ISRA 009, Area II
LOX (Non-Hazardous, Radionuclides > LUT)
Soil Sampling for Radionuclides
and Waste Certification

Introduction

This data package provides the laboratory results of the two samples taken at the LOX-1B-3 site in Area II. The location of the soil samples (LXWC0076) and the demarcated area (designated by the pink shaded 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

A total of 84 samples were taken in 79 locations at the LOX area for waste characterization. The majority of locations exhibited no elevated concentrations of radionuclides above background. One location (two samples) exhibited confirmed elevated concentrations of radionuclides above background.

Samples discussed here apply to the non-hazardous, radionuclides>LUT waste stream. Samples taken in 2010 and 2011 for waste disposal characterization were analyzed for strontium-90, tritium and/or gamma emitting radionuclides by gamma spectroscopy, using an off-site laboratory[2]. Minimum detectable concentrations (MDC) for cesium-137 and strontium-90 averaged 0.037 pCi/g and 0.047 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 background[3]. The USEPA has characterized local radionuclide background[4] in soil and published preliminary radiological trigger levels (RTL) based on the higher of background threshold values (BTV) or minimum detectable concentrations (MDC)[5].

On August 23, 2012, DTSC sent NASA a letter regarding excavation of ISRA soil[6]. In the letter, DTSC stated,

[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.

[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

"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 RTLs[7] in December 2012 which were, in general, higher than the original RTLs. USEPA also issued laboratory specific radiological reference concentrations (RRC) in December 2012[8]. Subsequently, DTSC issued draft provisional LUTs[9] for 16 radionuclides in January 2013, which in general matched the revised RTLs for those radionuclides whose RTLs were derived from BTVs[10] (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, LOX 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 two samples (LXWC0076S001 and re-sampled LXWC0076AS00l) taken at the LOX-1B-3 area compared to the draft provisional LUTs and sample MDCs. LUT exceedances are highlighted in yellow

Both original sample LXWC0076S001 (0.264 pCi/g) and resample LXWC0076AS001 (0.347 pCi/g) exceed the cesium-137 LUT of 0.225 pCi/g.

Both original sample LXWC0076S001 (2.08 pCi/g) and resample LXWC0076AS001 (1.99 pCi/g) exceed the uranium-238 LUT of 1.96 pCi/g.

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

[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 LOX-1B-3 (non-hazardous, radionuclides>LUT) area will be disposed of at EnergySolutions, Clive, Utah, a licensed low-level radioactive waste disposal facility.

Phil Rutherford
Manager, Health, Safety & Radiation Services

Appendix 1

LOX-1B-3 Sampling Locations

Outfall 009
Waste Characterization
Sample Locations for LOX-1B-3

Base Map Legend

- Administrative Area Boundary
- RFI Site Boundary
- Report Group Boundary
- NPDES Outfall
- A/C Paving
- Drainage
- Non Jurisdictional Surface Water Pathway
- Surface Water Divide

Base Map Legend

- ISRA Excavation Boundary

Notes:

	DTSC LUT
Cs-137:	0.225 pCi/g
U-235:	0.152 pCi/g
U-238:	1.96 pCI/g

Resampling confirmed the initial radionuclide result that met or exceeded the trigger level.

Boundary of non-hazardous soil with radionuclides above LUT value.

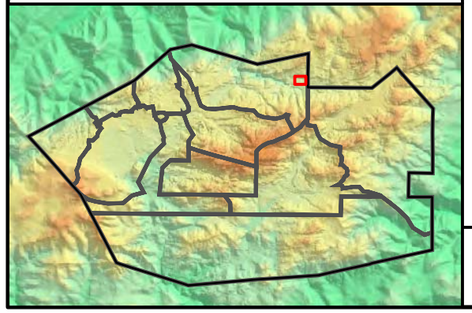
Note:

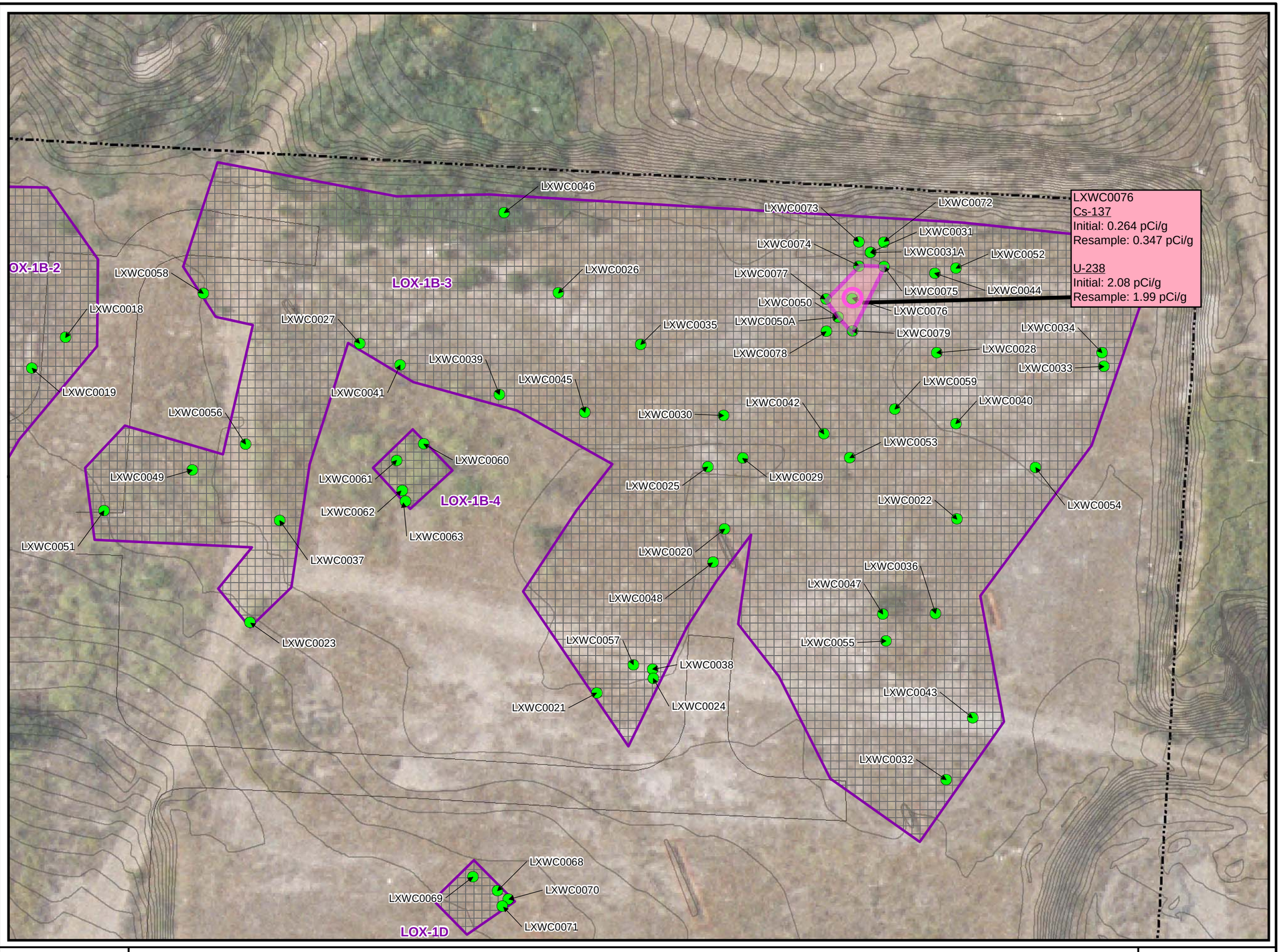
1. Sample locations and depths were randomly selected. The 3ft x 3ft grid used in the sample location selection process is shown.
2. Aerial imagery from Google Earth, 2010.
3. Topographic contours from Lidar data, 2008.

Document: ISRA_Plots_Working_LOX-1-B3_SampleLocations_WC.mxd Date: Feb 16, 2011

1 inch = 35 feet

0 35 70 Feet





MWH

S A N T A S U S A N A F I E L D L A B O R A T O R Y

FIGURE 1

Appendix 2

LOX-1B-3 (Non-Hazardous, Radionuclides > LUT)
Radionuclide Results

LOX NASA ISRA Soil Data
Non Haz, Radionuclides > LUT (pCi/g)

Sampling Date	Sampling Location (General)	Sampling Location (Specific)	Sample Serial Number	Media Type	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
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Americium-241	0.0251	0.0388	0.0633	0.0386	MDC	-	-	-	-	0.0251	-	YES	1.64	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Americium-241	0.057	0.0977	0.173	0.0386	MDC	YES	-	-	-	0.057	YES	YES	4.48	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Cesium-134	0	0.0427	0.0617	0.0431	MDC	-	-	-	-	0	-	YES	1.43	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Cesium-134	0	0.0388	0.062	0.0431	MDC	-	-	-	-	0	-	YES	1.44	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Cesium-137	0.347	0.0604	0.0432	0.225	BTV	YES	YES	0.347	YES	-	-	-	0.19	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Cesium-137	0.264	0.0656	0.0442	0.225	BTV	YES	YES	0.264	YES	-	-	-	0.20	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Cobalt-60	0.0214	0.0268	0.0485	0.0363	MDC	-	-	-	-	0.0214	-	YES	1.34	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Cobalt-60	-0.0335	0.0258	0.0385	0.0363	MDC	-	-	-	-	-0.0335	-	YES	1.06	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Europium-152	0.0541	0.0675	0.101	0.0739	MDC	-	-	-	-	0.0541	-	YES	1.37	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Europium-152	0.0645	0.0668	0.108	0.0739	MDC	-	-	-	-	0.0645	-	YES	1.46	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Europium-154	-0.0312	0.082	0.137	0.198	MDC	-	-	-	-	-0.0312	-	-	0.69	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Europium-154	-0.0491	0.0924	0.153	0.198	MDC	-	-	-	-	-0.0491	-	-	0.77	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Manganese-54	3.11E-05	0.0257	0.0437	-	-	-	-	-	-	0.0000311	-	-	-	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Manganese-54	0.0162	0.0257	0.0464	-	-	-	-	-	-	0.0162	-	-	-	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Potassium-40	21.4	2.12	0.31	35.5	BTV	-	YES	21.4	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Potassium-40	21.5	2.29	0.418	35.5	BTV	-	YES	21.5	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Sodium-22	-0.0101	0.0289	0.0484	0.0468	MDC	-	-	-	-	-0.0101	-	YES	1.03	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Sodium-22	-0.0149	0.0323	0.0538	0.0468	MDC	-	-	-	-	-0.0149	-	YES	1.15	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Thorium-228	1.77	0.225	0.0612	4.27	BTV	-	YES	1.77	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Thorium-228	1.72	0.193	0.0577	4.27	BTV	-	YES	1.72	-	-	-	-	0.01	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Thorium-232	1.68	0.314	0.142	3.44	BTV	-	YES	1.68	-	-	-	-	0.04	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Thorium-232	1.57	0.288	0.167	3.44	BTV	-	YES	1.57	-	-	-	-	0.05	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Uranium-235	0.00408	0.115	0.212	0.152	BTV	-	-	-	-	0.00408	-	YES	1.39	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Uranium-235	0.101	0.116	0.21	0.152	BTV	-	-	-	-	0.101	-	YES	1.38	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste
2/1/2011	LOX-1B-3	LXWC0076	LXWC0076AS001	Soil	Uranium-238	1.99	0.937	0.625	1.96	BTV	YES	YES	1.99	YES	-	-	-	0.32	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sample	271501	Waste
1/7/2011	LOX-1B-3	LXWC0076	LXWC0076S001	Soil	Uranium-238	2.08	1.62	1.44	1.96	BTV	YES	YES	2.08	YES	-	-	-	0.73	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	LXWC0050 Stepout #1; Re-sampled	270159	Waste