: C11010416

Efficiency: 29.20% +/- 0.12% TPU(2 sigma)

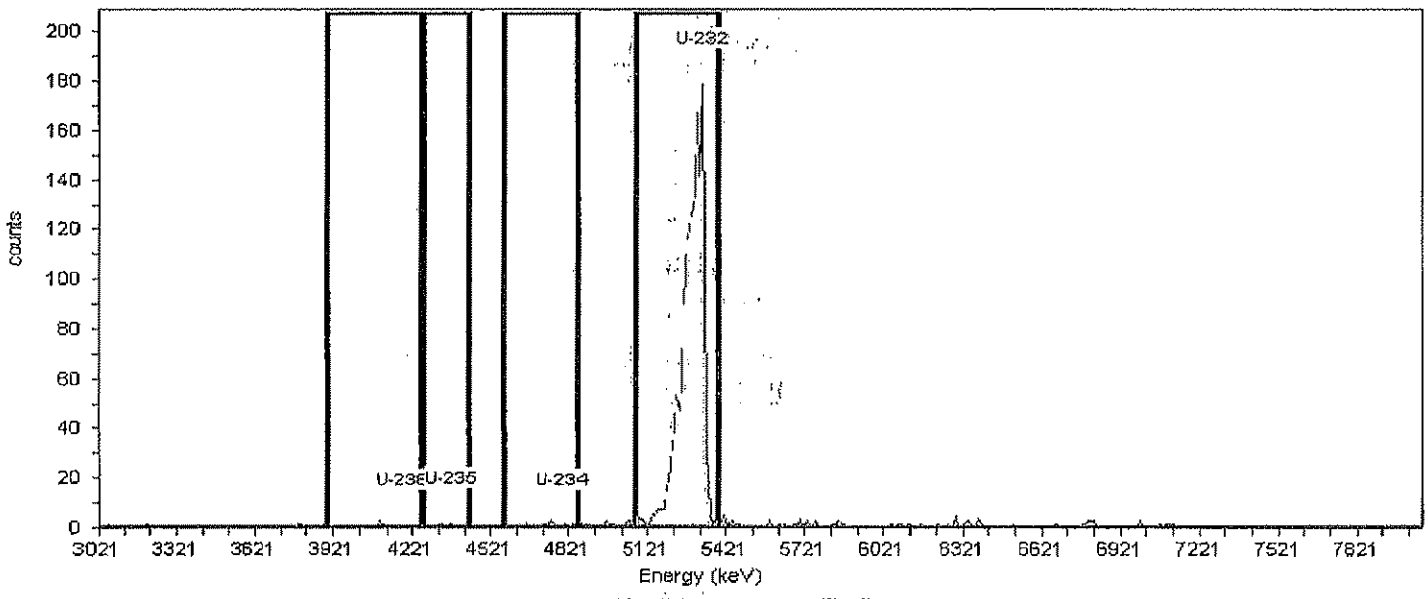
Energy Calibration: C11010416

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 87.44%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.6	3892.5	4248.9	59.0	100.2	3.00	1.50	1.50	8.8E-003	2.5E-002	1.3E-002	4.3E-002
U-235	4367.7	4258.8	4437.0	23.5	99.7	3.00	0.30	2.70	1.6E-002	2.2E-002	6.1E-003	2.8E-002
U-234	4793.4	4565.7	4852.8	24.9	100.0	9.00	1.20	7.80	4.6E-002	3.8E-002	1.2E-002	4.0E-002
U-232	5328.0	5070.6	5387.4	78.1	100.1	1,522.00	3.30	1,518.70	7.8E+000	4.0E-001	2.0E-002	5.6E-002

Reviewed By: TPS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-8
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 17a
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:07:58AM
Live Time: 300.00 min.
Real Time: 300.00 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010417; Det: 17a; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 12:06:22PM

Efficiency Calibration: C11010417

Efficiency: 31.08% +/- 0.20% TPU(2 sigma)

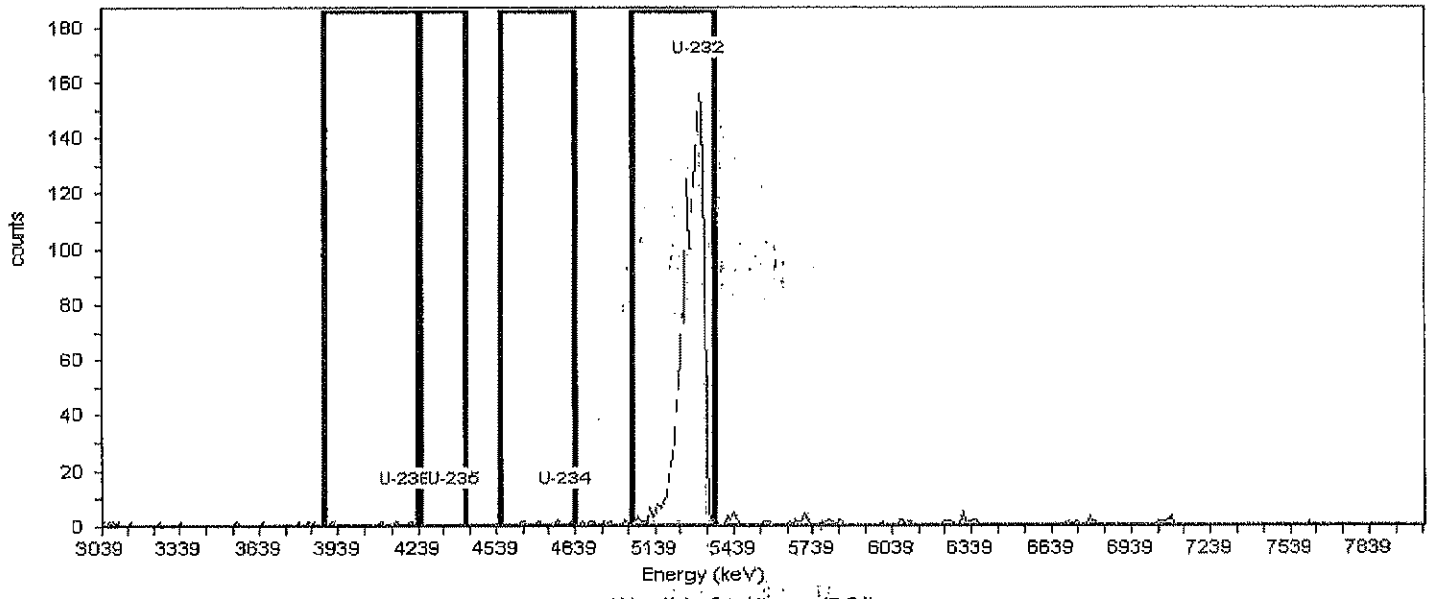
Energy Calibration: C11010417

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 75.37%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4188.4	3883.9	4237.6	21.3	100.2	7.00	2.70	4.30	2.7E-002	4.0E-002	2.0E-002	5.7E-002
U-235	4375.1	4247.4	4424.2	.0	99.7	0.00	0.00	0.00	0.0E+000	1.8E-002	0.0E+000	1.7E-002
U-234	4787.4	4551.9	4836.7	196.0	100.0	7.00	3.30	3.70	2.4E-002	4.1E-002	2.2E-002	6.1E-002
U-232	5308.2	5052.8	5367.1	47.6	100.1	1,403.00	9.60	1,393.40	6.8E+000	3.7E-001	3.7E-002	9.2E-002

Reviewed By: TS JP 9MF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-9
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 18
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:07:57AM
Live Time: 300.00 min.
Real Time: 300.00 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010418; Det: 18; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 12:17:28PM

Efficiency Calibration: C11010418

Efficiency: 30.05% +/- 0.15% TPU(2 sigma)

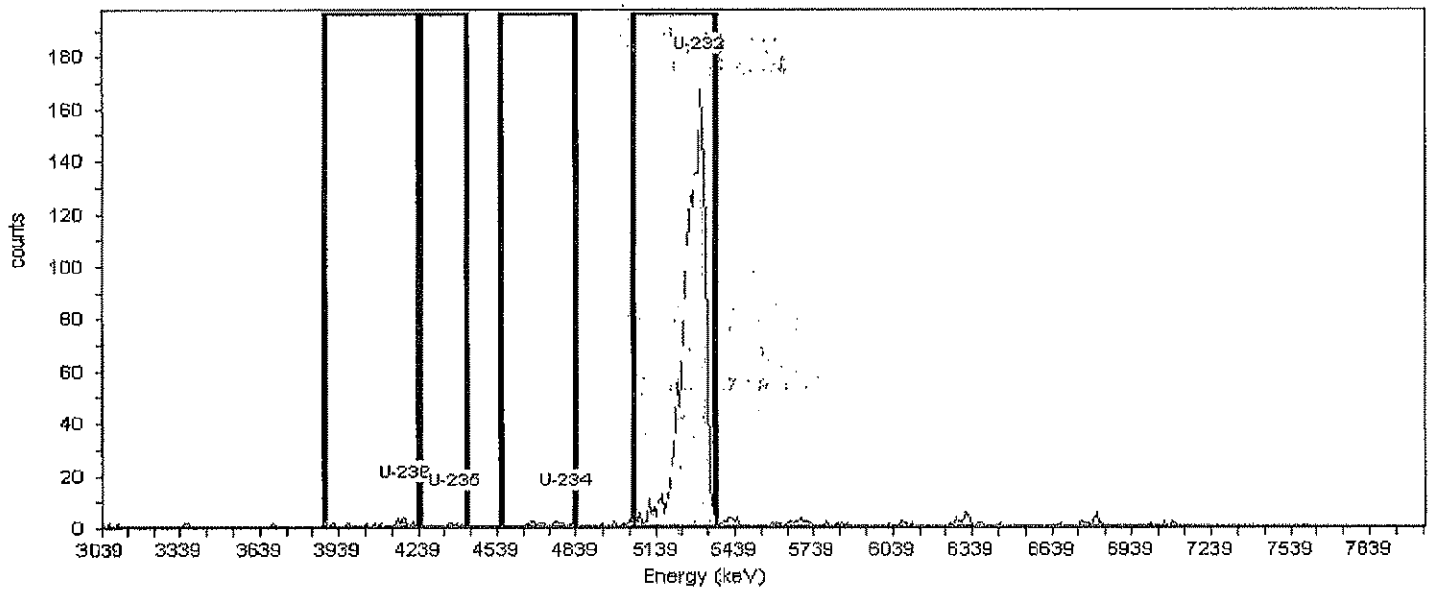
Energy Calibration: C11010418

Energy Cal: Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 86.50%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4188.4	3883.9	4237.6	15.8	100.2	20.00	2.40	17.60	1.0E-001	5.6E-002	1.7E-002	4.9E-002
U-235	4375.1	4247.4	4424.2	59.7	99.7	4.00	0.00	4.00	2.3E-002	2.6E-002	0.0E+000	1.6E-002
U-234	4797.4	4551.9	4836.7	173.8	100.0	14.00	2.70	11.30	6.5E-002	4.8E-002	1.8E-002	5.1E-002
U-232	5308.2	5052.8	5367.1	50.5	100.1	1,556.00	9.90	1,546.10	7.8E+000	4.0E-001	3.4E-002	8.4E-002

Reviewed By: JP

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-10
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 19
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:07:57AM
Live Time: 300.00 min.
Real Time: 300.00 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010419; Det: 19; Spectrum #1; Jan-04-2011 14:02

Calibration Date: 1/4/2011 12:07:43PM

Efficiency Calibration: C11010419

Efficiency: 29.09% +/- 0.16% TPU(2 sigma)

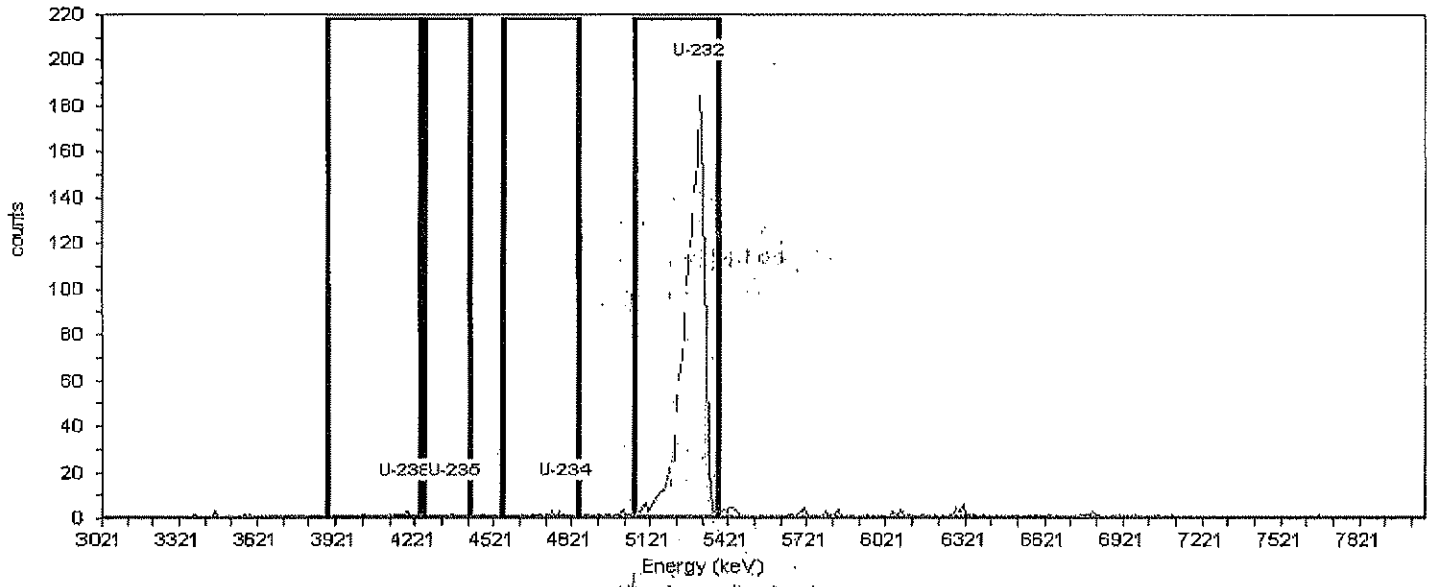
Energy Calibration: C11010419

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 92.80%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4179.8	3882.6	4239.0	14.0	100.2	9.00	0.60	8.40	4.7E-002	3.5E-002	8.1E-003	3.1E-002
U-235	4367.7	4248.9	4427.1	24.2	99.7	1.00	0.60	0.40	2.2E-003	1.4E-002	8.1E-003	3.1E-002
U-234	4793.4	4555.8	4842.9	124.0	100.0	11.00	2.40	8.60	4.8E-002	4.1E-002	1.6E-002	4.7E-002
U-232	5308.2	5060.7	5377.5	75.4	100.1	1,611.00	10.20	1,600.80	8.3E+000	4.2E-001	3.4E-002	8.2E-002

Reviewed By: PS JP JMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-11
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 25
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:52AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010425; Det: 25; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:04:20PM

Efficiency Calibration: C11010425

Efficiency: 29.05% +/- 0.20% TPU(2 sigma)

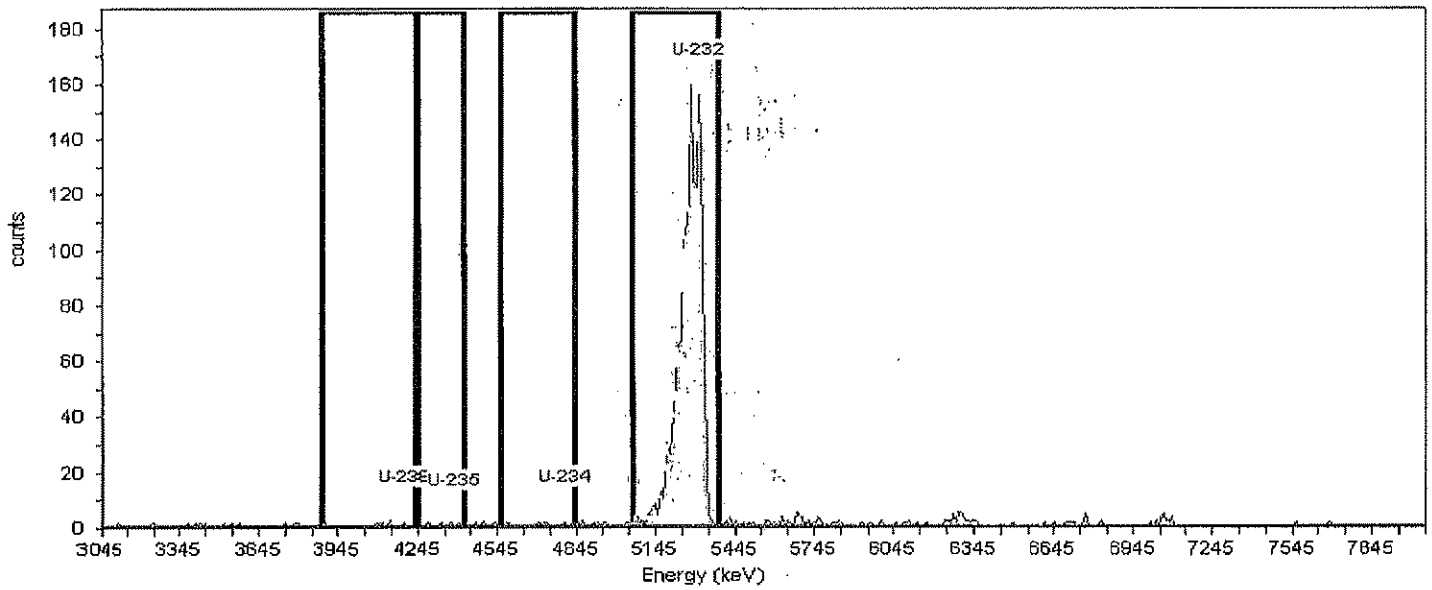
Energy Calibration: C11010425

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914,3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 84.27%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3879.2	4232.2	12.2	100.2	6.00	3.00	3.00	1.8E-002	3.7E-002	2.0E-002	5.6E-002
U-235	4379.3	4242.0	4418.5	13.9	99.7	4.00	0.90	3.10	1.9E-002	2.7E-002	1.1E-002	3.9E-002
U-234	4800.9	4555.7	4840.1	262.5	100.0	8.00	3.90	4.10	2.5E-002	4.2E-002	2.3E-002	6.2E-002
U-232	5310.7	5055.8	5379.3	99.2	100.1	1,467.00	11.10	1,455.90	7.6E+000	4.0E-001	3.9E-002	9.4E-002

Reviewed By:

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-12
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 26
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:53AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010426; Det: 26; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:05:14PM

Efficiency Calibration: C11010426

Efficiency: 31.48% +/- 0.15% TPU(2 sigma)

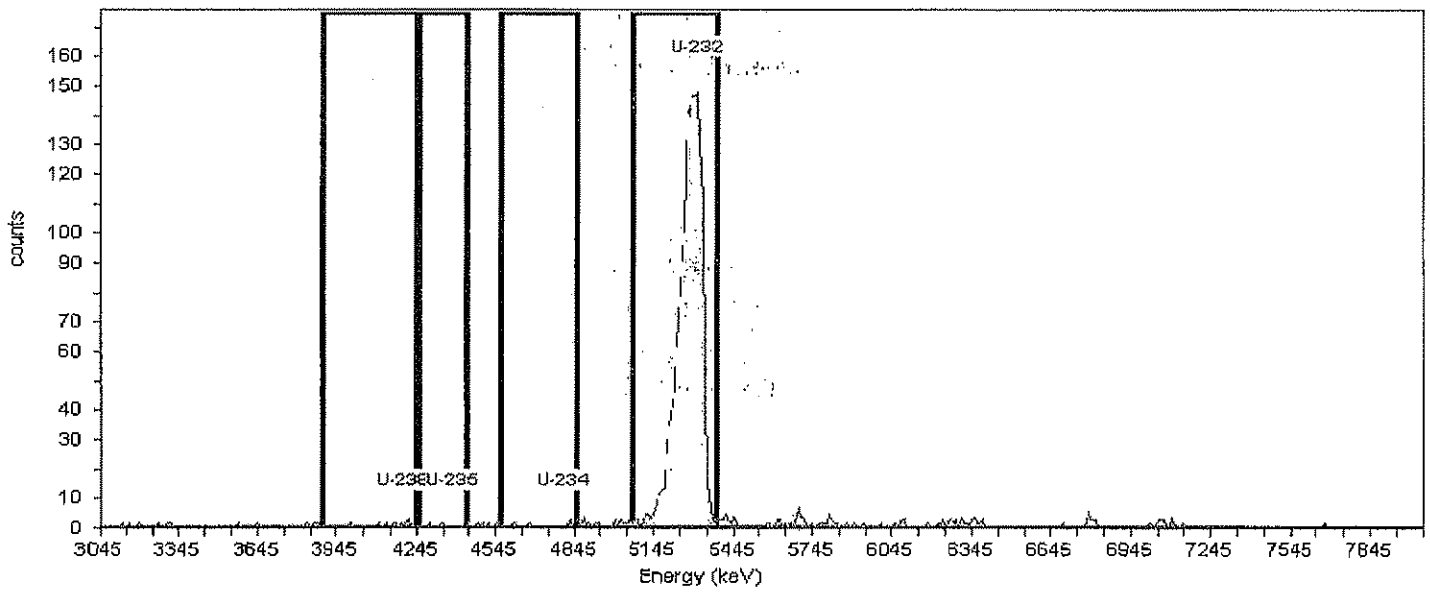
Energy Calibration: C11010426

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 83.90%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3889.0	4242.0	25.3	100.2	10.00	4.50	5.50	3.1E-002	4.3E-002	2.3E-002	6.0E-002
U-235	4379.3	4251.8	4428.3	24.2	99.7	2.00	1.80	0.20	1.1E-003	2.2E-002	1.4E-002	4.4E-002
U-234	4800.9	4565.5	4849.9	15.0	100.0	7.00	7.80	-0.80	0.0E+000	4.4E-002	3.0E-002	7.5E-002
U-232	5310.7	5065.6	5379.3	85.1	100.1	1,581.00	9.90	1,571.10	7.5E+000	3.8E-001	3.4E-002	8.3E-002

Reviewed By: TS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-13
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 27
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:53AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010427; Det: 27; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:06:06PM

Efficiency Calibration: C11010427

Efficiency: 29.42% +/- 0.16% TPU(2 sigma)

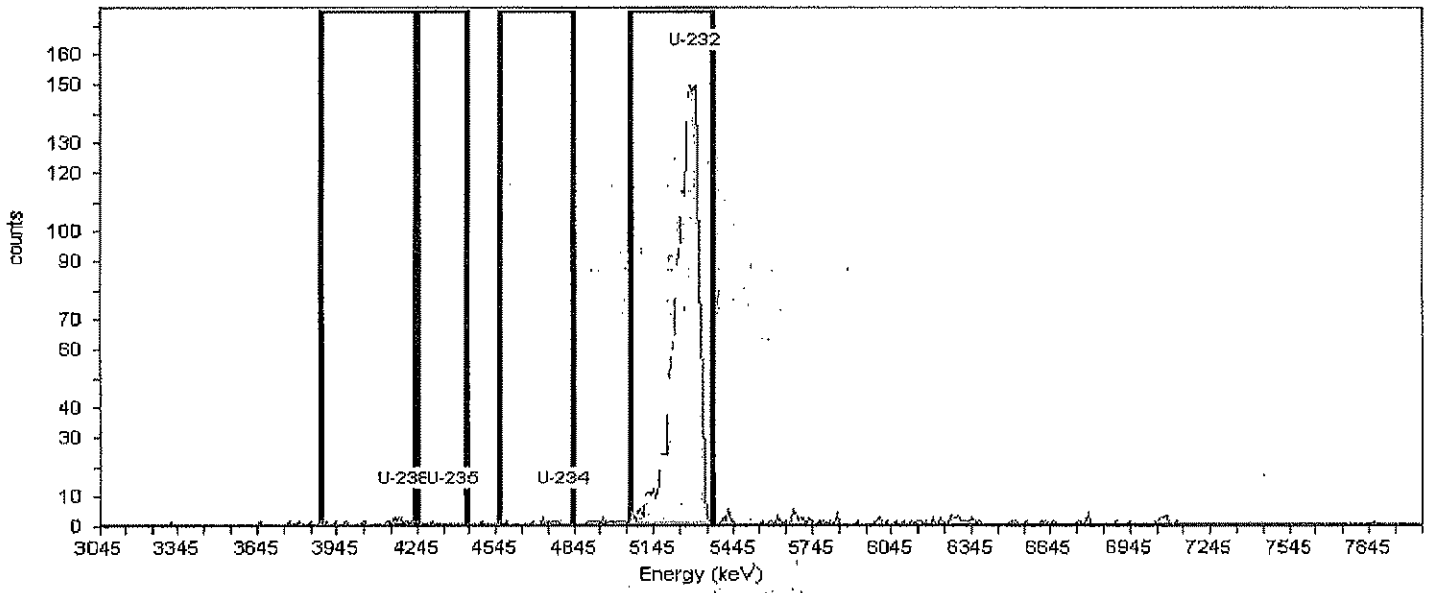
Energy Calibration: C11010427

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 91.22%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4193.0	3879.2	4232.2	50.7	100.2	16.00	3.00	13.00	7.3E-002	4.9E-002	1.8E-002	5.1E-002
U-235	4379.3	4242.0	4428.3	.0	99.7	2.00	0.30	1.70	9.5E-003	1.7E-002	5.8E-003	2.7E-002
U-234	4800.9	4555.7	4840.1	72.4	100.0	9.00	3.00	6.00	3.4E-002	3.9E-002	1.8E-002	5.1E-002
U-232	5300.9	5055.8	5369.5	99.3	100.1	1,605.00	8.70	1,596.30	8.2E+000	4.1E-001	3.1E-002	7.7E-002

Reviewed By: PS JP 9/WF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: 1012142-14
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 28
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:54AM
Live Time: 300.00 min.
Real Time: 300.01 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B11010428; Det: 28; Spectrum #1; Jan-04-2011 17:51

Calibration Date: 1/4/2011 3:07:13PM

Efficiency Calibration: C11010428

Efficiency: 28.65% +/- 0.20% TPU(2 sigma)

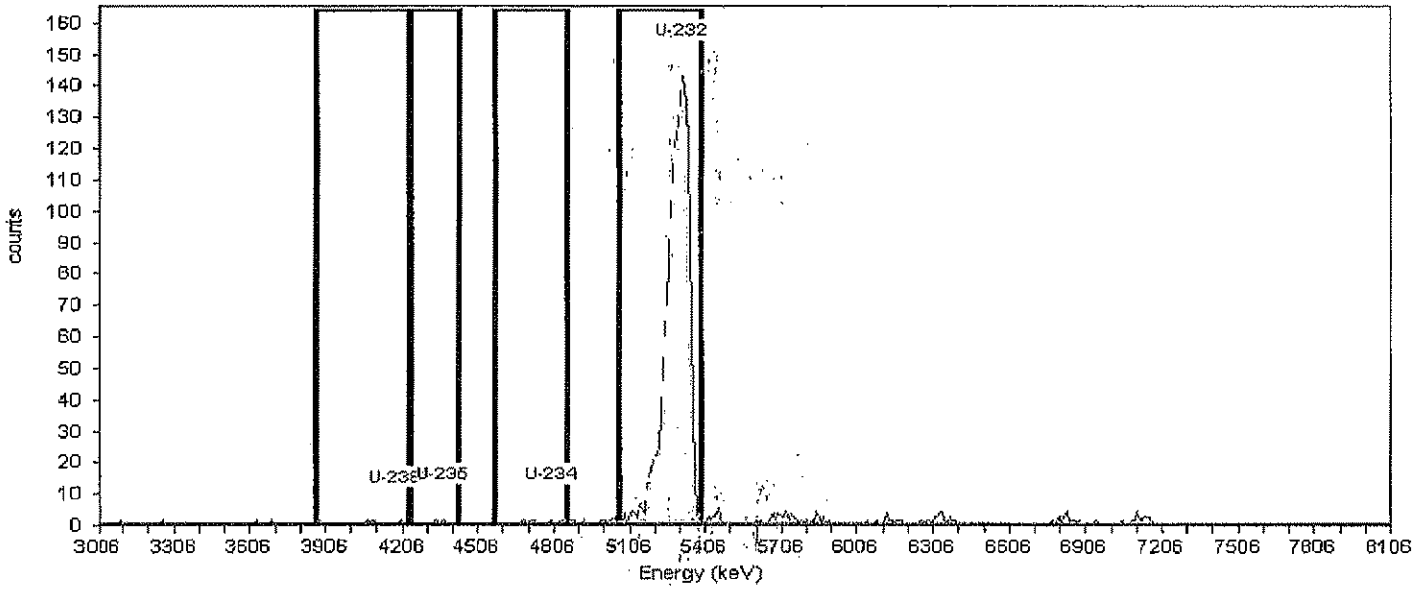
Energy Calibration: C11010428

Energy Cal: Gain = 9.9974 keV / Ch
Offset = 2,996.32 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 84.88%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4176.0	3866.1	4226.0	13.7	100.2	4.00	0.60	3.40	2.1E-002	2.7E-002	8.9E-003	3.5E-002
U-235	4366.0	4236.0	4426.0	22.5	99.7	2.00	0.30	1.70	1.1E-002	1.9E-002	6.4E-003	2.9E-002
U-234	4795.9	4565.9	4855.8	19.9	100.0	6.00	0.90	5.10	3.1E-002	3.3E-002	1.1E-002	3.9E-002
U-232	5315.7	5065.8	5385.7	71.4	100.1	1,453.00	6.60	1,446.40	7.6E+000	4.1E-001	3.0E-002	7.7E-002

Reviewed By: PS JP BMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-1MB
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 60
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:50AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010460; Det: 60; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:11:39PM

Efficiency Calibration: C11010460

Efficiency: 29.88% +/- 0.21% TPU(2 sigma)

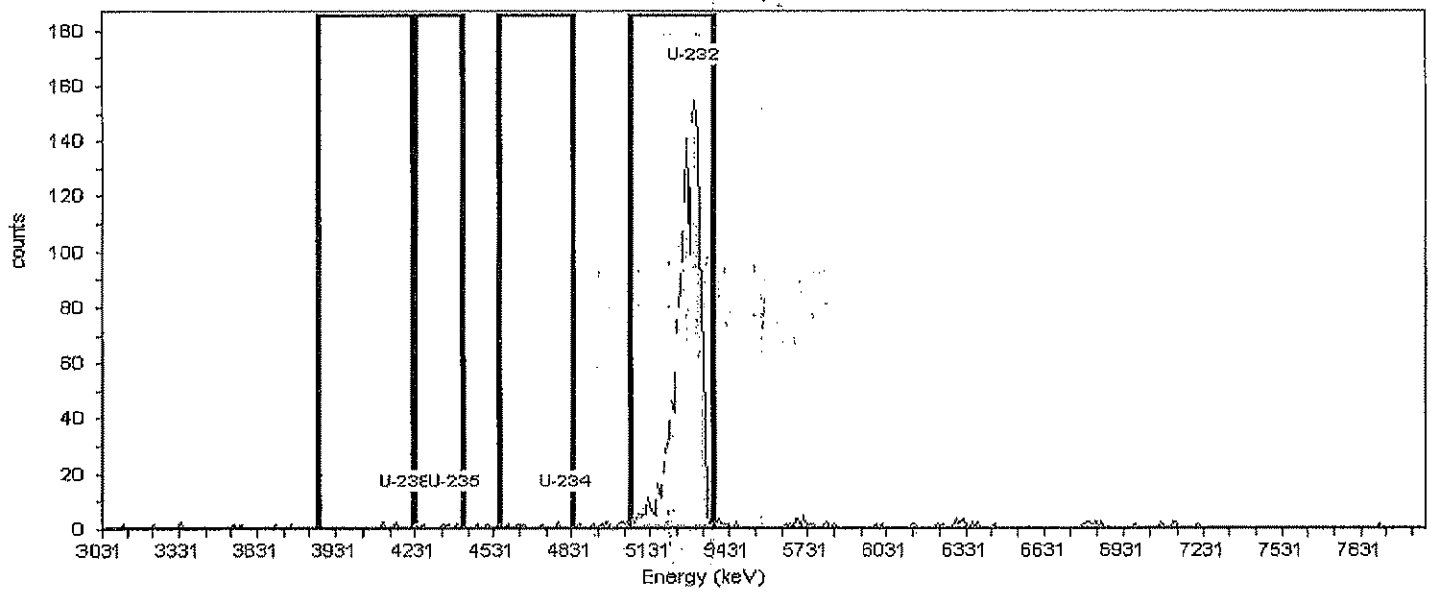
Energy Calibration: C11010460

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,021.28 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 85.73%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4189.5	3862.8	4219.2	71.4	100.2	4.00	2.40	1.60	9.4E-003	3.0E-002	1.7E-002	5.0E-002
U-235	4377.6	4229.1	4407.3	14.1	99.7	5.00	1.20	3.80	2.2E-002	2.9E-002	1.2E-002	4.0E-002
U-234	4803.3	4545.9	4833.0	.0	100.0	7.00	1.50	5.50	3.2E-002	3.4E-002	1.3E-002	4.3E-002
U-232	5298.3	5050.8	5367.6	79.6	100.1	1,530.00	6.30	1,523.70	7.7E+000	4.0E-001	2.8E-002	7.1E-002

Reviewed By: PS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-1LCS
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 61
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:50AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010461; Det: 61; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:13:53PM

Efficiency Calibration: C11010461

Efficiency: 31.49% +/- 0.13% TPU(2 sigma)

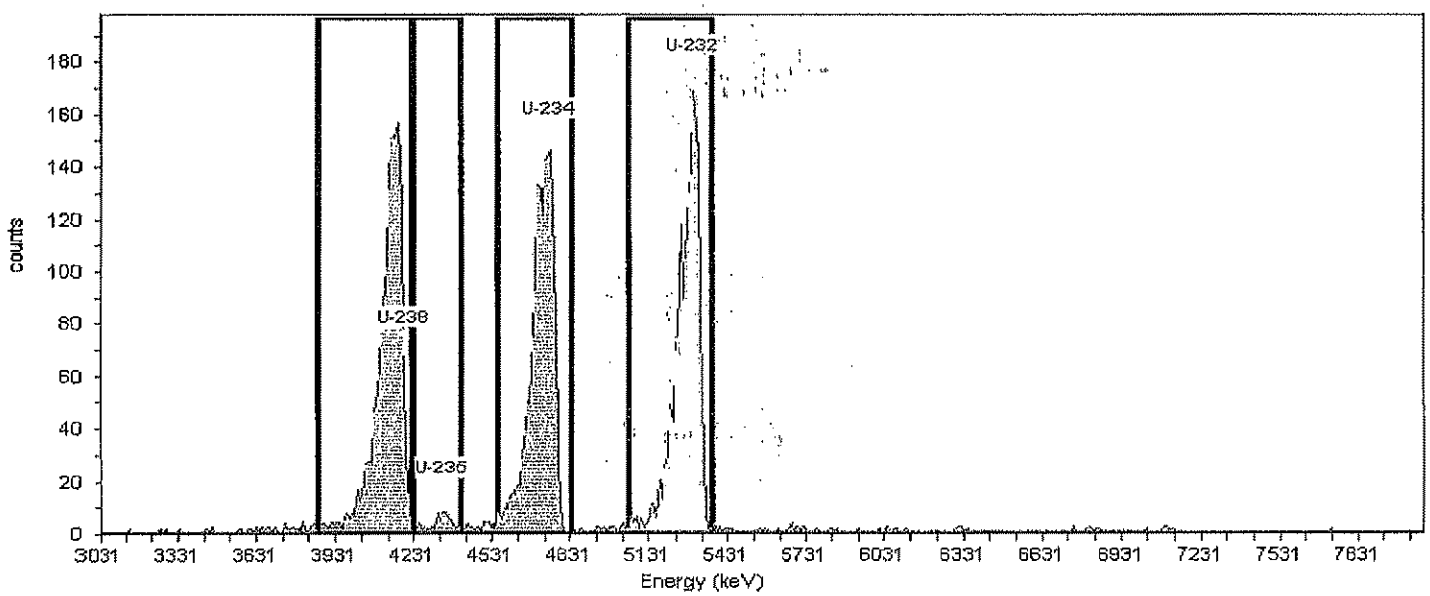
Energy Calibration: C11010461

Energy Cal: Gain = 9.9003 keV / Ch
Offset = 3,021.28 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 82.64%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4189.5	3862.8	4219.2	47.4	100.2	1,582.00	0.60	1,581.40	9.1E+000	1.1E+000	8.4E-003	3.2E-002
U-235	4338.0	4229.1	4407.3	59.2	99.7	59.00	0.30	58.70	3.4E-001	9.7E-002	5.9E-003	2.8E-002
U-234	4743.9	4545.9	4833.0	88.1	100.0	1,520.00	0.90	1,519.10	8.8E+000	1.1E+000	1.0E-002	3.6E-002
U-232	5298.3	5050.8	5367.6	56.2	100.1	1,551.00	3.30	1,547.70	7.4E+000	3.8E-001	2.0E-002	5.5E-002

Reviewed By: TDS JP 2MF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS Laboratory Group - Fort Collins

Alpha-Spectroscopy Analysis Report

Sample

Sample: AS101228-1LCSD
Spectrum #1 Analysis #1

Sample Size : 1.00

Acquisition

Detector: 62
Batch Name: UAS101228-1_A
Nuclide Library: Uranium Default
Analysis Method: Absolute Interactive ROI Analysis
ROI Set: Uranium Default

Acquisition Start Date: 1/7/2011 11:09:51AM
Live Time: 300.00 min.
Real Time: 300.02 min.
Dead Time: 0.01 %

Calibration

Bkgd Info: Sample: B11010462; Det: 62; Spectrum #1; Jan-04-2011 17:57

Calibration Date: 1/4/2011 5:33:17PM

Efficiency Calibration: C11010462

Efficiency: 29.69% +/- 0.15% TPU(2 sigma)

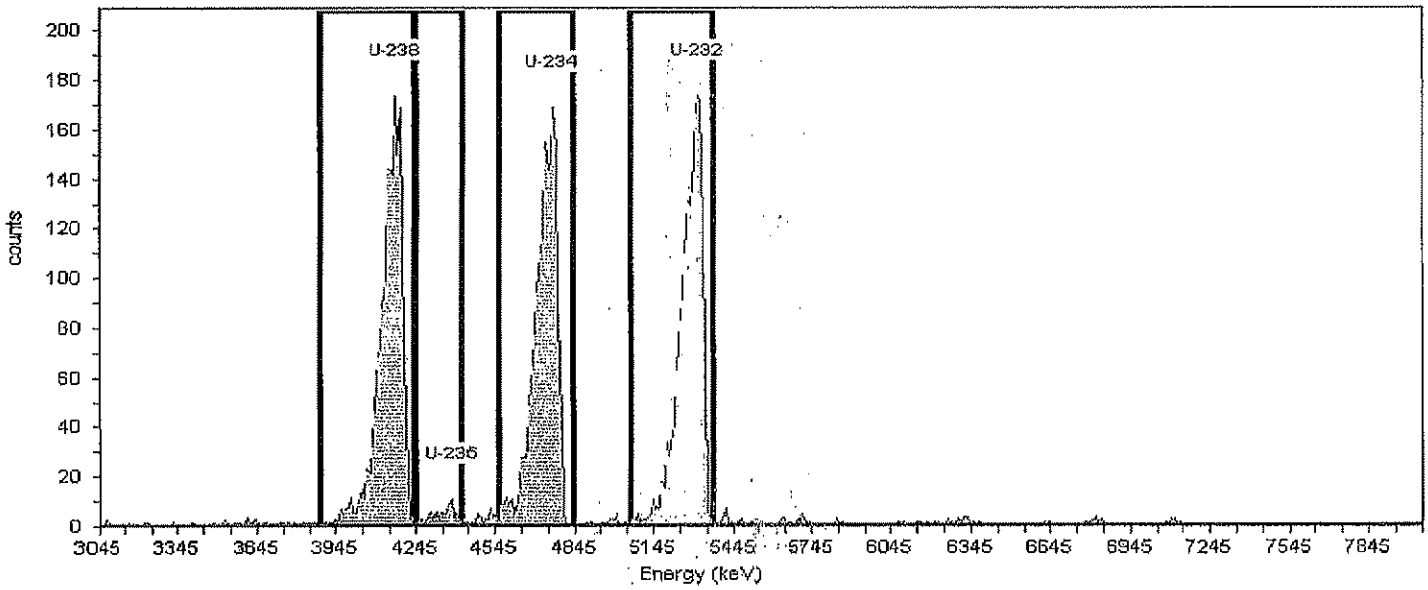
Energy Calibration: C11010462

Energy Cal: Gain = 9.8047 keV / Ch
Offset = 3,036.00 keV
Quadratic = 0.0000 keV / Ch^2

Tracer

Tracer Name: 914.3610.74 U-232
Tracer Activity: 19.93 DPM/mL x (Vol.)1.00 mL = 19.93 DPM

Tracer Nuclide: U-232
Tracer Recovery: 93.57%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %.	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/L	2.00Sigma TPU pCi/L	Critical Level pCi/L	MDA pCi/L
U-238	4163.6	3879.2	4232.2	51.8	100.2	1,658.00	1.80	1,656.20	8.9E+000	1.1E+000	1.4E-002	4.2E-002
U-235	4379.3	4242.0	4418.5	143.4	99.7	69.00	1.20	67.80	3.7E-001	1.0E-001	1.1E-002	3.7E-002
U-234	4761.6	4555.7	4840.1	87.6	100.0	1,569.00	2.10	1,566.90	8.5E+000	1.0E+000	1.5E-002	4.4E-002
U-232	5310.7	5055.8	5369.5	46.9	100.1	1,663.00	10.80	1,652.20	8.4E+000	4.2E-001	3.3E-002	8.2E-002

Reviewed By: JS JP EMF

All activity values and tracer recoveries are estimated values. The LIMS reporting system uses the count results to calculate all sample activity results. Thus, all activity values on this report may not be directly comparable to actual results on LIMS forms. The LIMS forms contain the actual true activity results for this sample.

ALS

FORM 746r8.xls (10/2/07)

Alpha Spectrometer Instrument Run Log

Date: 1-7-11

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
9	UAS1012281_A	1012142-1	U/F	300	TPS
10		2			
11		3			
12		4			
13		5			
14		6			
16		7			
17		8			
18		9			
19		10			
25		11			
26		12			
27		13			
28		14			
29		1012143-1			
30		2			
31		3			
32		4			
58		5			
59		6			
60		AS1012281MB			
61		LCS			
62		LCSD			
		TPS 1-7-11			

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
63	UAS1012291_TB	1012229-1	U/S	300	TPS
64		ID			
1	AAS1012093_TB	1012086-62	Am/F	1000	TPS
2		63			
3		64			
4		65			
5		66			
6		67			
7		AS1012093MMB			
8		PMB			
50		LCS			
51		LCSD			
52	AAS1012094_A	1012086-31	Am/F	1000	TPS
54		33			
55		34			
56		41			
~~43~~ 57		42			
~~44~~ 43		49			
~~45~~ 44		51			
~~46~~ 45		AS1012094MMB			
~~47~~ 46		PMB			
47		TPS 1-7-11 LCS			
		TPS 1-7-11			

* TPS 1-7-11

Notes:

Reviewed by: TPS

Date: 1-7-11

Section 6

QUALITY ASSURANCE SUMMARY REPORTS

6

No *NON-CONFORMANCE REPORTS* or *QUALITY ASSURANCE SUMMARY SHEETS* are included in this data package.

Section 7

LABORATORY BENCH SHEETS

1-7

Radiochemistry Instrument Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-1

Prep Procedure: UISO Default 300min (6.1)

Analytical QASS / NCR? Y / (N) NA

Prep Num	LabID	QC Type	Init Aliq	Fin Aliq	Units	Report Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	1012142-1	SMP	1	1	sample	pCi/sample	_C1421	9	TPS	_C1421			_C1421		A	
1	1012142-2	SMP	1	1	sample	pCi/sample	_C1422	10		_C1422			_C1422			
1	1012142-3	SMP	1	1	sample	pCi/sample	_C1423	11		_C1423			_C1423			
1	1012142-4	SMP	1	1	sample	pCi/sample	_C1424	12		_C1424			_C1424			
1	1012142-5	SMP	1	1	sample	pCi/sample	_C1425	13		_C1425			_C1425			
1	1012142-6	SMP	1	1	sample	pCi/sample	_C1426	14		_C1426			_C1426			
1	1012142-7	SMP	1	1	sample	pCi/sample	_C1427	16		_C1427			_C1427			
1	1012142-8	SMP	1	1	sample	pCi/sample	_C1428	17		_C1428			_C1428	TPS		
1	1012142-9	SMP	1	1	sample	pCi/sample	_C1429	18		_C1429			_C1429	1-15-11		TPS 1-15-11
1	1012142-10	SMP	1	1	sample	pCi/sample	_C14210	19		_C14210			_C14210			
1	1012142-11	SMP	1	1	sample	pCi/sample	_C14211	25		_C14211	TPS		_C14211			
1	1012142-12	SMP	1	1	sample	pCi/sample	_C14212	26		_C14212	1-15-11		_C14212			
1	1012142-13	SMP	1	1	sample	pCi/sample	_C14213	27		_C14213			_C14213			
1	1012142-14	SMP	1	1	sample	pCi/sample	_C14214	28		_C14214			_C14214			
1	1012143-1	SMP	1	1	sample	pCi/sample	_C1431	29		_C1431			_C1431			
1	1012143-2	SMP	1	1	sample	pCi/sample	_C1432	30		_C1432			_C1432			
1	1012143-3	SMP	1	1	sample	pCi/sample	_C1433	31		_C1433			_C1433			
1	1012143-4	SMP	1	1	sample	pCi/sample	_C1434	32		_C1434			_C1434			
1	1012143-5	SMP	1	1	sample	pCi/sample	_C1435	58		_C1435			_C1435			
1	1012143-6	SMP	1	1	sample	pCi/sample	_C1436	59		_C1436			_C1436			
1	AS101228-1	MB	1	1	sample	pCi/sample	_C281B	60		_C281B			_C281B			
1	AS101228-1	LCS	1	1	sample	pCi/sample	_C281L	61		_C281L			_C281L			
1	AS101228-1	LCSD	1	1	sample	pCi/sample	_C281LD	62		_C281LD			_C281LD			

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.888	DPM/ml	12/28/10	1	ml	AW019

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

63 of 100

Reporting Units

LabID:	TstGrpName:	RptUnits:
1012143-1	IsoU_Wipe/sample	pCi/samp
1012142-1	IsoU_Wipe/sample	pCi/samp
1012142-2	IsoU_Wipe/sample	pCi/samp
1012143-2	IsoU_Wipe/sample	pCi/samp
1012143-3	IsoU_Wipe/sample	pCi/samp
1012142-3	IsoU_Wipe/sample	pCi/samp
1012142-4	IsoU_Wipe/sample	pCi/samp
1012143-4	IsoU_Wipe/sample	pCi/samp
1012142-5	IsoU_Wipe/sample	pCi/samp
1012143-5	IsoU_Wipe/sample	pCi/samp
1012143-6	IsoU_Wipe/sample	pCi/samp
1012142-6	IsoU_Wipe/sample	pCi/samp
1012142-7	IsoU_Wipe/sample	pCi/samp
1012142-8	IsoU_Wipe/sample	pCi/samp
1012142-9	IsoU_Wipe/sample	pCi/samp
1012142-10	IsoU_Wipe/sample	pCi/samp
1012142-11	IsoU_Wipe/sample	pCi/samp
1012142-12	IsoU_Wipe/sample	pCi/samp
1012142-13	IsoU_Wipe/sample	pCi/samp
1012142-14	IsoU_Wipe/sample	pCi/samp

Sample Barcodes

1012142-1
AS101228-1PS1

1012142-2
AS101228-1PS2

1012142-3
AS101228-1PS3

1012142-4
AS101228-1PS4

1012142-5
AS101228-1PS5

1012142-6
AS101228-1PS6

1012142-7
AS101228-1PS7

1012142-8
AS101228-1PS8

1012142-9
AS101228-1PS9

1012142-10
AS101228-1PS10

1012142-11
AS101228-1PS11

1012142-12
AS101228-1PS12

1012142-13
AS101228-1PS13

1012142-14
AS101228-1PS14

64 of 100

ALS Environmental -- FC

Radiochemistry Instrument Worksheet

Prep Batch: AS101228-1

1012143-1 AS101228-1PS15		1012143-2 AS101228-1PS16	
1012143-3 AS101228-1PS17		1012143-4 AS101228-1PS18	
1012143-5 AS101228-1PS19		1012143-6 AS101228-1PS20	
AS101228-1MB AS101228-1PS21		AS101228-1LCS AS101228-1PS22	
AS101228-1LCSD AS101228-1PS23			

Radiochemistry Prep Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-1

Prep Procedure: UISO

Reviewed By: cas CLS **Review Date:** 1/3/2011

Non-Routine Pre-Treatment? (Y) / N **Batch:** See Comments **Re-Prep?** Y / (N) **Batch:** N/A **Prep QASS / NCR?** Y / (N) N/A

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq sample	Fin Alq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes
1	1	1012142-1	SMP		1	1	As Received				T1	
2	1	1012142-2	SMP		1	1	As Received				T1	
3	1	1012142-3	SMP		1	1	As Received				T1	
4	1	1012142-4	SMP		1	1	As Received				T1	
5	1	1012142-5	SMP		1	1	As Received				T1	
6	1	1012142-6	SMP		1	1	As Received				T1	
7	1	1012142-7	SMP		1	1	As Received				T1	
8	1	1012142-8	SMP		1	1	As Received				T1	
9	1	1012142-9	SMP		1	1	As Received				T1	
10	1	1012142-10	SMP		1	1	As Received				T1	
11	1	1012142-11	SMP		1	1	As Received				T1	
12	1	1012142-12	SMP		1	1	As Received				T1	
13	1	1012142-13	SMP		1	1	As Received				T1	
14	1	1012142-14	SMP		1	1	As Received				T1	
15	1	1012143-1	SMP		1	1	As Received				T1	
16	1	1012143-2	SMP		1	1	As Received				T1	
17	1	1012143-3	SMP		1	1	As Received				T1	
18	1	1012143-4	SMP		1	1	As Received				T1	
19	1	1012143-5	SMP		1	1	As Received				T1	
20	1	1012143-6	SMP		1	1	As Received				T1	
21	1	AS101228-1	MB		1	1	As Received				T1	
22	1	AS101228-1	LCS		1	1	As Received				S1,T1	
23	1	AS101228-1	LCSD		1	1	As Received				S1,T1	

CLS 1/3/11

CLS 1/3/11

66 of 99

Radiochemistry Prep Worksheet

ALS Environmental -- FC

Prep Batch: AS101228-1

Prep Procedure: UISO

Reviewed By: cas **Review Date:** 1/3/2011

Non-Routine Pre-Treatment? (Y) N **Batch:** See Comments **Re-Prep?** Y / (N) **Batch:** N/A **Prep QASS / NCR?** Y / (N) N/A

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq sample	Fin Alq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes

Comments

The samples in WO 1012142 and 1012143 were placed into 100 ml glass beakers. Due to limited sample, a LCSD was created to meet laboratory requirements for a prep batch duplicate. Samples were spiked and traced then muffled overnight at 450 degrees C. Samples were digested per SOP 773/r10.

Spiked By: Crystal Shaeffer **Date:** 12/28/2010

Witnessed By: Gabriel D. Wagner **Date:** 12/28/2010

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.888	DPM/ml	12/28/10	1	ml	AW019

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

ALS Environmental – FC

Radiochemistry Prep Worksheet

Prep Batch: AS101228-1

Prep Procedure: UISO

Prep Batch Not Validated!!!

Reviewed By: **Review Date:**

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep? Y / N** **Batch:** _____ **Prep QASS / NCR? Y / N** _____

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq sample	Fin Alq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes
1	1	1012142-1	SMP		1	1	As Received				T1	LLe2
2	1	1012142-2	SMP		1	1	As Received				T1	815
3	1	1012142-3	SMP		1	1	As Received				T1	698
4	1	1012142-4	SMP		1	1	As Received				T1	854
5	1	1012142-5	SMP		1	1	As Received				T1	849
6	1	1012142-6	SMP		1	1	As Received				T1	715
7	1	1012142-7	SMP		1	1	As Received				T1	493
8	1	1012142-8	SMP		1	1	As Received				T1	24X
9	1	1012142-9	SMP		1	1	As Received				T1	858
10	1	1012142-10	SMP		1	1	As Received				T1	521
11	1	1012142-11	SMP		1	1	As Received				T1	806
12	1	1012142-12	SMP		1	1	As Received				T1	528
13	1	1012142-13	SMP		1	1	As Received				T1	705
14	1	1012142-14	SMP		1	1	As Received				T1	692
15	1	1012143-1	SMP		1	1	As Received				T1	455
16	1	1012143-2	SMP		1	1	As Received				T1	829
17	1	1012143-3	SMP		1	1	As Received				T1	693
18	1	1012143-4	SMP		1	1	As Received				T1	727
19	1	1012143-5	SMP		1	1	As Received				T1	801
20	1	1012143-6	SMP		1	1	As Received				T1	859
21	1	AS101228-1	MB		1	1	As Received				T1	525
22	1	AS101228-1	LCS		1	1	As Received				S1,T1	800
23	1	AS101228-1	LCSD		1	1	As Received				S1,T1	837

ALS Environmental -- FC

Radiochemistry Prep Worksheet

Prep Batch: AS101228-1

Prep Procedure: UISO

Prep Batch Not Validated!!!

Reviewed By: Review Date:

Non-Routine Pre-Treatment? Y / N Batch: Re-Prep? Y / N Batch: Prep QASS / NCR? Y / N

Prep SOP: PAI 778 **Rev:** 13
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Crystal Shaeffer
Prep Date: 12/28/2010 CWS
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq sample	Fin Alq sample	Prep Basis	# of Filters	Micro Init	Micro Date	Standards	Prep Notes

Comments

Spiked By: CWS Date: 12/28/10
Witnessed By: GDA Date: 12/28/10

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	914.3610.74	19.888	DPM/ml	12/28/10	1	ml	AW019

exp: 10/24/11

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3610.02	19.272	DPM/ml	12/28/10	1	ml	AW019
S1	U-235	644.3610.02	0.921	DPM/ml	12/28/10	1	ml	AW019
S1	U-238	644.3610.02	20.008	DPM/ml	12/28/10	1	ml	AW019

exp: 05/15/11

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: CLS

ANALYSIS DATE: 12/28/10 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
1012142	1	AS Recd	Wipe	filter-like, some debris, soiled
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			
1012143	1			filter-like, not soiled, no debris
	2			
	3			
	4			
	5			
	6			

Section 8

STANDARDS TRACEABILITY DOCUMENTS

Notebook No. 3610

PROJECT 644.3610.02 U-238/Nat

Continued From Page

Prepare a working dilution of ~ 20.0 dpm/mL U-238 from 644.3020.53.

1) Determine Density of 1M HNO_3 lot# 073371 Bal ID 12

Mass of volumetric flask (100 mL)	68.2980 g
Mass of flask and 100 mL Acid	171.0125 g
Net Mass of Acid	102.7145 g

$\rho = 1.027145$ g/mL

2) Transfer 644.3020.53 Bal ID 12

Mass of Empty (No lid) 1000 mL Nalgene	74.7135 g
Mass of Nalgene and Std. Transferred	76.1629 g
Net Mass of Std Transferred	1.4494 g

3) Dilute to final Vol. Bal ID 26

Mass of Std, Nalgene, and diluent	1155.1 g
Mass of Nalgene	74.7135 g
Net Mass of New Std. Dilution	1080.3865 g

Final Activity Calculation

$$\left(242.0 \frac{Bq}{g}\right)\left(\frac{60\ dpm}{1\ Bq}\right)\left(1.4494\ g\right)\left(1.027145 \frac{g}{mL}\right) \Big/ \left(1080.3865\ g\right) = 20.01\ dpm/mL$$

NC 7/13/08

Stnd ID: 644.3610.02

Description: U-234/238
Expiration: 4/8/2009
Activity: 20.01 dpm/mL
Density of 1.0 gram/mL assumed
2s Uncertainty: 0.12 dpm/mL
Ref. Date: 8/1/1997
Ref Time: N/A
Prep Date: 4/7/2008 Prep by: jdd
Matrix/Comp: 1 M HNO3
Half Life (y): 4.47E+09

NC 7/13/08

NC 7/13/08

Reverification Log		
Analysis Date	Initials	Expiration Date
2/23/09	RG	2/23/2010
1/15/2010	RG	1/15/2011

NC 7/13/08

NC 7/13/08

Continued on Page

Read and Understood By

4/7/08 Date

Signed

7/13/08 Date

Direct transfer of RSD 644 to 40 mL VOA vial

Mass of VOA vial w/o lid: 20.9455 g
Mass of vial + standard: 24.6612 g
Net mass of std transferred: 3.7157 g

Bal 12

RSD 644
U-238: 242.0 Bq/g
U-235: 11.14 Bq/g
U-234: 233.1 Bq/g

11/28/06

Continued on Page

Read and Understood By

Signed	Date	Signed	Date
	11/28/06		7/13/08

National Institute of Standards & Technology

Certificate

PAT DO 0644
rec'd 10-18-02

Standard Reference Material 4321C
Natural Uranium Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive natural uranium nitrate and nitric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of alpha-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains uranium-238, uranium-235, and uranium-234 with a total activity of approximately 2600 Bq. Uranium decays by alpha-particle emission. The progeny of uranium-238, uranium-235, and uranium-234 have a total activity of approximately 2600 Bq and decay by alpha- and beta-particle emission. None of the alpha or beta particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 11 keV to 2.0 MeV are also emitted. Most of these photons escape from the SRM ampoule but their intensities are so small that they do not represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains nitric acid (HNO_3) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least August 2007.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
November 1997

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

PROPERTIES OF SRM 4321C
(Certified values are shown in bold type)

Source identification number	NIST SRM 4321C		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution density	**(1.053 ± 0.001) g·mL^{-1} at 21.4 °C** [b]*		
Solution mass	**(5.258 ± 0.002) g** [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol·L^{-1})	Mass Fraction (g·g^{-1})
	H_2O	53	0.91
	HNO_3	1.0	0.06
	$UO_2(NO_3)_2$	0.09	0.03
Radiological Properties:			
Radionuclide	**Natural Uranium (Mixture of U-238, U-235, and U-234)**		
Reference time	**1200 EST, 1 August 1997**		
Massic activity of the solution [c]	**U-238: 242.0 Bq·g^{-1}** **U-235: 11.14 Bq·g^{-1}** **U-234: 233.1 Bq·g^{-1}**		
Relative expanded uncertainty (k=2)	**U-238: 0.60%** [d] [e] **U-235: 0.62%** [d] [e] **U-234: 0.98%** [d] [e]		
Mass fraction of uranium	**(0.01960 ± 0.00010) g·g^{-1}** [b]		
Photon-emitting impurities	None detected [f]		
Half lives used	Uranium-238: (4.468 ± 0.003) × 10^9 a [g] Uranium-235: (7.038 ± 0.005) × 10^8 a [g] Uranium-234: (2.455 ± 0.006) × 10^5 a [g]		
Measuring instruments	Mass spectrometer, silicon surface-barrier detector, and $4\pi(\alpha+\beta)$ liquid-scintillation counting systems.		

*Notes and references are on pages 5 and 6.

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [h]	Relative Sensitivity Factor, $\lvert \partial y/\partial x_i \rvert \cdot (x_i/y)$ [i]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [j]
Isotopic uranium atom fraction in SRM 960	Standard deviation of the mean for repeated mass-spectrometric measurements (A)	U-238: 0.001 U-235: 0.07 U-234: 0.31	1.0 1.0 1.0	0.001 0.07 0.31
Half life	Standard uncertainty of the half life (A)	U-238: 0.07 U-235: 0.07 U-234: 0.25	1.0 1.0 1.0	0.07 0.07 0.25
Uranium mass fraction in SRM 960	Certificate value (B)	0.003	1.0	0.003
Quantitative dissolution	Estimated (B)	0.25	1.0	0.25
Gravimetric measurements	Estimated (B)	0.10	1.0	0.10
Photon-emitting impurities	Limit of detection (B) [k]	100.	0.001	0.10
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)			U-238: U-235: U-234:	0.30 0.31 0.49
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)			U-238: U-235: U-234:	0.60 0.62 0.98

*Notes and references are on pages 5 and 6.

NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.

Distance from Ampoule (cm):	1	30	100
Approximate Dose Rate (μSv/h):	<0.1	-	-

[b] The stated uncertainty is two times the standard uncertainty.

[c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) = |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y.

The **combined standard uncertainty** of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U, the **expanded uncertainty** of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic count rate is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[f] Estimated limits of detection for photon-emitting impurities are:
1.4 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 8 and 59 keV,
1.1 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 67 and 88 keV,
0.5 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 102 and 197 keV,
0.3 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 205 and 762 keV,
0.2 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 770 and 996 keV, and
0.1 $\gamma \cdot s^{-1} \cdot g^{-1}$ for energies between 1006 and 1900 keV,
provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of uranium-238, uranium-235, uranium-234, or their progeny.

[g] The stated uncertainty is the standard uncertainty. See reference [5].

[h] Relative standard uncertainty of the input quantity x_i.

[i] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[j] Relative component of combined standard uncertainty of output quantity y, rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y = |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

[k] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y) = \{(\text{response per Bq of impurity})/(\text{response per Bq of U-238})\} \cdot \{(\text{Bq of impurity})/(\text{Bq of U-238})\}$. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] Evaluated Nuclear Structure Data File (ENSDF), August 1997.

74
PROJECT 914.3610.74 U-232

Notebook No. 3610
Continued From Page N/A

Prepare a working dilution of ~20 dpm/ml from 914.3610.62

Note **

Density of 1M HNO_3 lot #'s J71044 + J02033

			Balance #
Mass of 100 ml Vol flask	JDD 8/13/10 ~~66.4334 g~~	56.4413 g	12
Mass of flask + Acid	~~166.5111 g~~	159.3439 g	1
Net:	~~100.0777 g~~	102.9026 g	

ρ = 1.0290 g/ml

Mass of Parent transferred		JDD 8/13	
Mass of 1000 ml Nalgene		74.6~~8~~439 g	12
Mass of Nalgene + Std		77.0507 g	1
Net:		2.4068 g	

Dilute to final mass		
Gross mass: Nalgene, Std, + Diluent	973.6 g	26
Mass of Nalgene	74.6439 g	12
Net:	898.9561 g	

Activity

$$\left(7261.8 \frac{dpm}{g}\right)\left(\frac{2.4068\ g}{898.9561\ g}\right)\left(1.0290\ g/ml\right) = \boxed{20.01\ dpm/ml}$$

Note: Density of Acid lot # J02033 was different than historical amount and was not used. JDD 8/13/10

RG 12/10/10

Stnd ID: 914.3610.74

RG 12/10/10

Description: U-232
Expiration: 10/24/2011
Activity: 20.01 dpm/mL

2s Uncertainty: 0.98 dpm/mL
Ref. Date: 5/27/2010
Ref Time: N/A
Prep Date: 8/13/2010 Prep by: JD
Matrix/Comp. 1M HNO3
Half Life (y): 6.89E+01

Reverification Log		
Analysis Date	Initials	Expiration Date

RG 12/10/10

Continued on Page

RG 12/10/10

Read and Understood By

Signed [signature] Date 8/13/10 Signed [signature] Date 10/22/10

62
PROJECT 914. 3610-62 U-232

Notebook No. 3610
Continued From Page

Prepare a Intermediate dilution of RCO # 914

Diluent is 1M HNO_3 Acid lot # J11044

Mass of parent transferred.

		bal #
Mass of Open tall Ampule + Beaker	38.0690 g	12
Mass of Empty Ampule + Beaker	32.9311 g	+
Net mass transferred	5.1379 g	

Dilute to final Mass

Mass of Vial, Std, + Diluent	58.6555 g	12
Mass of Vial	21.5981 g	-
Net Mass of New dilution	37.0574 g	

Final Activity

$$\left(4.552 \times 10^3 \text{ Bq}\right)\left(\frac{60 \text{ dpm}}{1 \text{ Bq}}\right)\left(\frac{5.1379 \text{ g}}{5.21459 \text{ g}}\right)\left(\frac{1}{37.0574 \text{ g}}\right) = 7261.8 \frac{\text{dpm}}{\text{g}}$$

Continued on Page

Read and Understood By

Signed

6/4/10
Date

Signed

06-17-2010
Date

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

Rec 6-1-10 RSO# 914

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

82306-307

U-232 5 mL Liquid in Flame Sealed Vial

Customer: ALS Laboratory Group / Fort Collins
P.O. No.: 73625 04-29-10, Item 1

This standard radionuclide source was prepared gravimetrically from a master solution calibrated by Eckert & Ziegler Analytics, using a germanium gamma spectrometer system. Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, % Type u_A	u_B	U	Reference Date (12:00 PM EST)
U-232	2.617E+04	4.552E+03	0.5	2.4	4.9	05/27/2010

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

Comments:
Impurities: γ-impurities (other than decay products) <0.1%. 5.21459 g 1M HNO3 solution, carrier free.

Source Prepared by: _____
W. Mao, Radiochemist

QA Approved: _____ Date: 5/27/10
J. D. McCorvey, QA Manager Alternate

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

AMA Form005 Rev. --

Single Isotope Certificate, Rev 1 9/28/2009

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

Alpha Spectroscopy

Quality Control Data

Weekly Background, Energy, and Efficiency Calibrations

Calibration Data Summary

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
1012142-1	SMP	AS101228-1	UISO	9	C11010409	1/4/2011	31.36	Pass	29.46	30.00	32.06	32.58
Spectrum #1		AS101228-1U			B11010409	1/4/2011	0.2910	Pass	0.0000	0.0498	0.4980	0.7500
1/7/2011					C11010409	1/4/2011	5545.9	Pass	5496.0	5506.0	5586.0	5596.0
1012142-2	SMP	AS101228-1	UISO	10a	C11010410	1/4/2011	31.79	Pass	29.79	30.31	32.41	32.93
Spectrum #1		AS101228-1U			B11010410	1/4/2011	0.2460	Pass	0.0000	0.0498	0.4980	0.7500
1/7/2011					C11010410	1/4/2011	5555.7	Pass	5486.2	5496.2	5576.2	5586.2
1012142-3	SMP	AS101228-1	UISO	11	C11010411	1/4/2011	31.28	Pass	29.69	30.21	32.29	32.81
Spectrum #1		AS101228-1U			B11010411	1/4/2011	0.2390	Pass	0.0000	0.0498	0.4980	0.7500
1/7/2011					C11010411	1/4/2011	5546.0	Pass	5497.0	5507.0	5587.0	5597.0
1012142-4	SMP	AS101228-1	UISO	12	C11010412	1/4/2011	30.57	Pass	29.29	29.80	31.86	32.37
Spectrum #1		AS101228-1U			B11010412	1/4/2011	0.2610	Pass	0.0000	0.0498	0.4980	0.7500
1/7/2011					C11010412	1/4/2011	5547.7	Pass	5507.7	5517.7	5597.7	5607.7
1012142-5	SMP	AS101228-1	UISO	13	C11010413	1/4/2011	31.43	Pass	30.25	30.78	32.90	33.43
Spectrum #1		AS101228-1U			B11010413	1/4/2011	0.3040	Pass	0.0000	0.0498	0.4980	0.7500
1/7/2011					C11010413	1/4/2011	5546.0	Pass	5486.2	5496.2	5576.2	5586.2
1012142-6	SMP	AS101228-1	UISO	14	C11010414A	1/4/2011	28.85	Pass	27.48	27.98	29.68	30.38
Spectrum #1		AS101228-1U			B11010414	1/4/2011	0.2390	Pass	0.0000	0.0498	0.4980	0.7500
1/7/2011					C11010414A	1/4/2011	5545.9	Pass	5503.7	5513.7	5593.7	5603.7
1012142-7	SMP	AS101228-1	UISO	16	C11010416	1/4/2011	29.20	Pass	27.91	28.41	30.35	30.85
Spectrum #1		AS101228-1U			B11010416	1/4/2011	0.2400	Pass	0.0000	0.0498	0.4980	0.7500
1/7/2011					C11010416	1/4/2011	5545.9	Pass	5497.9	5507.9	5587.9	5597.9
1012142-8	SMP	AS101228-1	UISO	17a	C11010417	1/4/2011	31.08	Pass	28.99	29.50	31.54	32.05
Spectrum #1		AS101228-1U			B11010417	1/4/2011	0.3970	Pass	0.0000	0.0498	0.4980	0.7500
1/7/2011					C11010417	1/4/2011	5543.9	Pass	5486.5	5496.5	5576.5	5586.5
1012142-9	SMP	AS101228-1	UISO	18	C11010418	1/4/2011	30.05	Pass	28.65	29.15	31.17	31.67
Spectrum #1		AS101228-1U			B11010418	1/4/2011	0.3880	Pass	0.0000	0.0498	0.4980	0.7500
1/7/2011					C11010418	1/4/2011	5543.9	Pass	5496.0	5506.0	5586.0	5596.0

Data Package ID: *UR1012142-1*

Abbreviations:				
	Eff - Efficiency	Bkg - Background	LCL - Lower Control Limit	UWL - Upper Warning Limit	
	Egy - Energy	CPM - Counts per Minute	LWL - Lower Warning Limit	UCL - Upper Control Limit	CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Calibration Data Summary

Laboratory Name: ALS Environmental -- FC
PAI Work Order: 1012142

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Saturday, January 15, 2011 6:20:34 PM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
1012142-10	SMP	AS101228-1	UISO	19	C11010419	1/4/2011	29.00	Pass	27.99	28.48	30.44	30.93
Spectrum #1		AS101228-1U			B11010419	1/4/2011	0.3750	Pass	0.0000	0.0498	0.4980	0.7500
1/7/2011					C11010419	1/4/2011	5545.9	Pass	5496.0	5506.0	5586.0	5596.0
1012142-11	SMP	AS101228-1	UISO	25	C11010425	1/4/2011	29.05	Pass	26.95	27.42	29.32	29.79
Spectrum #1		AS101228-1U			B11010425	1/4/2011	0.4420	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010425	1/4/2011	5546.0	Pass	5496.0	5506.0	5586.0	5596.0
1012142-12	SMP	AS101228-1	UISO	26	C11010426	1/4/2011	31.48	Pass	29.40	29.92	31.98	32.50
Spectrum #1		AS101228-1U			B11010426	1/4/2011	0.4720	Pass	0.0000	0.0498	0.4998	0.7500
1/7/2011					C11010426	1/4/2011	5546.0	Pass	5496.0	5506.0	5586.0	5596.0
1012142-13	SMP	AS101228-1	UISO	27	C11010427	1/4/2011	29.42	Pass	28.26	28.76	30.74	31.24
Spectrum #1		AS101228-1U			B11010427	1/4/2011	0.4020	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010427	1/4/2011	5546.0	Pass	5494.2	5504.2	5584.2	5594.2
1012142-14	SMP	AS101228-1	UISO	28	C11010428	1/4/2011	28.65	Pass	27.32	27.80	29.72	30.20
Spectrum #1		AS101228-1U			B11010428	1/4/2011	0.2950	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010428	1/4/2011	5555.7	Pass	5513.0	5523.0	5603.0	5613.0
AS101228-1	MB	AS101228-1	UISO	60	C11010460	1/4/2011	29.88	Pass	28.15	28.64	30.62	31.11
Spectrum #1		AS101228-1U			B11010460	1/4/2011	0.2636	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010460	1/4/2011	5555.8	Pass	5492.0	5502.0	5582.0	5592.0
AS101228-1	LCS	AS101228-1	UISO	61	C11010461	1/4/2011	31.49	Warning	28.67	29.17	31.18	31.69
Spectrum #1		AS101228-1U			B11010461	1/4/2011	0.2277	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010461	1/4/2011	5555.8	Pass	5513.6	5523.6	5603.6	5613.6
AS101228-1	LCSD	AS101228-1	UISO	62	C11010462	1/4/2011	29.70	Warning	27.06	27.53	29.43	29.91
Spectrum #1		AS101228-1U			B11010462	1/4/2011	0.3426	Pass	0.0000	0.0500	0.5000	0.7500
1/7/2011					C11010462	1/4/2011	5527.1	Pass	5513.6	5523.6	5603.6	5613.6

Data Package ID: *UR1012142-1*

Abbreviations:
Eff - Efficiency; Bkg - Background; LCL - Lower Control Limit; UWL - Upper Warning Limit
Egy - Energy; CPM - Counts per Minute; LWL - Lower Warning Limit; UCL - Upper Control Limit; CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Alpha Spec Calibration Source Re-Certification

Recalibration performed by Isotope Products Laboratories
Primary Certified Source
Source ALS ID: 190
Planchet Label: 9
Recalibrated on: 7/1/2010
Received by ALS on: 6/21/2010

Values from certificate
Source ID: 92MIX223027
Total Activity: 3741 dpm
Rel. Date: 7/1/10

Nuclide	Act (Bq)	Act (dpm)	Half-Life (yrs)	Decay Corrected
U-234:	49.43	2965.8	2.48E+05	2965.80 dpm
U-235:	1.09	65.34	7.04E+08	65.34 dpm
Am-241:	11.83	709.8	432.17	709.59 dpm
			TOTAL	3740.73 dpm

Efficiency Determination for Detector: 13

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Total cpm	Known dpm	Detector efficiency
92MIX223027	190	97-19-103-09	9/7/10	7489	32217	1072	2100	1165.09	3740.73	31.15%

Sources 1 through 8 activity determination

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Detector Efficiency	Am-241 dpm	U-234 dpm	U-235 dpm	Combined dpm
92MIX2203026	182	97-19-103-01	9/7/10	13260	80178	2247	2100	31.15%	1215.39	7355.04	206.13	8777.56
92MIX2203028	183	97-19-103-02	9/7/10	16216	158468	4098	2100	31.15%	1487.56	14536.69	357.87	16382.12
92MIX2203024	184	97-19-103-03	9/7/10	72679	75317	1928	2100	31.15%	6667.13	6909.13	176.86	13753.12
92MIX2203021	185	97-19-103-04	9/7/10	23210	64459	2046	2100	31.15%	2129.14	5913.08	187.67	8230.09
92MIX2203025	186	97-19-103-05	9/7/10	101868	124700	3393	2100	31.15%	9344.57	11439.22	311.71	21095.50
92MIX2203022	187	97-19-103-06	9/7/10	78536	83580	2162	2100	31.15%	7204.42	7667.12	198.33	15069.87
92MIX2203023	188	97-19-103-07	9/7/10	46086	71046	1885	2100	31.15%	4227.66	6517.33	172.92	10917.90
92MIX2203029	189	97-19-103-08	9/10/10	34718	218646	5354	2100	31.15%	3184.82	20167.34	682.68	23935.04

Efficiency Verification

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	Count dur (s)	Total cpm	Known dpm	Detector efficiency	RPD	FLAG
92MIX223027	190	97-19-103-09	9/7/10	7710	32190	1066	2100	1170.46	3740.73	31.29%	-0.46%	PASS

Sources 1 through 8 activity re-verification

Source Serial#	PA ID	Sequential #	Combined Observed dpm	Combined Certified dpm*	Percent Difference %	Within 5% of Certified value?
92MIX2203026	182	97-19-103-01	8777.56	8862.31	-0.96%	Yes
92MIX2203028	183	97-19-103-02	16392.12	16006.14	2.41%	Yes
92MIX2203024	184	97-19-103-03	13753.12	13564.84	1.39%	Yes
92MIX2203021	185	97-19-103-04	8230.09	8181.17	0.60%	Yes
92MIX2203025	186	97-19-103-05	21095.50	21064.32	0.15%	Yes
92MIX2203022	187	97-19-103-06	15069.87	15355.51	-1.86%	Yes
92MIX2203023	188	97-19-103-07	10917.90	10765.61	1.41%	Yes
92MIX2203029	189	97-19-103-08	23935.04	23624.62	1.31%	Yes

* Certificate values decay corrected to the count date

Data from certificates

Reference Date	U-234 (Bq)	U-234 (dpm)	U-235 (Bq)	U-235 (dpm)	Am-241 (Bq)	Am-241 (dpm)
5/1/2003	124.10	7446.00	2.43	145.74	21.43	1285.80
5/1/2003	239.30	14358.00	4.20	252.00	23.55	1413.00
5/1/2000	119.40	7164.00	1.93	115.56	106.00	6360.00
4/1/2003	101.00	6060.00	1.26	75.84	34.50	2070.00
4/1/2003	203.00	12180.00	3.41	204.72	146.40	8784.00
4/1/2003	132.90	7974.00	3.17	189.96	121.30	7278.00
4/1/2003	107.10	6426.00	0.93	55.54	72.26	4335.60
5/1/2003	334.80	20088.00	6.55	393.18	53.02	3181.20

Ok JP
9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
11:58:48AM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 190(#9)
Description:

Analysis Date: 9/7/2010 11:58:29AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

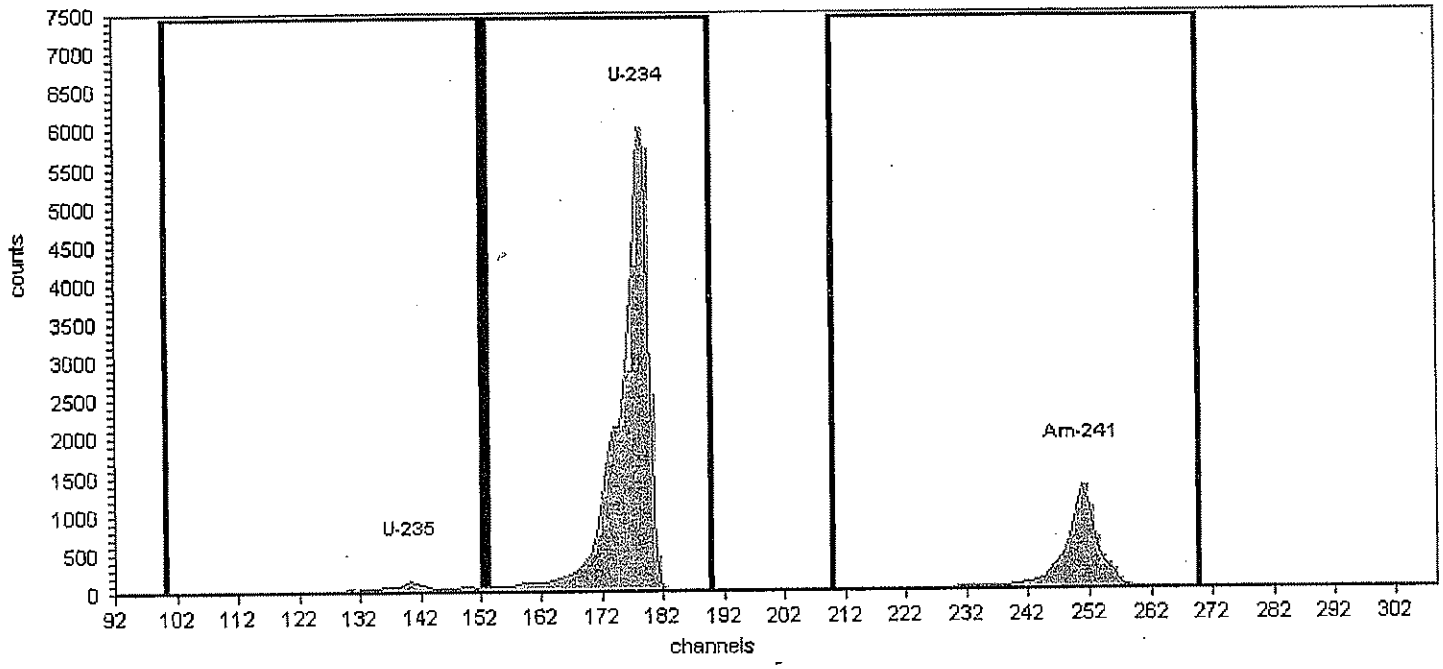
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 11:06:07AM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190(#9)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.63% +/- 0.31% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,072.00	30.63
U-234	178	4.78	153	190	32,217.00	920.49
Am-241	251	5.49	210	270	7,489.00	213.97

MR 9-8-10 JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
12:43:42PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 182(#1)
Description:

Analysis Date: 9/7/2010 12:43:35PM
Calibration Type: Energy

Source Info

Certificate ID: A1 RSO#182
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:24PM

Acquisition

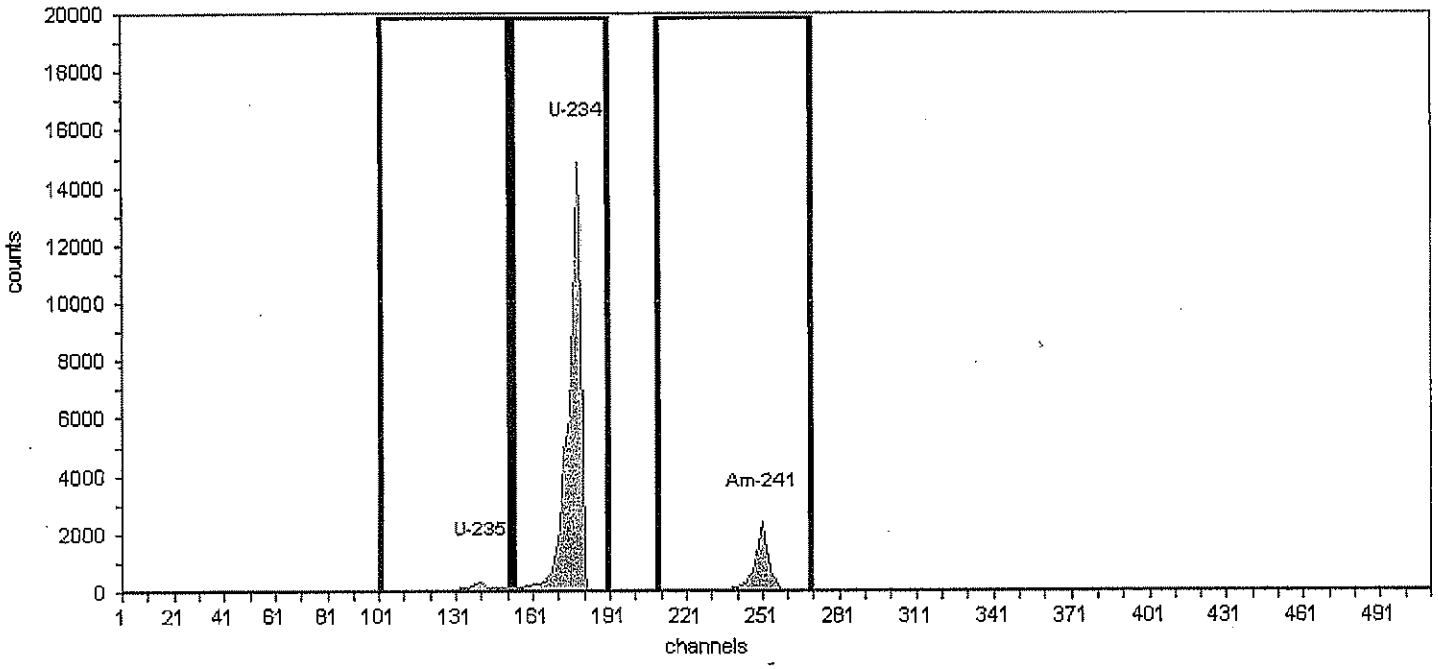
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 12:06:25PM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 182(#1)

Energy Calibration Equation:
Gain = 9.9003 keV / Ch
Offset = 3,011.38 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.62% +/- 0.20% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	101	152	2,247.00	64.20
U-234	178	4.78	153	190	80,178.00	2,290.80
Am-241	250	5.49	210	270	13,260.00	378.86

CC 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
1:27:44PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 183(#2)
Description:

Analysis Date: 9/7/2010 1:27:38PM
Calibration Type: Energy

Source Info

Certificate ID: A2 RSO#183
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

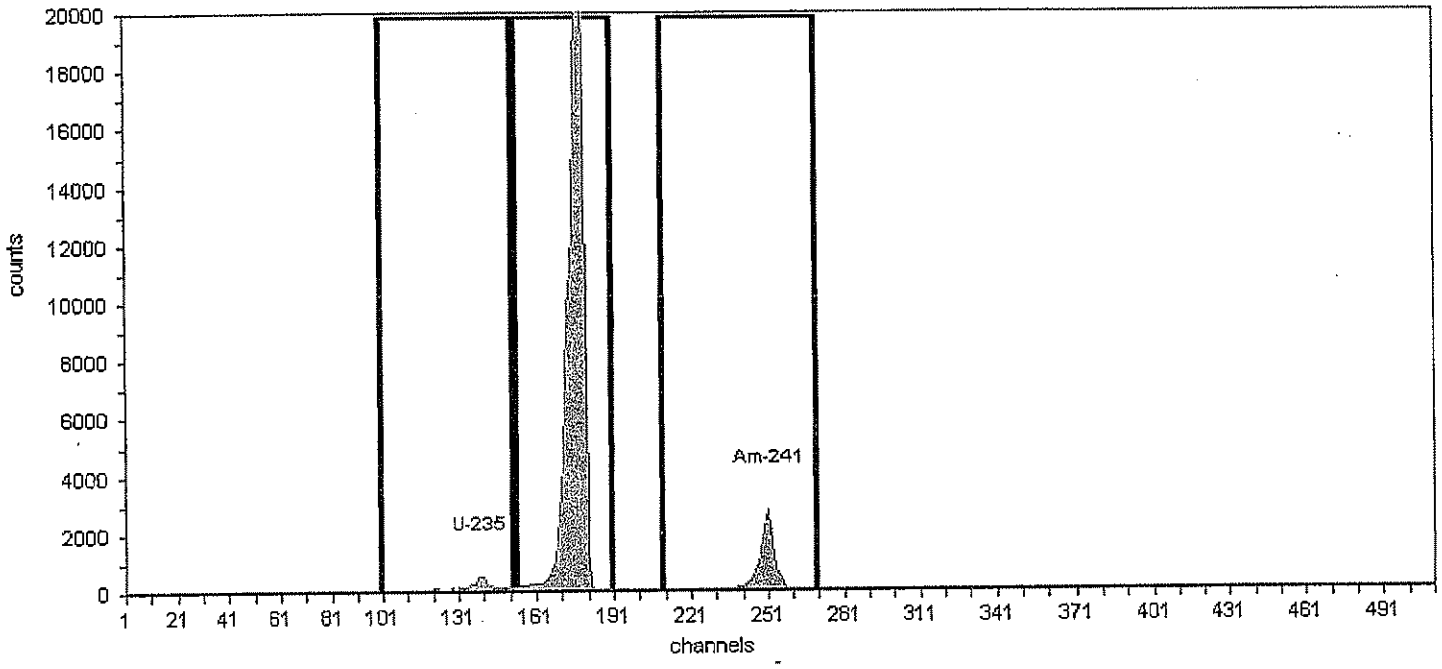
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 12:45:24PM

Live Time: 35.00 min.
Real Time: 35.06 min.

Efficiency Calibration Name: RSO 183(#2)

Energy Calibration Equation:
Gain = 9.7289 keV / Ch
Offset = 3,043.84 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.77% +/- 0.15% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	4,008.00	114.51
U-234	178	4.78	153	190	158,468.00	4,527.66
Am-241	251	5.49	210	270	16,216.00	463.31

MC 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 13
2:09:31PM 9/7/2010

Calibration

Energy Calibration: RSO 184(#3)
Description:

Analysis Date: 9/7/2010 2:09:24PM
Calibration Type: Energy

Source Info

Certificate ID: A3 RSO#184
Prepared by: IPL
Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

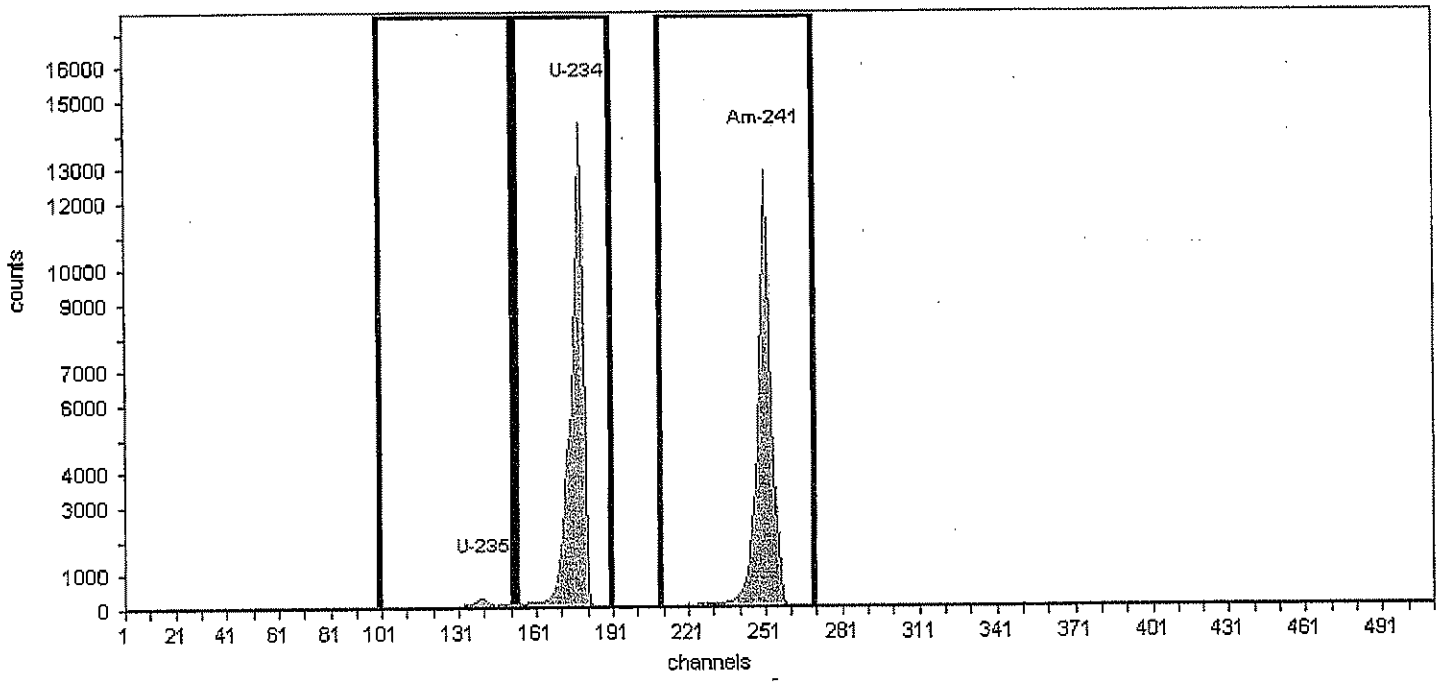
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 1:29:06PM

Live Time: 35.00 min.
Real Time: 35.05 min.

Efficiency Calibration Name: RSO 184(#3)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.40% +/- 0.16% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,928.00	55.09
U-234	178	4.78	153	190	75,317.00	2,151.91
Am-241	251	5.49	210	270	72,679.00	2,076.54

cc 9-8-10
JP 9/22/16

AlphaVision v5.3 **Alpha Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
2:54:34PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 185(#4)
Description:

Analysis Date: 9/7/2010 2:53:55PM
Calibration Type: Energy

Source Info

Certificate ID: A4 RSO#185
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

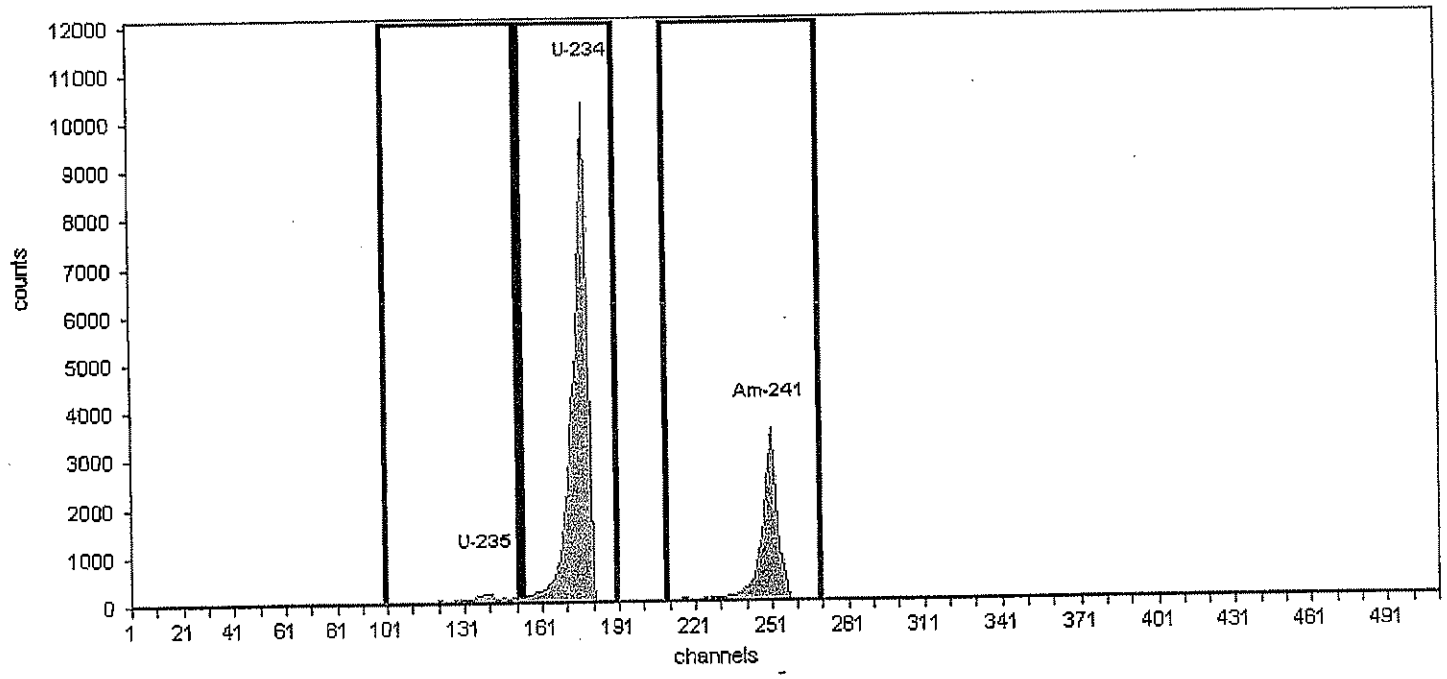
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 2:13:33PM

Live Time: 35.00 min.
Real Time: 35.03 min.

Efficiency Calibration Name: RSO 185(#4)

Energy Calibration Equation:
Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.90% +/- 0.21% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	2,048.00	58.51
U-234	178	4.78	153	190	64,459.00	1,841.69
Am-241	250	5.49	210	270	23,210.00	663.14

LL 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

3:40:07PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 186(#5)
Description:

Analysis Date: 9/7/2010 3:39:59PM
Calibration Type: Energy

Source Info

Certificate ID: A5 RSO#186
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

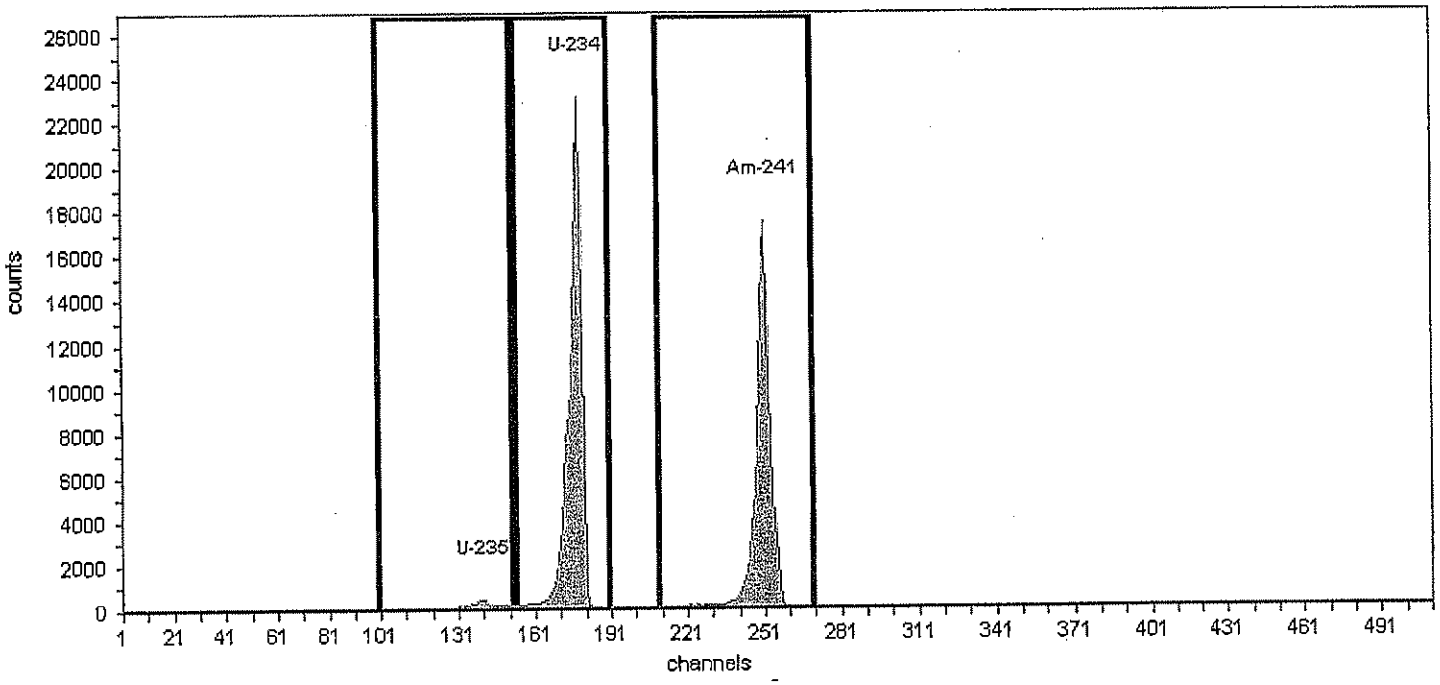
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 2:56:37PM

Live Time: 35.00 min.
Real Time: 35.08 min.

Efficiency Calibration Name: RSO 186(#5)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.95% +/- 0.13% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	3,398.00	97.09
U-234	178	4.78	153	190	124,700.00	3,562.86
Am-241	251	5.49	210	270	101,866.00	2,910.46

cu 9-8-10

JP 9/22/10

AlphaVision v5.3

Alpha-Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830

Analyst: ORTEC
Detector: 13

4:19:19PM 9/7/2010

Calibration

Energy Calibration: RSO 187(#6)
Description:

Analysis Date: 9/7/2010 4:19:10PM
Calibration Type: Energy

Source Info

Certificate ID: A6 RSO#187
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

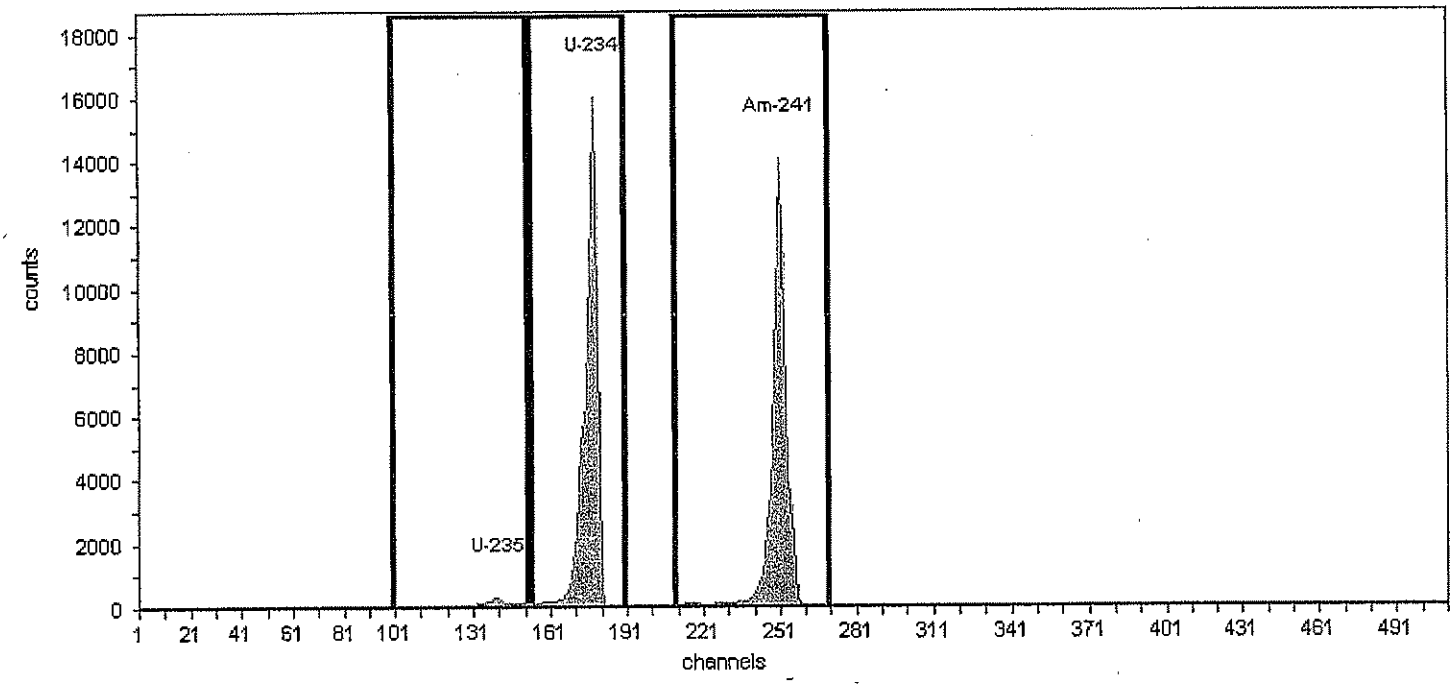
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 3:43:11PM

Live Time: 35.00 min.
Real Time: 35.06 min.

Efficiency Calibration Name: RSO 187(#6)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.54% +/- 0.15% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	2,162.00	61.77
U-234	178	4.78	153	190	83,580.00	2,388.00
Am-241	251	5.49	210	270	78,536.00	2,243.89

WE 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
4:58:15PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 188(#7)
Description:

Analysis Date: 9/7/2010 4:58:08PM
Calibration Type: Energy

Source Info

Certificate ID: A7 RSO#188
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

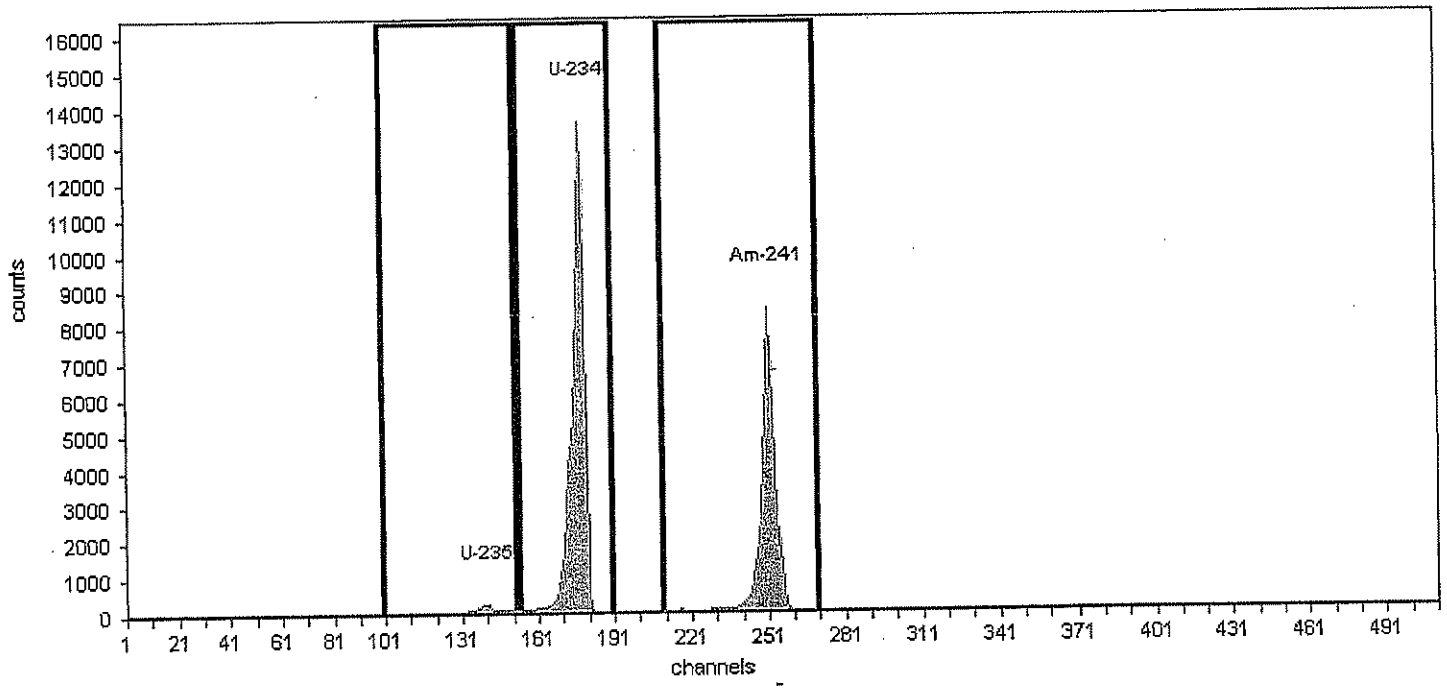
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 4:21:32PM

Live Time: 35.00 min.
Real Time: 35.04 min.

Efficiency Calibration Name: RSO 188(#7)

Energy Calibration Equation:
Gain = 9.8047 keV / Ch
Offset = 3,026.20 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.26% +/- 0.18% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,885.00	53.86
U-234	178	4.78	153	190	71,046.00	2,029.89
Am-241	251	5.49	210	270	46,086.00	1,316.74

LL 9-8-10

JP 9/22/10

AlphaVision v5.3 **Alpha-Spectroscopy Calibration Report**

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
10:29:59AM 9/10/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 189(#8)A
Description:

Analysis Date: 9/10/2010 10:29:52AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A8 RSO#189
Prepared by: IPL
Description:

Certification Date: 4/1/2003 12:00:00PM

Acquisition

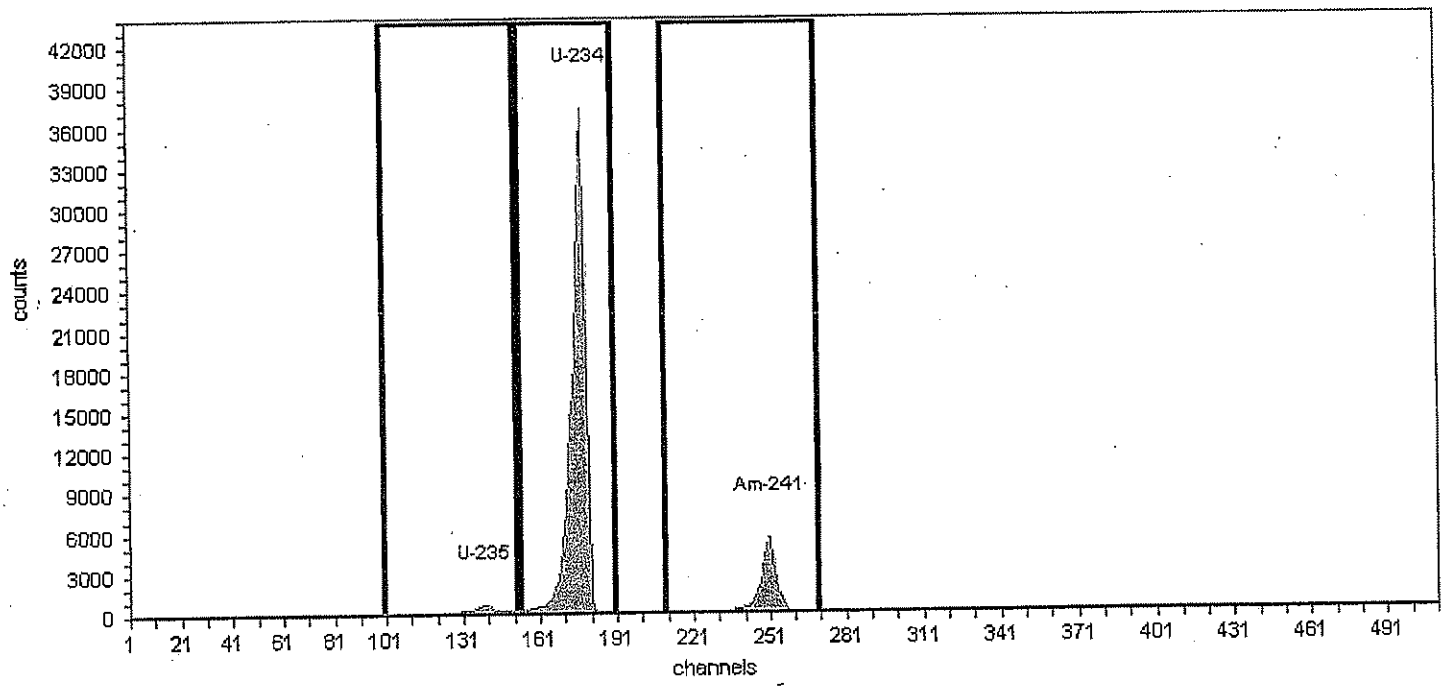
Detector: 13 , SN:
Acquisition Start Date: 9/10/2010 9:51:03AM

Live Time: 35.00 min.
Real Time: 35.09 min.

Efficiency Calibration Name: RSO 189(#8)A

Energy Calibration Equation:
Gain = 9.8224 keV / Ch
Offset = 3,029.39 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 31.43% +/- 0.12% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	6,354.00	181.54
U-234	178	4.78	153	190	219,846.00	6,281.32
Am-241	250	5.49	210	270	34,718.00	991.94

AR 9-10-10

JP 9/22/10

AlphaVision v5.3

Alpha Spectroscopy Calibration Report

ORTEC
801 S. Illinois Ave.
Oak Ridge, TN 37830
6:16:25PM 9/7/2010

Analyst: ORTEC
Detector: 13

Calibration

Energy Calibration: RSO 190(#9)A
Description:

Analysis Date: 9/7/2010 6:16:17PM
Calibration Type: Energy

Source Info

Certificate ID: A9 RSO#190
Prepared by: IPL
Description:

Certification Date: 6/1/2007 12:00:00PM

Acquisition

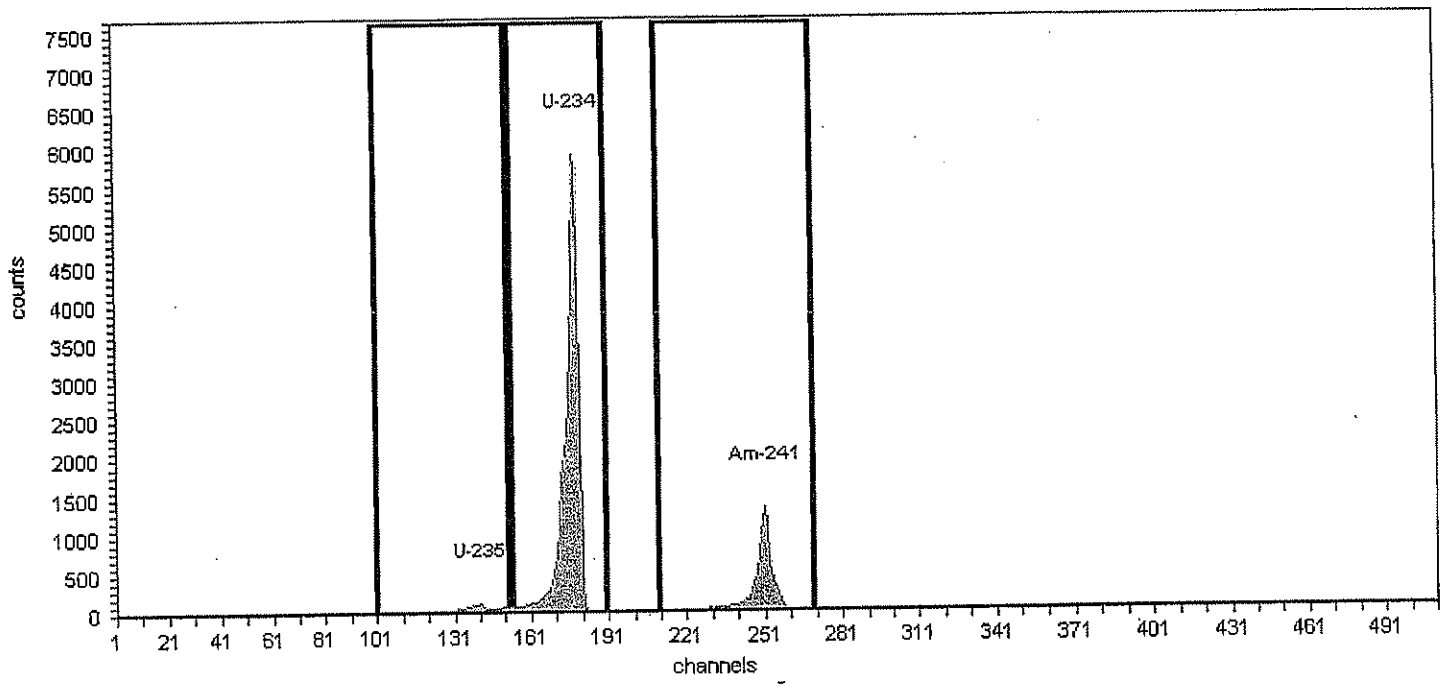
Detector: 13 , SN:
Acquisition Start Date: 9/7/2010 5:39:50PM

Live Time: 35.00 min.
Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190(#9)A

Energy Calibration Equation:
Gain = 9.8810 keV / Ch
Offset = 3,008.45 keV
Quadratic = 0.0000 keV / Ch^2

Efficiency: 30.78% +/- 0.31% TPU(2 sigma)



Method: Interactive ROI
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	141	4.40	100	152	1,066.00	30.46
U-234	178	4.78	153	190	32,190.00	919.71
Am-241	251	5.49	210	270	7,710.00	220.29

MG 9-8-10

JP 9/22/10

Eckert & Ziegler
Isotope Products

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

Rec'd 6/21/10 Email
#190

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide:	U-234	**Customer:**	ALS LABORATORY GROUP, FORT COLLINS
Radionuclide:	U-235	**P.O. No.:**	FC 1750/R4703
Radionuclide:	Am-241	**Catalog No.:**	MISC-STD
Half-life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Jul-10 12:00 PST
Half-life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX223027
Half-life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	1.336	**nCi,**	49.43	**Bq**	Am-241:	0.3197	**nCi,**	11.83	**Bq**
U-235:	0.02942	**nCi,**	1.089	**Bq**	Total Activity:	1.685	**nCi,**	62.35	**Bq**

Physical Description:

A. Capsule type:	Disk (47 mm OD x 0.76 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxide
C. Active diameter/volume:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in May 2001.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11889 α/min in 2π on 10-Jun-10.

Quality Control — 15 Jun 10 — Date

IPL Ref. No.: 1143-48

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10

PAI 187
recalibrate 4-1503

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203026

Contained Radioactivity:

U-234:	3.354	nCi (124.1 Bq)	Am-241:	0.5793	nCi (21.43 Bq)
U-235:	0.06566	nCi (2.429 Bq)	Total Activity:	3.999	nCi (148.0 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.7%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4483 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10
PAI 183
Recalibrated 4-15-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203028

Contained Radioactivity:

U-234:	6.467	nCi (239.3 Bq)	Am-241:	0.6366	nCi (23.55 Bq)
U-235:	0.1135	nCi (4.200 Bq)	Total Activity:	7.217	nCi (267.1 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.7%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:
- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 8091 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10
PAT I.D 184
recalibrated 4-1503

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203024
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.227	nCi	(119.4 Bq)	Am-241:	2.866	nCi	(106.0 Bq)
U-235:	0.05205	nCi	(1.926 Bq)	Total Activity:	6.145	nCi	(227.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.1%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 6889 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

Re-Verified 9/18/2010
Exp 9/18/2011
JP 9/22/10
PAI ID 00185
rec'd from recalibrator
3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203021

Contained Radioactivity:

U-234:	2.731	nCi	(101.0 Bq)	Am-241:	0.9325 nCi (34.50 Bq)
U-235:	0.03416	nCi	(1.264 Bq)	Total Activity:	3.698 nCi (136.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:
- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4145 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10
PAI ID 00186
calibration
received 3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203025
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	5.486	nCi	(203.0 Bq)	Am-241:	3.958	nCi	(146.4 Bq)
U-235:	0.09221	nCi	(3.412 Bq)	Total Activity:	9.536	nCi	(352.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 10690 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/8/2010
Exp. 9/8/2011
JP 9/22/10

RADIO 00187
recal for recalibration
3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203022

Contained Radioactivity:

U-234:	3.592	nCi	(132.9 Bq)	Am-241:	3.279	nCi	(121.3 Bq)
U-235:	0.08556	nCi	(3.166 Bq)	Total Activity:	6.957	nCi	(257.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:
- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 7799 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/8/2010
Exp 9/8/2011
JP 9/22/10

PAIP 188
rec'd for recalibration
3-28-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): (2.454 ± 0.006)E+05 years
Half Life (U-235): (7.037 ± 0.011)E+08 years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203023

Contained Radioactivity:

U-234:	2.895	nCi (107.1 Bq)	Am-241:	1.953	nCi (72.26 Bq)
U-235:	0.02502	nCi (0.9257 Bq)	Total Activity:	4.873	nCi (180.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:
- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 5463 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

Re-Verified 9/8/2010 9/10/2010
Exp 9/8/2011 9/10/2011
JP 9/22/10

PAI ID 189
recd 9-2-03
recalibrated 4-15-03

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203029
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	9.048	nCi	(334.8 Bq)	Am-241:	1.433	nCi	(53.02 Bq)
U-235:	0.1771	nCi	(6.553 Bq)	Total Activity:	10.66	nCi	(394.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.0%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11950 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7