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TREASURE ISLAND  
SSIC NO. 5090.3.A

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November 30, 2015

David Clark and Christopher Yantos  
Base Realignment and Closure  
Program Management Office West  
33000 Nixie Way, Bldg. 50  
San Diego, California 92147

**Subject: FINAL LETTER REPORT—Radiological Scoping Surveys of Installation Restoration Site 12 Housing Units—Investigation and Removal of Radiological Anomalies at 1240 North Point Drive Unit D, 1241 North Point Drive Unit B Shed, and 1303 Gateview Avenue Unit F, Former Naval Station Treasure Island, San Francisco, California**

**DCN: CBI-2005-0005-0018**

Dear Mr. Clark/Mr. Yantos:

This letter report summarizes the work CB&I Federal Services LLC (CB&I) completed at Buildings 1240 North Point Drive Unit D, 1241 North Point Drive Unit B Shed, and 1303 Gateview Avenue Unit F as part of the extraction of low-level radiological objects (LLRO) at three housing units that were surveyed under Contract No.N62473-12-D-2005, Contract Task Order 005—Radiological Scoping Surveys of Installation Restoration Site 12 Housing Units, Former Naval Station Treasure Island, San Francisco, California. The objective and end result of this work was to collect and present high quality data from the areas of interest, which was satisfactorily comprehensive to support no further investigation of the housing unit upon removal of the object(s).

## **Site Descriptions**

### Building 1240 North Point Drive Unit D

1240 Unit D is located on North Point Drive and follows Floor Plan 6B for a four-bedroom, 1200 series housing unit (*Final Task Specific Plan Addendum, Radiological Scoping Surveys of Installation Restoration Site 12 Housing Units—Investigation and Removal of Radiological Anomalies Former Naval Station Treasure Island San Francisco, California* [CB&I, 2015]). 1240 Unit D was unoccupied at the time of the initial survey. At the time of the initial survey, the elevated activity of interest was detected at the floor surface in the living room about 1.4 meters from the living room west wall (Grid H6). The maximum gross gamma measurement during the 2014 survey was 6.0 microrentgens per hour ( $\mu\text{R/hr}$ ) at 12 inches above the floor surface. (Radiological Affairs Support Office [RASO] calculation: 2.9 millirems per year [mrem/yr] based on an occupancy factor of three hours per day for 350 days per year.)

### Building 1241 North Point Drive Unit B Shed

Building 1241 Unit B Shed is located on North Point Drive and follows Floor Plan 5B for a three-bedroom, 1200 series housing unit (CB&I, 2015). 1241 Unit B Shed was used for storage by the occupant during the initial survey. At the time of the initial survey, the elevated activity of interest was detected over the concrete base of the exterior storage shed (Grid B2). The maximum gross gamma measurement during the 2014 survey was 4.8  $\mu\text{R/hr}$  at 12 inches above the concrete surface. (RASO calculation: 1.7 mrem/yr based on an occupancy factor of three hours per day for 350 days per year.)

### Building 1303 Gateview Avenue Unit F

Building 1303 Unit F is located on Gateview Avenue and follows Floor Plan 7 for a four-bedroom, 1300 series housing unit (CB&I, 2015). 1303 Unit F was occupied during the initial survey. At the time of the initial survey, the elevated activity of interest was detected at the floor surface in the doorway between the entry hallway and the kitchen (Grid E8). The maximum gross gamma measurement during the 2014 survey was 8.8  $\mu\text{R/hr}$  at 12 inches above the floor surface. (RASO calculation: 5.5 mrem/yr based on an occupancy factor of three hours per day for 365 days per year.)

## **July/August 2015 Fieldwork**

### Building 1240 North Point Drive Unit D

On July 6, 2015, CB&I began the radiological investigation, removal, and site restoration at 1240 Unit D. The unit was unoccupied at the time of the work. Prior to removal of the LLRO, the survey team confirmed the isolated location of the LLRO. The pre-extraction survey report is included in Attachment 1. CB&I then removed the floor surface concrete, underlying gravel, and soil to a depth of 10 inches to access the LLRO. The identified LLRO was located within the soil about 10 inches below the concrete surface. The object appeared to be a portion of a gage and was identified as Radium-226 ( $^{226}\text{Ra}$ ) by a portable Multichannel Analyzer (MCA). Photographs of the LLRO are included in Attachment 2.

The soil around the LLRO was over excavated and bounding samples were collected on July 7, 2015. On July 8, 2015, the excavated area was backfilled with clean fill and the concrete floor surface was restored. CB&I conducted the post investigation/restoration survey. All results, at that time indicated that area radioactivity levels at the excavation area were aligned with the floor surface background radiation levels.

On August 7, 2015, CB&I received the final results for bounding samples collected at 1240 Unit D. Samples results are presented in Table 1.

**Table 1**  
**Initial Bounding Soil Confirmation Sample Results**

Building 1240 Unit D Sample Location	Sample Identification	<sup>226</sup> Ra pCi/gm	Results Evaluation
Item Bedding Sample	001	26.2	Expected elevated activity, used to validate field radionuclide identification
<i>Post-Excavation Base</i>	<i>002</i>	<i>3.79</i>	<i>Requires additional excavation</i>
Post-Excavation Sidewall N	003	0.654	Satisfactory
Post-Excavation Sidewall S	004	0.439	Satisfactory

Notes:

N                    north  
pCi/gm            picoCuries/gram  
S                    south

On July 30, 2015, CB&I conducted the additional subsurface excavation at 1240 Unit D. The previously restored concrete floor was removed along with the clean fill. Additional soil was excavated at the base of the previous excavation and was controlled as low-level radiological waste (LLRW). CB&I re-sampled the base of the excavation. A representative from the California Department of Public Health (CDPH) was also on site to oversee the excavation and sampling activities and collected a duplicate soil sample from the base of the excavation.

CB&I performed the final site restoration at 1240 Unit D on August 20, 2015, after receiving satisfactory preliminary soil sample results for the second post-excavation base sample on August 17. On August 21, 2015, following site restoration, CB&I conducted the post extraction survey to confirm the reduction of radioactivity as seen in the initial 2014 survey. Results supported that area radioactivity levels at the excavation area were aligned with the floor surface background radiation levels for 1240 Unit D.

On September 2, 2015, CB&I received the final soil sample results for the second post-excavation base sample. All results were satisfactory. The final results are shown in Table 2 and are included in Attachment 3.

**Table 2**  
**Second Base Bounding Confirmation Soil Sample Results**

Building 1240 Unit D Sample Location	Sample Identification	<sup>226</sup> Ra pCi/gm	Results Evaluation
<i>Post-Excavation Base</i>	<i>002</i>	<i>3.79</i>	<i>Requires additional excavation</i>
<i>Second Post-Excavation Base</i>	<i>005</i>	<i>0.438</i>	<i>Additional excavation and sampling performed—Results Satisfactory</i>

Notes:

pCi/gm            picoCuries/gram

### Building 1241 North Point Drive Unit B Shed

On July 6, 2015, CB&I began the radiological investigation, removal, and site restoration at 1241 Unit B Shed. Prior to removal of the LLRO, the survey team confirmed the isolated location of the LLRO. The pre-extraction survey report is included in Attachment 1. CB&I then removed the shed base surface concrete, underlying gravel, and soil; a portion of the patio surface concrete; and a portion of the lower wall to access the LLRO. The identified LLRO was located within debris captured during the lower wall removal. The material appeared to be soil grain sized objects, possible metal or paint flakes. The LLRO was identified as  $^{226}\text{Ra}$  by a portable MCA. Photographs of the LLRO are included in Attachment 2.

The soil excavated during the investigation did not require additional control or characterization since the LLRO was found to have been secured above ground in the shed's lower wall surface. The area excavated was backfilled. On July 7, 2015, the site patio and shed floor was restored back to existing conditions and on July 8, 2015, CB&I conducted the post investigation/restoration survey to confirm the reduction of radioactivity as seen in the initial 2014 survey. Results supported that area radioactivity levels at the excavation area were aligned with the shed floor surface background radiation levels at 1241 Unit B.

### Building 1303 Gateview Avenue Unit F

On July 7, 2015, CB&I began the radiological investigation and removal at 1303 Unit F. Prior to removal of the LLRO, the survey team confirmed the isolated location of the LLRO. The pre-extraction survey report is included in Attachment 1. CB&I then removed the floor surface concrete, underlying gravel, and soil to a depth of about 24 inches to access the LLRO. Several malleable objects were identified at 24 inches below the top surface of the concrete floor and had varying readings ranging from 0.05 to 60.0 milliroentgens per hour on contact. Photographs of the objects are included in Attachment 2. No visible debris was found in the gravel/soil. Objects and soil were identified as  $^{226}\text{Ra}$  by a portable MCA.

Measurements within the excavation following the removal activities continued to indicate the presence of additional objects. It was determined that additional excavation and investigation would be necessary. This work was performed on July 8, 2015. The excavation boundary was approximately a 2-foot by 2-foot square to a depth of 30 inches. Removed soil was controlled as LLRW. Bounding samples were collected on July 8, 2015. The excavation area was covered until bounding sample results were received.

On July 15, 2015 a representative from the CDPH was on site to survey the open excavation and to obtain one soil sample from the base of the excavation to verify the condition of the excavation area at 1303 Unit F.

On August 7, 2015, CB&I received the final results for the bounding samples collected at 1303 Unit F. One sample indicated that additional soil removal was required. Samples results are presented in Table 3.

**Table 3**  
**Initial Bounding Confirmation Soil Sample Results**

Building 1303 Unit F Sample Location	Sample Identification	<sup>226</sup> Ra pCi/gm	Results Evaluation
Item Bedding Sample	001	122.0	Expected elevated activity, used to validate field radionuclide identification
Post-Excavation Base	002	0.366	Satisfactory
<i>Post-Excavation Sidewall N</i>	<i>003</i>	<i>1.11</i>	<i>Requires additional excavation</i>
Post-Excavation Sidewall S	004	0.611	Satisfactory

Notes:

N                      north  
pCi/gm                picoCuries/gram  
S                      south

On July 30, 2015, CB&I conducted the additional subsurface excavation at 1303 Unit F. Additional soil was excavated at the north side of the previous excavation and was controlled as LLRW. CB&I re-sampled the north side of the excavation. A representative from the CDPH was also on site to oversee the excavation and sampling activities and collected a duplicate soil sample from the north side of the excavation.

CB&I performed the final site restoration at 1303 Unit F on August 20, 2015, after receiving satisfactory preliminary soil sample results for the second post-excavation base sample on August 17. On August 21, 2015, following site restoration, CB&I conducted the post extraction survey to confirm the reduction of radioactivity as seen in the initial 2014 survey. Results supported that area radioactivity levels at the excavation area were aligned with the floor surface background radiation levels for 1303 Unit F.

On August 31, 2015, CB&I received the final soil sample analytical report for the second post-excavation north sidewall. The report confirmed that all sample result were satisfactory. The results are shown in Table 4 and are provided in Attachment 3.

**Table 4**  
**Second Base Bounding Confirmation Soil Sample Results**

Building 1303 Unit F Sample Location	Sample Identification	<sup>226</sup> Ra pCi/gm	Results Evaluation
<i>Post-Excavation Sidewall N</i>	<i>003</i>	<i>1.11</i>	<i>Requires additional excavation</i>
<i>Second Post-Excavation Sidewall N</i>	<i>005</i>	<i>0.539</i>	<i>Additional excavation and sampling performed—Results Satisfactory</i>

Notes:

N                      north  
pCi/gm                picoCuries/gram

Calibration records for all instruments used during fieldwork at all three sites are presented in Attachment 4.

## Survey Results

### Building 1240 North Point Drive Unit D

While the initial post-excavation base confirmation sample had a  $^{226}\text{Ra}$  result exceeding project criteria, after additional base excavation, the second post-excavation base confirmation sample results supported that any residual radiation from the LLRO found at 10 inches below the concrete surface had been removed successfully. The post investigation/restoration survey verified that the radioactivity levels at the excavation area (Grid H6) were aligned with the housing unit's background radiation levels and therefore met the project objectives of supporting that no further investigation of the unit is required and that post extraction radiation surveys met the project screening criteria of less than 2  $\mu\text{R/hr}$  above background, not to exceed 10 mrem/yr. The post extraction survey is provided in Attachment 1.

### Building 1241 North Point Drive Unit B Shed

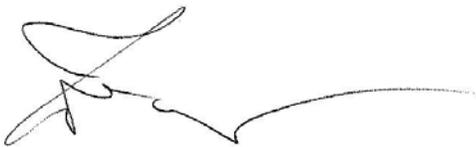
As stated in a previous section above, the soil excavated did not need additional control or characterization since the LLRO was found to be in the lower wall material, not in the soil. The post investigation/restoration survey verified that the radioactivity levels at the excavation area (Grid B2) were aligned with the shed's background radiation levels and therefore, met the project objectives of supporting that no further investigation of the storage shed structure is required and that post extraction radiation surveys met the project screening criteria of less than 2  $\mu\text{R/hr}$  above background, not to exceed 10 mrem/yr. The post extraction survey is provided in Attachment 1.

### Building 1303 Gateview Avenue Unit F

While the initial post-excavation north sidewall sample had a  $^{226}\text{Ra}$  result exceeding project criteria, after additional north sidewall excavation, the second post-excavation north sidewall sample results indicated that any residual radiation from the LLRO found within the excavation boundary had been removed successfully. The post investigation/restoration survey verified that the radioactivity levels at the excavation area (Grid E8) were aligned with the housing unit's background radiation levels and therefore, met the project objectives of supporting that no further investigation of the unit is required and that post extraction radiation surveys met the project screening criteria of less than 2  $\mu\text{R/hr}$  above background, not to exceed 10 mrem/yr. The post extraction survey is included in Attachment 1.

If you have any questions, please contact me at 619.446.4529.

Sincerely,



Ulrika T. Messer, PE  
Program Manager  
CB&I Federal Services LLC

Cc:

Zachary Edwards (RASO)

Gary Muneawa (Navy ROICC)

Patricia McFadden (Navy CSO)

**List of Tables (in text):**

Table 1: Initial Bounding Confirmation Soil Sample Results

Table 2: Second Base Bounding Confirmation Soil Sample Results (Preliminary)

Table 3: Initial Bounding Confirmation Soil Sample Results

Table 4: Second Base Bounding Confirmation Soil Sample Results

**List of Attachments:**

Attachment 1 Housing Unit Survey Reports (Pre and Post)

Attachment 2 Photograph Log

Attachment 3 Confirmation Sample Results

Attachment 4 Calibration Records

**Attachment 1**  
**Housing Unit Survey Reports (Pre and Post)**



**Unit Summary :**

Completion Date: 7/6/2015 12:06 PM  
 Instrument: 193-6  
 Serial #: 309119  
 Layout: Floor Plan 6B  
 Background Reading: 2.4 uR/hr  
 Dimensions (m): D W  
 Unit Furnished: No  
 Tenant Present: No

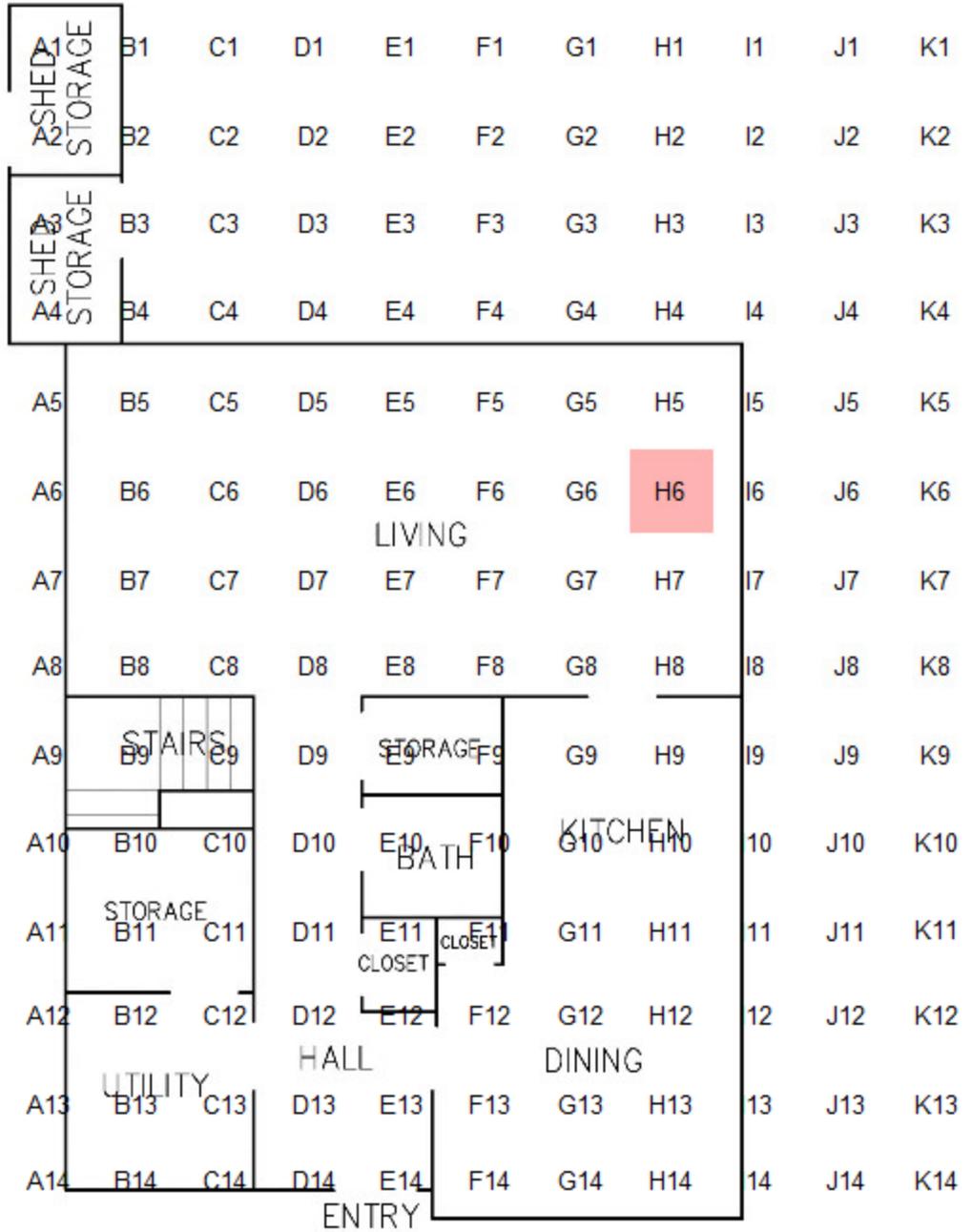
**Unit Notes:**

**Summary Statistics :**

Total # of Readings: 1  
 Average: 5.60 uR/hr  
 Standard Deviation: uR/hr  
 Minimum: 5.60 uR/hr  
 Maximum: 5.60 uR/hr  
 Median: 5.60 uR/hr  
 # Anomalies: 1

**Grid Legend:**

- No anomalous measurements
- Inaccessible (no measurement collected)
- Anomaly (elevated measurement)





**Survey Information:**

Grid	Primary Reading	Unit	Desc.	Cell Note	2nd Reading	Unit	Desc.	Cell Note	3rd Reading	Unit	Desc.	Cell Note	Anomaly	General Notes
H6	5.6	uR/hr	Living Room			uR/hr				uR/hr			Yes	Pre-extraction measurements.



**Secondary Readings : H6**

Secondary Type	Instrument ID	Instrument Serial	Reading	Reading Unit	Bulls Eye Location	ROC
Static Reading - On Contact, Center	193-6	309119	16.0	uR/hr		
Static Reading - 12 inch height, Center	193-6	309119	5.6	uR/hr		
Static Reading - 36 inch height, Center	193-6	309119	4.0	uR/hr		
Static Reading - 4 inch height, Bullseye	193-6	309119	8.4	uR/hr	Location 0	
Static Reading - 4 inch height, Bullseye	193-6	309119	5.6	uR/hr	Location 1	
Static Reading - 4 inch height, Bullseye	193-6	309119	6.0	uR/hr	Location 2	
Static Reading - 4 inch height, Bullseye	193-6	309119	9.6	uR/hr	Location 3	
Static Reading - 4 inch height, Bullseye	193-6	309119	8.8	uR/hr	Location 4	
Static Reading - 4 inch height, Bullseye	193-6	309119	4.4	uR/hr	Location 5	
Static Reading - 4 inch height, Bullseye	193-6	309119	4.0	uR/hr	Location 6	
Static Reading - 4 inch height, Bullseye	193-6	309119	6.4	uR/hr	Location 7	
Static Reading - 4 inch height, Bullseye	193-6	309119	5.6	uR/hr	Location 8	
<b>Secondary Type</b>	<b>Notes</b>					

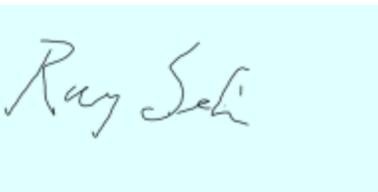


CBI Supervisor : Raymond Schul

Senior Technician : Richard George

Signature :

Signature :



Signoff Notes:



**Summary Report**  
**1240 Northpoint Drive Unit D-POST**

**Unit Summary :**

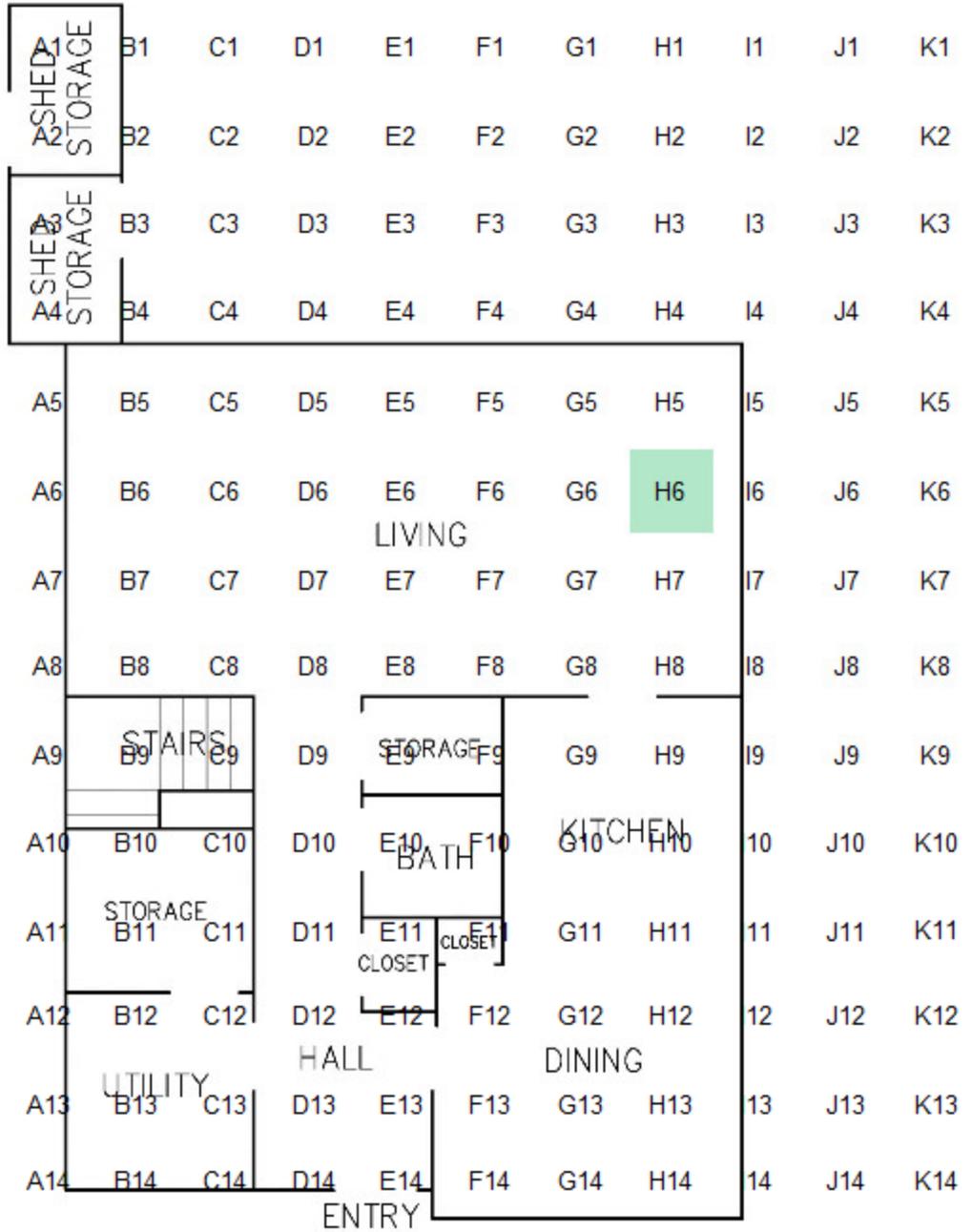
**Completion Date:** 7/8/2015 8:54 AM  
**Instrument:** 193-6  
**Serial #:** 309119  
**Layout:** Floor Plan 6B  
**Background Reading:** 3.6 uR/hr  
**Dimensions (m):** D W  
**Unit Furnished:**  
**Tenant Present:**  
**Unit Notes:**

**Summary Statistics :**

**Total # of Readings:** 1  
**Average:** 4.00 uR/hr  
**Standard Deviation:** uR/hr  
**Minimum:** 4.00 uR/hr  
**Maximum:** 4.00 uR/hr  
**Median:** 4.00 uR/hr  
**# Anomalies:** 1

**Grid Legend:**

- No anomalous measurements
- Inaccessible (no measurement collected)
- Anomaly (elevated measurement)





**Survey Information:**

Grid	Primary Reading	Unit	Desc.	Cell Note	2nd Reading	Unit	Desc.	Cell Note	3rd Reading	Unit	Desc.	Cell Note	Anomaly	General Notes
H6	4.0	uR/hr	Living Room			uR/hr				uR/hr			Yes	Post-extraction measurement.



**Secondary Readings : H6**

Secondary Type	Instrument ID	Instrument Serial	Reading	Reading Unit	Bulls Eye Location	ROC
Static Reading - On Contact, Center	193-6	309119	4.0	uR/hr		
Static Reading - 12 inch height, Center	193-6	309119	3.6	uR/hr		
Static Reading - 36 inch height, Center	193-6	309119	3.6	uR/hr		
Static Reading - 4 inch height, Bullseye	193-6	309119	4.0	uR/hr	Location 0	
Static Reading - 4 inch height, Bullseye	193-6	309119	4.0	uR/hr	Location 1	
Static Reading - 4 inch height, Bullseye	193-6	309119	4.0	uR/hr	Location 2	
Static Reading - 4 inch height, Bullseye	193-6	309119	4.0	uR/hr	Location 3	
Static Reading - 4 inch height, Bullseye	193-6	309119	4.0	uR/hr	Location 4	
Static Reading - 4 inch height, Bullseye	193-6	309119	4.0	uR/hr	Location 5	
Static Reading - 4 inch height, Bullseye	193-6	309119	4.0	uR/hr	Location 6	
Static Reading - 4 inch height, Bullseye	193-6	309119	4.0	uR/hr	Location 7	
Static Reading - 4 inch height, Bullseye	193-6	309119	3.6	uR/hr	Location 8	

Secondary Type	Notes



CBI Supervisor : Raymond Schul

Senior Technician : Richard George

Signature :



Signature :



Signoff Notes:



**Summary Report**  
1241 Northpoint Drive Unit B-PRE

**Unit Summary :**

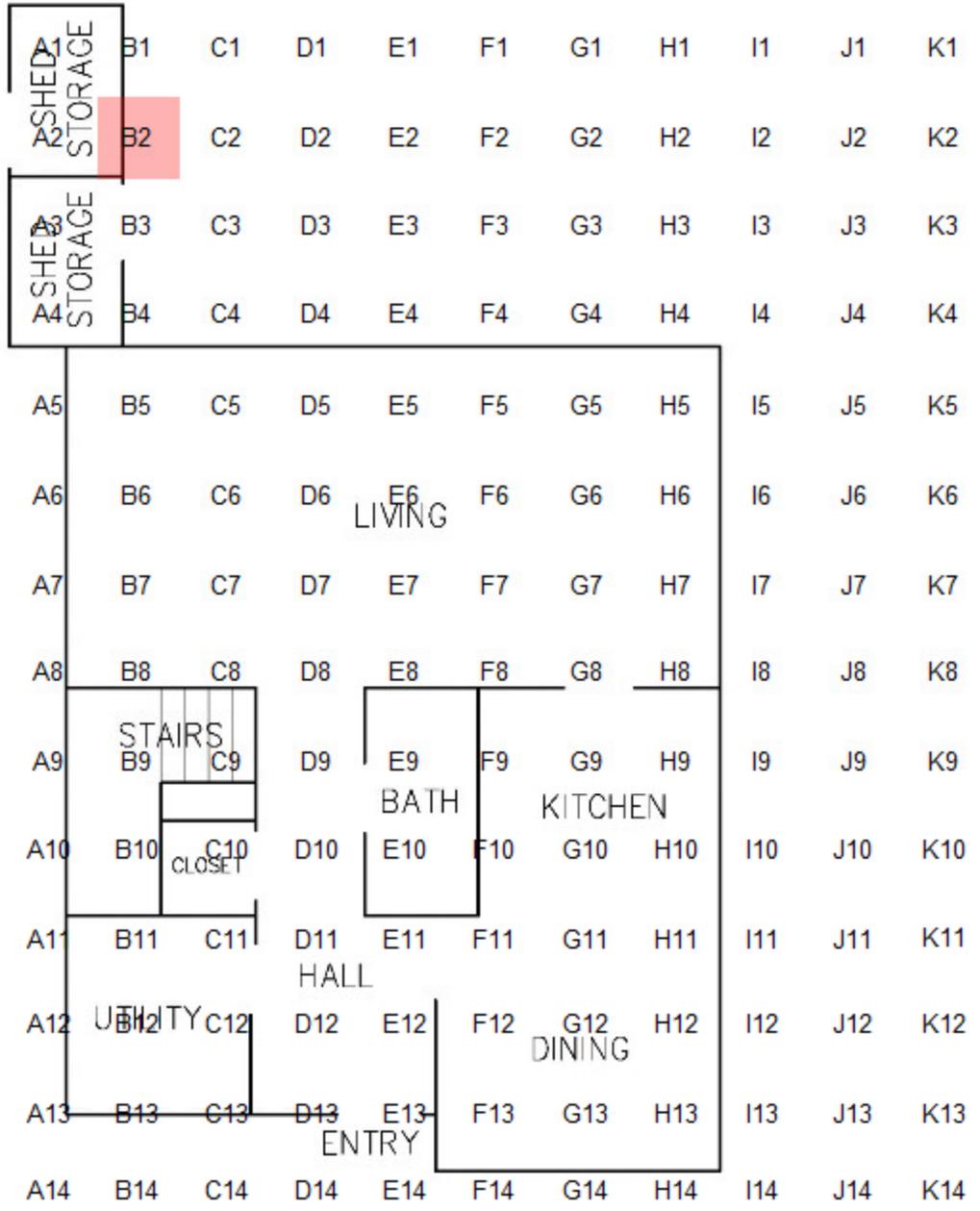
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**Instrument:** 193-6  
**Serial #:** 309110  
**Layout:** Floor Plan 5B  
**Background Reading:** 2.4 uR/hr  
**Dimensions (m):** D W  
**Unit Furnished:**  
**Tenant Present:**  
**Unit Notes:**

**Summary Statistics :**

**Total # of Readings:** 1  
**Average:** 5.20 uR/hr  
**Standard Deviation:** uR/hr  
**Minimum:** 5.20 uR/hr  
**Maximum:** 5.20 uR/hr  
**Median:** 5.20 uR/hr  
**# Anomalies:** 1

**Grid Legend:**

- No anomalous measurements
- Inaccessible (no measurement collected)
- Anomaly (elevated measurement)





**Survey Information:**

Grid	Primary Reading	Unit	Desc.	Cell Note	2nd Reading	Unit	Desc.	Cell Note	3rd Reading	Unit	Desc.	Cell Note	Anomaly	General Notes
B2	5.2	uR/hr	Storage Shed			uR/hr				uR/hr			Yes	Pre-extraction measurement.



**Secondary Readings : B2**

Secondary Type	Instrument ID	Instrument Serial	Reading	Reading Unit	Bulls Eye Location	ROC
Static Reading - On Contact, Center	193-6	309110	12.0	uR/hr		
Static Reading - 12 inch height, Center	193-6	309110	5.2	uR/hr		
Static Reading - 36 inch height, Center	193-6	309110	4.0	uR/hr		
Static Reading - 4 inch height, Bullseye	193-6	309110	6.0	uR/hr	Location 0	
Static Reading - 4 inch height, Bullseye	193-6	309110	4.9	uR/hr	Location 1	
Static Reading - 4 inch height, Bullseye	193-6	309110	4.8	uR/hr	Location 2	
Static Reading - 4 inch height, Bullseye	193-6	309110	5.6	uR/hr	Location 3	
Static Reading - 4 inch height, Bullseye	193-6	309110	4.8	uR/hr	Location 4	
Static Reading - 4 inch height, Bullseye	193-6	309110	4.4	uR/hr	Location 5	
Static Reading - 4 inch height, Bullseye	193-6	309110	4.4	uR/hr	Location 6	
Static Reading - 4 inch height, Bullseye	193-6	309110	5.2	uR/hr	Location 7	
Static Reading - 4 inch height, Bullseye	193-6	309110	4.8	uR/hr	Location 8	
<b>Secondary Type</b>	<b>Notes</b>					



CBI Supervisor : Raymond Schul

Senior Technician : Richard George

Signature :



Signature :



Signoff Notes:



**Summary Report**  
**1241 Northpoint Drive Unit B-POST**

**Unit Summary :**

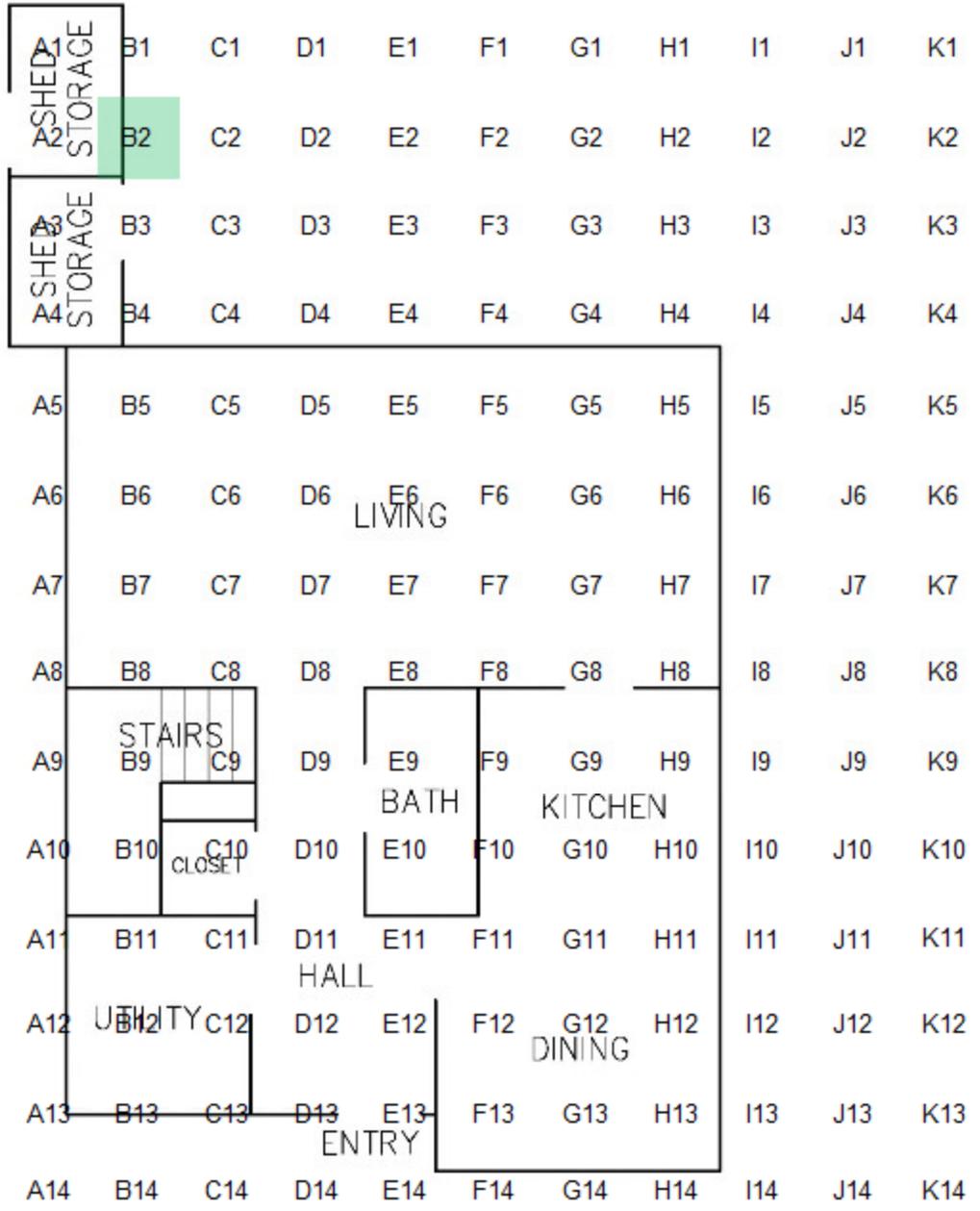
**Completion Date:** 7/9/2015 11:24 AM  
**Instrument:** 193-6  
**Serial #:** 309119  
**Layout:** Floor Plan 5B  
**Background Reading:** 2.8 uR/hr  
**Dimensions (m):** D W  
**Unit Furnished:**  
**Tenant Present:**  
**Unit Notes:**

**Summary Statistics :**

**Total # of Readings:** 1  
**Average:** 3.20 uR/hr  
**Standard Deviation:** uR/hr  
**Minimum:** 3.20 uR/hr  
**Maximum:** 3.20 uR/hr  
**Median:** 3.20 uR/hr  
**# Anomalies:** 1

**Grid Legend:**

- No anomalous measurements
- Inaccessible (no measurement collected)
- Anomaly (elevated measurement)





**Survey Information:**

Grid	Primary Reading	Unit	Desc.	Cell Note	2nd Reading	Unit	Desc.	Cell Note	3rd Reading	Unit	Desc.	Cell Note	Anomaly	General Notes
B2	3.2	uR/hr	Storage Shed			uR/hr				uR/hr			Yes	Post-extraction measurement.



**Secondary Readings : B2**

Secondary Type	Instrument ID	Instrument Serial	Reading	Reading Unit	Bulls Eye Location	ROC
Static Reading - On Contact, Center	193-6	309119	4.0	uR/hr		
Static Reading - 12 inch height, Center	193-6	309119	3.2	uR/hr		
Static Reading - 36 inch height, Center	193-6	309119	3.6	uR/hr		
Static Reading - 4 inch height, Bullseye	193-6	309119	3.6	uR/hr	Location 0	
Static Reading - 4 inch height, Bullseye	193-6	309119	3.6	uR/hr	Location 1	
Static Reading - 4 inch height, Bullseye	193-6	309119	3.6	uR/hr	Location 2	
Static Reading - 4 inch height, Bullseye	193-6	309119	3.6	uR/hr	Location 3	
Static Reading - 4 inch height, Bullseye	193-6	309119	3.6	uR/hr	Location 4	
Static Reading - 4 inch height, Bullseye	193-6	309119	3.6	uR/hr	Location 5	
Static Reading - 4 inch height, Bullseye	193-6	309119	3.6	uR/hr	Location 6	
Static Reading - 4 inch height, Bullseye	193-6	309119	3.6	uR/hr	Location 7	
Static Reading - 4 inch height, Bullseye	193-6	309119	3.6	uR/hr	Location 8	

Secondary Type	Notes



CBI Supervisor : Raymond Schul

Senior Technician : Richard George

Signature :



Signature :



Signoff Notes:



**Unit Summary :**

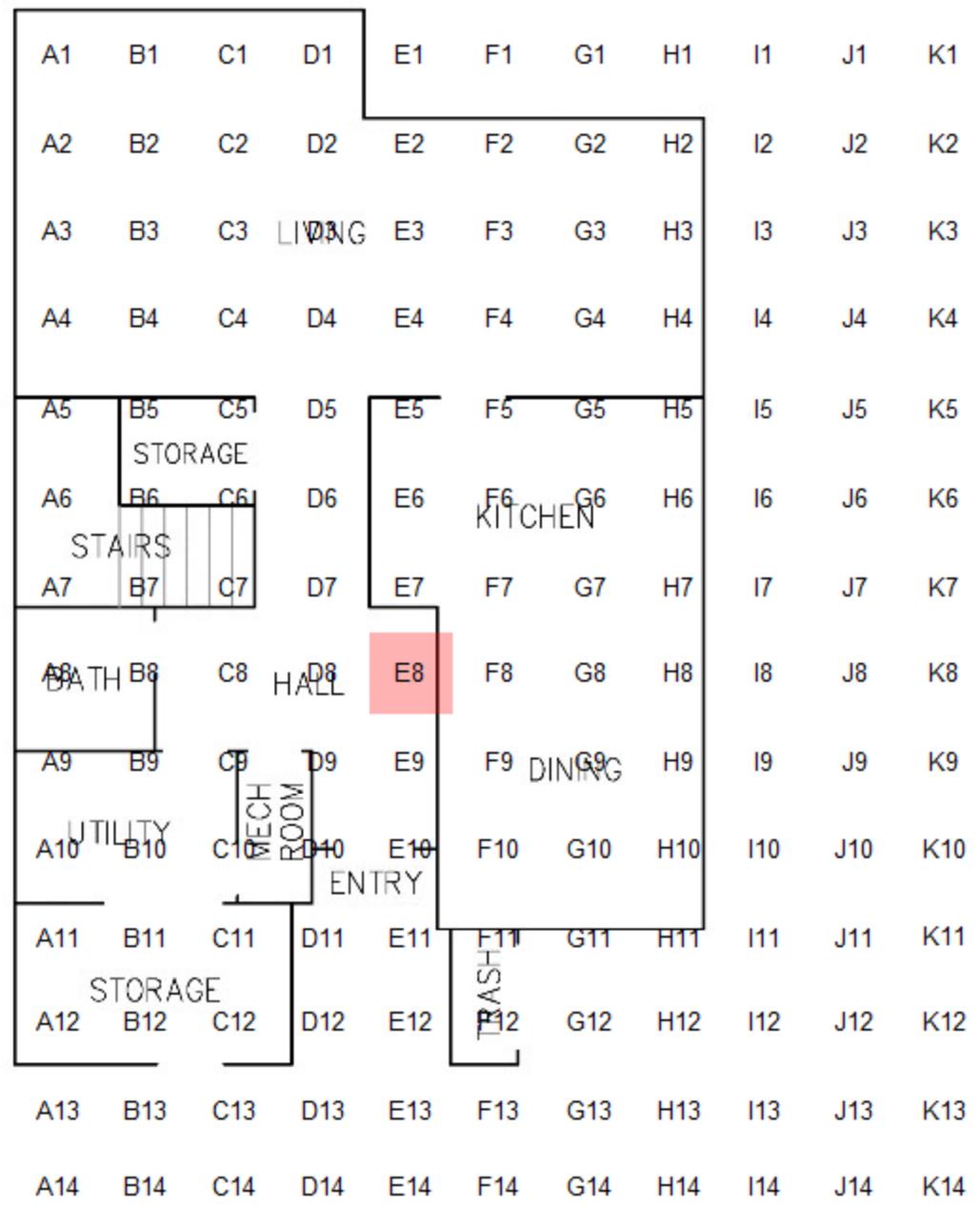
**Completion Date:** 7/6/2015 12:04 PM  
**Instrument:** 193-6  
**Serial #:** 309127  
**Layout:** Floor Plan 7  
**Background Reading:** 2.4 uR/hr  
**Dimensions (m):** D W  
**Unit Furnished:**  
**Tenant Present:**  
**Unit Notes:**

**Summary Statistics :**

**Total # of Readings:** 1  
**Average:** 8.80 uR/hr  
**Standard Deviation:** uR/hr  
**Minimum:** 8.80 uR/hr  
**Maximum:** 8.80 uR/hr  
**Median:** 8.80 uR/hr  
**# Anomalies:** 1

**Grid Legend:**

- No anomalous measurements
- Inaccessible (no measurement collected)
- Anomaly (elevated measurement)





**Survey Information:**

Grid	Primary Reading	Unit	Desc.	Cell Note	2nd Reading	Unit	Desc.	Cell Note	3rd Reading	Unit	Desc.	Cell Note	Anomaly	General Notes
E8	8.8	uR/hr	Hallway			uR/hr				uR/hr			Yes	Pre-extraction measurement.



**Secondary Readings : E8**

Secondary Type	Instrument ID	Instrument Serial	Reading	Reading Unit	Bulls Eye Location	ROC
Static Reading - On Contact, Center	193-6	309127	24.0	uR/hr		
Static Reading - 12 inch height, Center	193-6	309127	8.8	uR/hr		
Static Reading - 36 inch height, Center	193-6	309127	4.8	uR/hr		
Static Reading - 4 inch height, Bullseye	193-6	309127	16.0	uR/hr	Location 0	
Static Reading - 4 inch height, Bullseye	193-6	309127	8.8	uR/hr	Location 1	
Static Reading - 4 inch height, Bullseye	193-6	309127	9.2	uR/hr	Location 2	
Static Reading - 4 inch height, Bullseye	193-6	309127	8.4	uR/hr	Location 3	
Static Reading - 4 inch height, Bullseye	193-6	309127	8.4	uR/hr	Location 4	
Static Reading - 4 inch height, Bullseye	193-6	309127	8.0	uR/hr	Location 5	
Static Reading - 4 inch height, Bullseye	193-6	309127	6.8	uR/hr	Location 6	
Static Reading - 4 inch height, Bullseye	193-6	309127	8.0	uR/hr	Location 7	
Static Reading - 4 inch height, Bullseye	193-6	309127	8.8	uR/hr	Location 8	

Secondary Type	Notes



CBI Supervisor : Raymond Schul

Senior Technician : Richard George

Signature :



Signature :



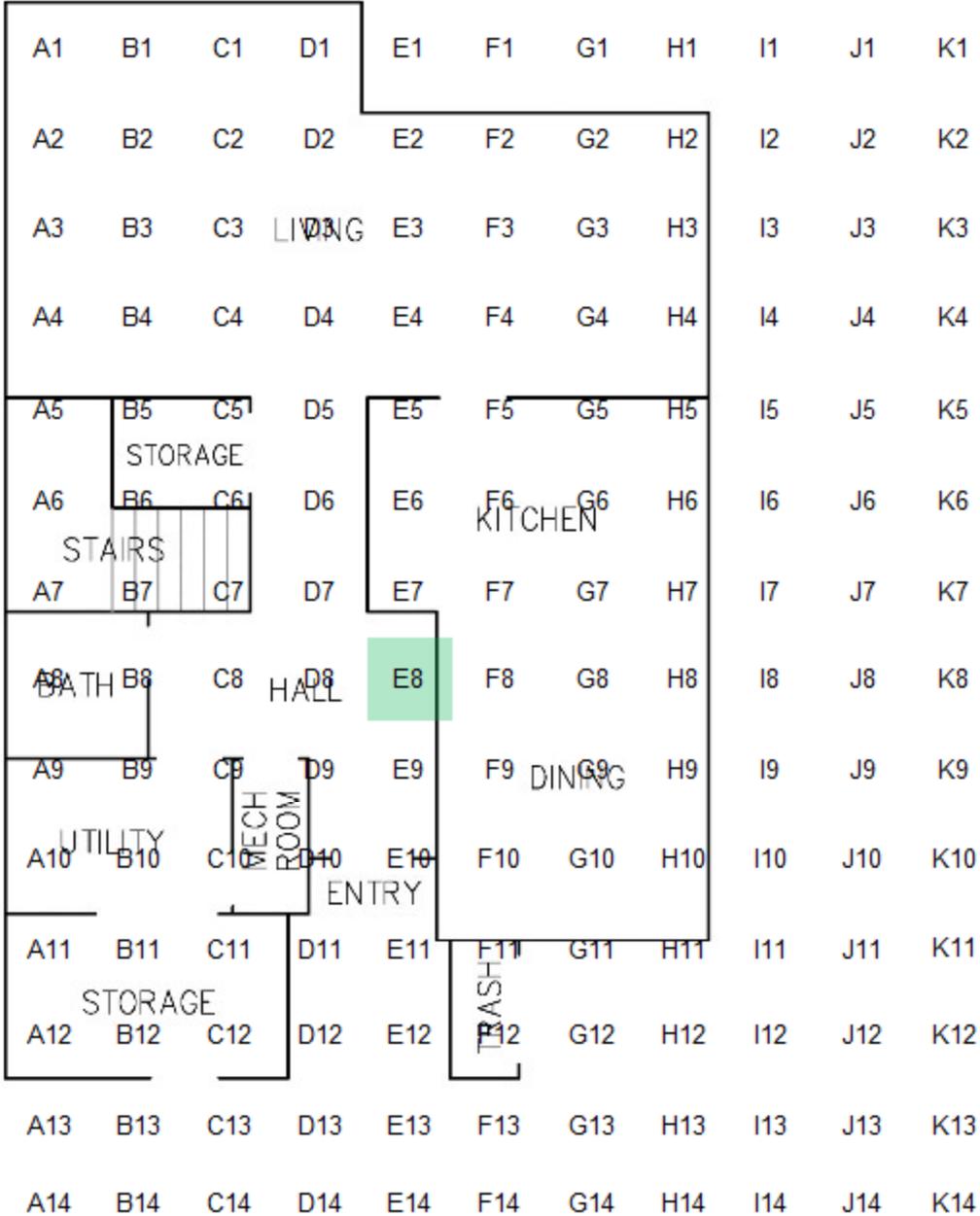
Signoff Notes:



**Summary Report**  
**1303 Gateview Avenue Unit F**

**Unit Summary :**

**Completion Date:** 8/21/2015 2:37 PM  
**Instrument:** 193-6  
**Serial #:** 309127  
**Layout:** Floor Plan 7  
**Background Reading:** 3.6 uR/hr  
**Dimensions (m):** D W  
**Unit Furnished:**  
**Tenant Present:**  
**Unit Notes:**



**Summary Statistics :**

**Total # of Readings:** 1  
**Average:** 4.00 uR/hr  
**Standard Deviation:** uR/hr  
**Minimum:** 4.00 uR/hr  
**Maximum:** 4.00 uR/hr  
**Median:** 4.00 uR/hr  
**# Anomalies:** 1

**Grid Legend:**

- No anomalous measurements
- Inaccessible (no measurement collected)
- Anomaly (elevated measurement)



**Survey Information:**

Grid	Primary Reading	Unit	Desc.	Cell Note	2nd Reading	Unit	Desc.	Cell Note	3rd Reading	Unit	Desc.	Cell Note	Anomaly	General Notes
E8	4.0	uR/hr	Hallway			uR/hr				uR/hr			Yes	Actual measurement is 4.0.



**Secondary Readings : E8**

Secondary Type	Instrument ID	Instrument Serial	Reading	Reading Unit	Bulls Eye Location	ROC
Static Reading - On Contact, Center	193-6	309127	4.0	uR/hr		
Static Reading - 12 inch height, Center	193-6	309127	4.0	uR/hr		
Static Reading - 36 inch height, Center	193-6	309127	4.0	uR/hr		
Static Reading - 4 inch height, Bullseye	193-6	309127	3.6	uR/hr	Location 0	
Static Reading - 4 inch height, Bullseye	193-6	309127	3.6	uR/hr	Location 1	
Static Reading - 4 inch height, Bullseye	193-6	309127	3.6	uR/hr	Location 2	
Static Reading - 4 inch height, Bullseye	193-6	309127	3.6	uR/hr	Location 3	
Static Reading - 4 inch height, Bullseye	193-6	309127	3.6	uR/hr	Location 4	
Static Reading - 4 inch height, Bullseye	193-6	309127	3.6	uR/hr	Location 5	
Static Reading - 4 inch height, Bullseye	193-6	309127	3.6	uR/hr	Location 6	
Static Reading - 4 inch height, Bullseye	193-6	309127	3.6	uR/hr	Location 7	
Static Reading - 4 inch height, Bullseye	193-6	309127	3.6	uR/hr	Location 8	
<b>Secondary Type</b>	<b>Notes</b>					



CBI Supervisor : Raymond Schul

Senior Technician : Neil Morrison

Signature :

Signature :



Signoff Notes:

**Attachment 2**  
**Photograph Log**

Photo Log: Investigation and Removal of Radiological Anomalies  
Former Naval Station Treasure Island Building 1240, Unit D

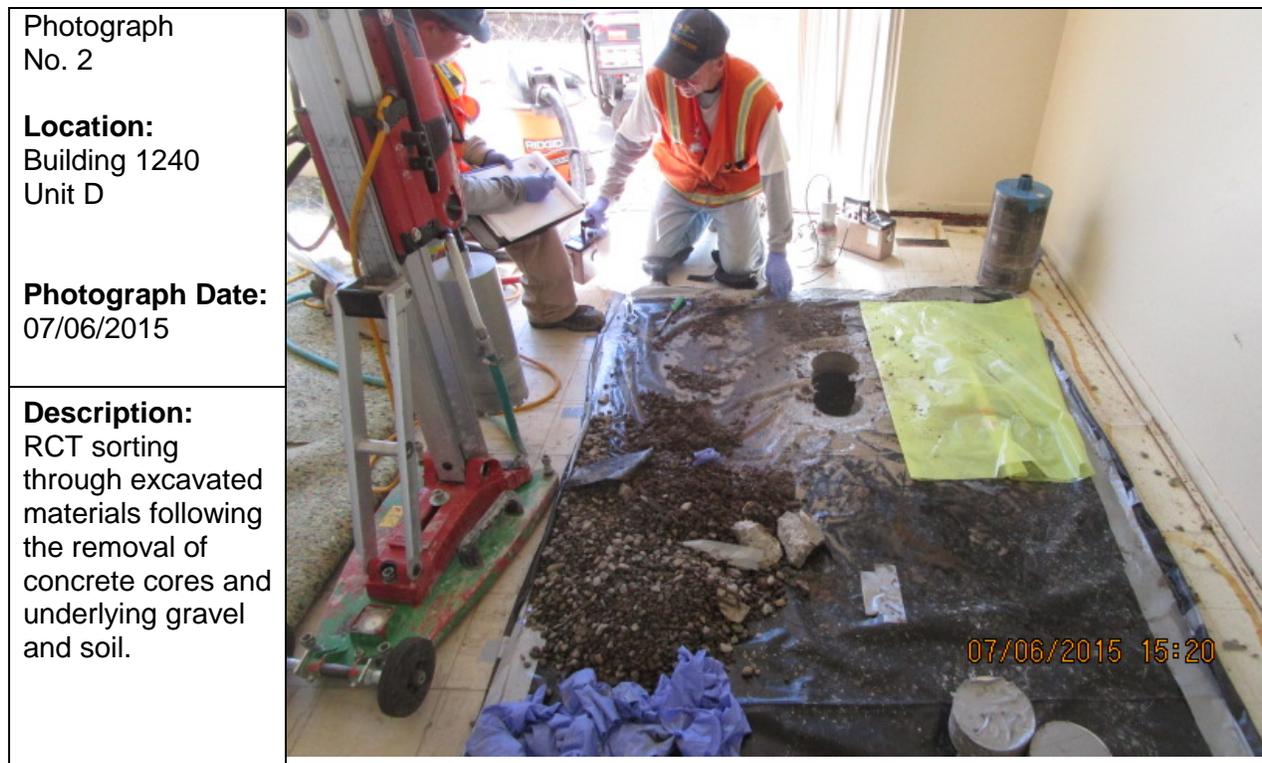
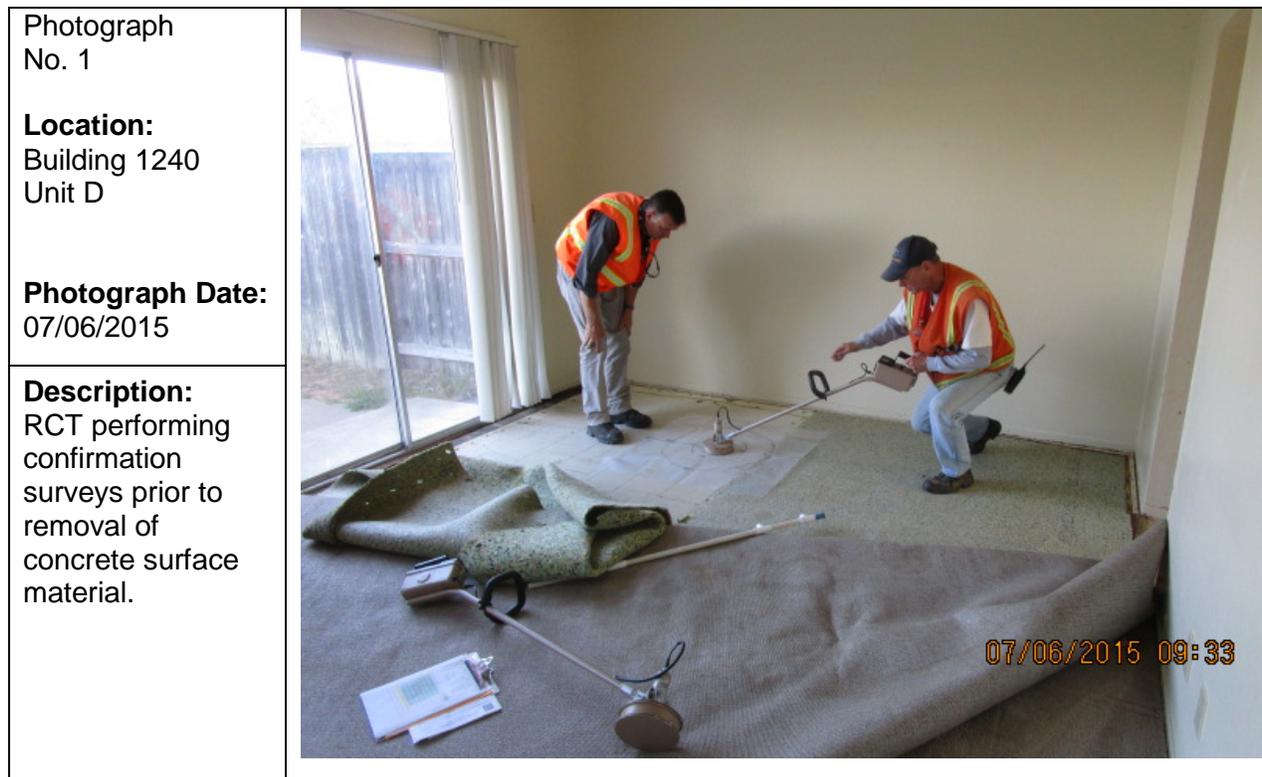


Photo Log: Investigation and Removal of Radiological Anomalies  
Former Naval Station Treasure Island Building 1240, Unit D

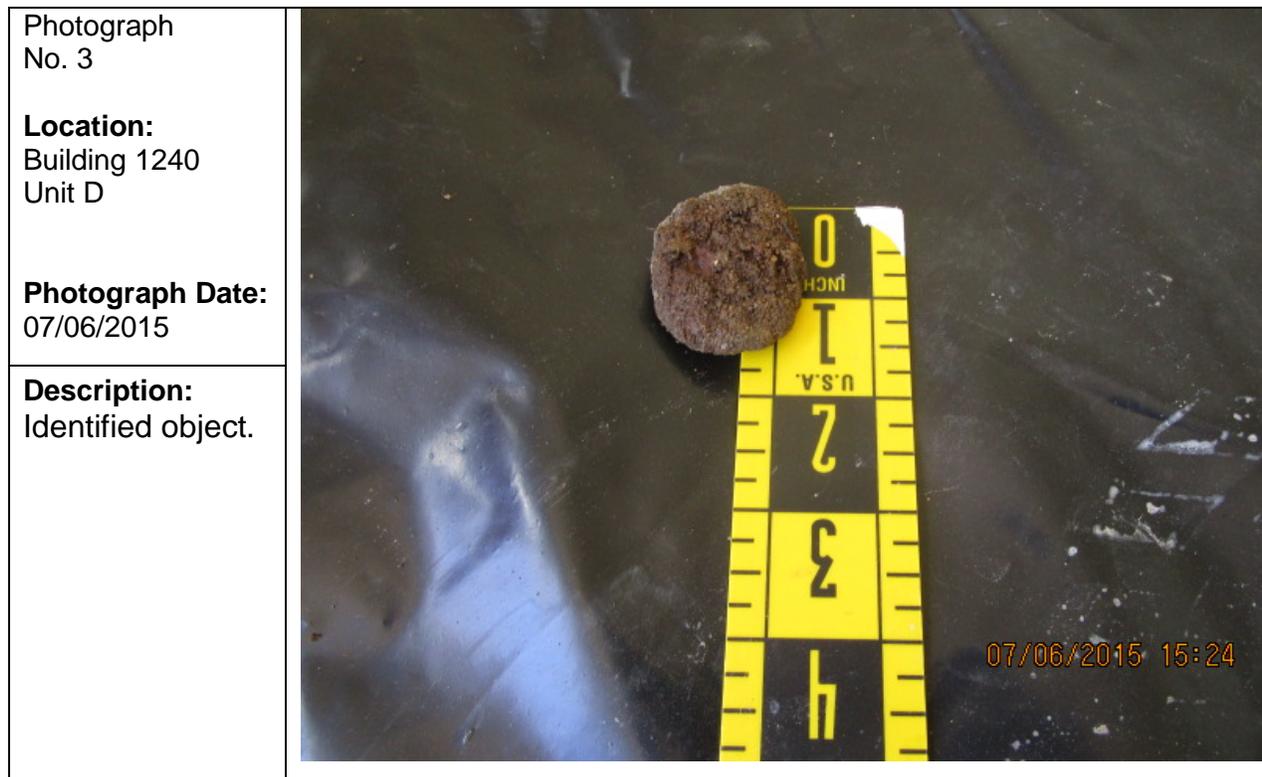


Photo Log: Investigation and Removal of Radiological Anomalies  
Former Naval Station Treasure Island Building 1240, Unit D



Photo Log: Investigation and Removal of Radiological Anomalies  
Former Naval Station Treasure Island Building 1240, Unit D

Photograph  
No. 7

**Location:**  
Building 1240  
Unit D

**Photograph Date:**  
08/21/2015

**Description:**  
Performing the  
final floor surface  
survey following  
the restoration of  
the excavation  
area.



Photo Log: Investigation and Removal of Radiological Anomalies  
Former Naval Station Treasure Island Building 1241, Unit B Shed

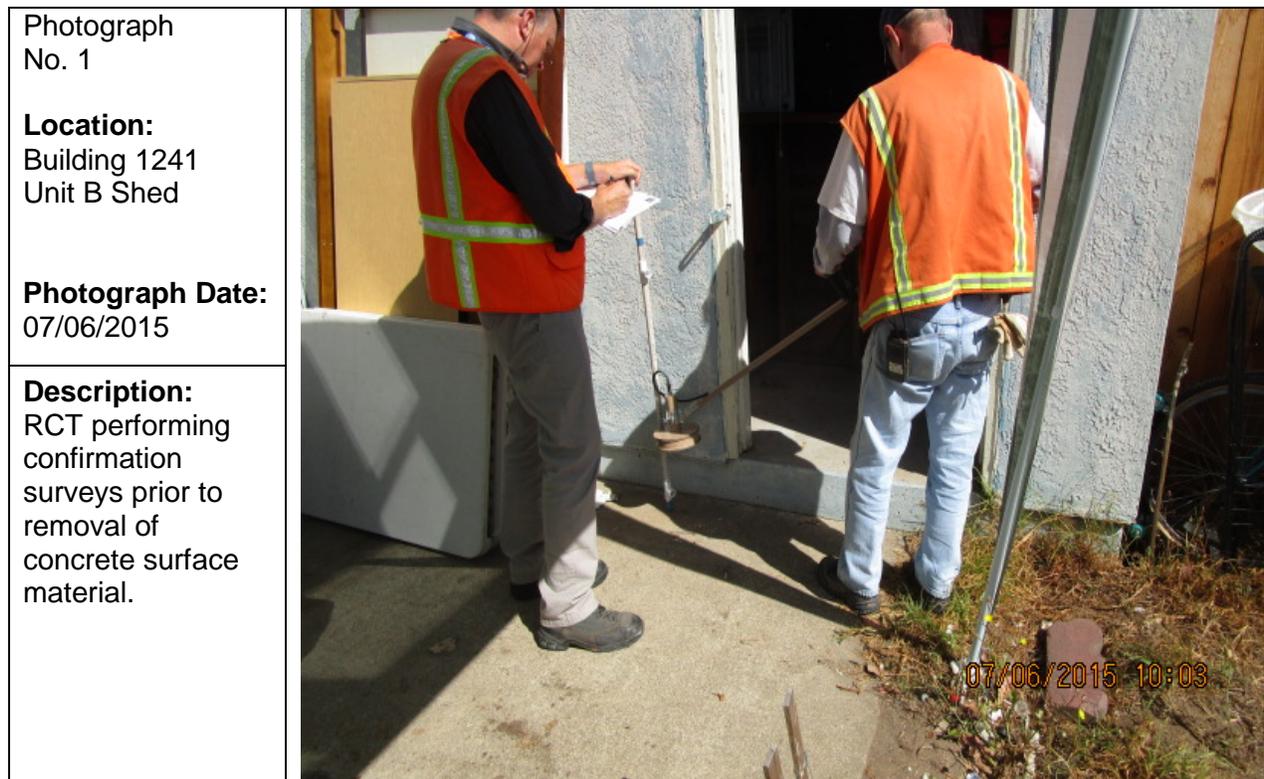


Photo Log: Investigation and Removal of Radiological Anomalies  
Former Naval Station Treasure Island Building 1241, Unit B Shed

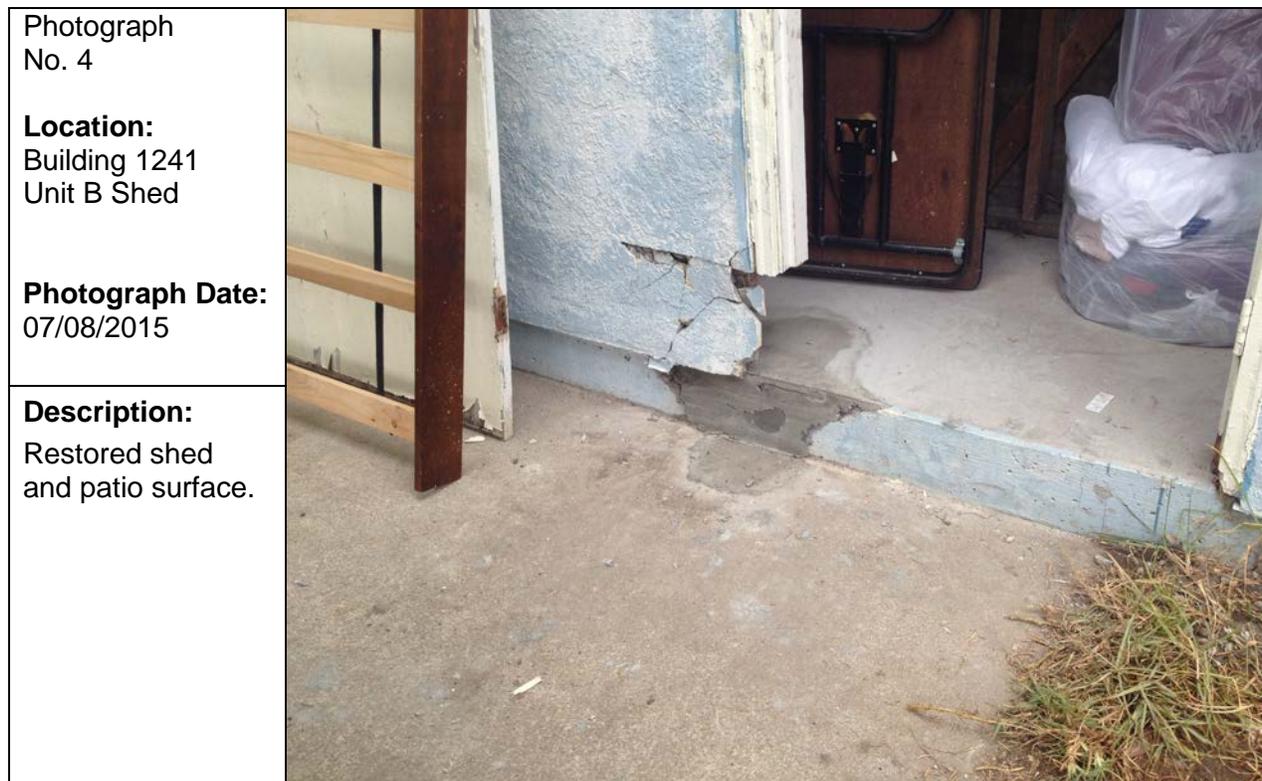


Photo Log: Investigation and Removal of Radiological Anomalies  
Former Naval Station Treasure Island Building 1303, Unit F

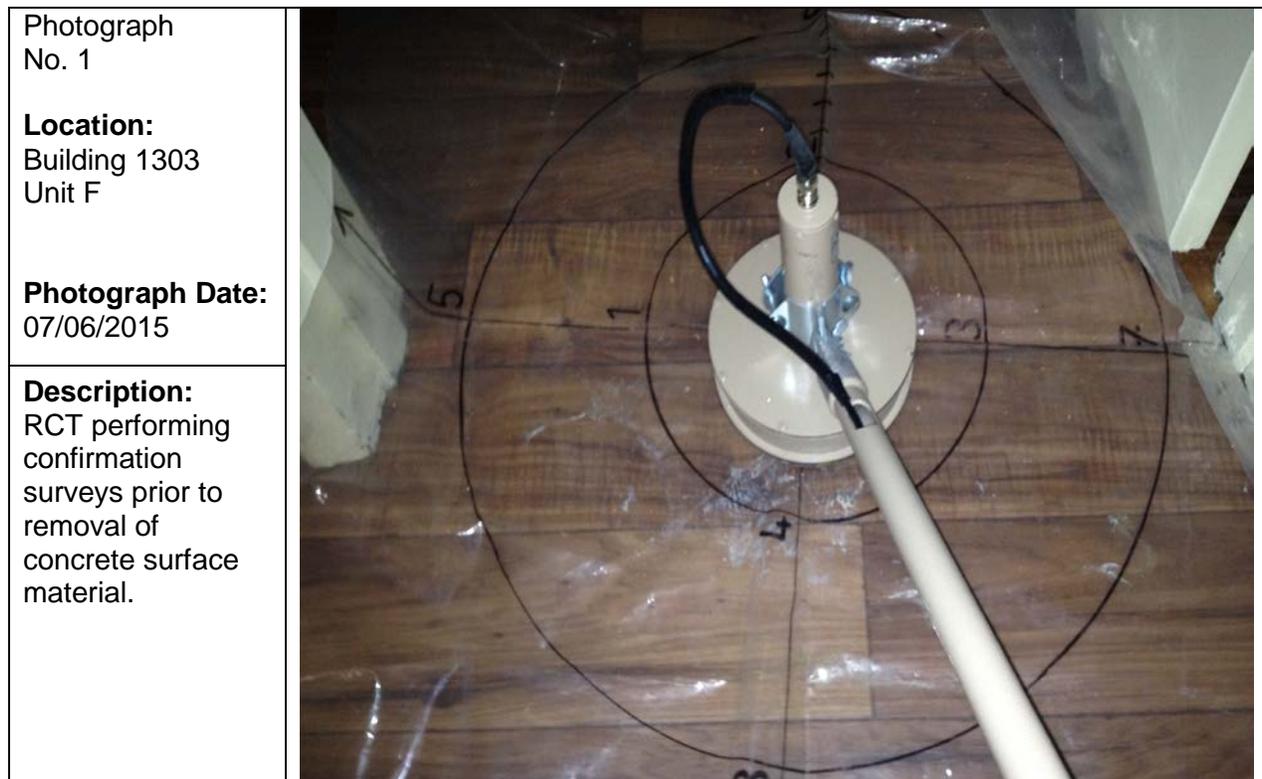


Photo Log: Investigation and Removal of Radiological Anomalies  
Former Naval Station Treasure Island Building 1303, Unit F

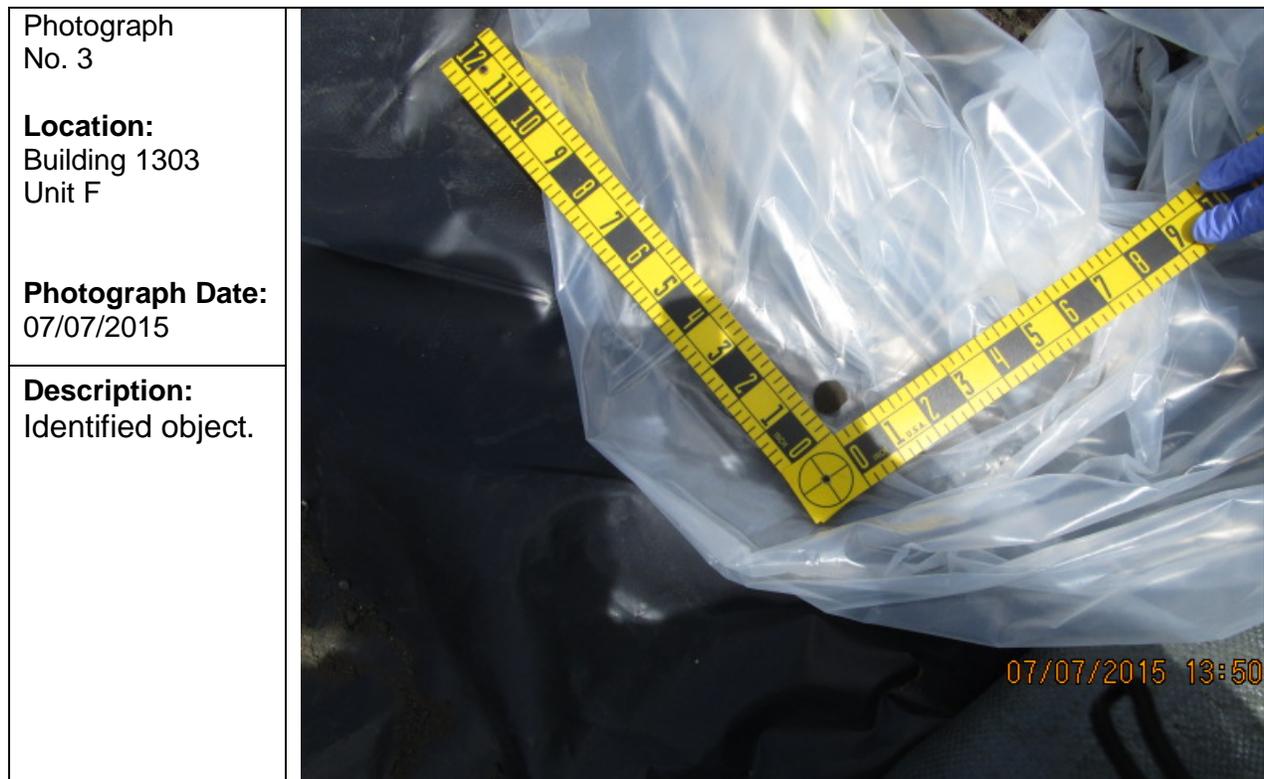


Photo Log: Investigation and Removal of Radiological Anomalies  
Former Naval Station Treasure Island Building 1303, Unit F

Photograph  
No. 5

**Location:**  
Building 1303  
Unit F

**Photograph Date:**  
07/30/2015

**Description:**  
Performing the  
final floor surface  
survey following  
the restoration of  
the excavation  
area.



**Attachment 3  
Sample Results**

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

TestAmerica Job ID: 160-12739-2

Client Project/Site: Treasure Island - 500191

For:

CB&I Environmental & Infrastructure, Inc  
4005 Port Chicago Hwy  
Concord, California 94520

Attn: Patricia Flynn



---

Authorized for release by:  
8/7/2015 10:56:24 AM

Erika Gish, Project Manager II  
(314)298-8566  
[erika.gish@testamericainc.com](mailto:erika.gish@testamericainc.com)

### LINKS

Review your project  
results through  
**TotalAccess**

Have a Question?



Visit us at:  
[www.testamericainc.com](http://www.testamericainc.com)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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Client Sample Results . . . . .	10
QC Sample Results . . . . .	12
QC Association Summary . . . . .	14

# Case Narrative

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12739-2

**Job ID: 160-12739-2**

**Laboratory: TestAmerica St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: CB&I Environmental & Infrastructure, Inc**

**Project: Treasure Island - 500191**

**Report Number: 160-12739-2**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup  
Method 3620C: Florisil Cleanup  
Method 3630C: Silica Gel Cleanup  
Method 3640A: Gel-Permeation Cleanup  
Method 3650B: Acid-Base Partition Cleanup  
Method 3660B: Sulfur Cleanup  
Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

## Case Narrative

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12739-2

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### Job ID: 160-12739-2 (Continued)

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#### Laboratory: TestAmerica St. Louis (Continued)

##### RECEIPT

The samples were received on 7/10/2015 8:40 AM; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 20.3° C.

##### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples TI-TO005-1240D\_ARDMEDIA-001 (160-12739-1), TI-TO005-1240D\_BENEATH-002 (160-12739-2), TI-TO005-1240D\_NORTH-003 (160-12739-3) and TI-TO005-1240D\_SOUTH-004 (160-12739-4) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 07/13/2015, prepared on 07/14/2015 and analyzed on 08/04/2015.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.



# Login Sample Receipt Checklist

Client: CB&I Environmental & Infrastructure, Inc

Job Number: 160-12739-2

**Login Number: 12739**

**List Number: 1**

**Creator: Clarke, Jill C**

**List Source: TestAmerica St. Louis**

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

# Definitions/Glossary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12739-2

## Qualifiers

### Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
▫	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

# Method Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12739-2

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Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL

---

**Protocol References:**

DOE = U.S. Department of Energy

**Laboratory References:**

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



# Sample Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12739-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-12739-1	TI-TO005-1240D_ARDMEDIA-001	Solid	07/07/15 07:40	07/10/15 08:40
160-12739-2	TI-TO005-1240D_BENEATH-002	Solid	07/07/15 09:21	07/10/15 08:40
160-12739-3	TI-TO005-1240D_NORTH-003	Solid	07/07/15 09:22	07/10/15 08:40
160-12739-4	TI-TO005-1240D_SOUTH-004	Solid	07/07/15 09:24	07/10/15 08:40

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# Client Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12739-2

**Client Sample ID: TI-TO005-1240D\_ARDMEDIA-001**

**Lab Sample ID: 160-12739-1**

Date Collected: 07/07/15 07:40

Matrix: Solid

Date Received: 07/10/15 08:40

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.366	U	0.303	0.305		0.611	pCi/g	07/14/15 15:37	08/04/15 13:29	1
Actinium-227	0.389	U	1.40	1.40		2.33	pCi/g	07/14/15 15:37	08/04/15 13:29	1
Bismuth-212	1.04	U	1.10	1.11		1.80	pCi/g	07/14/15 15:37	08/04/15 13:29	1
<b>Bismuth-214</b>	<b>26.2</b>		0.764	2.83		0.320	pCi/g	07/14/15 15:37	08/04/15 13:29	1
Cesium-137	-0.117	U	0.121	0.122		0.198	pCi/g	07/14/15 15:37	08/04/15 13:29	1
<b>Lead-210</b>	<b>7.51</b>		3.22	3.33		4.38	pCi/g	07/14/15 15:37	08/04/15 13:29	1
<b>Lead-212</b>	<b>0.512</b>		0.244	0.253		0.306	pCi/g	07/14/15 15:37	08/04/15 13:29	1
<b>Lead-214</b>	<b>27.5</b>		0.677	2.94		0.362	pCi/g	07/14/15 15:37	08/04/15 13:29	1
<b>Potassium-40</b>	<b>10.7</b>		1.92	2.21		1.47	pCi/g	07/14/15 15:37	08/04/15 13:29	1
Protactinium-231	0.00703	U	3.16	3.16		5.33	pCi/g	07/14/15 15:37	08/04/15 13:29	1
<b>Radium-226</b>	<b>26.2</b>		0.764	2.83	0.500	0.320	pCi/g	07/14/15 15:37	08/04/15 13:29	1
Radium-228	0.366	U	0.303	0.305		0.611	pCi/g	07/14/15 15:37	08/04/15 13:29	1
Thallium-208	0.0867	U	0.0790	0.0795		0.205	pCi/g	07/14/15 15:37	08/04/15 13:29	1
<b>Thorium-228</b>	<b>0.512</b>		0.244	0.253		0.306	pCi/g	07/14/15 15:37	08/04/15 13:29	1
Thorium-232	0.366	U	0.303	0.305		0.611	pCi/g	07/14/15 15:37	08/04/15 13:29	1
Thorium-234	0.940	U	3.15	3.15		5.25	pCi/g	07/14/15 15:37	08/04/15 13:29	1
Uranium-235	0.374	U	0.792	0.793		1.29	pCi/g	07/14/15 15:37	08/04/15 13:29	1
Uranium-238	0.940	U	3.15	3.15		5.25	pCi/g	07/14/15 15:37	08/04/15 13:29	1

**Client Sample ID: TI-TO005-1240D\_BENEATH-002**

**Lab Sample ID: 160-12739-2**

Date Collected: 07/07/15 09:21

Matrix: Solid

Date Received: 07/10/15 08:40

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.392</b>		0.148	0.153		0.265	pCi/g	07/14/15 15:37	08/04/15 14:00	1
Actinium-227	0.212	U	0.438	0.439		1.08	pCi/g	07/14/15 15:37	08/04/15 14:00	1
Bismuth-212	0.389	U	0.500	0.502		0.826	pCi/g	07/14/15 15:37	08/04/15 14:00	1
<b>Bismuth-214</b>	<b>3.79</b>		0.252	0.467		0.117	pCi/g	07/14/15 15:37	08/04/15 14:00	1
Cesium-137	-0.0198	U	0.0511	0.0511		0.0871	pCi/g	07/14/15 15:37	08/04/15 14:00	1
Lead-210	1.15	U	1.37	1.38		2.25	pCi/g	07/14/15 15:37	08/04/15 14:00	1
<b>Lead-212</b>	<b>0.423</b>		0.105	0.118		0.118	pCi/g	07/14/15 15:37	08/04/15 14:00	1
<b>Lead-214</b>	<b>4.15</b>		0.237	0.491		0.136	pCi/g	07/14/15 15:37	08/04/15 14:00	1
<b>Potassium-40</b>	<b>9.19</b>		1.08	1.43		0.488	pCi/g	07/14/15 15:37	08/04/15 14:00	1
Protactinium-231	0.565	U	1.22	1.22		2.05	pCi/g	07/14/15 15:37	08/04/15 14:00	1
<b>Radium-226</b>	<b>3.79</b>		0.252	0.467	0.500	0.117	pCi/g	07/14/15 15:37	08/04/15 14:00	1
<b>Radium-228</b>	<b>0.392</b>		0.148	0.153		0.265	pCi/g	07/14/15 15:37	08/04/15 14:00	1
<b>Thallium-208</b>	<b>0.131</b>		0.0437	0.0457		0.0486	pCi/g	07/14/15 15:37	08/04/15 14:00	1
<b>Thorium-228</b>	<b>0.423</b>		0.105	0.118		0.118	pCi/g	07/14/15 15:37	08/04/15 14:00	1
<b>Thorium-232</b>	<b>0.392</b>		0.148	0.153		0.265	pCi/g	07/14/15 15:37	08/04/15 14:00	1
Thorium-234	0.392	U	1.27	1.27		2.13	pCi/g	07/14/15 15:37	08/04/15 14:00	1
Uranium-235	0.107	U	0.296	0.296		0.517	pCi/g	07/14/15 15:37	08/04/15 14:00	1
Uranium-238	0.392	U	1.27	1.27		2.13	pCi/g	07/14/15 15:37	08/04/15 14:00	1

TestAmerica St. Louis

# Client Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12739-2

**Client Sample ID: TI-TO005-1240D\_NORTH-003**

**Lab Sample ID: 160-12739-3**

Date Collected: 07/07/15 09:22

Matrix: Solid

Date Received: 07/10/15 08:40

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.499</b>		0.196	0.203		0.218	pCi/g	07/14/15 15:37	08/04/15 14:01	1
Actinium-227	0.155	U	0.394	0.395		0.681	pCi/g	07/14/15 15:37	08/04/15 14:01	1
Bismuth-212	0.424	U	0.535	0.537		0.878	pCi/g	07/14/15 15:37	08/04/15 14:01	1
<b>Bismuth-214</b>	<b>0.654</b>		0.180	0.192		0.169	pCi/g	07/14/15 15:37	08/04/15 14:01	1
Cesium-137	0.0258	U	0.0479	0.0480		0.0819	pCi/g	07/14/15 15:37	08/04/15 14:01	1
Lead-210	1.18	U	1.22	1.23		1.96	pCi/g	07/14/15 15:37	08/04/15 14:01	1
<b>Lead-212</b>	<b>0.580</b>		0.145	0.163		0.144	pCi/g	07/14/15 15:37	08/04/15 14:01	1
<b>Lead-214</b>	<b>0.600</b>		0.138	0.152		0.117	pCi/g	07/14/15 15:37	08/04/15 14:01	1
<b>Potassium-40</b>	<b>8.45</b>		1.32	1.58		0.380	pCi/g	07/14/15 15:37	08/04/15 14:01	1
Protactinium-231	0.512	U	0.437	0.440		1.92	pCi/g	07/14/15 15:37	08/04/15 14:01	1
<b>Radium-226</b>	<b>0.654</b>		0.180	0.192	0.500	0.169	pCi/g	07/14/15 15:37	08/04/15 14:01	1
<b>Radium-228</b>	<b>0.499</b>		0.196	0.203		0.218	pCi/g	07/14/15 15:37	08/04/15 14:01	1
<b>Thallium-208</b>	<b>0.182</b>		0.0641	0.0668		0.0829	pCi/g	07/14/15 15:37	08/04/15 14:01	1
<b>Thorium-228</b>	<b>0.580</b>		0.145	0.163		0.144	pCi/g	07/14/15 15:37	08/04/15 14:01	1
<b>Thorium-232</b>	<b>0.499</b>		0.196	0.203		0.218	pCi/g	07/14/15 15:37	08/04/15 14:01	1
Thorium-234	1.24	U	0.643	0.656		1.73	pCi/g	07/14/15 15:37	08/04/15 14:01	1
Uranium-235	0.243	U	0.239	0.241		0.328	pCi/g	07/14/15 15:37	08/04/15 14:01	1
Uranium-238	1.24	U	0.643	0.656		1.73	pCi/g	07/14/15 15:37	08/04/15 14:01	1

**Client Sample ID: TI-TO005-1240D\_SOUTH-004**

**Lab Sample ID: 160-12739-4**

Date Collected: 07/07/15 09:24

Matrix: Solid

Date Received: 07/10/15 08:40

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.600</b>		0.175	0.185		0.152	pCi/g	07/14/15 15:37	08/04/15 14:02	1
Actinium-227	-0.0235	U	0.524	0.524		0.914	pCi/g	07/14/15 15:37	08/04/15 14:02	1
<b>Bismuth-212</b>	<b>1.05</b>		0.455	0.468		0.379	pCi/g	07/14/15 15:37	08/04/15 14:02	1
<b>Bismuth-214</b>	<b>0.439</b>		0.118	0.126		0.116	pCi/g	07/14/15 15:37	08/04/15 14:02	1
Cesium-137	0.0103	U	0.0422	0.0422		0.0752	pCi/g	07/14/15 15:37	08/04/15 14:02	1
Lead-210	1.65	U	1.51	1.52		2.02	pCi/g	07/14/15 15:37	08/04/15 14:02	1
<b>Lead-212</b>	<b>0.553</b>		0.120	0.140		0.124	pCi/g	07/14/15 15:37	08/04/15 14:02	1
<b>Lead-214</b>	<b>0.612</b>		0.128	0.143		0.113	pCi/g	07/14/15 15:37	08/04/15 14:02	1
<b>Potassium-40</b>	<b>8.55</b>		1.28	1.55		0.882	pCi/g	07/14/15 15:37	08/04/15 14:02	1
Protactinium-231	0.0435	U	0.0878	0.0880		1.79	pCi/g	07/14/15 15:37	08/04/15 14:02	1
<b>Radium-226</b>	<b>0.439</b>		0.118	0.126	0.500	0.116	pCi/g	07/14/15 15:37	08/04/15 14:02	1
<b>Radium-228</b>	<b>0.600</b>		0.175	0.185		0.152	pCi/g	07/14/15 15:37	08/04/15 14:02	1
<b>Thallium-208</b>	<b>0.198</b>		0.0531	0.0569		0.0477	pCi/g	07/14/15 15:37	08/04/15 14:02	1
<b>Thorium-228</b>	<b>0.553</b>		0.120	0.140		0.124	pCi/g	07/14/15 15:37	08/04/15 14:02	1
<b>Thorium-232</b>	<b>0.600</b>		0.175	0.185		0.152	pCi/g	07/14/15 15:37	08/04/15 14:02	1
Thorium-234	1.07	U	1.01	1.02		1.71	pCi/g	07/14/15 15:37	08/04/15 14:02	1
Uranium-235	0.141	U	0.171	0.172		0.406	pCi/g	07/14/15 15:37	08/04/15 14:02	1
Uranium-238	1.07	U	1.01	1.02		1.71	pCi/g	07/14/15 15:37	08/04/15 14:02	1

TestAmerica St. Louis

# QC Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12739-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

**Lab Sample ID: MB 160-200049/1-A**  
**Matrix: Solid**  
**Analysis Batch: 203804**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 200049**

Analyte	MB MB		Count	Total	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.01346	U	0.0681	0.0681		0.111	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Actinium-227	-0.02746	U	0.335	0.335		0.615	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Bismuth-212	0.1826	U	0.345	0.346		0.608	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Bismuth-214	-0.03040	U	0.172	0.172		0.173	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Cesium-137	0.001345	U	0.0383	0.0383		0.0736	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Lead-210	-0.009132	U	0.809	0.809		1.66	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Lead-212	0.02815	U	0.0522	0.0524		0.0992	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Lead-214	-0.01611	U	0.120	0.120		0.130	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Potassium-40	-0.1989	U	1.35	1.35		1.29	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Protactinium-231	0.04429	U	0.122	0.122		1.63	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Radium-226	-0.03040	U	0.172	0.172	0.500	0.173	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Radium-228	0.01346	U	0.0681	0.0681		0.111	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Thallium-208	0.01254	U	0.0552	0.0552		0.0775	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Thorium-228	0.02815	U	0.0522	0.0524		0.0992	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Thorium-232	0.01346	U	0.0681	0.0681		0.111	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Thorium-234	-0.02387	U	0.0621	0.0621		1.41	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Uranium-235	0.05676	U	0.132	0.132		0.233	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Uranium-238	-0.02387	U	0.0621	0.0621		1.41	pCi/g	07/14/15 15:37	08/04/15 12:46	1

**Lab Sample ID: LCS 160-200049/2-A**  
**Matrix: Solid**  
**Analysis Batch: 203805**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 200049**

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	MDC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium-241	97.3	102.4		10.8		1.21	pCi/g	105	87 - 116
Cesium-137	30.2	31.83		3.43		0.335	pCi/g	105	87 - 120
Cobalt-60	19.2	19.43		2.03		0.175	pCi/g	101	87 - 115

**Lab Sample ID: 160-12735-A-1-E DU**  
**Matrix: Solid**  
**Analysis Batch: 203807**

**Client Sample ID: Duplicate**  
**Prep Type: Total/NA**  
**Prep Batch: 200049**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total	LOQ	MDC	Unit	RER	RER
					Uncert. (2σ+/-)					Limit
Actinium 228	0.349		0.3566		0.147		0.105	pCi/g	0.03	1
Actinium-227	-0.148	U	0.1640	U	0.312		0.988	pCi/g	0.46	1
Bismuth-212	0.252	U	0.1698	U	0.529		0.944	pCi/g	0.08	1
Bismuth-214	0.404		0.4429		0.131		0.0931	pCi/g	0.17	1
Cesium-137	0.000	U	-0.01119	U	0.112		0.0995	pCi/g	0.09	1
Lead-210	0.487	U	-0.1878	U	1.18		2.05	pCi/g	0.33	1
Lead-212	0.483		0.4499		0.115		0.0965	pCi/g	0.14	1
Lead-214	0.456		0.4474		0.107		0.0565	pCi/g	0.04	1
Potassium-40	10.1		9.862		1.84		0.727	pCi/g	0.07	1
Protactinium-231	0.124	U	0.4172	U	0.477		1.27	pCi/g	0.41	1
Radium-226	0.404		0.4429		0.131	0.500	0.0931	pCi/g	0.17	1
Radium-228	0.349		0.3566		0.147		0.105	pCi/g	0.03	1

TestAmerica St. Louis

# QC Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12739-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-12735-A-1-E DU  
 Matrix: Solid  
 Analysis Batch: 203807

Client Sample ID: Duplicate  
 Prep Type: Total/NA  
 Prep Batch: 200049

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	RER	RER Limit
Thallium-208	0.170		0.1604		0.0565		0.0499	pCi/g	0.08	1
Thorium-228	0.483		0.4499		0.115		0.0965	pCi/g	0.14	1
Thorium-232	0.349		0.3566		0.147		0.105	pCi/g	0.03	1
Thorium-234	-0.0320	U	0.3052	U	0.334		1.89	pCi/g	0.72	1
Uranium-235	0.0687	U	-0.01778	U	0.0348		0.370	pCi/g	0.56	1
Uranium-238	-0.0320	U	0.3052	U	0.334		1.89	pCi/g	0.72	1

# QC Association Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12739-2

## Rad

### Leach Batch: 199799

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-12735-A-1-E DU	Duplicate	Total/NA	Solid	Dry and Grind	
160-12739-1	TI-TO005-1240D_ARDMEDIA-001	Total/NA	Solid	Dry and Grind	
160-12739-2	TI-TO005-1240D_BENEATH-002	Total/NA	Solid	Dry and Grind	
160-12739-3	TI-TO005-1240D_NORTH-003	Total/NA	Solid	Dry and Grind	
160-12739-4	TI-TO005-1240D_SOUTH-004	Total/NA	Solid	Dry and Grind	

### Prep Batch: 200049

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-12735-A-1-E DU	Duplicate	Total/NA	Solid	Fill_Geo-21	199799
160-12739-1	TI-TO005-1240D_ARDMEDIA-001	Total/NA	Solid	Fill_Geo-21	199799
160-12739-2	TI-TO005-1240D_BENEATH-002	Total/NA	Solid	Fill_Geo-21	199799
160-12739-3	TI-TO005-1240D_NORTH-003	Total/NA	Solid	Fill_Geo-21	199799
160-12739-4	TI-TO005-1240D_SOUTH-004	Total/NA	Solid	Fill_Geo-21	199799
LCS 160-200049/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-200049/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

TestAmerica Job ID: 160-13117-2

Client Project/Site: Treasure Island - 500191

For:

CB&I Environmental & Infrastructure, Inc  
4005 Port Chicago Hwy  
Concord, California 94520

Attn: Patricia Flynn



---

Authorized for release by:  
9/2/2015 4:20:43 PM

Erika Gish, Project Manager II  
(314)298-8566  
[erika.gish@testamericainc.com](mailto:erika.gish@testamericainc.com)

### LINKS

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*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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# Case Narrative

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13117-2

**Job ID: 160-13117-2**

**Laboratory: TestAmerica St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: CB&I Environmental & Infrastructure, Inc**

**Project: Treasure Island - 500191**

**Report Number: 160-13117-2**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup  
Method 3620C: Florisil Cleanup  
Method 3630C: Silica Gel Cleanup  
Method 3640A: Gel-Permeation Cleanup  
Method 3650B: Acid-Base Partition Cleanup  
Method 3660B: Sulfur Cleanup  
Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

## Case Narrative

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13117-2

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### Job ID: 160-13117-2 (Continued)

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#### Laboratory: TestAmerica St. Louis (Continued)

##### RECEIPT

The sample was received on 8/3/2015 8:40 AM; the sample arrived in good condition, properly preserved. The temperature of the cooler at receipt was 22.0° C.

##### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Sample TI-TO005-1240D\_BENEATH-005 (160-13117-1) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 08/04/2015, prepared on 08/05/2015 and analyzed on 08/27/2015.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.



# Login Sample Receipt Checklist

Client: CB&I Environmental & Infrastructure, Inc

Job Number: 160-13117-2

**Login Number: 13117**

**List Number: 1**

**Creator: Clarke, Jill C**

**List Source: TestAmerica St. Louis**

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

# Definitions/Glossary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13117-2

## Qualifiers

### Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
▫	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

# Method Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13117-2

Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL

**Protocol References:**

DOE = U.S. Department of Energy

**Laboratory References:**

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



# Sample Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13117-2

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Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-13117-1	TI-TO005-1240D_BENEATH-005	Solid	07/30/15 10:34	08/03/15 08:40

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# Client Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13117-2

**Client Sample ID: TI-TO005-1240D\_BENEATH-005**

**Lab Sample ID: 160-13117-1**

**Date Collected: 07/30/15 10:34**

**Matrix: Solid**

**Date Received: 08/03/15 08:40**

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.287	U	0.163	0.166		0.309	pCi/g	08/05/15 17:23	08/27/15 19:41	1
Actinium-227	0.101	U	0.522	0.522		0.907	pCi/g	08/05/15 17:23	08/27/15 19:41	1
Bismuth-212	0.0956	U	0.622	0.622		1.13	pCi/g	08/05/15 17:23	08/27/15 19:41	1
<b>Bismuth-214</b>	<b>0.438</b>		0.127	0.134		0.102	pCi/g	08/05/15 17:23	08/27/15 19:41	1
Cesium-137	0.000588	U	0.0448	0.0448		0.0916	pCi/g	08/05/15 17:23	08/27/15 19:41	1
Lead-210	0.387	U	1.06	1.06		1.82	pCi/g	08/05/15 17:23	08/27/15 19:41	1
<b>Lead-212</b>	<b>0.430</b>		0.0914	0.107		0.0819	pCi/g	08/05/15 17:23	08/27/15 19:41	1
<b>Lead-214</b>	<b>0.447</b>		0.125	0.134		0.148	pCi/g	08/05/15 17:23	08/27/15 19:41	1
<b>Potassium-40</b>	<b>10.5</b>		1.63	1.95		0.724	pCi/g	08/05/15 17:23	08/27/15 19:41	1
Protactinium-231	0.210	U	0.305	0.306		2.01	pCi/g	08/05/15 17:23	08/27/15 19:41	1
<b>Radium-226</b>	<b>0.438</b>		0.127	0.134	0.500	0.102	pCi/g	08/05/15 17:23	08/27/15 19:41	1
Radium-228	0.287	U	0.163	0.166		0.309	pCi/g	08/05/15 17:23	08/27/15 19:41	1
<b>Thallium-208</b>	<b>0.205</b>		0.0718	0.0749		0.0686	pCi/g	08/05/15 17:23	08/27/15 19:41	1
<b>Thorium-228</b>	<b>0.430</b>		0.0914	0.107		0.0819	pCi/g	08/05/15 17:23	08/27/15 19:41	1
Thorium-232	0.287	U	0.163	0.166		0.309	pCi/g	08/05/15 17:23	08/27/15 19:41	1
Thorium-234	1.38	U	0.979	0.989		1.64	pCi/g	08/05/15 17:23	08/27/15 19:41	1
Uranium-235	0.150	U	0.174	0.175		0.281	pCi/g	08/05/15 17:23	08/27/15 19:41	1
Uranium-238	1.38	U	0.979	0.989		1.64	pCi/g	08/05/15 17:23	08/27/15 19:41	1

# QC Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13117-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

**Lab Sample ID: MB 160-204193/1-A**  
**Matrix: Solid**  
**Analysis Batch: 208135**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 204193**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.09933	U	0.106	0.106		0.188	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Actinium-227	0.06181	U	0.310	0.310		0.563	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Bismuth-212	-0.1857	U	0.557	0.557		0.994	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Bismuth-214	-0.01347	U	0.0799	0.0799		0.157	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Cesium-137	0.002012	U	0.0375	0.0375		0.0719	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Lead-210	-0.06968	U	0.865	0.865		1.64	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Lead-212	-0.02218	U	0.155	0.155		0.118	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Lead-214	-0.05641	U	3.13	3.13		0.150	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Potassium-40	-0.1055	U	0.807	0.807		1.31	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Protactinium-231	0.2018	U	0.518	0.519		1.43	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Radium-226	-0.01347	U	0.0799	0.0799	0.500	0.157	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Radium-228	0.09933	U	0.106	0.106		0.188	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Thallium-208	0.01546	U	0.0171	0.0172		0.0770	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Thorium-228	-0.02218	U	0.155	0.155		0.118	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Thorium-232	0.09933	U	0.106	0.106		0.188	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Thorium-234	-0.5948	U	7.94	7.94		1.33	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Uranium-235	-0.01078	U	0.117	0.117		0.219	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Uranium-238	-0.5948	U	7.94	7.94		1.33	pCi/g	08/05/15 17:23	08/27/15 18:34	1

**Lab Sample ID: LCS 160-204193/2-A**  
**Matrix: Solid**  
**Analysis Batch: 208136**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 204193**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	%Rec	%Rec. Limits
Americium-241	97.3	99.66		10.5		1.33	pCi/g	102	87 - 116
Cesium-137	30.2	30.23		3.26		0.311	pCi/g	100	87 - 120
Cobalt-60	19.0	19.71		2.06		0.123	pCi/g	104	87 - 115

**Lab Sample ID: 160-13132-A-1-E DU**  
**Matrix: Solid**  
**Analysis Batch: 208143**

**Client Sample ID: Duplicate**  
**Prep Type: Total/NA**  
**Prep Batch: 204193**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	RER	RER Limit
Actinium 228	0.678		0.4123		0.165		0.288	pCi/g	0.77	1
Actinium-227	0.257	U	0.3885	U	0.457		0.744	pCi/g	0.17	1
Bismuth-212	0.518	U	-0.00050	U	0.504		0.958	pCi/g	0.49	1
Bismuth-214	0.703		0.6292		0.159		0.118	pCi/g	0.22	1
Cesium-137	-0.00364	U	-0.00039	U	0.0472		0.0880	pCi/g	0.04	1
Lead-210	0.615	U	0.8376	U	1.14		1.72	pCi/g	0.10	1
Lead-212	0.453		0.4346		0.120		0.105	pCi/g	0.07	1
Lead-214	0.609		0.4864		0.132		0.167	pCi/g	0.43	1
Potassium-40	11.6		11.41		2.07		1.08	pCi/g	0.05	1
Protactinium-231	-0.00952	U	-0.04757	U	0.780		1.44	pCi/g	0.05	1
Radium-226	0.703		0.6292		0.159	0.500	0.118	pCi/g	0.22	1

TestAmerica St. Louis

# QC Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13117-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-13132-A-1-E DU  
 Matrix: Solid  
 Analysis Batch: 208143

Client Sample ID: Duplicate  
 Prep Type: Total/NA  
 Prep Batch: 204193

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	RER	RER Limit
Radium-228	0.678		0.4123		0.165		0.288	pCi/g	0.77	1
Thallium-208	0.126		0.1730		0.0677		0.0644	pCi/g	0.38	1
Thorium-228	0.453		0.4346		0.120		0.105	pCi/g	0.07	1
Thorium-232	0.678		0.4123		0.165		0.288	pCi/g	0.77	1
Thorium-234	0.0862	U	0.8703	U	0.556		1.43	pCi/g	0.72	1
Uranium-235	0.150	U	0.1458	U	0.206		0.343	pCi/g	0.01	1
Uranium-238	0.0862	U	0.8703	U	0.556		1.43	pCi/g	0.72	1



# QC Association Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13117-2

## Rad

### Leach Batch: 203831

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-13117-1	TI-TO005-1240D_BENEATH-005	Total/NA	Solid	Dry and Grind	

### Leach Batch: 203861

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-13132-A-1-E DU	Duplicate	Total/NA	Solid	Dry and Grind	

### Prep Batch: 204193

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-13117-1	TI-TO005-1240D_BENEATH-005	Total/NA	Solid	Fill_Geo-21	203831
160-13132-A-1-E DU	Duplicate	Total/NA	Solid	Fill_Geo-21	203861
LCS 160-204193/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-204193/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

TestAmerica Job ID: 160-12738-2

Client Project/Site: Treasure Island - 500191

For:

CB&I Environmental & Infrastructure, Inc  
4005 Port Chicago Hwy  
Concord, California 94520

Attn: Patricia Flynn



---

Authorized for release by:  
8/7/2015 10:54:29 AM

Erika Gish, Project Manager II  
(314)298-8566  
[erika.gish@testamericainc.com](mailto:erika.gish@testamericainc.com)

### LINKS

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[www.testamericainc.com](http://www.testamericainc.com)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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# Case Narrative

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12738-2

**Job ID: 160-12738-2**

**Laboratory: TestAmerica St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: CB&I Environmental & Infrastructure, Inc**

**Project: Treasure Island - 500191**

**Report Number: 160-12738-2**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup  
Method 3620C: Florisil Cleanup  
Method 3630C: Silica Gel Cleanup  
Method 3640A: Gel-Permeation Cleanup  
Method 3650B: Acid-Base Partition Cleanup  
Method 3660B: Sulfur Cleanup  
Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

## Case Narrative

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12738-2

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### Job ID: 160-12738-2 (Continued)

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#### Laboratory: TestAmerica St. Louis (Continued)

##### RECEIPT

The samples were received on 7/10/2015 8:40 AM; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 20.3° C.

##### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples TI-TO005-1303F\_ARMEDIA-001 (160-12738-1), TI-TO005-1303F\_BENEATH-002 (160-12738-2), TI-TO005-1303F\_NORTH-003 (160-12738-3) and TI-TO005-1303F\_SOUTH-004 (160-12738-4) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 07/13/2015, prepared on 07/14/2015 and analyzed on 08/04/2015.

The detection goal for radium-226, analyzed by gamma spectroscopy, was not met for the following sample due to high activity: TI-TO005-1303F\_ARMEDIA-001 (160-12738-1). Analytical results are reported with the detection limit achieved.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.



## Login Sample Receipt Checklist

Client: CB&I Environmental & Infrastructure, Inc

Job Number: 160-12738-2

**Login Number: 12738**

**List Number: 1**

**Creator: Clarke, Jill C**

**List Source: TestAmerica St. Louis**

Question	Answer	Comment
Radioactivity wasn't checked or is <math>\leq</math> background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



# Definitions/Glossary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12738-2

## Qualifiers

### Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
▫	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

# Method Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12738-2

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Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL

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**Protocol References:**

DOE = U.S. Department of Energy

**Laboratory References:**

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



# Sample Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12738-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-12738-1	TI-TO005-1303F_ARMEDIA-001	Solid	07/08/15 13:45	07/10/15 08:40
160-12738-2	TI-TO005-1303F_BENEATH-002	Solid	07/08/15 13:52	07/10/15 08:40
160-12738-3	TI-TO005-1303F_NORTH-003	Solid	07/08/15 14:05	07/10/15 08:40
160-12738-4	TI-TO005-1303F_SOUTH-004	Solid	07/08/15 14:17	07/10/15 08:40



# Client Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12738-2

**Client Sample ID: TI-TO005-1303F\_ARMEDIA-001**

**Lab Sample ID: 160-12738-1**

**Date Collected: 07/08/15 13:45**

**Matrix: Solid**

**Date Received: 07/10/15 08:40**

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.440	U	0.654	0.655		1.42	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Actinium-227	-1.55	U	3.32	3.32		5.49	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Bismuth-212	-0.171	U	2.66	2.66		4.46	pCi/g	07/14/15 15:37	08/04/15 13:28	1
<b>Bismuth-214</b>	<b>122</b>		1.71	12.8		0.757	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Cesium-137	-0.0640	U	0.145	0.145		0.242	pCi/g	07/14/15 15:37	08/04/15 13:28	1
<b>Lead-210</b>	<b>149</b>		10.9	20.7		11.8	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Lead-212	0.622	U	0.535	0.541		0.667	pCi/g	07/14/15 15:37	08/04/15 13:28	1
<b>Lead-214</b>	<b>130</b>		1.57	13.6		0.993	pCi/g	07/14/15 15:37	08/04/15 13:28	1
<b>Potassium-40</b>	<b>11.1</b>		4.17	4.32		3.80	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Protactinium-231	1.02	U	2.72	2.73		7.61	pCi/g	07/14/15 15:37	08/04/15 13:28	1
<b>Radium-226</b>	<b>122</b>		1.71	12.8	0.500	0.757	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Radium-228	0.440	U	0.654	0.655		1.42	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Thallium-208	-0.0218	U	1.96	1.96		0.415	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Thorium-228	0.622	U	0.535	0.541		0.667	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Thorium-232	0.440	U	0.654	0.655		1.42	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Thorium-234	-3.75	U	10.5	10.5		12.6	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Uranium-235	-0.637	U	1.99	1.99		2.89	pCi/g	07/14/15 15:37	08/04/15 13:28	1
Uranium-238	-3.75	U	10.5	10.5		12.6	pCi/g	07/14/15 15:37	08/04/15 13:28	1

**Client Sample ID: TI-TO005-1303F\_BENEATH-002**

**Lab Sample ID: 160-12738-2**

**Date Collected: 07/08/15 13:52**

**Matrix: Solid**

**Date Received: 07/10/15 08:40**

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.235	U	0.133	0.136		0.261	pCi/g	07/14/15 15:37	08/04/15 13:32	1
Actinium-227	-0.149	U	0.372	0.373		0.639	pCi/g	07/14/15 15:37	08/04/15 13:32	1
Bismuth-212	-0.00575	U	0.479	0.479		0.835	pCi/g	07/14/15 15:37	08/04/15 13:32	1
<b>Bismuth-214</b>	<b>0.366</b>		0.104	0.111		0.104	pCi/g	07/14/15 15:37	08/04/15 13:32	1
Cesium-137	-0.00905	U	0.0407	0.0407		0.0735	pCi/g	07/14/15 15:37	08/04/15 13:32	1
Lead-210	0.190	U	0.812	0.813		1.45	pCi/g	07/14/15 15:37	08/04/15 13:32	1
<b>Lead-212</b>	<b>0.281</b>		0.0780	0.0860		0.0995	pCi/g	07/14/15 15:37	08/04/15 13:32	1
<b>Lead-214</b>	<b>0.340</b>		0.0945	0.101		0.133	pCi/g	07/14/15 15:37	08/04/15 13:32	1
<b>Potassium-40</b>	<b>7.44</b>		1.24	1.46		0.616	pCi/g	07/14/15 15:37	08/04/15 13:32	1
Protactinium-231	0.179	U	0.334	0.335		1.43	pCi/g	07/14/15 15:37	08/04/15 13:32	1
<b>Radium-226</b>	<b>0.366</b>		0.104	0.111	0.500	0.104	pCi/g	07/14/15 15:37	08/04/15 13:32	1
Radium-228	0.235	U	0.133	0.136		0.261	pCi/g	07/14/15 15:37	08/04/15 13:32	1
<b>Thallium-208</b>	<b>0.156</b>		0.0521	0.0546		0.0467	pCi/g	07/14/15 15:37	08/04/15 13:32	1
<b>Thorium-228</b>	<b>0.281</b>		0.0780	0.0860		0.0995	pCi/g	07/14/15 15:37	08/04/15 13:32	1
Thorium-232	0.235	U	0.133	0.136		0.261	pCi/g	07/14/15 15:37	08/04/15 13:32	1
Thorium-234	0.170	U	0.406	0.406		1.55	pCi/g	07/14/15 15:37	08/04/15 13:32	1
Uranium-235	0.119	U	0.111	0.111		0.367	pCi/g	07/14/15 15:37	08/04/15 13:32	1
Uranium-238	0.170	U	0.406	0.406		1.55	pCi/g	07/14/15 15:37	08/04/15 13:32	1

TestAmerica St. Louis

# Client Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12738-2

**Client Sample ID: TI-TO005-1303F\_NORTH-003**

**Lab Sample ID: 160-12738-3**

Date Collected: 07/08/15 14:05

Matrix: Solid

Date Received: 07/10/15 08:40

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.530</b>		0.220	0.227		0.177	pCi/g	07/14/15 15:37	08/04/15 13:31	1
Actinium-227	-0.0172	U	0.0882	0.0882		1.07	pCi/g	07/14/15 15:37	08/04/15 13:31	1
Bismuth-212	0.602	U	0.625	0.628		0.995	pCi/g	07/14/15 15:37	08/04/15 13:31	1
<b>Bismuth-214</b>	<b>1.11</b>		0.208	0.237		0.164	pCi/g	07/14/15 15:37	08/04/15 13:31	1
Cesium-137	-0.0195	U	0.0544	0.0544		0.0953	pCi/g	07/14/15 15:37	08/04/15 13:31	1
Lead-210	0.523	U	1.27	1.27		2.27	pCi/g	07/14/15 15:37	08/04/15 13:31	1
<b>Lead-212</b>	<b>0.297</b>		0.117	0.123		0.144	pCi/g	07/14/15 15:37	08/04/15 13:31	1
<b>Lead-214</b>	<b>1.16</b>		0.187	0.222		0.131	pCi/g	07/14/15 15:37	08/04/15 13:31	1
<b>Potassium-40</b>	<b>10.1</b>		1.58	1.89		0.645	pCi/g	07/14/15 15:37	08/04/15 13:31	1
Protactinium-231	-0.233	U	1.00	1.00		1.77	pCi/g	07/14/15 15:37	08/04/15 13:31	1
<b>Radium-226</b>	<b>1.11</b>		0.208	0.237	0.500	0.164	pCi/g	07/14/15 15:37	08/04/15 13:31	1
<b>Radium-228</b>	<b>0.530</b>		0.220	0.227		0.177	pCi/g	07/14/15 15:37	08/04/15 13:31	1
<b>Thallium-208</b>	<b>0.114</b>		0.0691	0.0701		0.106	pCi/g	07/14/15 15:37	08/04/15 13:31	1
<b>Thorium-228</b>	<b>0.297</b>		0.117	0.123		0.144	pCi/g	07/14/15 15:37	08/04/15 13:31	1
<b>Thorium-232</b>	<b>0.530</b>		0.220	0.227		0.177	pCi/g	07/14/15 15:37	08/04/15 13:31	1
Thorium-234	0.138	U	0.344	0.345		1.98	pCi/g	07/14/15 15:37	08/04/15 13:31	1
Uranium-235	0.155	U	0.237	0.237		0.443	pCi/g	07/14/15 15:37	08/04/15 13:31	1
Uranium-238	0.138	U	0.344	0.345		1.98	pCi/g	07/14/15 15:37	08/04/15 13:31	1

**Client Sample ID: TI-TO005-1303F\_SOUTH-004**

**Lab Sample ID: 160-12738-4**

Date Collected: 07/08/15 14:17

Matrix: Solid

Date Received: 07/10/15 08:40

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
<b>Actinium 228</b>	<b>0.758</b>		0.203	0.218		0.135	pCi/g	07/14/15 15:37	08/04/15 13:30	1
Actinium-227	-0.0235	U	0.512	0.512		0.889	pCi/g	07/14/15 15:37	08/04/15 13:30	1
Bismuth-212	0.363	U	0.503	0.504		0.835	pCi/g	07/14/15 15:37	08/04/15 13:30	1
<b>Bismuth-214</b>	<b>0.611</b>		0.158	0.170		0.145	pCi/g	07/14/15 15:37	08/04/15 13:30	1
Cesium-137	-0.00123	U	0.0365	0.0365		0.0676	pCi/g	07/14/15 15:37	08/04/15 13:30	1
Lead-210	1.27	U	1.21	1.21		1.83	pCi/g	07/14/15 15:37	08/04/15 13:30	1
<b>Lead-212</b>	<b>0.576</b>		0.121	0.142		0.117	pCi/g	07/14/15 15:37	08/04/15 13:30	1
<b>Lead-214</b>	<b>0.680</b>		0.127	0.145		0.122	pCi/g	07/14/15 15:37	08/04/15 13:30	1
<b>Potassium-40</b>	<b>9.63</b>		1.30	1.63		0.753	pCi/g	07/14/15 15:37	08/04/15 13:30	1
Protactinium-231	0.00546	U	0.784	0.784		1.42	pCi/g	07/14/15 15:37	08/04/15 13:30	1
<b>Radium-226</b>	<b>0.611</b>		0.158	0.170	0.500	0.145	pCi/g	07/14/15 15:37	08/04/15 13:30	1
<b>Radium-228</b>	<b>0.758</b>		0.203	0.218		0.135	pCi/g	07/14/15 15:37	08/04/15 13:30	1
<b>Thallium-208</b>	<b>0.168</b>		0.0548	0.0575		0.0551	pCi/g	07/14/15 15:37	08/04/15 13:30	1
<b>Thorium-228</b>	<b>0.576</b>		0.121	0.142		0.117	pCi/g	07/14/15 15:37	08/04/15 13:30	1
<b>Thorium-232</b>	<b>0.758</b>		0.203	0.218		0.135	pCi/g	07/14/15 15:37	08/04/15 13:30	1
Thorium-234	1.05	U	0.819	0.826		1.38	pCi/g	07/14/15 15:37	08/04/15 13:30	1
Uranium-235	0.142	U	0.241	0.242		0.403	pCi/g	07/14/15 15:37	08/04/15 13:30	1
Uranium-238	1.05	U	0.819	0.826		1.38	pCi/g	07/14/15 15:37	08/04/15 13:30	1

TestAmerica St. Louis

# QC Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12738-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

**Lab Sample ID: MB 160-200049/1-A**  
**Matrix: Solid**  
**Analysis Batch: 203804**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 200049**

Analyte	MB MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Actinium 228	0.01346	U	0.0681	0.0681		0.111	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Actinium-227	-0.02746	U	0.335	0.335		0.615	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Bismuth-212	0.1826	U	0.345	0.346		0.608	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Bismuth-214	-0.03040	U	0.172	0.172		0.173	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Cesium-137	0.001345	U	0.0383	0.0383		0.0736	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Lead-210	-0.009132	U	0.809	0.809		1.66	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Lead-212	0.02815	U	0.0522	0.0524		0.0992	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Lead-214	-0.01611	U	0.120	0.120		0.130	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Potassium-40	-0.1989	U	1.35	1.35		1.29	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Protactinium-231	0.04429	U	0.122	0.122		1.63	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Radium-226	-0.03040	U	0.172	0.172	0.500	0.173	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Radium-228	0.01346	U	0.0681	0.0681		0.111	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Thallium-208	0.01254	U	0.0552	0.0552		0.0775	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Thorium-228	0.02815	U	0.0522	0.0524		0.0992	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Thorium-232	0.01346	U	0.0681	0.0681		0.111	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Thorium-234	-0.02387	U	0.0621	0.0621		1.41	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Uranium-235	0.05676	U	0.132	0.132		0.233	pCi/g	07/14/15 15:37	08/04/15 12:46	1
Uranium-238	-0.02387	U	0.0621	0.0621		1.41	pCi/g	07/14/15 15:37	08/04/15 12:46	1

**Lab Sample ID: LCS 160-200049/2-A**  
**Matrix: Solid**  
**Analysis Batch: 203805**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 200049**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	%Rec	%Rec. Limits
Cesium-137	30.2	31.83		3.43		0.335	pCi/g	105	87 - 120
Cobalt-60	19.2	19.43		2.03		0.175	pCi/g	101	87 - 115

**Lab Sample ID: 160-12735-A-1-E DU**  
**Matrix: Solid**  
**Analysis Batch: 203807**

**Client Sample ID: Duplicate**  
**Prep Type: Total/NA**  
**Prep Batch: 200049**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	RER	RER Limit
Actinium-227	-0.148	U	0.1640	U	0.312		0.988	pCi/g	0.46	1
Bismuth-212	0.252	U	0.1698	U	0.529		0.944	pCi/g	0.08	1
Bismuth-214	0.404		0.4429		0.131		0.0931	pCi/g	0.17	1
Cesium-137	0.000	U	-0.01119	U	0.112		0.0995	pCi/g	0.09	1
Lead-210	0.487	U	-0.1878	U	1.18		2.05	pCi/g	0.33	1
Lead-212	0.483		0.4499		0.115		0.0965	pCi/g	0.14	1
Lead-214	0.456		0.4474		0.107		0.0565	pCi/g	0.04	1
Potassium-40	10.1		9.862		1.84		0.727	pCi/g	0.07	1
Protactinium-231	0.124	U	0.4172	U	0.477		1.27	pCi/g	0.41	1
Radium-226	0.404		0.4429		0.131	0.500	0.0931	pCi/g	0.17	1
Radium-228	0.349		0.3566		0.147		0.105	pCi/g	0.03	1

TestAmerica St. Louis

# QC Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12738-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-12735-A-1-E DU  
 Matrix: Solid  
 Analysis Batch: 203807

Client Sample ID: Duplicate  
 Prep Type: Total/NA  
 Prep Batch: 200049

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	RER	RER
										Limit
Thallium-208	0.170		0.1604		0.0565		0.0499	pCi/g	0.08	1
Thorium-228	0.483		0.4499		0.115		0.0965	pCi/g	0.14	1
Thorium-232	0.349		0.3566		0.147		0.105	pCi/g	0.03	1
Thorium-234	-0.0320	U	0.3052	U	0.334		1.89	pCi/g	0.72	1
Uranium-235	0.0687	U	-0.01778	U	0.0348		0.370	pCi/g	0.56	1
Uranium-238	-0.0320	U	0.3052	U	0.334		1.89	pCi/g	0.72	1

# QC Association Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-12738-2

## Rad

### Leach Batch: 199799

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-12735-A-1-E DU	Duplicate	Total/NA	Solid	Dry and Grind	
160-12738-1	TI-TO005-1303F_ARMEDIA-001	Total/NA	Solid	Dry and Grind	
160-12738-2	TI-TO005-1303F_BENEATH-002	Total/NA	Solid	Dry and Grind	
160-12738-3	TI-TO005-1303F_NORTH-003	Total/NA	Solid	Dry and Grind	
160-12738-4	TI-TO005-1303F_SOUTH-004	Total/NA	Solid	Dry and Grind	

### Prep Batch: 200049

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-12735-A-1-E DU	Duplicate	Total/NA	Solid	Fill_Geo-21	199799
160-12738-1	TI-TO005-1303F_ARMEDIA-001	Total/NA	Solid	Fill_Geo-21	199799
160-12738-2	TI-TO005-1303F_BENEATH-002	Total/NA	Solid	Fill_Geo-21	199799
160-12738-3	TI-TO005-1303F_NORTH-003	Total/NA	Solid	Fill_Geo-21	199799
160-12738-4	TI-TO005-1303F_SOUTH-004	Total/NA	Solid	Fill_Geo-21	199799
LCS 160-200049/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-200049/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

TestAmerica Job ID: 160-13115-2

Client Project/Site: Treasure Island - 500191

For:

CB&I Environmental & Infrastructure, Inc  
4005 Port Chicago Hwy  
Concord, California 94520

Attn: Patricia Flynn

*Elizabeth M. Hoerchler*

Authorized for release by:  
8/31/2015 4:51:24 PM

Elizabeth Hoerchler, Project Mgmt. Assistant  
[elizabeth.hoerchler@testamericainc.com](mailto:elizabeth.hoerchler@testamericainc.com)

Designee for

Erika Gish, Project Manager II  
(314)298-8566  
[erika.gish@testamericainc.com](mailto:erika.gish@testamericainc.com)

### LINKS

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results through  
**TotalAccess**

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Visit us at:  
[www.testamericainc.com](http://www.testamericainc.com)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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# Case Narrative

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13115-2

**Job ID: 160-13115-2**

**Laboratory: TestAmerica St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: CB&I Environmental & Infrastructure, Inc**

**Project: Treasure Island - 500191**

**Report Number: 160-13115-2**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup  
Method 3620C: Florisil Cleanup  
Method 3630C: Silica Gel Cleanup  
Method 3640A: Gel-Permeation Cleanup  
Method 3650B: Acid-Base Partition Cleanup  
Method 3660B: Sulfur Cleanup  
Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

## Case Narrative

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13115-2

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### Job ID: 160-13115-2 (Continued)

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#### Laboratory: TestAmerica St. Louis (Continued)

##### RECEIPT

The samples were received on 08/03/2015; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 22.0° C.

##### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Sample TI-TO005-1303F\_NORTH-005 (160-13115-1) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 08/04/2015, prepared on 08/05/2015 and analyzed on 08/28/2015.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.



## Login Sample Receipt Checklist

Client: CB&I Environmental & Infrastructure, Inc

Job Number: 160-13115-2

**Login Number: 13115**

**List Source: TestAmerica St. Louis**

**List Number: 1**

**Creator: Clarke, Jill C**

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

# Definitions/Glossary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13115-2

## Qualifiers

### Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
▫	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

# Method Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13115-2

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Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL

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**Protocol References:**

DOE = U.S. Department of Energy

**Laboratory References:**

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



# Sample Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13115-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-13115-1	TI-TO005-1303F_NORTH-005	Solid	07/30/15 10:00	08/03/15 08:40

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# Client Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13115-2

**Client Sample ID: TI-TO005-1303F\_NORTH-005**

**Lab Sample ID: 160-13115-1**

**Date Collected: 07/30/15 10:00**

**Matrix: Solid**

**Date Received: 08/03/15 08:40**

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.363</b>		0.173	0.177		0.264	pCi/g	08/05/15 17:23	08/28/15 12:07	1
Actinium-227	0.408	U	0.577	0.578		0.957	pCi/g	08/05/15 17:23	08/28/15 12:07	1
Bismuth-212	0.000	U	0.322	0.322		1.58	pCi/g	08/05/15 17:23	08/28/15 12:07	1
<b>Bismuth-214</b>	<b>0.539</b>		0.127	0.139		0.0786	pCi/g	08/05/15 17:23	08/28/15 12:07	1
Cesium-137	0.00371	U	0.0456	0.0456		0.0933	pCi/g	08/05/15 17:23	08/28/15 12:07	1
Lead-210	0.788	U	1.23	1.23		2.05	pCi/g	08/05/15 17:23	08/28/15 12:07	1
<b>Lead-212</b>	<b>0.471</b>		0.134	0.147		0.133	pCi/g	08/05/15 17:23	08/28/15 12:07	1
<b>Lead-214</b>	<b>0.704</b>		0.151	0.168		0.115	pCi/g	08/05/15 17:23	08/28/15 12:07	1
<b>Potassium-40</b>	<b>9.61</b>		1.60	1.88		0.762	pCi/g	08/05/15 17:23	08/28/15 12:07	1
Protactinium-231	0.282	U	0.262	0.263		2.13	pCi/g	08/05/15 17:23	08/28/15 12:07	1
<b>Radium-226</b>	<b>0.539</b>		0.127	0.139	0.500	0.0786	pCi/g	08/05/15 17:23	08/28/15 12:07	1
<b>Radium-228</b>	<b>0.363</b>		0.173	0.177		0.264	pCi/g	08/05/15 17:23	08/28/15 12:07	1
<b>Thallium-208</b>	<b>0.152</b>		0.0648	0.0667		0.0679	pCi/g	08/05/15 17:23	08/28/15 12:07	1
<b>Thorium-228</b>	<b>0.471</b>		0.134	0.147		0.133	pCi/g	08/05/15 17:23	08/28/15 12:07	1
<b>Thorium-232</b>	<b>0.363</b>		0.173	0.177		0.264	pCi/g	08/05/15 17:23	08/28/15 12:07	1
Thorium-234	1.62	U	1.65	1.66		2.01	pCi/g	08/05/15 17:23	08/28/15 12:07	1
Uranium-235	0.0653	U	0.212	0.212		0.378	pCi/g	08/05/15 17:23	08/28/15 12:07	1
Uranium-238	1.62	U	1.65	1.66		2.01	pCi/g	08/05/15 17:23	08/28/15 12:07	1

# QC Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13115-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

**Lab Sample ID: MB 160-204193/1-A**  
**Matrix: Solid**  
**Analysis Batch: 208135**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 204193**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.09933	U	0.106	0.106		0.188	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Actinium-227	0.06181	U	0.310	0.310		0.563	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Bismuth-212	-0.1857	U	0.557	0.557		0.994	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Bismuth-214	-0.01347	U	0.0799	0.0799		0.157	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Cesium-137	0.002012	U	0.0375	0.0375		0.0719	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Lead-210	-0.06968	U	0.865	0.865		1.64	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Lead-212	-0.02218	U	0.155	0.155		0.118	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Lead-214	-0.05641	U	3.13	3.13		0.150	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Potassium-40	-0.1055	U	0.807	0.807		1.31	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Protactinium-231	0.2018	U	0.518	0.519		1.43	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Radium-226	-0.01347	U	0.0799	0.0799	0.500	0.157	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Radium-228	0.09933	U	0.106	0.106		0.188	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Thallium-208	0.01546	U	0.0171	0.0172		0.0770	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Thorium-228	-0.02218	U	0.155	0.155		0.118	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Thorium-232	0.09933	U	0.106	0.106		0.188	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Thorium-234	-0.5948	U	7.94	7.94		1.33	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Uranium-235	-0.01078	U	0.117	0.117		0.219	pCi/g	08/05/15 17:23	08/27/15 18:34	1
Uranium-238	-0.5948	U	7.94	7.94		1.33	pCi/g	08/05/15 17:23	08/27/15 18:34	1

**Lab Sample ID: LCS 160-204193/2-A**  
**Matrix: Solid**  
**Analysis Batch: 208136**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 204193**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	%Rec	%Rec. Limits
Americium-241	97.3	99.66		10.5		1.33	pCi/g	102	87 - 116
Cesium-137	30.2	30.23		3.26		0.311	pCi/g	100	87 - 120
Cobalt-60	19.0	19.71		2.06		0.123	pCi/g	104	87 - 115

**Lab Sample ID: 160-13132-A-1-E DU**  
**Matrix: Solid**  
**Analysis Batch: 208143**

**Client Sample ID: Duplicate**  
**Prep Type: Total/NA**  
**Prep Batch: 204193**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	RER	RER Limit
Actinium 228	0.678		0.4123		0.165		0.288	pCi/g	0.77	1
Actinium-227	0.257	U	0.3885	U	0.457		0.744	pCi/g	0.17	1
Bismuth-212	0.518	U	-0.00050	U	0.504		0.958	pCi/g	0.49	1
Bismuth-214	0.703		0.6292		0.159		0.118	pCi/g	0.22	1
Cesium-137	-0.00364	U	-0.00039	U	0.0472		0.0880	pCi/g	0.04	1
Lead-210	0.615	U	0.8376	U	1.14		1.72	pCi/g	0.10	1
Lead-212	0.453		0.4346		0.120		0.105	pCi/g	0.07	1
Lead-214	0.609		0.4864		0.132		0.167	pCi/g	0.43	1
Potassium-40	11.6		11.41		2.07		1.08	pCi/g	0.05	1
Protactinium-231	-0.00952	U	-0.04757	U	0.780		1.44	pCi/g	0.05	1
Radium-226	0.703		0.6292		0.159	0.500	0.118	pCi/g	0.22	1

TestAmerica St. Louis

# QC Sample Results

Client: CB&I Environmental & Infrastructure, Inc  
 Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13115-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

**Lab Sample ID: 160-13132-A-1-E DU**  
**Matrix: Solid**  
**Analysis Batch: 208143**

**Client Sample ID: Duplicate**  
**Prep Type: Total/NA**  
**Prep Batch: 204193**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	MDC	Unit	RER	RER
										Limit
Radium-228	0.678		0.4123		0.165		0.288	pCi/g	0.77	1
Thallium-208	0.126		0.1730		0.0677		0.0644	pCi/g	0.38	1
Thorium-228	0.453		0.4346		0.120		0.105	pCi/g	0.07	1
Thorium-232	0.678		0.4123		0.165		0.288	pCi/g	0.77	1
Thorium-234	0.0862	U	0.8703	U	0.556		1.43	pCi/g	0.72	1
Uranium-235	0.150	U	0.1458	U	0.206		0.343	pCi/g	0.01	1
Uranium-238	0.0862	U	0.8703	U	0.556		1.43	pCi/g	0.72	1



# QC Association Summary

Client: CB&I Environmental & Infrastructure, Inc  
Project/Site: Treasure Island - 500191

TestAmerica Job ID: 160-13115-2

## Rad

### Leach Batch: 203831

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-13115-1	TI-TO005-1303F_NORTH-005	Total/NA	Solid	Dry and Grind	

### Leach Batch: 203861

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-13132-A-1-E DU	Duplicate	Total/NA	Solid	Dry and Grind	

### Prep Batch: 204193

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-13115-1	TI-TO005-1303F_NORTH-005	Total/NA	Solid	Fill_Geo-21	203831
160-13132-A-1-E DU	Duplicate	Total/NA	Solid	Fill_Geo-21	203861
LCS 160-204193/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-204193/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	

**Attachment 4**  
**Calibration Records**



Designer and Manufacturer  
of  
Scientific and Industrial  
Instruments

### CERTIFICATE OF CALIBRATION

### LUDLUM MEASUREMENTS, INC.

501 Oak Street  
325-235-5494  
Sweetwater, TX 79556, U.S.A.

10744 Dutchtown Road  
865-392-4601  
Knoxville, TN 37932, U.S.A.

CUSTOMER CB&I FEDERAL SVCS LLOC ORDER NO. 20268822/421692

Mfg. Ludlum Measurements, Inc. Model 193-6 Serial No. 309110

Mfg. Ludlum Measurements, Inc. Model 44-132 Serial No. PR 337393

Cal. Date 2-Jun-15 Cal Due Date 2-Jun-16 Cal. Interval 1 Year Meterface 202-910

Check mark  applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 48 % Alt 698.8 mm Hg

New Instrument  Instrument Received  Within Toler. +-10%  10-20%  Out of Tol.  Requiring Repair  Other-See comments

Mechanical ck.  Meter Zeroed  Background Subtract  Input Sens. Linearity

F/S Resp. ck.  Reset ck.  Window Operation  Geotropism

Audio ck.  Alarm Setting ck.  Batt. ck. (Min. Volt) 2.2 VDC

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.  Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 950 V Input Sens. 11 mV Det. Oper. 950 V at 11 mV Threshold Dial Ratio \_\_\_\_\_ = \_\_\_\_\_ mV

HV Readout (2 points) Ref./Inst. \_\_\_\_\_ / \_\_\_\_\_ V Ref./Inst. \_\_\_\_\_ / \_\_\_\_\_ V

**COMMENTS:**

sigma alarm ck but not set  
alarm set to full scale(range dependent)  
cal with a 50" cable

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1k	800 µR/hr = <u>120 0000 cpm</u>	<u>0.84</u>	<u>0.8</u>
x1k	200 µR/hr	<u>0.24</u>	<u>0.22</u>
x100	<u>120 000</u> cpm	<u>0.84</u>	<u>0.8</u>
x100	<u>30000</u> cpm	<u>0.24</u>	<u>0.2</u>
x10	<u>12000</u> cpm	<u>0.84</u>	<u>0.8</u>
x10	<u>3000</u> cpm	<u>0.24</u>	<u>0.2</u>
x1	<u>1200</u> cpm	<u>0.84</u>	<u>0.8</u>
x1	<u>300</u> cpm	<u>0.24</u>	<u>0.2</u>

\*Uncertainty within ± 10% C.F. within ± 20%

X100, X10, X1 Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: Cs-137 S/N:  059  2171CP  2261CP  720  734  781  1131  1616  1696  1909  1916CP  5105  5717CO  5719CO  60646  70897  73410  E552  G112  M565  S-394  S-1054  T10081  T10082 Neutron Am-241 Be S/N:  T-304 Ra-226 S/N:  Y982

Alpha S/N \_\_\_\_\_  Beta S/N \_\_\_\_\_  Other Am241 #E289; Cs137 #E128

m 500 S/N 189509  Oscilloscope S/N \_\_\_\_\_  Multimeter S/N 71300492

Calibrated By: Wendell Williams Date 2 Jun 15

Reviewed By: Paul H. Date 2 Jun 15

AC Inst. Only	<input type="checkbox"/>	Passed Dielectric (Hi-Pot) and Continuity Test
	<input type="checkbox"/>	Failed: _____





Designer and Manufacturer  
of  
Scientific and Industrial  
Instruments

# CERTIFICATE OF CALIBRATION

## LUDLUM MEASUREMENTS, INC.

501 Oak Street  
325-235-5494  
Sweetwater, TX 79556, U.S.A.

10744 Dutchtown Road  
865-392-4601  
Knoxville, TN 37932, U.S.A.

CUSTOMER CB&I FEDERAL SVCS LLOC ORDER NO. 20268822/421692

Mfg. Ludlum Measurements, Inc. Model 193-6 Serial No. 309119

Mfg. Ludlum Measurements, Inc. Model 44-132 Serial No. PR 337363

Cal. Date 2-Jun-15 Cal Due Date 2-Jun-16 Cal. Interval 1 Year Meterface 202-910

Check mark  applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 48 % Alt 698.8 mm Hg

New Instrument  Instrument Received  Within Toler. +/-10%  10-20%  Out of Tol.  Requiring Repair  Other-See comments

Mechanical ck.  Meter Zeroed  Background Subtract  Input Sens. Linearity

F/S Resp. ck.  Reset ck.  Window Operation  Geotropism

Audio ck.  Alarm Setting ck.  Batt. ck. (Min. Volt) 2.2 VDC

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.  Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 900 V Input Sens. 11 mV Det. Oper. 900 V at 11 mV Threshold Dial Ratio          =          mV

HV Readout (2 points) Ref./Inst.          /          V Ref./Inst.          /          V

### COMMENTS:

sigma alarm ck but not set  
alarm set to full scale(range dependent)  
cal with a 50" cable

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1k	800 µR/hr = <u>1160000 cpm</u>	<u>0.84</u>	<u>0.8</u>
x1k	200 µR/hr	<u>0.24</u>	<u>0.22</u>
x100	<u>11600</u> cpm	<u>0.84</u>	<u>0.8</u>
x100	<u>2900</u> cpm	<u>0.24</u>	<u>0.2</u>
x10	<u>1160</u> cpm	<u>0.84</u>	<u>0.8</u>
x10	<u>290</u> cpm	<u>0.24</u>	<u>0.2</u>
x1	<u>116</u> cpm	<u>0.84</u>	<u>0.8</u>
x1	<u>29</u> cpm	<u>0.24</u>	<u>0.2</u>

\*Uncertainty within ± 10% C.F. within ± 20% X100, X10, X1 Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSS Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: Cs-137 S/N:  059  2171CP  2261CP  720  734  781  1131  1616  1696  1909  1916CP  5105  5717CO  5719CO  60646  70897  73410  E552  G112  M565  S-394  S-1054  T10081  T10082 Neutron Am-241 Be S/N:  T-304 Ra-226 S/N:  Y982

Alpha S/N           Beta S/N           Other Am241 #E289; Cs137 #E128

500 S/N 189509  Oscilloscope S/N           Multimeter S/N 71300492

Calibrated By: Wendell Miller Date 2 Jun 15

Reviewed By: Mal Hi Date 2 Jun 15

AC Inst.  Passed Dielectric (Hi-Pot) and Continuity Test  
Only  Failed:





Designer and Manufacturer  
of  
Scientific and Industrial  
Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.

501 Oak Street 10744 Dutchtown Road  
325-235-5494 865-392-4601  
Sweetwater, TX 79556, U.S.A. Knoxville, TN 37932, U.S.A.

CUSTOMER CB&I FEDERAL SVCS LLOC ORDER NO. 20268822/421692

Mfg. Ludlum Measurements, Inc. Model 193-6 Serial No. 309127

Mfg. Ludlum Measurements, Inc. Model 44-132 Serial No. PR 337359

Cal. Date 2-Jun-15 Cal Due Date 2-Jun-16 Cal. Interval 1 Year Meterface 202-910

Check mark  applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 48 % Alt 698.8 mm Hg

New Instrument  Instrument Received  Within Toler. +-10%  10-20%  Out of Tol.  Requiring Repair  Other-See comments

Mechanical ck.  Meter Zeroed  Background Subtract  Input Sens. Linearity

F/S Resp. ck.  Reset ck.  Window Operation  Geotropism

Audio ck.  Alarm Setting ck.  Batt. ck. (Min. Volt) 2.2 VDC

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.  Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 1050 V Input Sens. 11 mV Det. Oper. 1050 V at 11 mV Threshold Dial Ratio = mV

HV Readout (2 points) Ref./Inst. / V Ref./Inst. / V

COMMENTS:

sigma alarm ck but not set  
alarm set to full scale(range dependent)  
cal with a 50" cable

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1k	800 µR/hr = 1210000 cpm	0.84	0.8
x1k	200 µR/hr	0.24	0.22
x100	121000 cpm	0.84	0.8
x100	30250 cpm	0.24	0.2
x10	12100 cpm	0.84	0.8
x10	3025 cpm	0.24	0.2
x1	1210 cpm	0.84	0.8
x1	302 cpm	0.24	0.2

\*Uncertainty within ± 10% C.F. within ± 20% X100, X10, X1 Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCCL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: Cs-137 S/N:  059  2171CP  2261CP  720  734  781  1131  1616  1696  1909  1916CP  5105  5717CO  5719CO  60646  70897  73410  E552  G112  M565  S-394  S-1054  T10081  T10082 Neutron Am-241 Be S/N:  T-304 Ra-226 S/N:  Y982

Alpha S/N  Beta S/N  Other Am241 #E289; Cs137 #E128

m 500 S/N 189509  Oscilloscope S/N  Multimeter S/N 71300492

Calibrated By: *or adell willis* Date 2 Jun 15

Reviewed By: *Paul H.* Date 2 Jun 15

AC Inst.  Passed Dielectric (Hi-Pot) and Continuity Test Only  Failed: \_\_\_\_\_

