
ISRA 009, Area II
ELV-1D (F-Listed, Radionuclides > LUT)
Soil Sampling for Radionuclides
and Waste Certification

Introduction

This data package provides the laboratory results of the eight samples taken at five locations at the ELV-1D (F-listed, Radionuclides > LUT) site in Area II. Soil sample locations and the demarcated area (designated by the pink area) are shown in Appendix 1. Soil sample results are compared to the draft provisional DTSC look-up table (LUT) values in order to determine if soil exceeds background as required for the NASA/DTSC Administrative Order on Consent (AOC)¹.

Methodology

Numerous samples have been taken in the ELV-1D area for waste characterization (Appendix 1). The majority of samples exhibited no elevated concentrations of radionuclides above background. The minority of samples discussed here exhibited elevated concentrations of cesium-137 (Cs-137) above background.

Samples discussed here apply to the F-listed, radionuclides > LUT, waste stream. One location (ISWC0062), sampled in 2009 for waste disposal characterization, exhibited elevated cesium-137 above the LUT. This location was subsequently re-sampled later in 2009 and the exceedance confirmed. The initial 2009 locations were analyzed for strontium-90, tritium and gamma emitting radionuclides by gamma spectroscopy, using an off-site laboratory². The 2009 re-sampled location was analyzed for only gamma emitting radionuclides. Step-out samples conducted in 2013 and analyzed for cesium-137 only enabled the lateral extent of elevated cesium to be demarcated. Average minimum detectable concentrations (MDC) for cesium-137 and strontium-90 were 0.041 pCi/g and 0.043 pCi/g respectively. The gamma spectroscopy library also included the following contaminants-of-concern: Na-22, K-40, Mn-54, Co-60, Cs-134, Eu-152, Eu-154, Th-228, Th-232, U-235, U-238 and Am-241.

NASA and DTSC have signed an AOC that requires soils on Area II and portions of Area I to be cleaned up to background³. The USEPA has characterized local radionuclide background⁴ in soil and has published preliminary radiological trigger levels (RTL) based on the higher of background threshold values (BTV) or minimum detectable concentrations (MDC)⁵.

¹ "Administrative Order on Consent for Remedial Action (AOC)", December 6, 2010, signed by the National Aeronautics and Space Administration (NASA) and the Department of Toxic Substances Control (DTSC).

² Boeing, "ISRA Soil Management Plan", Attachment A, "ISRA Sampling for Radionuclides", July 2009.

³ Page 5, Section 2.1 of the AOC states, "The cleanup of soils at the Site [Area II and portions of Area I] shall result in the end state of the Site after cleanup to be consistent with "background." That is, at the completion of the cleanup, no contaminants shall remain in the soil above local background levels, with the exception of the exercise of the exemptions that are specifically expressed in the AIP. All response actions taken pursuant to this Order shall be performed so as to accomplish this objective, in full compliance with the terms and conditions detailed in the AIP, and in accordance with workplans that have been submitted to and approved by DTSC. Similarly, to the extent any radiological materials are determined to be present at this portion of the Site, the cleanup of soils at the Site contaminated with radiological materials shall result in no radiological contaminants remaining in the soil above local background levels, with the exception of the exercise of the same exemptions expressed in the AIP."

⁴ USEPA, "Final Radiological Background Study Report, Santa Susana Field Laboratory, Ventura County, California", October 2011.

⁵ USEPA, "Technical Memorandum, Radiological Trigger Levels, Santa Susana Field Laboratory Site, Area IV Radiological Study", December 12, 2011.

On August 23, 2012, DTSC sent NASA a letter regarding excavation of ISRA soil⁶. In the letter, DTSC stated,

“DTSC agrees with using the December 2011 USEPA RTLs for all radionuclides as the values for disposal of the ISRA soils. DTSC has concluded that use of the RTLs will not be inconsistent with SSFL radiological Lookup Table values.”

“ISRA radiological soil sample results that exceed the RTLs and that have not been re-sampled may be re-sampled to evaluate the initial RTL exceedance. Soil at locations characterized by initial and re-sample radiological results exceeding their respective RTLs will be removed and disposed of at a LLRW disposal facility, per Section 2.10 of the AOC.”

“Validated radiological sample concentrations below the sample MDC can be treated as “non-detects” and the associated soil is not subject to the Section 2.10, AOC soil disposal conditions.”

USEPA issued revised RTLs⁷ in December 2012 which were, in general, higher than the original RTLs. USEPA also issued laboratory specific radiological reference concentrations (RRC) in December 2012⁸. Subsequently, DTSC issued draft provisional LUTs⁹ for 16 radionuclides in January 2013, which in general matched the revised RTLs for those radionuclides whose RTLs were derived from BTVs¹⁰ (for example cesium-137 and uranium-238). The draft provisional LUTs subset also matched exactly the lower of the two lab-specific RRCs. Consistent with DTSC’s intent in issuing draft provisional LUTs for interim remedial action implementation, ELV-1C data is compared to draft provisional LUTs and sample MDCs to determine compliance with the DTSC/NASA AOC.

Results

Appendix 2 shows the soil radionuclide data for the cesium elevated samples taken at the ELV-1D F-listed area compared to the draft provisional LUTs and sample MDCs. LUT exceedances are highlighted in yellow

Cesium-137 in samples at locations ISWC0062, ISCW0137, ISWC0138 and ISCW0143 exceed the cesium-137 LUT of 0.225 pCi/g.

Therefore, according to the NASA/DTSC AOC this waste is classified as contaminated above background.

⁶ DTSC, “Management and Disposal of Radionuclide-impacted Soil Excavated for Interim Source Removal Actions on NASA Property, Santa Susana Field Laboratory, Ventura County, California”, August 23, 2012

⁷ USEPA, “Attachment A – Original and Corrected Radiological Trigger Levels - Development and Use of Radiological Reference Concentrations”, Appendix K of “Final Radiological Characterization of Soils - Area IV and Northern Buffer Zone”, December 21, 2012.

⁸ USEPA, “Attachment B - Radiological Reference Concentrations - Development and Use of Radiological Reference Concentrations”, Appendix K of “Final Radiological Characterization of Soils - Area IV and Northern Buffer Zone”, December 21, 2012.

⁹ DTSC, “Development of the Draft Provisional Radiological Look-Up Table”, DTSC Public Meeting, Chatsworth, California, January 30, 2013.

¹⁰ A notable exception was strontium-90 with a BTV of 0.075 pCi/g, an original RTL of 0.485 pCi/g, a revised RTL of 0.645 pCi/g, lab specific RRCs of 1.07 and 0.117 pCi/g and a draft provisional LUT of 0.117 pCi/g.

Conclusions

In compliance with the NASA/DTSC AOC, excavated soil from the ELV-1D (F-listed, radionuclides > LUT) area have been disposed of at EnergySolutions, Clive, Utah, a licensed low-level radioactive waste disposal site.

A handwritten signature in cursive script that reads "Phil Rutherford".

Phil Rutherford
Manager, Health, Safety & Radiation Services

Appendix 1
ELV-1D Sampling Locations

Outfall 009 Waste Characterization Sample Locations for ELV-1D

- Base Map Legend**
- Administrative Area Boundary
 - RFI Site Boundary
 - NPDES Outfall
 - A/C Paving
 - Drainage
 - Non Jurisdictional Surface Water Pathway
 - Surface Water Divide

- Figure Legend**
- Planned ISRA Excavation Boundary
 - Sample Location
 - Gray shading indicates sample not analyzed

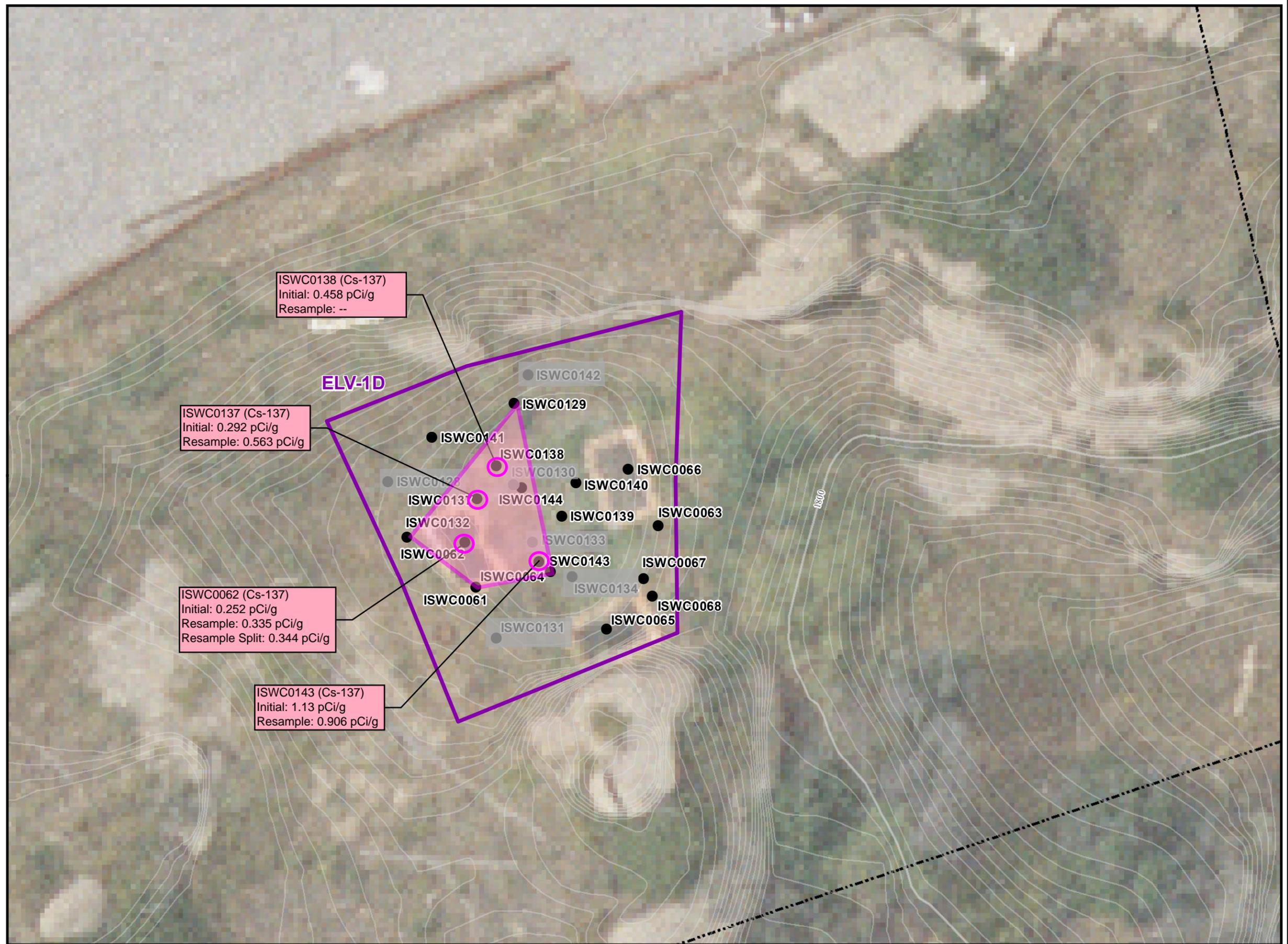
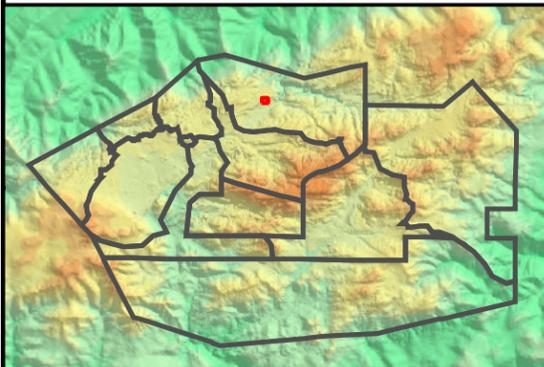
January 2013 LUT Value
Cs-137 = 0.225 pCi/g

- Sample with confirmed result above LUT value.
- Boundary of F-Listed soil with radionuclides above LUT value.

Note:
1. Aerial imagery from 2010 Sage Consulting.
2. Topographic contours from 2010 Sage Consulting.

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1 inch = 15 feet
0 10 20 Feet



Appendix 2
ELV-1D (F-listed, Radionuclides > LUT)
Radionuclide Results

ELV-1D NASA ISRA F-Listed, Radionuclides > LUT (pCi/g)

Sampling Date	Sampling Location (General)	Sampling Location (Specific)	Sample Serial Number	Isotope	Activity	Error (+/-)	MDC	DTSC LUT	LUT Source	Activity > LUT ?	Activity > MDC ?	Detected Activity	Detected Activity > LUT ?	Non-detect Activity	Non-detect Activity > LUT ?	MDC > LUT ?	Ratio of MDC to LUT	Units	Error Type	Analysis Protocol	Analysis Organization	Comments	Document	Status
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Americium-241	0.0215	0.075	0.122	0.0386	MDC	-	-	-	-	0.0215	-	YES	3.16	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Americium-241	0.00439	0.104	0.172	0.0386	MDC	-	-	-	-	0.00439	-	YES	4.46	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Cesium-134	0	0.033	0.0484	0.0431	MDC	-	-	-	-	0	-	YES	1.12	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Cesium-134	0	0.0401	0.0549	0.0431	MDC	-	-	-	-	0	-	YES	1.27	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Cesium-137	0.335	0.0468	0.039	0.225	BTV	YES	YES	0.335	YES	-	-	-	0.17	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Cesium-137	0.252	0.0436	0.038	0.225	BTV	YES	YES	0.252	YES	-	-	-	0.17	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
6/10/2013	ELV-1D	ISWC0137	ISWC0137AS001	Cesium-137	0.563	0.0526	0.0414	0.225	BTV	YES	YES	0.563	YES	-	-	-	0.18	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	Re-sample	327331	Waste
6/5/2013	ELV-1D	ISWC0137	ISWC0137S001	Cesium-137	0.292	0.0403	0.0421	0.225	BTV	YES	YES	0.292	YES	-	-	-	0.19	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	Re-sampled	327028	Waste
6/12/2013	ELV-1D	ISWC0138	ISWC0138S001	Cesium-137	0.458	0.0345	0.0285	0.225	BTV	YES	YES	0.458	YES	-	-	-	0.13	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		327534	Waste
10/17/2013	ELV-1D	ISWC0143	ISWC0143AS001	Cesium-137	0.906	0.0632	0.0446	0.225	BTV	YES	YES	0.906	YES	-	-	-	0.20	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	Re-sample	335884	Waste
10/7/2013	ELV-1D	ISWC0143	ISWC0143S001	Cesium-137	1.13	0.0766	0.0517	0.225	BTV	YES	YES	1.13	YES	-	-	-	0.23	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	Re-sampled	335055	Waste
10/7/2013	ELV-1D	ISWC0144	ISWC0144S002	Cesium-137	0.0037	0.0216	0.0405	0.225	BTV	-	-	-	-	0.0037	-	-	0.18	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL		335055	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Cobalt-60	0.0248	0.0214	0.0395	0.0363	MDC	-	-	-	-	0.0248	-	YES	1.09	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Cobalt-60	-0.00286	0.0213	0.0363	0.0363	MDC	-	-	-	-	-0.00286	-	-	1.00	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Europium-152	-0.0167	0.0755	0.091	0.0739	MDC	-	-	-	-	-0.0167	-	YES	1.23	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Europium-152	0.02	0.0624	0.0986	0.0739	MDC	-	-	-	-	0.02	-	YES	1.33	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Europium-154	0.00596	0.0671	0.115	0.198	MDC	-	-	-	-	0.00596	-	-	0.58	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Europium-154	0.0284	0.0701	0.125	0.198	MDC	-	-	-	-	0.0284	-	-	0.63	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Manganese-54	0.0327	0.0223	0.035	-	-	-	-	-	-	0.0327	-	-	-	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Manganese-54	-0.00548	0.022	0.0374	-	-	-	-	-	-	-0.00548	-	-	-	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Potassium-40	23.8	1.96	0.318	35.5	BTV	-	YES	23.8	-	-	-	-	0.01	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Potassium-40	22.2	1.85	0.292	35.5	BTV	-	YES	22.2	-	-	-	-	0.01	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Sodium-22	0.00228	0.0239	0.0409	0.0468	MDC	-	-	-	-	0.00228	-	-	0.87	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Sodium-22	0.0101	0.0249	0.0446	0.0468	MDC	-	-	-	-	0.0101	-	-	0.95	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Strontium-90	0.0228	0.0258	0.0431	0.117	MDC	-	-	-	-	0.0228	-	-	0.37	pCi/g	2 sigma	EPA 905.0 Modified	GEL		234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Thorium-228	1.21	0.105	0.0509	4.27	BTV	-	YES	1.21	-	-	-	-	0.01	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Thorium-228	1.06	0.0998	0.0564	4.27	BTV	-	YES	1.06	-	-	-	-	0.01	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Thorium-232	1.16	0.195	0.11	3.44	BTV	-	YES	1.16	-	-	-	-	0.03	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Thorium-232	1.05	0.196	0.112	3.44	BTV	-	YES	1.05	-	-	-	-	0.03	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Tritium	1.11	0.884	1.46	8.59	MDC	-	-	-	-	1.11	-	-	0.17	pCi/g	2 sigma	EPA 906.0 Modified	GEL		234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Uranium-235	0.0801	0.115	0.208	0.152	BTV	-	-	-	-	0.0801	-	YES	1.37	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Uranium-235	-0.059	0.127	0.22	0.152	BTV	-	-	-	-	-0.059	-	YES	1.45	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste
8/28/2009	ELV-1D	ISWC0062	ISWC0062ARadS001	Uranium-238	1.49	0.833	1.06	1.96	BTV	-	YES	1.49	-	-	-	-	0.54	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sample	236227	Waste
7/28/2009	ELV-1D	ISWC0062	ISWC0062RadS001	Uranium-238	1.61	1.29	1.36	1.96	BTV	-	YES	1.61	-	-	-	-	0.69	pCi/g	2 sigma	EML HASL 300, 4.5.2.3	GEL	Re-sampled	234235	Waste