

**ISRA 009 – AP/STP-1D.
Soil Sampling for Radionuclides.
Results and Statistical Analysis.
Waste Certification.**

This data package provides the laboratory results and statistical analysis of the 5 samples taken at the ISRA Outfall 009, AP/STP-1D area. This analysis and data interpretation complies with the procedure approved by the California Department of Public Health¹.

Samples taken for waste disposal characterization were analyzed for strontium-90, tritium and gamma emitting radionuclides by gamma spectroscopy, using an off-site laboratory. Minimum detectable activity (MDA) for cesium-137 and strontium-90 averaged ~0.043 pCi/g and ~0.048 pCi/g respectively. Minimum detectable activity for tritium averaged ~0.61 pCi/g. The gamma spectroscopy library also included the following contaminants-of-concern: Na-22, K-40, Mn-54, Co-60, Cs-134, Cs-137, Eu-152, Eu-154, Th-228, Th-232, U-235, U-238 and Am-241.

Statistical evaluation of sample analytical results to determine whether or not the sampled waste contains Cs-137 or Sr-90 activity elevated above local background was conducted using the Wilcoxon Rank Sum Test using protocols described in NUREG-1505² and DTSC guidance³ (See Appendix 1). Appendix 2 shows the complete analytical results for all radionuclides. Complete laboratory data packages are available on request.

Local background data for cesium-137 and strontium-90 was taken from Table 20 of the 1991i0l and the EPA preliminary

⁵ for residential 10^{-6} risk.

Conclusions

Cesium-137 - Based on the results of the statistical analysis of Appendix 1, soil to be excavated from AP/STP-1D does not exceed the local background for Cs-137. The incremental dose from Cs-137 above background is therefore zero mrem/y. The highest Cs-137 result is 0.137 pCi/g

¹ Boeing, "Northern Drainage Waste Sampling for Radionuclides." Revision 9, November 5, 2007. (Attachment 3 to Northern Drainage Work Plan) and "ISRA Waste Sampling for Radionuclides", Attachment A to the ISRA Soil Management Plan.

² NUREG-1505, Nuclear Regulatory Commission, "A Non-parametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys." January 1998. http://www.philrutherford.com/Radiation_Cleanup_Standards/NUREG-1505.pdf

³ DTSC, "Selecting Inorganic Constituents as Chemicals of Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities." February 1997.

⁴ McLaren/Hart, "Additional Soil and Water Sampling at the Brandeis-Bardin Institute and Santa Monica Mountains Conservancy." Jan 19, 1995. <http://www.etec.energy.gov/Health-and-Safety/Documents/BrandeisBardin/AddSoilandWaterSamp.pdf>

⁵ EPA preliminary remediation goals for radionuclides (Effective January 1, 2007) - <http://epa-prgs.ornl.gov/radionuclides/>.

California Department of Public Health (CDPH) Radiologic Health Branch (RHB) are not required for the off-site disposal of decommissioned material or of the subject material¹⁰.



Phil Rutherford
Manager, Health, Safety & Radiation Services

¹⁰ The California Department of Public Health (CDPH) Radiologic Health Branch (RHB) has stated in a November 9, 2007 email to Phil Rutherford (Boeing) ... *"The Governor's Executive Order D-62-02, does not specifically require the Department of Health Services (now the Department of Public Health) to perform verification sampling of decommissioned material or to provide approval for disposal of specific decommissioned material shipped offsite (e.g., to Class I or II landfills). The California DPH has not imposed a requirement that Boeing or the Department of Energy (DOE) seek DPH verification sampling or approval of all decommissioned material destined for Class I or II landfills in compliance with the Governor's Executive Order."*

Santa Susana Field Laboratory
The Boeing Company



Wilcoxon Rank Sum Test -- (Cesium-137)

General Information:

How to use this template:

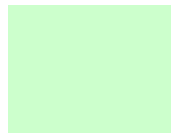
Critical Value (including ties)	1510.7
Sum of Reference Ranks	1515.0

Test Result:
Survey sample concentrations do not exceed those in the background by more than the DCGL

Bkgd Ref (R)	Survey (S)
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No.	Soil ID	Cs-137	Adjusted Cs-137	Area	Ranks	Reference Ranks
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No.	Soil ID	Cs-137	Adjusted Cs-137	Area	Ranks	Reference Ranks
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Sum	1596.0	1515.0
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Soil Data from ISRA 009 - AP/STP-1D

Wilcoxon Rank Sum Test -- (Strontium-90)

General Information:

How to use this template:

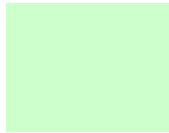
Critical Value (including ties)	1510.3
Sum of Reference Ranks	1515.0

Test Result:
Survey sample concentrations do not exceed those in the background by more than the DCGL

<u>Bkgd Ref (R)</u>	<u>Survey (S)</u>
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No.	Soil ID	Sr-90	Adjusted Sr-90	Area	Ranks	Reference Ranks
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No.	Soil ID	Sr-90	Adjusted Sr-90	Area	Ranks	Reference Ranks
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Sum	1596.0	1515.0
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Appendix 2
Radionuclide Results

ISRA Outfall 009 - AP/STP-1D

Project Name	Sampling Organization	Sampling Date	Sampling Location (General)	Sampling Location (Specific)	Sample Serial Number	Media Type	Isotope	Value	Error (+/-)	MDA	Non-Detect?	Units	Error Type	Analysis Protocol	Analysis Organization	Document	Status
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0301	APWC0301S001	Soil	Americium-241	0.028	0.149	0.258	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0302	APWC0302S001	Soil	Americium-241	-0.0138	0.109	0.204	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0303	APWC0303S001	Soil	Americium-241	-0.0243	0.0701	0.115	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0304	APWC0304S001	Soil	Americium-241	0.00976	0.0903	0.172	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0305	APWC0305S001	Soil	Americium-241	-0.0304	0.0703	0.116	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0301	APWC0301S001	Soil	Cesium-134	0	0.0383	0.0547	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0302	APWC0302S001	Soil	Cesium-134	0	0.0496	0.0654	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0303	APWC0303S001	Soil	Cesium-134	0	0.0345	0.0515	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0304	APWC0304S001	Soil	Cesium-134	0	0.0453	0.0578	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0305	APWC0305S001	Soil	Cesium-134	0	0.0409	0.0595	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0301	APWC0301S001	Soil	Cesium-137	-0.00265	0.022	0.0388	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0302	APWC0302S001	Soil	Cesium-137	0.137	0.0447	0.0425	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0303	APWC0303S001	Soil	Cesium-137	0.00525	0.0222	0.0388	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0304	APWC0304S001	Soil	Cesium-137	0.0213	0.025	0.0462	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0305	APWC0305S001	Soil	Cesium-137	0.0526	0.0358	0.0497	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0301	APWC0301S001	Soil	Cobalt-60	-0.000923	0.0263	0.0451	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0302	APWC0302S001	Soil	Cobalt-60	-0.00714	0.024	0.0403	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0303	APWC0303S001	Soil	Cobalt-60	-0.00375	0.0236	0.039	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0304	APWC0304S001	Soil	Cobalt-60	-0.0155	0.0241	0.0382	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0305	APWC0305S001	Soil	Cobalt-60	-0.007	0.0265	0.0438	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0301	APWC0301S001	Soil	Europium-152	-0.0112	0.0589	0.103	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0302	APWC0302S001	Soil	Europium-152	-0.0268	0.0972	0.115	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0303	APWC0303S001	Soil	Europium-152	-0.00591	0.0596	0.0966	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0304	APWC0304S001	Soil	Europium-152	0.0106	0.0647	0.102	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0305	APWC0305S001	Soil	Europium-152	-0.00976	0.0711	0.109	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0301	APWC0301S001	Soil	Europium-154	0.0186	0.0839	0.148	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0302	APWC0302S001	Soil	Europium-154	-0.0127	0.0844	0.145	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0303	APWC0303S001	Soil	Europium-154	-0.0336	0.0787	0.128	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0304	APWC0304S001	Soil	Europium-154	0.00A	0.109	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste	
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0305	APWC0305S001	Soil	Europium-1969-1871(0.0184677o72157)156			0.109	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste

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Project Name	Sampling Organization	Sampling Date	Sampling Location (General)	Sampling Location (Specific)	Sample Serial Number	Media Type	Isotope	Value	Error (+/-)	MDA	Non-Detect?	Units	Error Type	Analysis Protocol	Analysis Organization	Document	Status
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0304	APWC0304S001	Soil	Tritium	0.134	0.301	0.526	NDA	pCi/g	2 sigma	EPA 906.0 Modified	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0305	APWC0305S001	Soil	Tritium	-0.114	0.384	0.746	NDA	pCi/g	2 sigma	EPA 906.0 Modified	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0301	APWC0301S001	Soil	Uranium-235	0.0732	0.126	0.225	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0302	APWC0302S001	Soil	Uranium-235	-0.000692	0.152	0.265	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0303	APWC0303S001	Soil	Uranium-235	0.0397	0.108	0.197	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0304	APWC0304S001	Soil	Uranium-235	0.126	0.136	0.24	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0305	APWC0305S001	Soil	Uranium-235	-0.0453	0.13	0.22	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0301	APWC0301S001	Soil	Uranium-238	1.36	1.43	1.99	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0302	APWC0302S001	Soil	Uranium-238	-0.0454	0.984	1.8	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0303	APWC0303S001	Soil	Uranium-238	1.18	1.06	1.03		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/28/2010	AP/STP-1D	APWC0304	APWC0304S001	Soil	Uranium-238	0.276	0.834	1.6	NDA	pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257427	Waste
2010 ISRA Waste Characterization	MWH	7/29/2010	AP/STP-1D	APWC0305	APWC0305S001	Soil	Uranium-238	1.72	1.06	1.05		pCi/g	2 sigma	DOE HASL 300, 4.5.2.3/Ga-01-R	GEL	257559	Waste

