



The Boeing Company
Santa Susana Field Laboratory
5800 Woolsey Canyon Road
Canoga Park, CA 91304-1148

February 15, 2019
In reply, refer to SHEA-115986

Mr. Mark Malinowski, P.G.
DTSC Performance Manager – SSFL
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826-3200

Subject: Revised Technical Memorandum – The Boeing Company’s Radiological Air Monitoring Data Associated with the Woolsey Fire, *Santa Susana Field Laboratory, Ventura County, California*.

Dear Mr. Malinowski:

The Boeing Company (Boeing) is submitting the attached revised package to the “*Technical Memorandum – Boeing’s Radiological Air Monitoring Data Associated with the Woolsey Fire*”. This memorandum was sent to the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) under a cover letter dated January 4, 2019. After the letter was submitted, further evaluation of the Boeing air monitoring radiological data showed that there were minor errors in the number of radiological sampling events reported and in the presentation of radiological data in the version of this report submitted to DTSC on January 4. This revised memorandum includes the following changes to Appendix A for gross alpha and gross beta:

- Include one additional month of post-fire baseline data,
- Include measurement uncertainties, and
- Correct previously reported minimum detectable concentrations (MDC).

None of these errors change any of the conclusions or discussions presented in the Technical Memorandum. Please replace the memorandum submitted to DTSC on January 7, 2019 with the attached.



If you have any questions regarding this submittal, please contact me at (818) 466-8776.

Sincerely,

A handwritten signature in black ink that reads "Michael O. Bower". The signature is fluid and cursive, with the first name "Michael" being the most prominent.

Michael O. Bower, P.E.
Associate Technical Fellow
The Boeing Company

Cc: Roger Paulson, DTSC (3 copies)
DTSC Chatsworth Regional Records Office (1 copy)
Alexa Stamets, Jacobs (electronic only)
Dixie Hambrick, Stantec (electronic only)



Technical Memorandum

Boeing's Radiological Air Monitoring Data Associated with the Woolsey Fire

To: Michael Bower, Boeing SSFL Remediation Project Manager
From: Phil Rutherford, Phil Rutherford *Consulting*, under contract to Stantec
Date: February 8, 2019
Project: 185865220.100
Task Order: T30753-N

Boeing operates six air monitoring stations as part of a Baseline Air Monitoring Program at the Santa Susana Field Laboratory (SSFL)¹. These monitoring stations have been operating since April 2018 establishing baseline data. Two of these stations (#4, #5) collect airborne particulates on glass fiber filters that are changed approximately twice a week and are counted for gross alpha and gross beta radioactivity. These air monitors were operational during the Woolsey Fire that burned across portions of SSFL in November 2018. The design of the samplers, sampler locations and procedures are described in the referenced Workplan.

Gross alpha and gross beta data for the period 4/9/2018 through 1/14/2019, including the period of the fire², are provided in Appendix A³. As shown in Appendix A, gross beta concentrations during the fire are consistent with the level of gross beta concentrations before and after the fire, indicating that the fire had no significant impact on gross beta concentrations. There was an increase in gross alpha concentrations during the fire consistent with increases that are seen during any forest or brush fire when increased airborne particulate matter from smoke is present.

¹ NASA, The Boeing Company and the Department of Energy, "Baseline Air Monitoring Workplan, Santa Susana Field Laboratory, Ventura County, California", September 2017.

² The principal burn days at SSFL were 11/8/2018 and 11/9/2018 that are included in the sampling period, 11/8/2018 to 11/13/2018.

³ Appendix A for gross alpha and beta data has been revised to (1) include one extra month of post-fire baseline data, (2) include measurement uncertainties, and (3) correct previously reported minimum detectable concentrations (MDC).



In order to evaluate the data collected during the fire, isotopic analysis of the filters collected during the fire period was conducted by an independent, State-certified laboratory for sixty-one radionuclides, including those radionuclides specified in the referenced Workplan. Results are reported in Appendix B and C. Appendix B includes analysis protocols and QA/QC procedures, in addition to sample results. Data validation of this isotopic data is provided in Appendix D. Reported activities per filter (pCi/filter) are converted to air concentrations ($\mu\text{Ci}/\text{mL}$) in Appendix E.

Isotopic analysis confirmed that only naturally-occurring radioactive material (NORM), including alpha-emitting radionuclides (^{210}Po , ^{230}Th , and ^{232}Th) and beta-emitting ^7Be were detected. No anthropogenic (man-made), nuclear by-product radionuclides were detected in these samples, indicating residual contamination from site operations at SSFL had no impact on radionuclide air concentrations due to the fire.

Appendices

- A. Gross Alpha and Gross Beta Air Concentrations
- B. Letter from GEL Laboratories to Stantec Consulting, "SSFL Post Woolsey Sampling - Work Order 465305", December 7, 2018
- C. Electronic Data Deliverable (EDD) - Work Order 465305
- D. Data Validation of Isotopic Results
- E. Conversion of Filter Paper Activity to Air Concentrations for Detected Radionuclides

Phil Rutherford Consulting

Appendix A
Gross Alpha and Gross Beta Air Concentrations

Table 1. Gross Alpha and Beta Airborne Concentrations at the Boeing #4 Sampling Station

Start Date/Time	End Date/Time	Gross Alpha (µCi/mL)			Gross Beta (µCi/mL)		
		Concentration ¹	Uncertainty ²	MDC ³	Concentration ¹	Uncertainty ²	MDC ³
4/9/18 9:31	4/12/18 10:29	-3.66E-15	1.94E-15	8.12E-15	3.52E-14	1.02E-14	3.22E-14
4/12/18 10:33	4/16/18 8:55	4.42E-16	1.77E-15	6.36E-15	3.25E-14	7.96E-15	2.48E-14
4/16/18 9:00	4/20/18 8:31	-1.75E-16	1.48E-15	5.59E-15	3.76E-15	7.42E-15	2.47E-14
4/20/18 8:40	4/24/18 10:16	1.45E-15	1.54E-15	5.30E-15	3.21E-14	8.04E-15	2.53E-14
4/24/18 10:22	4/27/18 9:10	-1.18E-15	2.37E-15	8.75E-15	3.67E-14	1.04E-14	3.29E-14
4/27/18 10:16	4/30/18 10:32	5.69E-16	2.28E-15	8.20E-15	2.56E-14	9.79E-15	3.16E-14
4/30/18 10:42	5/4/18 9:05	-4.42E-16	1.50E-15	5.57E-15	3.15E-14	7.78E-15	2.45E-14
5/4/18 9:03	5/8/18 9:27	-1.04E-15	1.73E-15	6.40E-15	4.15E-14	8.22E-15	2.52E-14
5/8/18 9:38	5/10/18 7:52	2.71E-15	3.79E-15	1.30E-14	2.54E-14	1.55E-14	5.12E-14
5/10/18 18:05	5/14/18 10:49	-1.27E-15	1.60E-15	6.24E-15	1.35E-15	7.17E-15	2.41E-14
5/14/18 10:54	5/17/18 9:16	-2.62E-15	2.14E-15	8.45E-15	2.12E-14	1.00E-14	3.25E-14
5/17/18 9:23	5/21/18 9:11	8.71E-16	1.65E-15	5.75E-15	2.38E-14	7.58E-15	2.43E-14
5/21/18 9:19	5/25/18 7:38	-1.33E-15	1.41E-15	5.48E-15	2.27E-14	7.78E-15	2.49E-14
5/25/18 7:41	5/29/18 10:06	4.24E-16	1.44E-15	5.26E-15	7.55E-15	7.29E-15	2.42E-14
5/29/18 10:10	6/1/18 9:24	-2.34E-15	1.87E-15	7.61E-15	-4.45E-15	9.84E-15	3.34E-14
6/1/18 9:33	6/4/18 9:12	-8.15E-16	2.21E-15	8.38E-15	1.57E-14	1.02E-14	3.36E-14
6/4/18 9:16	6/7/18 9:33	-2.31E-15	2.08E-15	8.20E-15	5.19E-14	9.70E-15	2.95E-14
6/7/18 9:39	6/11/18 10:05	8.65E-16	1.64E-15	5.71E-15	4.18E-14	7.79E-15	2.37E-14
6/11/18 10:09	6/14/18 9:14	5.87E-16	2.00E-15	7.28E-15	2.78E-14	1.03E-14	3.33E-14
6/14/18 9:26	6/18/18 9:08	2.18E-15	1.74E-15	5.75E-15	2.61E-14	7.85E-15	2.49E-14
6/18/18 9:11	6/21/18 8:09	-1.18E-15	1.88E-15	7.41E-15	2.54E-14	9.99E-15	3.22E-14
6/21/18 8:16	6/25/18 10:58	4.23E-16	1.44E-15	5.32E-15	3.24E-14	7.61E-15	2.38E-14
6/25/18 11:03	6/28/18 8:46	8.02E-15	2.51E-15	7.30E-15	2.18E-14	1.02E-14	3.31E-14
6/28/18 12:16	7/2/18 9:51	2.15E-15	1.55E-15	5.25E-15	1.94E-14	7.40E-15	2.38E-14
7/2/18 9:55	7/5/18 10:02	0.00E+00	1.85E-15	7.06E-15	3.35E-14	1.01E-14	3.20E-14
7/5/18 10:07	7/9/18 12:00	8.52E-16	1.45E-15	5.20E-15	3.42E-14	7.59E-15	2.36E-14
7/9/18 12:35	7/12/18 7:54	1.86E-15	2.11E-15	7.56E-15	4.44E-14	1.09E-14	3.43E-14
7/12/18 7:57	7/16/18 9:29	1.88E-15	1.54E-15	5.22E-15	3.69E-14	7.70E-15	2.37E-14
7/16/18 9:40	7/19/18 8:12	-2.37E-16	2.25E-15	8.40E-15	2.72E-14	1.01E-14	3.25E-14
7/19/18 8:17	7/23/18 10:30	1.27E-15	1.70E-15	5.95E-15	4.11E-14	7.81E-15	2.39E-14
7/23/18 10:36	7/26/18 9:34	1.41E-15	2.35E-15	8.23E-15	6.08E-14	1.09E-14	3.30E-14
7/26/18 9:23	7/30/18 9:39	2.17E-15	1.65E-15	5.46E-15	4.87E-14	7.89E-15	2.37E-14
7/30/18 10:04	8/2/18 9:35	2.33E-16	1.98E-15	7.35E-15	4.90E-14	1.03E-14	3.16E-14
8/2/18 9:44	8/6/18 10:30	-1.03E-15	1.90E-15	6.98E-15	4.22E-14	7.85E-15	2.38E-14
8/6/18 10:37	8/10/18 9:21	-1.06E-15	1.94E-15	7.13E-15	4.85E-14	8.10E-15	2.43E-14
8/10/18 9:25	8/14/18 10:14	-4.31E-16	1.64E-15	6.20E-15	3.86E-14	7.76E-15	2.39E-14
8/14/18 12:30	8/16/18 11:35	1.77E-15	3.01E-15	1.08E-14	1.49E-14	1.51E-14	5.00E-14
8/16/18 9:31	8/20/18 11:35	1.87E-15	1.45E-15	4.85E-15	3.73E-14	7.66E-15	2.36E-14
8/20/18 13:38	8/23/18 12:47	3.74E-15	2.37E-15	7.86E-15	2.97E-14	1.09E-14	3.49E-14
8/28/18 11:23	8/31/18 9:02	-2.87E-16	2.87E-15	1.05E-14	3.74E-14	1.24E-14	3.94E-14
8/31/18 9:06	9/4/18 10:50	1.02E-15	1.95E-15	6.76E-15	3.65E-14	9.22E-15	2.91E-14
9/4/18 10:54	9/6/18 13:10	-3.98E-16	3.78E-15	1.37E-14	7.57E-15	1.63E-14	5.48E-14
9/6/18 13:14	9/10/18 9:57	7.56E-16	2.05E-15	7.23E-15	5.33E-14	1.00E-14	3.06E-14
9/10/18 9:58	9/13/18 9:35	8.74E-16	2.50E-15	8.74E-15	4.85E-14	1.11E-14	3.48E-14
9/13/18 9:41	9/17/18 11:04	9.07E-16	1.72E-15	5.99E-15	3.17E-14	8.25E-15	2.59E-14
9/17/18 11:08	9/20/18 10:45	-7.03E-15	2.47E-15	1.02E-14	5.82E-14	1.11E-14	3.39E-14
9/20/18 11:15	9/24/18 10:05	2.01E-15	1.64E-15	5.57E-15	3.99E-14	8.39E-15	2.59E-14
9/24/18 10:06	9/27/18 10:22	-3.21E-15	2.26E-15	8.79E-15	1.99E-14	1.04E-14	3.40E-14
9/27/18 10:28	10/1/18 10:27	3.75E-15	1.79E-15	5.54E-15	5.14E-14	8.22E-15	2.45E-14
10/1/18 10:31	10/4/18 9:24	1.45E-15	2.18E-15	7.50E-15	3.21E-14	1.02E-14	3.22E-14
10/4/18 9:45	10/8/18 9:31	4.21E-15	1.52E-15	4.48E-15	2.37E-14	7.62E-15	2.43E-14
10/8/18 9:36	10/11/18 10:11	8.28E-16	2.36E-15	5.91E-15	4.32E-14	1.03E-14	3.20E-14
10/11/18 10:13	10/15/18 11:15	2.08E-16	1.87E-15	6.66E-15	3.56E-14	9.27E-15	2.93E-14

Table 1. Gross Alpha and Beta Airborne Concentrations at the Boeing #4 Sampling Station

Start Date/Time	End Date/Time	Gross Alpha (μCi/mL)			Gross Beta (μCi/mL)		
		Concentration ¹	Uncertainty ²	MDC ³	Concentration ¹	Uncertainty ²	MDC ³
10/15/18 11:21	10/19/18 10:10	6.33E-16	1.72E-15	6.15E-15	4.88E-14	8.51E-15	2.60E-14
10/19/18 10:11	10/23/18 10:45	-8.89E-16	1.69E-15	6.40E-15	5.42E-14	8.53E-15	2.54E-14
10/23/18 9:59	10/25/18 9:22	-1.27E-15	3.26E-15	1.23E-14	5.60E-14	1.67E-14	5.31E-14
10/25/18 11:23	10/29/18 9:16	6.33E-16	1.72E-15	6.15E-15	9.40E-14	9.49E-15	2.60E-14
10/29/18 9:05	11/1/18 9:50	5.54E-15	2.24E-15	6.84E-15	3.55E-14	1.05E-14	3.34E-14
11/1/18 9:08	11/5/18 10:45	0.00E+00	1.76E-15	6.33E-15	4.26E-14	8.26E-15	2.53E-14
11/5/18 10:50	11/8/18 10:15	-2.40E-16	2.40E-15	8.65E-15	3.95E-14	1.09E-14	3.46E-14
11/8/18 10:59	11/13/18 10:30	8.73E-15	1.80E-15	4.80E-15	6.32E-14	6.80E-15	1.89E-14
11/13/18 12:25	11/16/18 10:30	-2.45E-15	2.20E-15	8.82E-15	1.85E-14	1.08E-14	3.53E-14
11/16/18 11:08	11/19/18 9:32	5.12E-15	2.44E-15	7.80E-15	7.45E-14	1.17E-14	3.49E-14
11/19/18 9:38	11/21/18 8:50	8.00E-15	3.64E-15	1.16E-14	9.40E-14	1.71E-14	5.20E-14
11/21/18 8:57	11/26/18 12:15	2.07E-15	1.54E-15	4.99E-15	3.41E-14	6.99E-15	2.16E-14
11/26/18 12:19	11/30/18 9:15	1.38E-15	1.94E-15	6.83E-15	1.50E-14	7.94E-15	2.59E-14
11/30/18 9:17	12/3/18 9:05	-8.03E-16	2.06E-15	7.80E-15	-8.49E-15	9.41E-15	3.21E-14
12/3/18 9:05	12/7/18 9:25	-7.95E-16	2.16E-15	7.95E-15	1.77E-14	9.77E-15	3.19E-14
12/7/18 9:31	12/10/18 10:42	1.76E-15	2.11E-15	7.27E-15	1.66E-14	9.97E-15	3.25E-14
12/10/18 10:47	12/13/18 10:28	-1.44E-15	2.15E-15	8.02E-15	7.46E-14	1.10E-14	3.23E-14
12/13/18 10:30	12/17/18 8:00	2.02E-15	1.74E-15	5.87E-15	4.98E-14	8.26E-15	2.46E-14
12/17/18 7:55	12/20/18 8:20	8.29E-16	2.37E-15	8.29E-15	3.93E-14	1.02E-14	3.22E-14
12/20/18 8:34	1/2/19 9:35	1.15E-15	6.30E-16	2.00E-15	2.99E-14	2.88E-15	7.73E-15
1/2/19 9:36	1/4/19 8:35	-3.65E-16	3.65E-15	1.33E-14	1.41E-14	1.57E-14	5.20E-14
1/4/19 8:40	1/8/19 10:10	5.06E-15	1.94E-15	5.92E-15	1.77E-14	9.26E-15	3.02E-14
1/8/19 10:14	1/10/19 9:45	-1.26E-15	3.43E-15	1.30E-14	1.99E-15	1.50E-14	5.04E-14
1/10/19 9:43	1/14/19 11:28	2.61E-15	1.78E-15	5.95E-15	2.90E-14	8.98E-15	2.88E-14

¹ Negative numbers result from subtraction of blank filter background

² Uncertainty is at the 1 sigma (σ) level

³ MDC = minimum detectable concentration

Yellow highlight represents sampling period that includes the burn period

Table 2. Gross Alpha and Beta Airborne Concentrations at the Boeing #5 Sampling Station

Start Date/Time	End Date/Time	Gross Alpha (µCi/mL)			Gross Beta (µCi/mL)		
		Concentration ¹	Uncertainty ²	MDC ³	Concentration ¹	Uncertainty ²	MDC ³
4/9/18 10:23	4/12/18 9:26	-2.52E-16	2.39E-15	8.93E-15	2.78E-14	1.09E-14	3.55E-14
4/12/18 9:32	4/16/18 8:10	-2.60E-16	2.60E-15	9.35E-15	3.73E-14	1.14E-14	3.65E-14
4/16/18 8:33	4/20/18 8:05	1.80E-16	1.62E-15	5.75E-15	6.10E-15	7.63E-15	2.54E-14
4/20/18 8:13	4/24/18 9:55	6.15E-16	1.49E-15	5.44E-15	1.52E-14	7.90E-15	2.60E-14
4/24/18 10:05	4/27/18 8:20	-1.22E-15	2.44E-15	9.04E-15	5.01E-14	1.10E-14	3.39E-14
4/27/18 8:22	4/30/18 9:57	-2.33E-16	2.33E-15	8.40E-15	2.90E-14	1.01E-14	3.24E-14
4/30/18 10:02	5/4/18 8:43	4.82E-15	2.60E-15	8.20E-15	2.46E-14	1.11E-14	3.61E-14
5/4/18 8:50	5/8/18 9:14	-1.78E-16	1.78E-15	6.58E-15	3.63E-14	8.27E-15	2.59E-14
5/8/18 9:20	5/10/18 9:15	3.58E-15	3.76E-15	1.29E-14	6.55E-14	1.61E-14	5.08E-14
5/10/18 9:18	5/14/18 10:04	-1.06E-15	1.77E-15	6.56E-15	7.09E-16	7.53E-15	2.54E-14
5/14/18 10:07	5/17/18 8:54	6.06E-16	2.42E-15	8.60E-15	4.22E-14	1.05E-14	3.31E-14
5/17/18 9:00	5/21/18 8:50	1.34E-15	1.70E-15	5.91E-15	1.52E-14	7.61E-15	2.50E-14
5/21/18 8:57	5/25/18 7:15	1.36E-15	1.64E-15	5.64E-15	2.60E-14	8.01E-15	2.57E-14
5/25/18 7:21	5/29/18 9:31	-1.75E-16	1.49E-15	5.42E-15	2.36E-15	7.43E-15	2.50E-14
5/29/18 10:10	6/1/18 9:24	1.41E-15	2.23E-15	7.61E-15	7.61E-15	1.01E-14	3.34E-14
6/1/18 9:07	6/4/18 8:50	0.00E+00	2.39E-15	8.61E-15	2.62E-14	1.06E-14	3.46E-14
6/4/18 8:55	6/7/18 9:02	-1.19E-15	2.26E-15	8.45E-15	4.07E-14	9.75E-15	3.04E-14
6/7/18 9:08	6/11/18 9:33	3.92E-15	1.87E-15	5.87E-15	3.36E-14	7.83E-15	2.44E-14
6/11/18 9:38	6/14/18 8:54	5.27E-15	2.51E-15	7.78E-15	3.14E-14	1.10E-14	3.56E-14
6/14/18 9:01	6/18/18 8:44	-1.08E-15	1.52E-15	5.91E-15	2.78E-14	8.07E-15	2.56E-14
6/18/18 8:47	6/21/18 7:52	3.86E-15	2.29E-15	7.61E-15	2.44E-14	1.03E-14	3.31E-14
6/21/18 7:59	6/25/18 10:18	3.49E-15	1.75E-15	5.50E-15	2.29E-14	7.68E-15	2.45E-14
6/25/18 10:26	6/28/18 8:23	2.08E-15	2.21E-15	7.48E-15	3.63E-14	1.07E-14	3.40E-14
6/28/18 8:31	7/2/18 9:20	3.46E-15	1.68E-15	5.40E-15	1.90E-14	7.62E-15	2.45E-14
7/2/18 9:22	7/5/18 9:38	3.56E-15	2.14E-15	7.24E-15	8.07E-15	9.85E-15	3.29E-14
7/5/18 9:42	7/9/18 11:17	1.76E-15	1.58E-15	5.36E-15	4.93E-14	8.09E-15	2.44E-14
7/9/18 12:23	7/12/18 7:36	1.26E-15	2.14E-15	7.67E-15	4.74E-14	1.12E-14	3.48E-14
7/12/18 8:03	7/16/18 9:14	1.77E-15	1.59E-15	5.38E-15	3.71E-14	7.86E-15	2.45E-14
7/16/18 9:19	7/19/18 7:47	-8.52E-16	2.31E-15	8.65E-15	4.29E-14	1.07E-14	3.35E-14
7/19/18 7:51	7/23/18 9:57	2.36E-15	1.84E-15	6.12E-15	2.86E-14	7.78E-15	2.46E-14
7/23/18 10:02	7/26/18 9:08	1.81E-15	2.41E-15	8.45E-15	4.34E-14	1.09E-14	3.39E-14
7/26/18 9:18	7/30/18 9:21	6.25E-16	1.61E-15	5.62E-15	4.39E-14	8.03E-15	2.45E-14
7/30/18 10:22	8/2/18 8:53	3.60E-15	2.28E-15	7.55E-15	4.48E-14	1.04E-14	3.25E-14
8/2/18 8:59	8/6/18 9:59	0.00E+00	2.03E-15	7.16E-15	5.87E-14	8.31E-15	2.44E-14
8/6/18 10:04	8/10/18 8:59	-3.16E-15	1.90E-15	7.32E-15	5.61E-14	8.40E-15	2.49E-14
8/10/18 9:06	8/14/18 9:40	-6.22E-16	1.69E-15	6.40E-15	3.86E-14	7.99E-15	2.46E-14
8/14/18 11:28	8/16/18 10:32	5.47E-15	3.28E-15	1.11E-14	5.47E-15	1.53E-14	5.14E-14
8/16/18 8:56	8/20/18 10:32	3.69E-15	1.58E-15	5.01E-15	2.69E-14	7.65E-15	2.43E-14
8/20/18 12:30	8/23/18 12:34	-8.33E-16	2.02E-15	7.50E-15	4.15E-14	1.06E-14	3.33E-14
8/23/18 12:31	8/27/18 9:45	5.24E-15	2.12E-15	6.71E-15	4.03E-14	8.18E-15	2.52E-14
8/27/18 9:56	8/31/18 8:38	0.00E+00	1.81E-15	6.61E-15	3.65E-14	7.97E-15	2.48E-14
8/31/18 8:41	9/4/18 10:16	-1.32E-15	1.49E-15	5.80E-15	4.40E-14	8.18E-15	2.50E-14
9/4/18 10:22	9/6/18 13:29	1.68E-15	3.36E-15	1.16E-14	1.86E-14	1.39E-14	4.61E-14
9/6/18 13:34	9/10/18 9:29	1.86E-16	1.77E-15	6.25E-15	5.17E-14	8.76E-15	2.64E-14
9/10/18 9:34	9/13/18 8:52	6.02E-16	2.41E-15	8.42E-15	5.93E-14	1.09E-14	3.36E-14
9/13/18 8:57	9/17/18 10:47	1.31E-15	1.67E-15	5.78E-15	3.23E-14	7.98E-15	2.50E-14
9/17/18 10:50	9/20/18 10:14	-3.24E-15	2.64E-15	9.97E-15	6.35E-14	1.09E-14	3.30E-14
9/20/18 10:38	9/24/18 9:40	4.24E-15	1.80E-15	5.50E-15	5.19E-14	8.48E-15	2.56E-14
9/24/18 9:45	9/27/18 10:06	1.42E-15	2.48E-15	8.75E-15	4.22E-14	1.08E-14	3.38E-14
9/27/18 10:09	10/1/18 9:49	2.86E-15	1.70E-15	5.55E-15	6.41E-14	8.50E-15	2.45E-14
10/1/18 9:56	10/4/18 9:08	0.00E+00	2.05E-15	7.47E-15	5.52E-14	1.05E-14	3.20E-14
10/4/18 9:13	10/8/18 9:06	3.75E-15	1.52E-15	4.47E-15	3.53E-14	7.77E-15	2.42E-14
10/8/18 9:12	10/11/18 9:58	-1.76E-15	2.23E-15	5.88E-15	3.41E-14	1.01E-14	3.19E-14

Table 2. Gross Alpha and Beta Airborne Concentrations at the Boeing #5 Sampling Station

Start Date/Time	End Date/Time	Gross Alpha (μCi/mL)			Gross Beta (μCi/mL)		
		Concentration ¹	Uncertainty ²	MDC ³	Concentration ¹	Uncertainty ²	MDC ³
10/11/18 9:58	10/15/18 10:38	7.33E-16	1.89E-15	6.71E-15	3.33E-14	9.32E-15	2.94E-14
10/15/18 10:42	10/19/18 9:51	1.80E-15	1.80E-15	6.12E-15	5.17E-14	8.55E-15	2.58E-14
10/19/18 9:53	10/23/18 10:12	-8.89E-16	1.69E-15	6.40E-15	6.73E-14	8.80E-15	2.54E-14
10/23/18 11:16	10/25/18 10:16	-3.64E-16	3.46E-15	1.24E-14	7.67E-14	1.71E-14	5.34E-14
10/25/18 9:30	10/29/18 8:42	1.80E-16	1.71E-15	6.12E-15	9.24E-14	9.46E-15	2.58E-14
10/29/18 8:39	11/1/18 9:15	4.13E-15	2.13E-15	6.85E-15	5.63E-14	1.09E-14	3.34E-14
11/1/18 8:28	11/5/18 10:13	1.49E-15	1.84E-15	6.32E-15	3.97E-14	8.16E-15	2.53E-14
11/5/18 10:15	11/8/18 9:53	2.40E-16	2.40E-15	8.62E-15	5.79E-14	1.13E-14	3.45E-14
11/8/18 10:56	11/13/18 11:00	1.34E-14	2.14E-15	5.15E-15	6.84E-14	7.29E-15	2.02E-14
11/13/18 10:08	11/16/18 10:45	0.00E+00	2.36E-15	8.50E-15	-1.20E-14	9.92E-15	3.40E-14
11/16/18 10:51	11/19/18 8:50	8.58E-16	2.21E-15	7.85E-15	7.63E-14	1.18E-14	3.51E-14
11/19/18 8:55	11/21/18 8:21	3.62E-15	3.44E-15	1.16E-14	7.67E-14	1.66E-14	5.17E-14
11/21/18 8:25	11/26/18 11:47	1.14E-15	1.45E-15	4.95E-15	2.11E-14	6.70E-15	2.14E-14
11/26/18 11:51	11/30/18 8:40	-3.20E-15	1.90E-15	7.40E-15	1.74E-14	8.60E-15	2.80E-14
11/30/18 8:41	12/3/18 8:40	-5.96E-16	2.15E-15	8.10E-15	-9.53E-16	9.89E-15	3.34E-14
12/3/18 8:44	12/7/18 9:50	-5.91E-16	2.25E-15	8.27E-15	8.04E-15	9.93E-15	3.32E-14
12/7/18 9:56	12/10/18 10:24	-1.18E-15	1.89E-15	7.34E-15	2.78E-14	1.02E-14	3.28E-14
12/10/18 10:29	12/13/18 10:08	1.79E-15	2.27E-15	8.02E-15	7.55E-14	1.10E-14	3.23E-14
12/13/18 10:13	12/17/18 7:45	1.83E-15	1.74E-15	5.87E-15	5.58E-14	8.35E-15	2.46E-14
12/17/18 7:45	12/20/18 8:05	3.20E-15	2.49E-15	8.30E-15	1.33E-14	9.72E-15	3.22E-14
12/20/18 8:15	1/2/19 9:05	1.37E-16	5.76E-16	2.00E-15	3.13E-14	2.91E-15	7.73E-15
1/2/19 9:07	1/4/19 8:18	-2.73E-15	3.45E-15	1.33E-14	1.69E-14	1.56E-14	5.18E-14
1/4/19 8:16	1/8/19 9:30	2.84E-15	1.79E-15	5.79E-15	2.89E-14	9.27E-15	2.96E-14
1/8/19 9:44	1/10/19 9:25	-3.96E-15	3.24E-15	1.30E-14	5.40E-15	1.49E-14	5.02E-14
1/10/19 9:21	1/14/19 10:55	5.26E-15	2.04E-15	6.12E-15	2.51E-14	9.23E-15	2.96E-14

¹ Negative numbers result from subtraction of blank filter background

² Uncertainty is at the 1 sigma (σ) level

³ MDC = minimum detectable concentration

Yellow highlight represents sampling period that includes the burn period

Appendix B

Letter from GEL Laboratories to Stantec Consulting, "SSFL Post Woolsey Sampling - Work Order 465305", December 7, 2018



December 07, 2018

Stantec Consulting
5800 Woolsey Canyon Rd.
Canoga Park, California 91304

Re: SSFL Post-Woolsey Sampling
Work Orders: 465305

Dear Ms. VonRaesfeld:

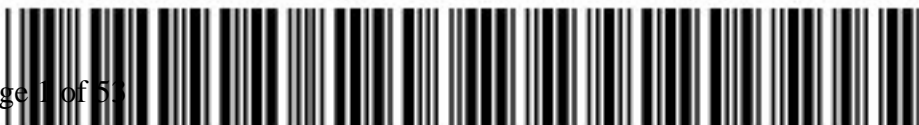
GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on November 23, 2018. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4289.

Sincerely,

Julie Robinson
Project Manager

Enclosures



GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 – (843) 556-8171 – www.gel.com

Certificate of Analysis Report for

SNTC001 Stantec Consulting

Client SDG: 465305 GEL Work Order: 465305

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a Tracer compound
- ** Analyte is a surrogate compound
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy—Uncertain identification

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Julie Robinson.

Reviewed by _____

Julie Robinson

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
 Address : 5800 Woolsey Canyon Rd.

 Canoga Park, California 91304
 Contact: Ms. Sarah VonRaesfeld
 Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-4	Project: SNTC00118
Sample ID: 465305001	Client ID: SNTC001
Matrix: Filter	
Collect Date: 13-NOV-18 10:30	
Receive Date: 23-NOV-18	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
AlphaSpec Ra226, Filter "As Received"													
Radium-226	U	1.12	+/-1.24	1.89	28.4	pCi/Filter			BXA4	12/05/18	0910	1826522	1
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0181	+/-0.117	0.240	0.630	pCi/Filter			BXA4	12/04/18	2118	1826529	2
Alphaspec Po210, Filter "As Received"													
Polonium-210		1.84	+/-1.28	1.11	28.4	pCi/Filter			BXA4	12/06/18	1001	1826520	3
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.00431	+/-0.218	0.473	0.630	pCi/Filter			BXA4	12/05/18	0925	1826533	4
Plutonium-239/240	U	0.0279	+/-0.185	0.379	0.630	pCi/Filter							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.0317	+/-0.0888	0.159	0.630	pCi/Filter			BXA4	12/05/18	1403	1826534	5
Thorium-230	U	0.108	+/-0.110	0.169	0.630	pCi/Filter							
Thorium-232		0.148	+/-0.0842	0.0479	0.126	pCi/Filter							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.230	+/-0.231	0.310	1.58	pCi/Filter			BXA4	12/05/18	0924	1826536	6
Uranium-235/236	U	0.0611	+/-0.168	0.292	1.89	pCi/Filter							
Uranium-238	U	0.0402	+/-0.137	0.254	1.89	pCi/Filter							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-8.14	+/-11.8	20.4	25.2	pCi/Filter			BXA4	12/06/18	0652	1826538	7
Rad Gamma Spec Analysis													
Gammaspac, Gamma, Filter (Standard List) "As Received"													
Actinium-228	U	-2.67	+/-3.65	6.50		pCi/Filter			MXR1	11/28/18	1116	1826402	8
Antimony-124	U	0.0949	+/-2.07	4.43		pCi/Filter							
Antimony-125	U	0.947	+/-1.60	3.25		pCi/Filter							
Barium-133	U	0.934	+/-1.06	1.62		pCi/Filter							
Barium-140	U	2.78	+/-4.36	9.20		pCi/Filter							
Beryllium-7		26.9	+/-11.7	11.0	94500	pCi/Filter							
Bismuth-212	U	-1.73	+/-10.5	19.1		pCi/Filter							
Bismuth-214	U	-0.251	+/-2.07	3.61		pCi/Filter							
Cerium-139	U	0.356	+/-0.454	0.862		pCi/Filter							
Cerium-141	U	-0.998	+/-1.09	1.73		pCi/Filter							
Cerium-144	U	-0.149	+/-3.22	5.63		pCi/Filter							
Cesium-134	U	-0.537	+/-0.726	1.17		pCi/Filter							
Cesium-136	U	-1.79	+/-2.24	3.86		pCi/Filter							
Cesium-137	U	-0.49	+/-0.715	1.19	6300	pCi/Filter							

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
Address : 5800 Woolsey Canyon Rd.

Canoga Park, California 91304

Contact: Ms. Sarah VonRaesfeld
Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-4
Sample ID: 465305001

Project: SNTC00118
Client ID: SNTC001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gamma Spec Analysis												
Gammascpec, Gamma, Filter (Standard List) "As Received"												
Chromium-51	U	-2.84	+/-7.00	11.3		pCi/Filter						
Cobalt-56	U	0.502	+/-0.923	1.87		pCi/Filter						
Cobalt-57	U	-0.0923	+/-0.375	0.648		pCi/Filter						
Cobalt-58	U	-0.39	+/-1.06	1.73		pCi/Filter						
Cobalt-60	U	-0.388	+/-1.04	1.75	1580	pCi/Filter						
Europium-152	U	-0.495	+/-1.62	2.98		pCi/Filter						
Europium-154	U	-1.82	+/-2.29	3.82		pCi/Filter						
Europium-155	U	1.86	+/-1.52	3.00		pCi/Filter						
Iridium-192	U	-0.21	+/-0.582	1.07		pCi/Filter						
Iron-59	U	0.923	+/-2.05	4.36		pCi/Filter						
Lead-210	U	-13.2	+/-31.7	53.2		pCi/Filter						
Lead-212	U	0.868	+/-1.68	1.50		pCi/Filter						
Lead-214	U	-0.514	+/-1.88	3.10		pCi/Filter						
Manganese-54	U	0.0502	+/-0.748	1.43		pCi/Filter						
Mercury-203	U	0.619	+/-0.712	1.34		pCi/Filter						
Neodymium-147	U	-1.79	+/-9.34	17.4		pCi/Filter						
Neptunium-239	U	-2.67	+/-4.13	6.83		pCi/Filter						
Niobium-94	U	0.196	+/-0.779	1.49		pCi/Filter						
Niobium-95	U	0.549	+/-0.880	1.80		pCi/Filter						
Potassium-40	U	5.84	+/-14.5	30.8	18900	pCi/Filter						
Promethium-144	U	0.293	+/-0.846	1.62		pCi/Filter						
Promethium-146	U	-1.07	+/-0.797	1.23		pCi/Filter						
Radium-228	U	-2.67	+/-3.65	6.50	63.0	pCi/Filter						
Ruthenium-106	U	0.167	+/-7.58	12.7		pCi/Filter						
Silver-110m	U	-0.764	+/-1.01	1.60		pCi/Filter						
Sodium-22	U	-0.643	+/-0.808	1.35		pCi/Filter						
Thallium-208	U	0.629	+/-1.18	1.25		pCi/Filter						
Thorium-234	U	1.87	+/-16.5	29.9		pCi/Filter						
Tin-113	U	0.558	+/-0.841	1.69		pCi/Filter						
Uranium-235	U	-1.53	+/-3.98	5.98		pCi/Filter						
Uranium-238	U	1.87	+/-16.5	29.9		pCi/Filter						
Yttrium-88	U	-0.0756	+/-0.648	1.44		pCi/Filter						
Zinc-65	U	-0.334	+/-2.07	3.51		pCi/Filter						
Zirconium-95	U	0.133	+/-1.44	2.77		pCi/Filter						

Rad Gas Flow Proportional Counting
GFPC, Sr90, Filter "As Received"

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Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
 Address : 5800 Woolsey Canyon Rd.

 Canoga Park, California 91304
 Contact: Ms. Sarah VonRaesfeld
 Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-4	Project: SNTC00118
Sample ID: 465305001	Client ID: SNTC001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	0.257	+/-0.936	1.67	1.89	pCi/Filter			KSD1	12/05/18	0942	1826813	9

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	11/30/18	1110	1826500

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	Eichrom Industries, AN-1421	
2	DOE EML HASL-300, Am-05-RC Modified	
3	DOE EML HASL-300, Po-01-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE EML HASL-300, Th-01-RC Modified	
6	DOE EML HASL-300, U-02-RC Modified	
7	DOE EML HASL-300, Pu-11-RC Modified	
8	DOE HASL 300, 4.5.2.3/Ga-01-R	
9	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	AlphaSpec Ra226, Filter "As Received"			83.9	(15%-125%)
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			83.3	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			50.4	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			70.7	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			73.5	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			76.2	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			70.7	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			82.8	(25%-125%)

Notes:
 Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
Address : 5800 Woolsey Canyon Rd.

Canoga Park, California 91304
Contact: Ms. Sarah VonRaesfeld
Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-4
Sample ID: 465305001

Project: SNTC00118
Client ID: SNTC001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
Address : 5800 Woolsey Canyon Rd.

Canoga Park, California 91304
Contact: Ms. Sarah VonRaesfeld
Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-5 Project: SNTC00118
Sample ID: 465305002 Client ID: SNTC001
Matrix: Filter
Collect Date: 13-NOV-18 11:00
Receive Date: 23-NOV-18
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
AlphaSpec Ra226, Filter "As Received"													
Radium-226	U	0.580	+/-0.930	1.55	28.4	pCi/Filter			BXA4	12/05/18	0910	1826522	1
Alphaspec Am241, Filter "As Received"													
Americium-241	U	-0.0201	+/-0.0891	0.232	0.630	pCi/Filter			BXA4	12/04/18	2118	1826529	2
Alphaspec Po210, Filter "As Received"													
Polonium-210		2.43	+/-1.65	1.55	28.4	pCi/Filter			BXA4	12/06/18	1001	1826520	3
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.0333	+/-0.149	0.292	0.630	pCi/Filter			BXA4	12/04/18	2118	1826533	4
Plutonium-239/240	U	-0.0449	+/-0.183	0.432	0.630	pCi/Filter							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	0.037	+/-0.0917	0.163	0.630	pCi/Filter			BXA4	12/05/18	1403	1826534	5
Thorium-230		0.146	+/-0.0917	0.112	0.630	pCi/Filter							
Thorium-232		0.101	+/-0.0709	0.0738	0.126	pCi/Filter							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.0872	+/-0.156	0.260	1.58	pCi/Filter			BXA4	12/05/18	0924	1826536	6
Uranium-235/236	U	0.177	+/-0.190	0.216	1.89	pCi/Filter							
Uranium-238	U	0.137	+/-0.169	0.245	1.89	pCi/Filter							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-9.52	+/-11.5	19.9	25.2	pCi/Filter			BXA4	12/06/18	0855	1826538	7
Rad Gamma Spec Analysis													
Gammaspac, Gamma, Filter (Standard List) "As Received"													
Actinium-228	U	-0.287	+/-3.43	6.72		pCi/Filter			MXR1	11/28/18	1117	1826402	8
Antimony-124	U	1.18	+/-2.44	5.82		pCi/Filter							
Antimony-125	U	0.429	+/-1.76	3.47		pCi/Filter							
Barium-133	U	0.137	+/-0.851	1.64		pCi/Filter							
Barium-140	U	2.07	+/-6.86	12.4		pCi/Filter							
Beryllium-7		22.2	+/-12.4	12.5	94500	pCi/Filter							
Bismuth-212	U	-8.2	+/-11.3	18.7		pCi/Filter							
Bismuth-214	U	0.260	+/-2.03	3.56		pCi/Filter							
Cerium-139	U	0.00371	+/-0.586	0.940		pCi/Filter							
Cerium-141	U	-2.28	+/-1.35	1.76		pCi/Filter							
Cerium-144	U	0.606	+/-3.91	6.92		pCi/Filter							
Cesium-134	U	-0.221	+/-0.666	1.23		pCi/Filter							
Cesium-136	U	1.66	+/-2.15	5.12		pCi/Filter							
Cesium-137	U	-0.121	+/-0.897	1.59	6300	pCi/Filter							

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
Address : 5800 Woolsey Canyon Rd.

Canoga Park, California 91304

Contact: Ms. Sarah VonRaesfeld
Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-5
Sample ID: 465305002

Project: SNTC00118
Client ID: SNTC001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gamma Spec Analysis												
Gammascpec, Gamma, Filter (Standard List) "As Received"												
Chromium-51	U	5.15	+/-7.61	15.4		pCi/Filter						
Cobalt-56	U	-0.283	+/-0.796	1.43		pCi/Filter						
Cobalt-57	U	-0.194	+/-0.419	0.703		pCi/Filter						
Cobalt-58	U	1.11	+/-0.980	1.48		pCi/Filter						
Cobalt-60	U	0.188	+/-0.800	1.83	1580	pCi/Filter						
Europium-152	U	-0.692	+/-2.19	3.67		pCi/Filter						
Europium-154	U	0.474	+/-2.37	5.29		pCi/Filter						
Europium-155	U	-1.93	+/-1.97	3.11		pCi/Filter						
Iridium-192	U	-0.187	+/-0.687	1.27		pCi/Filter						
Iron-59	U	-0.0658	+/-1.67	3.53		pCi/Filter						
Lead-210	UI	0.00	+/-384	332		pCi/Filter						
Lead-212	U	1.87	+/-1.80	2.00		pCi/Filter						
Lead-214	U	-0.985	+/-1.97	3.27		pCi/Filter						
Manganese-54	U	-0.0178	+/-0.757	1.46		pCi/Filter						
Mercury-203	U	0.889	+/-0.767	1.60		pCi/Filter						
Neodymium-147	U	-3.47	+/-11.2	20.5		pCi/Filter						
Neptunium-239	U	-0.506	+/-5.04	8.78		pCi/Filter						
Niobium-94	U	0.143	+/-0.856	1.64		pCi/Filter						
Niobium-95	U	-0.813	+/-1.22	1.73		pCi/Filter						
Potassium-40	U	-1.44	+/-12.7	27.1	18900	pCi/Filter						
Promethium-144	U	0.181	+/-0.879	1.69		pCi/Filter						
Promethium-146	U	-0.256	+/-0.860	1.58		pCi/Filter						
Radium-228	U	-0.287	+/-3.43	6.72	63.0	pCi/Filter						
Ruthenium-106	U	-2.76	+/-6.51	11.6		pCi/Filter						
Silver-110m	U	0.810	+/-1.18	2.55		pCi/Filter						
Sodium-22	U	-0.00893	+/-0.854	1.81		pCi/Filter						
Thallium-208	U	-0.122	+/-0.882	1.60		pCi/Filter						
Thorium-234	U	6.65	+/-41.1	70.8		pCi/Filter						
Tin-113	U	-0.372	+/-0.968	1.75		pCi/Filter						
Uranium-235	U	-0.435	+/-4.41	7.06		pCi/Filter						
Uranium-238	U	6.65	+/-41.1	70.8		pCi/Filter						
Yttrium-88	U	-0.213	+/-0.861	1.78		pCi/Filter						
Zinc-65	U	-0.185	+/-1.76	3.58		pCi/Filter						
Zirconium-95	U	0.793	+/-1.39	2.93		pCi/Filter						

Rad Gas Flow Proportional Counting
GFPC, Sr90, Filter "As Received"

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Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
 Address : 5800 Woolsey Canyon Rd.

 Canoga Park, California 91304
 Contact: Ms. Sarah VonRaesfeld
 Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-5	Project: SNTC00118
Sample ID: 465305002	Client ID: SNTC001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-0.319	+/-0.771	1.47	1.89	pCi/Filter			KSD1	12/05/18	0943	1826813	9

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	11/30/18	1110	1826500

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	Eichrom Industries, AN-1421	
2	DOE EML HASL-300, Am-05-RC Modified	
3	DOE EML HASL-300, Po-01-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE EML HASL-300, Th-01-RC Modified	
6	DOE EML HASL-300, U-02-RC Modified	
7	DOE EML HASL-300, Pu-11-RC Modified	
8	DOE HASL 300, 4.5.2.3/Ga-01-R	
9	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	AlphaSpec Ra226, Filter "As Received"			91	(15%-125%)
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			63.8	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			42.9	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			71.9	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			75.2	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			95.2	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			71.9	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			94.7	(25%-125%)

Notes:
 Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

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Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
Address : 5800 Woolsey Canyon Rd.

Canoga Park, California 91304
Contact: Ms. Sarah VonRaesfeld
Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-5
Sample ID: 465305002

Project: SNTC00118
Client ID: SNTC001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
 Address : 5800 Woolsey Canyon Rd.

 Canoga Park, California 91304
 Contact: Ms. Sarah VonRaesfeld
 Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-BLANK	Project: SNTC00118
Sample ID: 465305003	Client ID: SNTC001
Matrix: Filter	
Collect Date: 13-NOV-18 15:00	
Receive Date: 23-NOV-18	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
AlphaSpec Ra226, Filter "As Received"													
Radium-226	U	0.705	+/-0.874	1.27	28.4	pCi/Filter			BXA4	12/05/18	0910	1826522	1
Alphaspec Am241, Filter "As Received"													
Americium-241	U	0.0998	+/-0.208	0.367	0.630	pCi/Filter			BXA4	12/04/18	2118	1826529	2
Alphaspec Po210, Filter "As Received"													
Polonium-210	U	0.494	+/-0.802	1.14	28.4	pCi/Filter			BXA4	12/06/18	1247	1826520	3
Alphaspec Pu, Filter "As Received"													
Plutonium-238	U	0.00153	+/-0.113	0.252	0.630	pCi/Filter			BXA4	12/04/18	2118	1826533	4
Plutonium-239/240	U	-0.119	+/-0.101	0.362	0.630	pCi/Filter							
Alphaspec Th, Filter "As Received"													
Thorium-228	U	-0.0104	+/-0.0694	0.140	0.630	pCi/Filter			BXA4	12/05/18	1403	1826534	5
Thorium-230	U	0.0659	+/-0.0912	0.151	0.630	pCi/Filter							
Thorium-232	U	0.0157	+/-0.0429	0.0708	0.126	pCi/Filter							
Alphaspec U, Filter "As Received"													
Uranium-233/234	U	0.0327	+/-0.290	0.613	1.58	pCi/Filter			BXA4	12/06/18	0854	1826536	6
Uranium-235/236	U	0.066	+/-0.290	0.525	1.89	pCi/Filter							
Uranium-238	U	0.200	+/-0.330	0.475	1.89	pCi/Filter							
Liquid Scint Pu241, Filter "As Received"													
Plutonium-241	U	-13.2	+/-11.7	20.4	25.2	pCi/Filter			BXA4	12/06/18	1059	1826538	7
Rad Gamma Spec Analysis													
Gammaspes, Gamma, Filter (Standard List) "As Received"													
Actinium-228	U	-0.105	+/-4.82	8.96		pCi/Filter			MXR1	11/28/18	1132	1826402	8
Antimony-124	U	-0.969	+/-2.13	4.13		pCi/Filter							
Antimony-125	U	-0.925	+/-2.04	3.62		pCi/Filter							
Barium-133	U	0.498	+/-1.31	1.90		pCi/Filter							
Barium-140	U	3.95	+/-5.91	12.4		pCi/Filter							
Beryllium-7	U	5.63	+/-7.14	15.0	94500	pCi/Filter							
Bismuth-212	U	-2.53	+/-11.0	20.4		pCi/Filter							
Bismuth-214	U	0.418	+/-2.14	3.93		pCi/Filter							
Cerium-139	U	0.333	+/-0.554	1.09		pCi/Filter							
Cerium-141	U	0.155	+/-1.19	2.26		pCi/Filter							
Cerium-144	U	1.02	+/-3.93	7.52		pCi/Filter							
Cesium-134	U	-0.247	+/-0.920	1.69		pCi/Filter							
Cesium-136	U	2.26	+/-2.79	6.24		pCi/Filter							
Cesium-137	U	0.506	+/-0.721	1.61	6300	pCi/Filter							

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Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
Address : 5800 Woolsey Canyon Rd.

Canoga Park, California 91304

Contact: Ms. Sarah VonRaesfeld
Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-BLANK
Sample ID: 465305003

Project: SNTC00118
Client ID: SNTC001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Gamma Spec Analysis												
Gammascpec, Gamma, Filter (Standard List) "As Received"												
Chromium-51	U	7.01	+/-8.92	17.8		pCi/Filter						
Cobalt-56	U	-0.206	+/-1.02	1.88		pCi/Filter						
Cobalt-57	U	0.308	+/-0.480	0.950		pCi/Filter						
Cobalt-58	U	-0.476	+/-1.04	1.69		pCi/Filter						
Cobalt-60	U	0.387	+/-0.970	2.35	1580	pCi/Filter						
Europium-152	U	-0.489	+/-2.13	3.70		pCi/Filter						
Europium-154	U	-1.3	+/-2.85	5.42		pCi/Filter						
Europium-155	U	1.31	+/-2.22	3.66		pCi/Filter						
Iridium-192	U	-0.396	+/-0.745	1.32		pCi/Filter						
Iron-59	U	-0.20	+/-2.15	4.39		pCi/Filter						
Lead-210	U	-84.2	+/-128	207		pCi/Filter						
Lead-212	U	0.885	+/-2.20	2.73		pCi/Filter						
Lead-214	U	-0.813	+/-2.00	3.14		pCi/Filter						
Manganese-54	U	0.156	+/-1.01	1.96		pCi/Filter						
Mercury-203	U	-0.208	+/-0.804	1.47		pCi/Filter						
Neodymium-147	U	-3.49	+/-13.1	23.9		pCi/Filter						
Neptunium-239	U	1.34	+/-5.07	9.78		pCi/Filter						
Niobium-94	U	0.0708	+/-0.904	1.72		pCi/Filter						
Niobium-95	U	-0.525	+/-1.15	2.00		pCi/Filter						
Potassium-40	U	8.77	+/-10.1	25.1	18900	pCi/Filter						
Promethium-144	U	0.539	+/-1.05	2.07		pCi/Filter						
Promethium-146	U	-0.0764	+/-0.702	1.36		pCi/Filter						
Radium-228	U	-0.105	+/-4.82	8.96	63.0	pCi/Filter						
Ruthenium-106	U	-5.75	+/-7.49	12.4		pCi/Filter						
Silver-110m	U	-0.156	+/-1.37	2.56		pCi/Filter						
Sodium-22	U	-0.562	+/-1.05	1.94		pCi/Filter						
Thallium-208	U	-1.11	+/-1.09	1.62		pCi/Filter						
Thorium-234	U	52.3	+/-66.5	72.2		pCi/Filter						
Tin-113	U	0.390	+/-0.939	1.87		pCi/Filter						
Uranium-235	U	-0.658	+/-4.52	7.72		pCi/Filter						
Uranium-238	U	52.3	+/-66.5	72.2		pCi/Filter						
Yttrium-88	U	1.10	+/-1.28	3.28		pCi/Filter						
Zinc-65	U	-1.4	+/-2.04	3.66		pCi/Filter						
Zirconium-95	U	1.83	+/-2.56	3.75		pCi/Filter						

Rad Gas Flow Proportional Counting
GFPC, Sr90, Filter "As Received"

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: December 7, 2018

Company : Stantec Consulting
 Address : 5800 Woolsey Canyon Rd.

 Canoga Park, California 91304
 Contact: Ms. Sarah VonRaesfeld
 Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-BLANK	Project: SNTC00118
Sample ID: 465305003	Client ID: SNTC001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Filter "As Received"													
Strontium-90	U	-0.349	+/-0.871	1.66	1.89	pCi/Filter			KSD1	12/05/18	0943	1826813	9

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Filter Prep	Filter Prep	CXC1	11/30/18	1110	1826500

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	Eichrom Industries, AN-1421	
2	DOE EML HASL-300, Am-05-RC Modified	
3	DOE EML HASL-300, Po-01-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE EML HASL-300, Th-01-RC Modified	
6	DOE EML HASL-300, U-02-RC Modified	
7	DOE EML HASL-300, Pu-11-RC Modified	
8	DOE HASL 300, 4.5.2.3/Ga-01-R	
9	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Barium-133 Tracer	AlphaSpec Ra226, Filter "As Received"			91.4	(15%-125%)
Americium-243 Tracer	Alphaspec Am241, Filter "As Received"			74.1	(15%-125%)
Polonium-209 Tracer	Alphaspec Po210, Filter "As Received"			49.5	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu, Filter "As Received"			72.7	(15%-125%)
Thorium-229 Tracer	Alphaspec Th, Filter "As Received"			76.4	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Filter "As Received"			85.9	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Filter "As Received"			72.7	(15%-125%)
Strontium Carrier	GFPC, Sr90, Filter "As Received"			85.2	(25%-125%)

Notes:
 Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

GEL LABORATORIES LLC

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Certificate of Analysis

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Company : Stantec Consulting
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Canoga Park, California 91304
Contact: Ms. Sarah VonRaesfeld
Project: SSFL Post-Woolsey Sampling

Client Sample ID: 20181113-BOEING-BLANK
Sample ID: 465305003

Project: SNTC00118
Client ID: SNTC001

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: December 7, 2018

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Stantec Consulting
5800 Woolsey Canyon Rd.
Canoga Park, California

Contact: Ms. Sarah VonRaesfeld

Workorder: 465305

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1826520										
QC1204168605	LCS			31.8	pCi/Filter		111	(75%-125%)	BXA4	12/06/18	10:01
Polonium-210	28.6										
QC1204168606	LCSD			28.7	pCi/Filter	10.2	100	(0%-20%)		12/06/18	12:47
Polonium-210	28.6										
QC1204168604	MB		U	0.152	pCi/Filter					12/06/18	10:01
Polonium-210											
<hr/>											
Batch	1826522										
QC1204168610	LCS			66.6	pCi/Filter		108	(75%-125%)	BXA4	12/05/18	09:10
Radium-226	61.8										
QC1204168611	LCSD			61.5	pCi/Filter	8.02	99.4	(0%-20%)		12/05/18	09:10
Radium-226	61.8										
QC1204168609	MB		U	0.948	pCi/Filter					12/05/18	09:10
Radium-226											
<hr/>											
Batch	1826529										
QC1204168636	LCS			9.22	pCi/Filter		94.9	(75%-125%)	BXA4	12/04/18	21:18
Americium-241	9.71										
QC1204168637	LCSD			9.97	pCi/Filter	7.75	103	(0%-20%)		12/04/18	21:18
Americium-241	9.71										
QC1204168635	MB		U	-0.191	pCi/Filter					12/04/18	21:18
Americium-241											

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QC Summary

Workorder: 465305

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<hr/>											
Rad Alpha Spec											
Batch	1826533										
QC1204168639	LCS										
Plutonium-238			U	-0.0136	pCi/Filter				BXA4	12/04/18	21:18
Plutonium-239/240	9.90			8.63	pCi/Filter		87.2	(75%-125%)			
QC1204168640	LCSD										
Plutonium-238			U	-0.0384	pCi/Filter	0				12/04/18	21:18
Plutonium-239/240	9.90			10.5	pCi/Filter	19.2	106	(0%-20%)			
QC1204168638	MB										
Plutonium-238			U	-0.0531	pCi/Filter					12/04/18	21:18
Plutonium-239/240			U	-0.0283	pCi/Filter						
<hr/>											
Batch	1826534										
QC1204168646	LCS										
Thorium-228				10.3	pCi/Filter				BXA4	12/05/18	14:03
Thorium-230				1.30	pCi/Filter			(75%-125%)			
Thorium-232	9.81			10.2	pCi/Filter		104	(75%-125%)			
QC1204168647	LCSD										
Thorium-228				9.29	pCi/Filter	9.88				12/05/18	14:03
Thorium-230				1.08	pCi/Filter	18.5		(0%-20%)			
Thorium-232	9.81			9.91	pCi/Filter	2.66	101	(0%-20%)			
QC1204168645	MB										
Thorium-228			U	0.048	pCi/Filter					12/05/18	14:03

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QC Summary

Workorder: 465305

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1826534										
Thorium-230			U	0.0177	pCi/Filter				BXA4	12/05/18	14:03
Thorium-232			U	0.0306	pCi/Filter						
Batch	1826536										
QC1204168649	LCS										
Uranium-233/234				11.9	pCi/Filter				BXA4	12/05/18	09:24
Uranium-235/236				0.839	pCi/Filter						
Uranium-238	13.5			12.8	pCi/Filter		95	(75%-125%)			
QC1204168650	LCSD										
Uranium-233/234				12.8	pCi/Filter	7.07				12/05/18	09:24
Uranium-235/236				0.667	pCi/Filter	22.8					
Uranium-238	13.5			13.1	pCi/Filter	2.62	97.5	(0%-20%)			
QC1204168648	MB										
Uranium-233/234			U	-0.0878	pCi/Filter					12/05/18	09:24
Uranium-235/236			U	0.0517	pCi/Filter						
Uranium-238			U	0.0915	pCi/Filter						
Batch	1826538										
QC1204168652	LCS										
Plutonium-241				677	pCi/Filter		83.3	(75%-125%)	BXA4	12/07/18	10:32
QC1204168653	LCSD										
Plutonium-241				677	pCi/Filter	15.1	71.6*	(0%-20%)		12/07/18	10:49

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1826538										
QC1204168651	MB										
Plutonium-241			U	-8.75	pCi/Filter				BXA4	12/06/18	13:03
Rad Gamma Spec											
Batch	1826402										
QC1204168354	465305001	DUP									
Actinium-228		U	-2.67	U	-1.87	pCi/Filter	N/A		N/A	MXR1	11/28/18 13:27
Antimony-124		U	0.0949	U	1.56	pCi/Filter	N/A		N/A		
Antimony-125		U	0.947	U	0.477	pCi/Filter	N/A		N/A		
Barium-133		U	0.934	U	0.412	pCi/Filter	N/A		N/A		
Barium-140		U	2.78	U	4.30	pCi/Filter	N/A		N/A		
Beryllium-7			26.9	U	10.9	pCi/Filter	75.1	(0% - 100%)			
Bismuth-212		U	-1.73	U	11.3	pCi/Filter	N/A		N/A		
Bismuth-214		U	-0.251	U	-0.012	pCi/Filter	N/A		N/A		
Cerium-139		U	0.356	U	-0.318	pCi/Filter	N/A		N/A		
Cerium-141		U	-0.998	U	-0.796	pCi/Filter	N/A		N/A		
Cerium-144		U	-0.149	U	-0.429	pCi/Filter	N/A		N/A		
Cesium-134		U	-0.537	U	0.288	pCi/Filter	N/A		N/A		
Cesium-136		U	-1.79	U	-1.03	pCi/Filter	N/A		N/A		

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Cesium-137	U	-0.49	U	0.597	pCi/Filter	N/A		N/A	MXR1	11/28/18	13:27
Chromium-51	U	-2.84	U	-1.72	pCi/Filter	N/A		N/A			
Cobalt-56	U	0.502	U	0.365	pCi/Filter	N/A		N/A			
Cobalt-57	U	-0.0923	U	-0.209	pCi/Filter	N/A		N/A			
Cobalt-58	U	-0.39	U	-0.356	pCi/Filter	N/A		N/A			
Cobalt-60	U	-0.388	U	0.488	pCi/Filter	N/A		N/A			
Europium-152	U	-0.495	U	0.485	pCi/Filter	N/A		N/A			
Europium-154	U	-1.82	U	0.648	pCi/Filter	N/A		N/A			
Europium-155	U	1.86	U	-0.174	pCi/Filter	N/A		N/A			
Iridium-192	U	-0.21	U	-0.686	pCi/Filter	N/A		N/A			
Iron-59	U	0.923	U	-1.83	pCi/Filter	N/A		N/A			
Lead-210	U	-13.2	U	3.49	pCi/Filter	N/A		N/A			
Lead-212	U	0.868	U	0.958	pCi/Filter	N/A		N/A			
Lead-214	U	-0.514	U	1.63	pCi/Filter	N/A		N/A			
Manganese-54	U	0.0502	U	0.0043	pCi/Filter	N/A		N/A			

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Mercury-203	U	0.619	U	0.056	pCi/Filter	N/A		N/A	MXR1	11/28/18	13:27
Neodymium-147	U	-1.79	U	-8.54	pCi/Filter	N/A		N/A			
Neptunium-239	U	-2.67	U	-2.16	pCi/Filter	N/A		N/A			
Niobium-94	U	0.196	U	-0.582	pCi/Filter	N/A		N/A			
Niobium-95	U	0.549	U	0.443	pCi/Filter	N/A		N/A			
Potassium-40	U	5.84	U	-15.1	pCi/Filter	N/A		N/A			
Promethium-144	U	0.293	U	0.122	pCi/Filter	N/A		N/A			
Promethium-146	U	-1.07	U	0.276	pCi/Filter	N/A		N/A			
Radium-228	U	-2.67	U	-1.87	pCi/Filter	N/A		N/A			
Ruthenium-106	U	0.167	U	2.40	pCi/Filter	N/A		N/A			
Silver-110m	U	-0.764	U	0.0365	pCi/Filter	N/A		N/A			
Sodium-22	U	-0.643	U	0.150	pCi/Filter	N/A		N/A			
Thallium-208	U	0.629	U	0.290	pCi/Filter	N/A		N/A			
Thorium-234	U	1.87	U	1.84	pCi/Filter	N/A		N/A			
Tin-113	U	0.558	U	0.506	pCi/Filter	N/A		N/A			

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Uranium-235	U	-1.53	U	-2.13	pCi/Filter	N/A		N/A	MXR1	11/28/18	13:27
Uranium-238	U	1.87	U	1.84	pCi/Filter	N/A		N/A			
Yttrium-88	U	-0.0756	U	-0.692	pCi/Filter	N/A		N/A			
Zinc-65	U	-0.334	U	-0.824	pCi/Filter	N/A		N/A			
Zirconium-95	U	0.133	U	1.69	pCi/Filter	N/A		N/A			
QC1204168355	LCS										
Americium-241	30600			29200	pCi/Filter		95.6	(75%-125%)		11/28/18	13:41
Actinium-228			U	-52	pCi/Filter						
Antimony-124			U	12.2	pCi/Filter						
Antimony-125			U	45.2	pCi/Filter						
Barium-133			U	32.5	pCi/Filter						
Barium-140			U	41.7	pCi/Filter						
Beryllium-7			U	-127	pCi/Filter						
Bismuth-212			U	106	pCi/Filter						
Bismuth-214			U	30.0	pCi/Filter						
Cerium-139			U	-3.97	pCi/Filter						

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Cerium-141			U	8.18	pCi/Filter				MXR1	11/28/18	13:41
Cerium-144			U	-21.4	pCi/Filter						
Cesium-134			U	-13.2	pCi/Filter						
Cesium-136			U	-11.5	pCi/Filter						
Cesium-137	9730			9620	pCi/Filter		98.9	(75%-125%)			
Chromium-51			U	-45.2	pCi/Filter						
Cobalt-56			U	2.57	pCi/Filter						
Cobalt-57			U	-9.6	pCi/Filter						
Cobalt-58			U	-12	pCi/Filter						
Cobalt-60	5670			5570	pCi/Filter		98.4	(75%-125%)			
Europium-152			U	35.7	pCi/Filter						
Europium-154			U	27.5	pCi/Filter						
Europium-155			U	-29.8	pCi/Filter						
Iridium-192			U	-4.43	pCi/Filter						
Iron-59			U	-56.5	pCi/Filter			(75%-125%)			

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Lead-210				2.56E+05	pCi/Filter				MXR1	11/28/18	13:41
Lead-212			U	-9.93	pCi/Filter						
Lead-214			U	18.4	pCi/Filter						
Manganese-54			U	13.6	pCi/Filter						
Mercury-203			U	3.84	pCi/Filter						
Neodymium-147			U	21.4	pCi/Filter						
Neptunium-239			U	-38.7	pCi/Filter						
Niobium-94			U	2.63	pCi/Filter						
Niobium-95			U	1.34	pCi/Filter						
Potassium-40			U	116	pCi/Filter						
Promethium-144			U	-16.2	pCi/Filter						
Promethium-146			U	9.18	pCi/Filter						
Radium-228			U	-52	pCi/Filter						
Ruthenium-106			U	43.7	pCi/Filter						
Silver-110m			U	13.6	pCi/Filter						

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Sodium-22			U	1.40	pCi/Filter				MXR1	11/28/18	13:41
Thallium-208			U	4.56	pCi/Filter						
Thorium-234			U	-133	pCi/Filter						
Tin-113			U	-18.8	pCi/Filter						
Uranium-235			U	13.7	pCi/Filter						
Uranium-238			U	-133	pCi/Filter						
Yttrium-88			U	-4.44	pCi/Filter						
Zinc-65			U	-30.1	pCi/Filter						
Zirconium-95			U	-16.2	pCi/Filter						
QC1204168353	MB										
Actinium-228			U	-0.286	pCi/Filter					11/28/18	11:32
Antimony-124			U	0.285	pCi/Filter						
Antimony-125			U	0.238	pCi/Filter						
Barium-133			U	-0.183	pCi/Filter						
Barium-140			U	-0.373	pCi/Filter						
Beryllium-7			U	1.89	pCi/Filter						

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Bismuth-212			U	-3.85	pCi/Filter				MXR1	11/28/18	11:32
Bismuth-214			U	-0.493	pCi/Filter						
Cerium-139			U	-0.285	pCi/Filter						
Cerium-141			U	-1.24	pCi/Filter						
Cerium-144			U	-0.0736	pCi/Filter						
Cesium-134			U	0.247	pCi/Filter						
Cesium-136			U	-1.61	pCi/Filter						
Cesium-137			U	-0.472	pCi/Filter						
Chromium-51			U	-2.52	pCi/Filter						
Cobalt-56			U	0.0933	pCi/Filter						
Cobalt-57			U	-0.103	pCi/Filter						
Cobalt-58			U	0.625	pCi/Filter						
Cobalt-60			U	0.510	pCi/Filter						
Europium-152			U	-1.29	pCi/Filter						
Europium-154			U	-0.609	pCi/Filter						

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Europium-155			U	0.124	pCi/Filter				MXR1	11/28/18	11:32
Iridium-192			U	0.117	pCi/Filter						
Iron-59			U	1.19	pCi/Filter						
Lead-210			U	-120	pCi/Filter						
Lead-212			U	2.38	pCi/Filter						
Lead-214			U	0.353	pCi/Filter						
Manganese-54			U	0.580	pCi/Filter						
Mercury-203			U	-0.022	pCi/Filter						
Neodymium-147			U	2.99	pCi/Filter						
Neptunium-239			U	-0.163	pCi/Filter						
Niobium-94			U	0.461	pCi/Filter						
Niobium-95			U	0.318	pCi/Filter						
Potassium-40			U	1.51	pCi/Filter						
Promethium-144			U	0.0894	pCi/Filter						
Promethium-146			U	0.0347	pCi/Filter						

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Radium-228			U	-0.286	pCi/Filter				MXR1	11/28/18	11:32
Ruthenium-106			U	-0.106	pCi/Filter						
Silver-110m			U	0.175	pCi/Filter						
Sodium-22			U	-0.0686	pCi/Filter						
Thallium-208			U	-0.152	pCi/Filter						
Thorium-234			U	19.5	pCi/Filter						
Tin-113			U	0.283	pCi/Filter						
Uranium-235			U	0.546	pCi/Filter						
Uranium-238			U	19.5	pCi/Filter						
Yttrium-88			U	-0.448	pCi/Filter						
Zinc-65			U	-0.318	pCi/Filter						
Zirconium-95			U	-0.113	pCi/Filter						

Rad Gas Flow											
Batch	1826813										
QC1204169237	LCS										
Strontium-90		172		185	pCi/Filter		107	(75%-125%)	KSD1	12/05/18	09:42
QC1204169460	LCSD										
Strontium-90		172		175	pCi/Filter	5.75	101	(0%-20%)		12/05/18	09:42

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	1826813										
QC1204169235	MB										
Strontium-90			U	1.20	pCi/Filter				KSD1	12/05/18	09:42

Notes:

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded
- J Value is estimated
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- M M if above MDC and less than LLD
- M REMP Result > MDC/CL and < RDL
- N/A RPD or %Recovery limits do not apply.
- N1 See case narrative
- ND Analyte concentration is not detected above the detection limit
- NJ Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Q One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
- R Sample results are rejected
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy--Uncertain identification
- UJ Gamma Spectroscopy--Uncertain identification
- UL Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y Other specific qualifiers were required to properly define the results. Consult case narrative.
- ^ RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
- h Preparation or preservation holding time was exceeded

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<u>Parmname</u>	<u>NOM</u>	<u>Sample Qual</u>	<u>QC</u>	<u>Units</u>	<u>RPD%</u>	<u>REC%</u>	<u>Range</u>	<u>Anlst</u>	<u>Date</u>	<u>Time</u>
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N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

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QC Summary

Report Date: December 7, 2018

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Client : Stantec Consulting
5800 Woolsey Canyon Rd.

Canoga Park, California

Contact: Ms. Sarah VonRaesfeld

Workorder: 465305

Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Alpha Spec									
Batch	1826520								
QC1204168605	LCS								
Polonium-210	28.6		31.8	pCi/Filter		111	(75%-125%)	BXA4	12/06/1810:01
	Uncert:		+/-5.32						
	TPU:		+/-9.14						
QC1204168606	LCS								
Polonium-210	28.6		28.7	pCi/Filter	10.2	100	(0%-20%)	BXA4	12/06/1812:47
	Uncert:		+/-4.31						
	TPU:		+/-7.22						
QC1204168604	MB								
Polonium-210		U	0.152	pCi/Filter				BXA4	12/06/1810:01
	Uncert:		+/-0.660						
	TPU:		+/-0.662						
Batch	1826522								
QC1204168610	LCS								
Radium-226	61.8		66.6	pCi/Filter		108	(75%-125%)	BXA4	12/05/1809:10
	Uncert:		+/-6.60						
	TPU:		+/-14.8						
QC1204168611	LCS								
Radium-226	61.8		61.5	pCi/Filter	8.02	99.4	(0%-20%)	BXA4	12/05/1809:10
	Uncert:		+/-6.23						
	TPU:		+/-15.7						
QC1204168609	MB								
Radium-226		U	0.948	pCi/Filter				BXA4	12/05/1809:10
	Uncert:		+/-1.03						
	TPU:		+/-1.04						
Batch	1826529								
QC1204168636	LCS								
Americium-241	9.71		9.22	pCi/Filter		94.9	(75%-125%)	BXA4	12/04/1821:18
	Uncert:		+/-1.22						
	TPU:		+/-1.74						
QC1204168637	LCS								
Americium-241	9.71		9.97	pCi/Filter	7.75	103	(0%-20%)	BXA4	12/04/1821:18
	Uncert:		+/-1.28						
	TPU:		+/-1.87						
QC1204168635	MB								
Americium-241		U	-0.191	pCi/Filter				BXA4	12/04/1821:18
	Uncert:		+/-0.211						
	TPU:		+/-0.212						
Batch	1826533								
QC1204168639	LCS								
Plutonium-238		U	-0.0136	pCi/Filter				BXA4	12/04/1821:18

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Alpha Spec									
Batch	1826533								
Plutonium-239/240	9.90		8.63	pCi/Filter		87.2	(75%-125%)		
		Uncert:	+/-0.205						
		TPU:	+/-0.205						
QC1204168640	LCS								
Plutonium-238		U	-0.0384	pCi/Filter	0			BXA4	12/04/1821:18
		Uncert:	+/-0.130						
		TPU:	+/-0.130						
Plutonium-239/240	9.90		10.5	pCi/Filter	19.2	106	(0%-20%)		
		Uncert:	+/-1.30						
		TPU:	+/-1.98						
QC1204168638	MB								
Plutonium-238		U	-0.0531	pCi/Filter				BXA4	12/04/1821:18
		Uncert:	+/-0.101						
		TPU:	+/-0.101						
Plutonium-239/240		U	-0.0283	pCi/Filter					
		Uncert:	+/-0.167						
		TPU:	+/-0.167						
Batch	1826534								
QC1204168646	LCS								
Thorium-228			10.3	pCi/Filter				BXA4	12/05/1814:03
		Uncert:	+/-0.550						
		TPU:	+/-1.17						
Thorium-230			1.30	pCi/Filter			(75%-125%)		
		Uncert:	+/-0.208						
		TPU:	+/-0.247						
Thorium-232	9.81		10.2	pCi/Filter		104	(75%-125%)		
		Uncert:	+/-0.543						
		TPU:	+/-1.16						
QC1204168647	LCS								
Thorium-228			9.29	pCi/Filter	9.88			BXA4	12/05/1814:03
		Uncert:	+/-0.490						
		TPU:	+/-1.03						
Thorium-230			1.08	pCi/Filter	18.5		(0%-20%)		
		Uncert:	+/-0.181						
		TPU:	+/-0.210						
Thorium-232	9.81		9.91	pCi/Filter	2.66	101	(0%-20%)		
		Uncert:	+/-0.505						
		TPU:	+/-1.09						
QC1204168645	MB								
Thorium-228		U	0.048	pCi/Filter				BXA4	12/05/1814:03
		Uncert:	+/-0.140						
		TPU:	+/-0.140						
Thorium-230		U	0.0177	pCi/Filter					
		Uncert:	+/-0.133						

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec										
Batch	1826534									
Thorium-232										
			TPU:							
				+/-0.133						
		U		0.0306	pCi/Filter					
			Uncert:	+/-0.0786						
			TPU:	+/-0.0787						
Batch	1826536									
QC1204168649	LCS									
Uranium-233/234				11.9	pCi/Filter			BXA4	12/05/1809:24	
			Uncert:	+/-1.15						
			TPU:	+/-1.93						
Uranium-235/236				0.839	pCi/Filter					
			Uncert:	+/-0.351						
			TPU:	+/-0.367						
Uranium-238	13.5			12.8	pCi/Filter		95 (75%-125%)			
			Uncert:	+/-1.19						
			TPU:	+/-2.05						
QC1204168650	LCSD									
Uranium-233/234				12.8	pCi/Filter	7.07		BXA4	12/05/1809:24	
			Uncert:	+/-1.20						
			TPU:	+/-2.05						
Uranium-235/236				0.667	pCi/Filter	22.8				
			Uncert:	+/-0.317						
			TPU:	+/-0.329						
Uranium-238	13.5			13.1	pCi/Filter	2.62	97.5 (0%-20%)			
			Uncert:	+/-1.22						
			TPU:	+/-2.10						
QC1204168648	MB									
Uranium-233/234			U	-0.0878	pCi/Filter			BXA4	12/05/1809:24	
			Uncert:	+/-0.0774						
			TPU:	+/-0.0776						
Uranium-235/236			U	0.0517	pCi/Filter					
			Uncert:	+/-0.142						
			TPU:	+/-0.142						
Uranium-238			U	0.0915	pCi/Filter					
			Uncert:	+/-0.148						
			TPU:	+/-0.149						
Batch	1826538									
QC1204168652	LCS									
Plutonium-241				677	pCi/Filter		83.3 (75%-125%)	BXA4	12/07/1810:32	
			Uncert:	+/-52.7						
			TPU:	+/-136						
QC1204168653	LCSD									
Plutonium-241				677	pCi/Filter	15.1	71.6* (0%-20%)	BXA4	12/07/1810:49	
			Uncert:	+/-45.7						
			TPU:	+/-116						
QC1204168651	MB									
Plutonium-241			U	-8.75	pCi/Filter			BXA4	12/06/1813:03	

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1826538										
				Uncert:							+/-13.0
				TPU:							+/-13.0
Rad Gamma Spec											
Batch	1826402										
QC1204168354	465305001 DUP										
Actinium-228	U	-2.67	U	-1.87	pCi/Filter	0			N/A	MXR1	11/28/18 13:27
		Uncert:		+/-3.65							+/-3.61
		TPU:		+/-3.86							+/-3.72
Antimony-124	U	0.0949	U	1.56	pCi/Filter	0			N/A		
		Uncert:		+/-2.07							+/-2.29
		TPU:		+/-2.07							+/-2.40
Antimony-125	U	0.947	U	0.477	pCi/Filter	0			N/A		
		Uncert:		+/-1.60							+/-2.06
		TPU:		+/-1.66							+/-2.07
Barium-133	U	0.934	U	0.412	pCi/Filter	0			N/A		
		Uncert:		+/-1.06							+/-0.741
		TPU:		+/-1.14							+/-0.765
Barium-140	U	2.78	U	4.30	pCi/Filter	0			N/A		
		Uncert:		+/-4.36							+/-5.24
		TPU:		+/-4.54							+/-5.61
Beryllium-7		26.9	U	10.9	pCi/Filter	75.1		(0% - 100%)			
		Uncert:		+/-11.7							+/-15.9
		TPU:		+/-12.0							+/-15.9
Bismuth-212	U	-1.73	U	11.3	pCi/Filter	0			N/A		
		Uncert:		+/-10.5							+/-11.8
		TPU:		+/-10.5							+/-13.0
Bismuth-214	U	-0.251	U	-0.012	pCi/Filter	0			N/A		
		Uncert:		+/-2.07							+/-2.16
		TPU:		+/-2.07							+/-2.16
Cerium-139	U	0.356	U	-0.318	pCi/Filter	0			N/A		
		Uncert:		+/-0.454							+/-0.587
		TPU:		+/-0.488							+/-0.608
Cerium-141	U	-0.998	U	-0.796	pCi/Filter	0			N/A		
		Uncert:		+/-1.09							+/-1.38
		TPU:		+/-1.18							+/-1.43
Cerium-144	U	-0.149	U	-0.429	pCi/Filter	0			N/A		
		Uncert:		+/-3.22							+/-3.86
		TPU:		+/-3.22							+/-3.86
Cesium-134	U	-0.537	U	0.288	pCi/Filter	0			N/A		
		Uncert:		+/-0.726							+/-0.816
		TPU:		+/-0.769							+/-0.827
Cesium-136	U	-1.79	U	-1.03	pCi/Filter	0			N/A		
		Uncert:		+/-2.24							+/-2.38
		TPU:		+/-2.39							+/-2.43
Cesium-137	U	-0.49	U	0.597	pCi/Filter	0			N/A		
		Uncert:		+/-0.715							+/-0.933

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Chromium-51		TPU:	+/-0.752								
	U		-2.84	U							N/A
		Uncert:	+/-7.00								
Cobalt-56		TPU:	+/-7.12								
	U		0.502	U							N/A
		Uncert:	+/-0.923								
Cobalt-57		TPU:	+/-0.952								
	U		-0.0923	U							N/A
		Uncert:	+/-0.375								
Cobalt-58		TPU:	+/-0.378								
	U		-0.39	U							N/A
		Uncert:	+/-1.06								
Cobalt-60		TPU:	+/-1.07								
	U		-0.388	U							N/A
		Uncert:	+/-1.04								
Europium-152		TPU:	+/-1.05								
	U		-0.495	U							N/A
		Uncert:	+/-1.62								
Europium-154		TPU:	+/-1.64								
	U		-1.82	U							N/A
		Uncert:	+/-2.29								
Europium-155		TPU:	+/-2.44								
	U		1.86	U							N/A
		Uncert:	+/-1.52								
Iridium-192		TPU:	+/-1.74								
	U		-0.21	U							N/A
		Uncert:	+/-0.582								
Iron-59		TPU:	+/-0.589								
	U		0.923	U							N/A
		Uncert:	+/-2.05								
Lead-210		TPU:	+/-2.09								
	U		-13.2	U							N/A
		Uncert:	+/-31.7								
Lead-212		TPU:	+/-32.3								
	U		0.868	U							N/A
		Uncert:	+/-1.68								
Lead-214		TPU:	+/-1.68								
	U		-0.514	U							N/A
		Uncert:	+/-1.88								
Manganese-54		TPU:	+/-1.89								
	U		0.0502	U							N/A
		Uncert:	+/-0.748								
Mercury-203		TPU:	+/-0.748								
	U		0.619	U							N/A
		Uncert:	+/-0.712								
		TPU:	+/-0.766								

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Neodymium-147	U	-1.79	U	-8.54	pCi/Filter	0			N/A		
	Uncert:	+/-9.34		+/-9.98							
	TPU:	+/-9.38		+/-10.7							
Neptunium-239	U	-2.67	U	-2.16	pCi/Filter	0			N/A		
	Uncert:	+/-4.13		+/-4.88							
	TPU:	+/-4.31		+/-4.98							
Niobium-94	U	0.196	U	-0.582	pCi/Filter	0			N/A		
	Uncert:	+/-0.779		+/-0.836							
	TPU:	+/-0.785		+/-0.879							
Niobium-95	U	0.549	U	0.443	pCi/Filter	0			N/A		
	Uncert:	+/-0.880		+/-0.866							
	TPU:	+/-0.918		+/-0.891							
Potassium-40	U	5.84	U	-15.1	pCi/Filter	0			N/A		
	Uncert:	+/-14.5		+/-13.2							
	TPU:	+/-14.8		+/-14.9							
Promethium-144	U	0.293	U	0.122	pCi/Filter	0			N/A		
	Uncert:	+/-0.846		+/-0.823							
	TPU:	+/-0.858		+/-0.825							
Promethium-146	U	-1.07	U	0.276	pCi/Filter	0			N/A		
	Uncert:	+/-0.797		+/-1.17							
	TPU:	+/-0.940		+/-1.18							
Radium-228	U	-2.67	U	-1.87	pCi/Filter	0			N/A		
	Uncert:	+/-3.65		+/-3.61							
	TPU:	+/-3.86		+/-3.72							
Ruthenium-106	U	0.167	U	2.40	pCi/Filter	0			N/A		
	Uncert:	+/-7.58		+/-6.97							
	TPU:	+/-7.59		+/-7.06							
Silver-110m	U	-0.764	U	0.0365	pCi/Filter	0			N/A		
	Uncert:	+/-1.01		+/-0.860							
	TPU:	+/-1.07		+/-0.860							
Sodium-22	U	-0.643	U	0.150	pCi/Filter	0			N/A		
	Uncert:	+/-0.808		+/-0.830							
	TPU:	+/-0.860		+/-0.833							
Thallium-208	U	0.629	U	0.290	pCi/Filter	0			N/A		
	Uncert:	+/-1.18		+/-0.863							
	TPU:	+/-1.19		+/-0.874							
Thorium-234	U	1.87	U	1.84	pCi/Filter	0			N/A		
	Uncert:	+/-16.5		+/-46.5							
	TPU:	+/-16.5		+/-46.5							
Tin-113	U	0.558	U	0.506	pCi/Filter	0			N/A		
	Uncert:	+/-0.841		+/-0.829							
	TPU:	+/-0.879		+/-0.861							
Uranium-235	U	-1.53	U	-2.13	pCi/Filter	0			N/A		
	Uncert:	+/-3.98		+/-4.41							
	TPU:	+/-4.05		+/-4.52							
Uranium-238	U	1.87	U	1.84	pCi/Filter	0			N/A		

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec											
Batch	1826402										
Yttrium-88		Uncert:	+/-16.5								
		TPU:	+/-16.5								
	U		-0.0756	U	-0.692	pCi/Filter	0		N/A		
		Uncert:	+/-0.648		+/-0.994						
		TPU:	+/-0.649		+/-1.04						
Zinc-65				U	-0.334	pCi/Filter	0		N/A		
		Uncert:	+/-2.07		+/-1.80						
		TPU:	+/-2.08		+/-1.84						
Zirconium-95				U	0.133	pCi/Filter	0		N/A		
		Uncert:	+/-1.44		+/-1.46						
		TPU:	+/-1.44		+/-1.66						
QC1204168355	LCS										
Americium-241	30600				29200	pCi/Filter	95.6	(75%-125%)	MXR1	11/28/18	13:41
		Uncert:			+/-552						
		TPU:			+/-2420						
Actinium-228				U	-52	pCi/Filter					
		Uncert:			+/-120						
		TPU:			+/-122						
Antimony-124				U	12.2	pCi/Filter					
		Uncert:			+/-30.7						
		TPU:			+/-31.2						
Antimony-125				U	45.2	pCi/Filter					
		Uncert:			+/-65.5						
		TPU:			+/-68.8						
Barium-133				U	32.5	pCi/Filter					
		Uncert:			+/-24.5						
		TPU:			+/-28.6						
Barium-140				U	41.7	pCi/Filter					
		Uncert:			+/-73.7						
		TPU:			+/-76.3						
Beryllium-7				U	-127	pCi/Filter					
		Uncert:			+/-215						
		TPU:			+/-223						
Bismuth-212				U	106	pCi/Filter					
		Uncert:			+/-304						
		TPU:			+/-308						
Bismuth-214				U	30.0	pCi/Filter					
		Uncert:			+/-40.5						
		TPU:			+/-42.8						
Cerium-139				U	-3.97	pCi/Filter					
		Uncert:			+/-10.6						
		TPU:			+/-10.8						
Cerium-141				U	8.18	pCi/Filter					
		Uncert:			+/-18.2						
		TPU:			+/-18.6						
Cerium-144				U	-21.4	pCi/Filter					

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec										
Batch	1826402									
Cesium-134		U	-13.2	pCi/Filter						
			Uncert: +/-76.9							
			TPU: +/-77.6							
Cesium-136		U	-11.5	pCi/Filter						
			Uncert: +/-26.0							
			TPU: +/-26.8							
Cesium-137	9730		9620	pCi/Filter		98.9	(75%-125%)			
			Uncert: +/-165							
			TPU: +/-1390							
Chromium-51		U	-45.2	pCi/Filter						
			Uncert: +/-135							
			TPU: +/-137							
Cobalt-56		U	2.57	pCi/Filter						
			Uncert: +/-26.3							
			TPU: +/-26.3							
Cobalt-57		U	-9.6	pCi/Filter						
			Uncert: +/-10.3							
			TPU: +/-11.2							
Cobalt-58		U	-12	pCi/Filter						
			Uncert: +/-24.3							
			TPU: +/-25.0							
Cobalt-60	5670		5570	pCi/Filter		98.4	(75%-125%)			
			Uncert: +/-163							
			TPU: +/-529							
Europium-152		U	35.7	pCi/Filter						
			Uncert: +/-79.1							
			TPU: +/-80.8							
Europium-154		U	27.5	pCi/Filter						
			Uncert: +/-46.3							
			TPU: +/-48.0							
Europium-155		U	-29.8	pCi/Filter						
			Uncert: +/-52.6							
			TPU: +/-54.4							
Iridium-192		U	-4.43	pCi/Filter						
			Uncert: +/-16.0							
			TPU: +/-16.1							
Iron-59		U	-56.5	pCi/Filter			(75%-125%)			
			Uncert: +/-58.6							
			TPU: +/-64.2							
Lead-210			2.56E+05	pCi/Filter						
			Uncert: +/-8330							
			TPU: +/-24600							
Lead-212		U	-9.93	pCi/Filter						
			Uncert: +/-27.8							
			TPU:							

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec										
Batch	1826402									
Lead-214			U	18.4						
	Uncert:			+/-28.1						
	TPU:			+/-41.5						
Manganese-54			U	13.6						
	Uncert:			+/-26.3						
	TPU:			+/-27.1						
Mercury-203			U	3.84						
	Uncert:			+/-14.4						
	TPU:			+/-14.5						
Neodymium-147			U	21.4						
	Uncert:			+/-143						
	TPU:			+/-143						
Neptunium-239			U	-38.7						
	Uncert:			+/-114						
	TPU:			+/-116						
Niobium-94			U	2.63						
	Uncert:			+/-18.7						
	TPU:			+/-18.8						
Niobium-95			U	1.34						
	Uncert:			+/-22.6						
	TPU:			+/-22.6						
Potassium-40			U	116						
	Uncert:			+/-131						
	TPU:			+/-141						
Promethium-144			U	-16.2						
	Uncert:			+/-18.8						
	TPU:			+/-20.3						
Promethium-146			U	9.18						
	Uncert:			+/-36.7						
	TPU:			+/-36.9						
Radium-228			U	-52						
	Uncert:			+/-120						
	TPU:			+/-122						
Ruthenium-106			U	43.7						
	Uncert:			+/-188						
	TPU:			+/-189						
Silver-110m			U	13.6						
	Uncert:			+/-39.5						
	TPU:			+/-40.0						
Sodium-22			U	1.40						
	Uncert:			+/-17.0						
	TPU:			+/-17.0						
Thallium-208			U	4.56						
	Uncert:			+/-19.4						
	TPU:			+/-19.5						

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec										
Batch	1826402									
Thorium-234		U	-133	pCi/Filter						
	Uncert:		+/-869							
	TPU:		+/-872							
Tin-113		U	-18.8	pCi/Filter						
	Uncert:		+/-25.8							
	TPU:		+/-27.2							
Uranium-235		U	13.7	pCi/Filter						
	Uncert:		+/-77.4							
	TPU:		+/-77.6							
Uranium-238		U	-133	pCi/Filter						
	Uncert:		+/-869							
	TPU:		+/-872							
Yttrium-88		U	-4.44	pCi/Filter						
	Uncert:		+/-17.2							
	TPU:		+/-17.3							
Zinc-65		U	-30.1	pCi/Filter						
	Uncert:		+/-61.8							
	TPU:		+/-63.3							
Zirconium-95		U	-16.2	pCi/Filter						
	Uncert:		+/-35.6							
	TPU:		+/-36.4							
QC1204168353	MB									
Actinium-228		U	-0.286	pCi/Filter				MXR1	11/28/18	11:32
	Uncert:		+/-4.74							
	TPU:		+/-4.75							
Antimony-124		U	0.285	pCi/Filter						
	Uncert:		+/-2.30							
	TPU:		+/-2.30							
Antimony-125		U	0.238	pCi/Filter						
	Uncert:		+/-2.11							
	TPU:		+/-2.12							
Barium-133		U	-0.183	pCi/Filter						
	Uncert:		+/-0.820							
	TPU:		+/-0.824							
Barium-140		U	-0.373	pCi/Filter						
	Uncert:		+/-2.50							
	TPU:		+/-2.51							
Beryllium-7		U	1.89	pCi/Filter						
	Uncert:		+/-6.66							
	TPU:		+/-6.72							
Bismuth-212		U	-3.85	pCi/Filter						
	Uncert:		+/-11.8							
	TPU:		+/-11.9							
Bismuth-214		U	-0.493	pCi/Filter						
	Uncert:		+/-2.37							
	TPU:		+/-2.38							

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Parname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec										
Batch	1826402									
Cerium-139		U	-0.285	pCi/Filter						
	Uncert:		+/-0.462							
	TPU:		+/-0.483							
Cerium-141		U	-1.24	pCi/Filter						
	Uncert:		+/-1.03							
	TPU:		+/-1.17							
Cerium-144		U	-0.0736	pCi/Filter						
	Uncert:		+/-3.76							
	TPU:		+/-3.76							
Cesium-134		U	0.247	pCi/Filter						
	Uncert:		+/-0.920							
	TPU:		+/-0.927							
Cesium-136		U	-1.61	pCi/Filter						
	Uncert:		+/-1.10							
	TPU:		+/-1.34							
Cesium-137		U	-0.472	pCi/Filter						
	Uncert:		+/-0.874							
	TPU:		+/-0.902							
Chromium-51		U	-2.52	pCi/Filter						
	Uncert:		+/-4.92							
	TPU:		+/-5.05							
Cobalt-56		U	0.0933	pCi/Filter						
	Uncert:		+/-1.04							
	TPU:		+/-1.04							
Cobalt-57		U	-0.103	pCi/Filter						
	Uncert:		+/-0.425							
	TPU:		+/-0.428							
Cobalt-58		U	0.625	pCi/Filter						
	Uncert:		+/-1.55							
	TPU:		+/-1.56							
Cobalt-60		U	0.510	pCi/Filter						
	Uncert:		+/-0.910							
	TPU:		+/-0.940							
Europium-152		U	-1.29	pCi/Filter						
	Uncert:		+/-1.95							
	TPU:		+/-2.04							
Europium-154		U	-0.609	pCi/Filter						
	Uncert:		+/-2.67							
	TPU:		+/-2.68							
Europium-155		U	0.124	pCi/Filter						
	Uncert:		+/-1.94							
	TPU:		+/-1.94							
Iridium-192		U	0.117	pCi/Filter						
	Uncert:		+/-0.621							
	TPU:		+/-0.624							
Iron-59		U	1.19	pCi/Filter						

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QC Summary

Workorder: 465305

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec										
Batch	1826402									
			Uncert:							
			TPU:							
Lead-210		U	-120	pCi/Filter						
			Uncert:							
			TPU:							
Lead-212		U	2.38	pCi/Filter						
			Uncert:							
			TPU:							
Lead-214		U	0.353	pCi/Filter						
			Uncert:							
			TPU:							
Manganese-54		U	0.580	pCi/Filter						
			Uncert:							
			TPU:							
Mercury-203		U	-0.022	pCi/Filter						
			Uncert:							
			TPU:							
Neodymium-147		U	2.99	pCi/Filter						
			Uncert:							
			TPU:							
Neptunium-239		U	-0.163	pCi/Filter						
			Uncert:							
			TPU:							
Niobium-94		U	0.461	pCi/Filter						
			Uncert:							
			TPU:							
Niobium-95		U	0.318	pCi/Filter						
			Uncert:							
			TPU:							
Potassium-40		U	1.51	pCi/Filter						
			Uncert:							
			TPU:							
Promethium-144		U	0.0894	pCi/Filter						
			Uncert:							
			TPU:							
Promethium-146		U	0.0347	pCi/Filter						
			Uncert:							
			TPU:							
Radium-228		U	-0.286	pCi/Filter						
			Uncert:							
			TPU:							
Ruthenium-106		U	-0.106	pCi/Filter						
			Uncert:							
			TPU:							
Silver-110m		U	0.175	pCi/Filter						
			Uncert:							
			TPU:							

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QC Summary

Workorder: 465305

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Parmname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gamma Spec										
Batch	1826402									
Sodium-22			U							
				+/-1.22						
				-0.0686	pCi/Filter					
	Uncert:			+/-0.886						
	TPU:			+/-0.887						
Thallium-208			U							
				-0.152	pCi/Filter					
	Uncert:			+/-1.05						
	TPU:			+/-1.05						
Thorium-234			U							
				19.5	pCi/Filter					
	Uncert:			+/-64.9						
	TPU:			+/-65.7						
Tin-113			U							
				0.283	pCi/Filter					
	Uncert:			+/-0.770						
	TPU:			+/-0.781						
Uranium-235			U							
				0.546	pCi/Filter					
	Uncert:			+/-4.31						
	TPU:			+/-4.32						
Uranium-238			U							
				19.5	pCi/Filter					
	Uncert:			+/-64.9						
	TPU:			+/-65.7						
Yttrium-88			U							
				-0.448	pCi/Filter					
	Uncert:			+/-1.31						
	TPU:			+/-1.32						
Zinc-65			U							
				-0.318	pCi/Filter					
	Uncert:			+/-1.70						
	TPU:			+/-1.70						
Zirconium-95			U							
				-0.113	pCi/Filter					
	Uncert:			+/-1.37						
	TPU:			+/-1.37						
Rad Gas Flow										
Batch	1826813									
QC1204169237	LCS									
Strontium-90		172		185	pCi/Filter		107 (75%-125%)	KSD1	12/05/1809:42	
		Uncert:		+/-10.8						
		TPU:		+/-49.2						
QC1204169460	LCSD									
Strontium-90		172		175	pCi/Filter	5.75	101 (0%-20%)	KSD1	12/05/1809:42	
		Uncert:		+/-10.6						
		TPU:		+/-46.7						
QC1204169235	MB									
Strontium-90			U	1.20	pCi/Filter			KSD1	12/05/1809:42	
		Uncert:		+/-0.986						
		TPU:		+/-1.03						

Notes:

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

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QC Summary

Workorder: 465305

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Parname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
**	Analyte is a Tracer compound									
<	Result is less than value reported									
>	Result is greater than value reported									
BD	Results are either below the MDC or tracer recovery is low									
FA	Failed analysis.									
H	Analytical holding time was exceeded									
J	Value is estimated									
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.									
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.									
M	M if above MDC and less than LLD									
M	REMP Result > MDC/CL and < RDL									
N/A	RPD or %Recovery limits do not apply.									
N1	See case narrative									
ND	Analyte concentration is not detected above the detection limit									
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier									
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.									
R	Sample results are rejected									
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.									
UI	Gamma Spectroscopy--Uncertain identification									
UJ	Gamma Spectroscopy--Uncertain identification									
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.									
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier									
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.									
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.									
h	Preparation or preservation holding time was exceeded									

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

** Indicates analyte is a surrogate/tracer compound.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Project # _____
GEL Quote #: _____
COC Number (1): _____
PO Number: _____

405305
GEL Work Order Number: _____



Chain of Custody and Analytical Request

GEL Project Manager: Julie Robinson

Client Name: Stantec Consulting Phone # 818-466-8864 (Earl)

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Project/Site Name: SSFL Post-Woolsey Sampling Fax # _____

Should this sample be considered:

Address: 5800 Woolsey Canyon Rd. Canoga Park, 91304

Collected By: Earl Sorrels Send Results To: Sarah.VonRaesfeld@stantec.com
Earl.Sorrels@Stantec.com

<-- Preservative Type (6)

Comments
Note: extra sample is required for sample specific QC

Sample ID <i>*For composites - indicate start and stop date/time</i>	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Radioactive (if yes, please supply isotope info)	(7) Known or possible Hazards	Total number of containers	Gamma Spec	Str-90	Po-210	Am-241	U-234, U-235, U-238	Th-228, Th-230, Th-232	Pu-238, Pu-239	Pu-241	Ra-226	
20181113-BOEING-4	11/13/2018	10:30	N	--	F	N	--	1	X	X	X	X	X	X	X	X	X	
20181113-BOEING-5	11/13/2018	11:00	N	--	F	N	--	1	X	X	X	X	X	X	X	X	X	
20181113-BOEING-BLANK	11/13/2018	15:00	N	--	F	N	--	1	X	X	X	X	X	X	X	X	X	

Chain of Custody Signatures

TAT Requested: Normal: _____ Rush: 5 day Specify: _____ (Subject to Surcharge)

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1 <i>[Signature]</i>	11-21-18	16:48	1 Fed Ex	11-21-18	17:30
2 <i>[Signature]</i>			2 L. Matthews	11/23/18	825
3			3		

Fax Results: Yes No
Select Deliverable: C of A QC Summary level 1 Level 2 Level 3 Level 4
Additional Remarks: Provide BEDMS format EDD; MDA requirements to follow.
For Lab Receiving Use Only: Custody Seal Intact? Yes No Cooler Temp: _____ °C

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone: Eastern Pacific Central Mountain Other.

- 1.) Chain of Custody Number = Client Determined
- 2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
- 3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
- 4.) Matrix Codes: DW=Drinking Water, GW=Groundwater, SW=Surface Water, WW=Waste Water, W=Water, ML=Misc Liquid, SO=Soil, SD=Sediment, SL=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Fecal, N=Nasal
- 5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
- 6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

RCRA Metals	
As = Arsenic	Hg= Mercury
Ba = Barium	Se= Selenium
Cd = Cadmium	Ag= Silver
Cr = Chromium	MR= Misc. RCRA metals
Pb = Lead	

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive
TSCA Regulated
PCB = Polychlorinated biphenyls

Listed Waste
LW= Listed Waste
(F, K, P and U-listed wastes.)
Waste code(s):

Other
OT= Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. (i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)

Please handle the filters as non-radioactive, environmental samples



Laboratories LLC

JK

SAMPLE RECEIPT & REVIEW FORM

Client: SNTC	SDG/AR/COC/Work Order: 405305
Received By: LM	Date Received: 11/23/18
Carrier and Tracking Number	Circle Applicable: <input checked="" type="radio"/> FedEx Express <input type="radio"/> FedEx Ground <input type="radio"/> UPS <input type="radio"/> Field Services <input type="radio"/> Courier <input type="radio"/> Other 7737 8721 2781

Suspected Hazard Information	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
Shipped as a DOT Hazardous?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____
COC/Samples marked or classified as radioactive?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> <input checked="" type="radio"/> CPM/mR/Hr Classified as: Rad 1 Rad 2 Rad 3
Is package, COC, and/or Samples marked HAZ?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry Ice <input checked="" type="radio"/> None Other: _____ *all temperatures are recorded in Celsius TEMP: 23°C
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: IR4-17 Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If Yes, Are Encores or Soil Kits present? Yes ___ No ___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes ___ No ___ N/A (If unknown, select No) VOA vials free of headspace? Yes ___ No ___ N/A Sample ID's and containers affected: _____
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected: _____
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected: _____
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected: _____
12 Are sample containers identifiable as GEL provided?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials **KG** Date **11/23/18** Page **1** of **1**

**Radiochemistry
Technical Case Narrative
Stantec Consulting (SNTC)
SDG #: 465305**

Product: Alphaspec Po210, Filter

Analytical Method: DOE EML HASL-300, Po-01-RC Modified

Analytical Procedure: GL-RAD-A-016 REV# 18

Analytical Batch: 1826520

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 17

Preparation Batch: 1826500

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
465305001	20181113-BOEING-4
465305002	20181113-BOEING-5
465305003	20181113-BOEING-BLANK
1204168604	Method Blank (MB)
1204168605	Laboratory Control Sample (LCS)
1204168606	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 465305003 (20181113-BOEING-BLANK) was recounted due to a peak shift. The recount is reported.
Sample 1204168606 (LCSD) was recounted due to detector error. The recount is reported.

Product: AlphaSpec Ra226, Filter

Analytical Method: Eichrom Industries, AN-1421

Analytical Procedure: GL-RAD-A-046 REV# 10

Analytical Batch: 1826522

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 17

Preparation Batch: 1826500

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
465305001	20181113-BOEING-4
465305002	20181113-BOEING-5
465305003	20181113-BOEING-BLANK
1204168609	Method Blank (MB)
1204168610	Laboratory Control Sample (LCS)
1204168611	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec Am241, Filter

Analytical Method: DOE EML HASL-300, Am-05-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 26

Analytical Batch: 1826529

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 17

Preparation Batch: 1826500

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
465305001	20181113-BOEING-4
465305002	20181113-BOEING-5
465305003	20181113-BOEING-BLANK
1204168635	Method Blank (MB)
1204168636	Laboratory Control Sample (LCS)
1204168637	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1204168635 (MB)	Americium-241	Result -0.191 < MDA 0.644 > RDL 0.63 pCi/Filter

Product: Alphaspec Pu, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 26

Analytical Batch: 1826533

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 17

Preparation Batch: 1826500

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
465305001	20181113-BOEING-4
465305002	20181113-BOEING-5
465305003	20181113-BOEING-BLANK
1204168638	Method Blank (MB)
1204168639	Laboratory Control Sample (LCS)
1204168640	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 465305001 (20181113-BOEING-4) was recounted due to results more negative than the three sigma TPU. The second count is reported.

Product: Alphaspec Th, Filter

Analytical Method: DOE EML HASL-300, Th-01-RC Modified

Analytical Procedure: GL-RAD-A-038 REV# 17

Analytical Batch: 1826534

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 17

Preparation Batch: 1826500

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
465305001	20181113-BOEING-4
465305002	20181113-BOEING-5
465305003	20181113-BOEING-BLANK
1204168645	Method Blank (MB)
1204168646	Laboratory Control Sample (LCS)
1204168647	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1204168645 (MB)	Thorium-232	Result 0.0306 < MDA 0.128 > RDL 0.126 pCi/Filter

Miscellaneous Information

Manual Integration

Manual integrations of alpha spectroscopy spectra 1204168646 (LCS) and 1204168647 (LCSD) were performed to fully separate counts in Regions of Interest which would have been biased.

Product: Alphaspec U, Filter

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 26

Analytical Batch: 1826536

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 17

Preparation Batch: 1826500

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
465305001	20181113-BOEING-4
465305002	20181113-BOEING-5

465305003	20181113-BOEING-BLANK
1204168648	Method Blank (MB)
1204168649	Laboratory Control Sample (LCS)
1204168650	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts

Sample 465305003 (20181113-BOEING-BLANK) was recounted due to a suspected false positive. The recount is reported.

Miscellaneous Information

Additional Comments

The tracer peak centroid for sample 1204168648 (MB) is greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Product: Gammaspec, Gamma, Filter (Standard List)

Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 1826402

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
465305001	20181113-BOEING-4
465305002	20181113-BOEING-5
465305003	20181113-BOEING-BLANK
1204168353	Method Blank (MB)
1204168354	465305001(20181113-BOEING-4) Sample Duplicate (DUP)
1204168355	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to high counting uncertainty.	Lead-210	465305002	20181113-BOEING-5

Product: GFPC, Sr90, Filter

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 20

Analytical Batch: 1826813

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 17

Preparation Batch: 1826500

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
465305001	20181113-BOEING-4
465305002	20181113-BOEING-5
465305003	20181113-BOEING-BLANK
1204169235	Method Blank (MB)
1204169237	Laboratory Control Sample (LCS)
1204169460	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Liquid Scint Pu241, Filter

Analytical Method: DOE EML HASL-300, Pu-11-RC Modified

Analytical Procedure: GL-RAD-A-035 REV# 20

Analytical Batch: 1826538

Preparation Method: Filter Prep

Preparation Procedure: GL-RAD-A-026 REV# 17

Preparation Batch: 1826500

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
465305001	20181113-BOEING-4
465305002	20181113-BOEING-5

465305003 20181113-BOEING-BLANK
1204168651 Method Blank (MB)
1204168652 Laboratory Control Sample (LCS)
1204168653 Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Laboratory Control Sample (LCS) Recovery

The Laboratory Control Sample Duplicate (see below) does not meet the recovery requirement, however, the Laboratory Control Sample does meet the recovery requirement and they meet the duplication criteria. There is not enough sample remaining for a re-analysis.

Sample	Analyte	Value
1204168653 (LCSD)	Plutonium-241	71.6* (75%-125%)

Technical Information

Recounts

Samples 1204168652 (LCS) and 1204168653 (LCSD) were recounted due to low recovery. The recounts are reported.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

List of current GEL Certifications as of 07 December 2018

State	Certification
Alaska	17-018
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA180011
Maryland	270
Massachusetts	M-SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122019-1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	9904
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-18-13
Utah NELAP	SC000122018-27
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Appendix C
Electronic Data Deliverable (EDD) - Work Order 465305

Electronic Data Deliverable (EDD) 465305

Air Sample Filters from Boeing Stations #4 and #5 for period 11/8/2018 to 11/13/2018

Sample Name	Sample Date	Lab Sample Name	Result Type	SDG Number	Code Description	Analysis Method	Analyte	Result Value	Result Value Units	Project Qualifier Code	Lab Qualifier Code	Lab Qualifier Description	1.96g Uncertainty	Uncertainty Units	MDA	MDA Units	Lower Limit	Upper Limit	Report Date	Lab Batch No
20181113-BOEING-4	11/13/2018 10:30	465305001	Primary Result	465305	FILTER EPA 905 Modified/DOE RPS01 Rev. 1 Modified/GPC, 350, Filter	E9300	Strontium-90	0.257	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.036	pCi/Filtrer	1.67	pCi/Filtrer			12/7/2018	1826813
20181113-BOEING-4	11/13/2018 10:30	465305002	Primary Result	465305	FILTER EPA 905 Modified/DOE RPS01 Rev. 1 Modified/GPC, 350, Filter	E9300	Americium-241	0.076	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.011	pCi/Filtrer	0.24	pCi/Filtrer			12/7/2018	1826813
20181113-BOEING-4	11/13/2018 10:30	465305003	Primary Result	465305	FILTER DOE EML HASL-300, Pu-11-RC Modified,Alphaspec Pu, Filter	E9300 M	Plutonium-238	0.00431	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.218	pCi/Filtrer	0.473	pCi/Filtrer			12/7/2018	1826533
20181113-BOEING-4	11/13/2018 10:30	465305004	Primary Result	465305	FILTER DOE EML HASL-300, Pu-11-RC Modified,Alphaspec Pu, Filter	E9300 M	Plutonium-239/240	0.0279	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.185	pCi/Filtrer	0.379	pCi/Filtrer			12/7/2018	1826533
20181113-BOEING-4	11/13/2018 10:30	465305005	Primary Result	465305	FILTER DOE EML HASL-300, Pu-11-RC Modified,Liquid Scint Pu241, Filter	E9300 M	Plutonium-241	-8.14	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	11.8	pCi/Filtrer	20.4	pCi/Filtrer			12/7/2018	1826533
20181113-BOEING-4	11/13/2018 10:30	465305006	Primary Result	465305	FILTER DOE EML HASL-300, Pu-01-RC Modified,Alphaspec Pu210, Filter	E9300 M	Polonium-210	1.84	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	1.78	pCi/Filtrer	1.11	pCi/Filtrer			12/7/2018	1826530
20181113-BOEING-4	11/13/2018 10:30	465305007	Primary Result	465305	FILTER DOE EML HASL-300, Th-01-RC Modified,Alphaspec Th, Filter	E9300 M	Polonium-210	0.187	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.089	pCi/Filtrer	0.29	pCi/Filtrer			12/7/2018	1826534
20181113-BOEING-4	11/13/2018 10:30	465305008	Primary Result	465305	FILTER DOE EML HASL-300, Th-01-RC Modified,Alphaspec Th, Filter	E9300 M	Thorium-230	0.108	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.11	pCi/Filtrer	0.169	pCi/Filtrer			12/7/2018	1826534
20181113-BOEING-4	11/13/2018 10:30	465305009	Primary Result	465305	FILTER DOE EML HASL-300, Th-01-RC Modified,Alphaspec Th, Filter	E9300 M	Thorium-232	0.148	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.084	pCi/Filtrer	0.0479	pCi/Filtrer			12/7/2018	1826534
20181113-BOEING-4	11/13/2018 10:30	465305010	Primary Result	465305	FILTER DOE EML HASL-300, U-02-RC Modified,Alphaspec U, Filter	E9300 M	Uranium-233/234	0.23	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.231	pCi/Filtrer	0.31	pCi/Filtrer			12/7/2018	1826536
20181113-BOEING-4	11/13/2018 10:30	465305011	Primary Result	465305	FILTER DOE EML HASL-300, U-02-RC Modified,Alphaspec U, Filter	E9300 M	Uranium-235	0.0611	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.168	pCi/Filtrer	0.292	pCi/Filtrer			12/7/2018	1826536
20181113-BOEING-4	11/13/2018 10:30	465305012	Primary Result	465305	FILTER DOE EML HASL-300, U-02-RC Modified,Alphaspec U, Filter	E9300 M	Uranium-238	0.0402	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.137	pCi/Filtrer	0.254	pCi/Filtrer			12/7/2018	1826536
20181113-BOEING-4	11/13/2018 10:30	465305013	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Actinium-228	-2.67	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	3.65	pCi/Filtrer	6.5	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305014	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Antimony-124	0.0949	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	2.07	pCi/Filtrer	4.43	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305015	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Antimony-125	0.947	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	1.6	pCi/Filtrer	3.25	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305016	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Barium-133	0.994	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	1.06	pCi/Filtrer	1.62	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305017	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Bismuth-212	-2.78	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	11.7	pCi/Filtrer	22.2	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305018	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Bismuth-214	-1.73	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	10.5	pCi/Filtrer	19.1	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305019	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Bismuth-214	-0.251	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	2.07	pCi/Filtrer	3.61	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305020	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cerium-139	0.356	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.454	pCi/Filtrer	0.862	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305021	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cerium-141	0.598	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.72	pCi/Filtrer	1.73	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305022	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cerium-144	-0.149	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	3.22	pCi/Filtrer	5.63	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305023	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cesium-134	-0.537	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.726	pCi/Filtrer	1.17	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305024	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cesium-136	-1.79	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	2.24	pCi/Filtrer	3.86	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305025	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cesium-137	-0.49	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.715	pCi/Filtrer	1.19	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305026	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cerium-142	0.139	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	1.86	pCi/Filtrer	3.19	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305027	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cobalt-56	0.502	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.923	pCi/Filtrer	1.87	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305028	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cobalt-57	-0.0923	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	3.75	pCi/Filtrer	6.68	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305029	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cobalt-58	-0.39	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	1.07	pCi/Filtrer	1.73	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305030	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Cobalt-60	-0.388	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	1.04	pCi/Filtrer	1.75	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305031	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Europium-148	-0.158	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.86	pCi/Filtrer	1.52	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305032	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Europium-154	-1.82	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	2.29	pCi/Filtrer	3.82	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305033	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Europium-155	1.86	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	1.52	pCi/Filtrer	3	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305034	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Europium-156	-0.21	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.582	pCi/Filtrer	1.07	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305035	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Iron-59	0.933	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	2.65	pCi/Filtrer	4.36	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305036	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Lead-213	-1.79	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	9.34	pCi/Filtrer	17.4	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305037	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Lead-212	0.888	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	1.68	pCi/Filtrer	1.5	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305038	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Lead-214	-0.514	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	1.88	pCi/Filtrer	3.1	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305039	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Manganese-54	0.0502	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.748	pCi/Filtrer	1.43	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305040	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Mercury-203	0.619	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	0.712	pCi/Filtrer	1.34	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305041	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Neodymium-247	-1.79	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.	9.34	pCi/Filtrer	17.4	pCi/Filtrer			12/7/2018	1826402
20181113-BOEING-4	11/13/2018 10:30	465305042	Primary Result	465305	FILTER DOE HASL 300, 4.5, 2.3/Ga-O1-R,Gammaspac, Gamma, Filter (Standard List)	HASL 300-GA-O1-R	Neptunium-239	-2.67	pCi/Filtrer	U	U	Analyte was analyzed, but not detected above the MDL, MDA, MDC or LOD.								

Electronic Data Deliverable (EDD) 465305
Air Sample Filters from Boeing Stations #4 and #5 for period 11/08/2018 to 11/13/2018

Sample Name	Sample Date	Lab Sample Name	Result Type	SDG Number	Code Description	Analysis Method	Analyte	Result Value	Result Value Units	Project Qualifier Code	Lab Qualifier Code	Lab Qualifier Description	1.95g Uncertainty	Uncertainty Units	MDA	MDA Units	Lower Limit	Upper Limit	Report Date	Lab Batch No
1204168353 MB 465305	11/28/2018 9:45	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Europium-152	1.79	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	1.95	pCi/Filter	3.33	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Europium-152	0.629	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	1.95	pCi/Filter	5.14	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Europium-155	0.124	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	1.94	pCi/Filter	3.43	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Iridium-192	0.117	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.261	pCi/Filter	1.18	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Iron-59	1.19	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.721	pCi/Filter	4.38	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Lead-210	-320	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	1.84	pCi/Filter	313	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Lead-212	2.38	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.899	pCi/Filter	2.77	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Lead-214	0.353	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	1.61	pCi/Filter	2.89	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Manganese-54	0.58	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.746	pCi/Filter	1.69	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Mercury-203	-0.022	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.568	pCi/Filter	1.06	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Neodymium-147	2.29	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	4.36	pCi/Filter	9.47	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Neptunium-237	-0.163	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	4.93	pCi/Filter	8.11	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Niobium-99	0.461	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.791	pCi/Filter	1.67	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Niobium-95	0.318	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.748	pCi/Filter	1.58	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Potassium-40	1.51	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	1.23	pCi/Filter	2.73	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Promethium-144	0.0894	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.845	pCi/Filter	1.66	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Radium-226	-0.286	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	4.24	pCi/Filter	8.8	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Ruthenium-106	-0.106	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	7.03	pCi/Filter	13.8	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Silver-110m	0.175	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	1.22	pCi/Filter	2.45	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Sodium-22	-0.0888	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.886	pCi/Filter	1.78	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Thallium-208	-0.152	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	1.05	pCi/Filter	1.93	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Thorium-234	19.5	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	6.49	pCi/Filter	77.4	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Tin-113	0.283	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.77	pCi/Filter	1.52	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Uranium-235	0.546	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	4.31	pCi/Filter	7.15	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Uranium-238	19.5	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	64.9	pCi/Filter	77.4	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Zinc-65	-0.318	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	2.48	pCi/Filter	2.48	pCi/Filter			12/7/2018	1826402
1204168353 MB 465305	11/28/2018 9:15	1204168353	Lab Method Blank	465305		HASL 300-GA-01-R	Zirconium-95	-0.113	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	1.37	pCi/Filter	2.68	pCi/Filter			12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Actinium-228	-1.87	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	3.61	pCi/Filter	6.46	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Antimony-124	1.26	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.249	pCi/Filter	5.79	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Barium-132	0.412	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.729	pCi/Filter	3.66	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Barium-133	0.82	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.741	pCi/Filter	1.42	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Barium-140	4.3	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	5.24	pCi/Filter	11.3	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Beryllium-7	10.9	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	15.4	pCi/Filter	12.2	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Bismuth-212	11.3	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	11.8	pCi/Filter	25.5	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Biuranyl-234	-0.079	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	3.28	pCi/Filter	3.79	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Cerium-139	-0.318	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.587	pCi/Filter	0.959	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Cerium-141	-0.796	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	1.38	pCi/Filter	2.11	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Cerium-144	-0.429	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	3.86	pCi/Filter	6.66	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Cesium-134	0.288	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.916	pCi/Filter	1.58	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Cesium-136	-1.03	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	2.38	pCi/Filter	3.86	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Cesium-137	0.597	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.833	pCi/Filter	1.81	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Chromium-51	-1.72	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	8.09	pCi/Filter	14.9	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Cobalt-56	0.365	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.899	pCi/Filter	1.84	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Cobalt-57	-0.209	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.844	pCi/Filter	0.812	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Cobalt-58	0.442	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.29	pCi/Filter	1.48	pCi/Filter	0	20	12/7/2018	1826402
1204168354 DUP 465305	11/13/2018 10:30	1204168354	Lab Duplicate	465305		HASL 300-GA-01-R	Cobalt-60	0.488	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.727	pCi/Filter	1.87	pCi/Filter	0			

**Electronic Data Deliverable (EDD) 465305
Air Sample Filters from Boeing Stations #4 and #5 for period 11/08/2018 to 11/13/2018**

Sample Name	Sample Date	Lab Sample Name	Result Type	SDG Number	Code Description	Analysis Method	Analyte	Result Value	Result Value Units	Project Qualifier Code	Lab Qualifier Code	Lab Qualifier Description	1.95g Uncertainty	Uncertainty Units	MDA	MDA Units	Lower Limit	Upper Limit	Report Date	Lab Batch No
1204168649_B5_465305	11/29/2018 10:55	1204168649	Laboratory Control Sample	465305		EH300 M	Uranium-238	95	%								75	125	12/7/2018	1826536
1204168650_B5D_465305	11/28/2018 10:55	1204168650	Laboratory Control Sample Duplicate	465305		EH300 M	Uranium-238	97.5	%								75	125	12/7/2018	1826536
1204168651_MB_465305	11/28/2018 10:56	1204168651	Lab Method Blank	465305		EH300 M	Plutonium-241	-8.75	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	13	pCi/Filter	22.5	pCi/Filter			12/7/2018	1826538
1204168652_B5_465305	11/28/2018 10:56	1204168652	Laboratory Control Sample	465305		EH300 M	Plutonium-241	83.3	%								75	125	12/7/2018	1826538
1204168653_B5D_465305	11/28/2018 10:56	1204168653	Laboratory Control Sample Duplicate	465305		EH300 M	Plutonium-241	71.6	%	QC	*						75	125	12/7/2018	1826538
1204169235_MB_465305	11/29/2018 8:46	1204169235	Lab Method Blank	465305		905	Strontium-90	1.2	pCi/Filter	U	U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.	0.986	pCi/Filter	1.61	pCi/Filter			12/7/2018	1826813
1204169237_B5_465305	11/29/2018 8:46	1204169237	Laboratory Control Sample	465305		905	Strontium-90	107	%								75	125	12/7/2018	1826813
1204169460_B5D_465305	11/29/2018 11:37	1204169460	Laboratory Control Sample Duplicate	465305		905	Strontium-90	101	%								75	125	12/7/2018	1826813



Appendix D
Data Validation of Isotopic Results



DATA VALIDATION REPORT

Boeing SSFL RFI -Post-Woolsey Fire Sampling

SAMPLE DELIVERY GROUP: 465305

Prepared for
Stantec

21 December, 2018

MEC^x, Inc.
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TABLES

- 1 – Sample Identification
- 2 – Data Qualifier Reference
- 3 - Reason Code Reference

**I. INTRODUCTION****Task Order Title:** Boeing SSFL RFI – Post Woolsey Fire Sampling**Contract:** S10503977-100598 OF**MEC^X Project No.:** 1261.500D.01.001**Sample Delivery Group:** 465305**Project Manager:** Dixie Hambrick**Matrix:** Filter**QC Level:** IV**No. of Samples:** 3**No. of Reanalyses/Dilutions:** 0**Laboratory:** Gel Laboratories, LLC.**TABLE 1 - SAMPLE IDENTIFICATION**

Sample Name	Lab Sample Name	Matrix	Collection	Method
20181113-BOEING-4	465305001	FILTER	11/13/2018 10:30	905, EH300 M, HASL 300-GA-01-R, AN-1421
20181113-BOEING-5	465305002	FILTER	11/13/2018 11:00	905, EH300 M, HASL 300-GA-01-R, AN-1421
20181113-BOEING-BLANK	465305003	FILTER	11/13/2018 15:00	905, EH300 M, HASL 300-GA-01-R, AN-1421



II. SAMPLE MANAGEMENT

According to the case narrative, sample condition upon receipt form and the chain-of-custody (COC) provided by the laboratory for sample delivery group (SDG) 465305:

- The laboratory received samples in this SDG at ambient temperature, as is acceptable for radiochemistry analysis.
- The laboratory received the sample containers intact.
- Field and laboratory personnel signed and dated the COC.



TABLE 2 - DATA QUALIFIER REFERENCE

Qualifier	Organics	Inorganics
U	The analyte was analyzed for, but was not detected as noted in the quantitation section of each method reviewed.	The analyte was analyzed for, but was not detected as noted in the sample results verification section of each method reviewed.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may inaccurate or imprecise.	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may inaccurate or imprecise.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."	Not applicable.
NJ	The analyte has been "tentatively identified" or "presumptively" as present and the associated numerical value is the estimated concentration in the sample.	Not applicable.
T-I	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents an approximate concentration. The tentative identification represents a compound with a Chemical Abstract Service (CAS) number and fit greater than 80%.	Not applicable



T-II	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents an approximate concentration. The tentative identification represents a class of compound, and is not of sufficient identification quality to represent a specific compound.	Not applicable
T-III	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents an approximate concentration. The tentative identification represents an unknown compound.	Not applicable
R	The data are unusable. The sample results are rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.	The data are unusable. The sample results are rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.



TABLE 3 - REASON CODE REFERENCE

Reason Code	Organic	Inorganic
H	Holding time was exceeded.	Holding time was exceeded.
S	Surrogate recovery was outside control limits.	Not applicable.
C	Calibration percent relative standard deviation (%RSD) or percent deviation (%D) were noncompliant, or coefficient of determination (r^2) was <0.990.	Correlation coefficient (r) was <0.995.
R	Calibration relative response factor (RRF) was <0.05.	Percent recovery (%R) for calibration was outside control limits.
B	The analyte was detected in an associated blank as well as in the sample.	The analyte was detected in an associated blank as well as in the sample.
L	Laboratory control sample (LCS) or /LCS duplicate (LCSD) %R was outside the control limits.	LCS or LCSD %R was outside the control limits.
L1	LCS/LCSD relative percent difference (RPD) was outside the control limit.	LCS/LCSD RPD was outside the control limit.
Q	Matrix spike/matrix spike duplicate (MS/MSD) %R was outside control limits.	MS or MSD %R was outside the control limit.
Q1	MS/MSD RPD was outside the control limit.	MS/MSD RPD was outside the control limit.
E	Result was reported as an estimated maximum possible concentration (EMPC).	Laboratory duplicate RPD was outside the control limit.
I	Internal standard recovery was outside control limits.	Inductively coupled plasma (ICP) interference check standard (ICSA/ICSAB) result was outside control limits.
I1	Not applicable.	ICP mass spectrometer (ICPMS) internal standard recovery was outside control limits.
A	Not applicable.	Serial dilution %D was outside control limits.
M	Tuning (BFB or DFTPP) was not compliant.	ICPMS tune was not compliant.
T	The analyte was detected in an associated trip blank as well as in the sample.	Not applicable.



Reason Code	Organic	Inorganic
+	False positive – reported compound was not present.	False positive – reported compound was not present.
-	False negative – compound was present but not reported.	False negative – compound was present but not reported.
F	The analyte was detected in an associated field blank (FB) or equipment blank (EB) as well as in the sample.	The analyte was detected in an associated field blank (FB) or equipment blank (EB) as well as in the sample.
F1	Field duplicate RPD was outside the control limit.	Field duplicate RPD was outside the control limit.
§	The reviewer corrected the reported result and/or other information.	The reviewer corrected the reported result and/or other information.
D	The analysis was not used because another more technically sound analysis was available.	The analysis was not used because another more technically sound analysis was available.
P	Instrument performance not compliant.	Post digestion spike recovery was outside of control limits.
*II, *III	Other problems identified in the data are described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.	Other problems identified in the data are described in Section II, "Sample Management," or Section III, "Method Analyses." The number following the asterisk (*) will indicate the report section where a description of the problem can be found.



III. VARIOUS EPA METHOD —METHOD 905, DOE EML HASL 300 FOR ALPHA AND GAMMA SPECTROSCOPY AND AN-1421 FOR RADIUM 226

Elizabeth A. Wessling of MEC^x reviewed the SDG on December 21, 2018

The samples listed in Table 1 for these analyses were validated based on the guidelines outlined in the *EPA Method 905, DOE EML HASL-300 Alpha Spectroscopy Modified, DOE HASL-300 Gamma Spectroscopy, Eichrom Industries AN-1421 for Radium 226, Paar Evaluation of Radiochemical Data Usability* and the *National Functional Guidelines for Inorganic Data Review (1/17)*.

III.1. HOLDING TIMES

The air samples were collected 11/8-13/2018. The samples were prepared on 11/28/2018 for gamma spec isotopes and on 12/4/2018 for the remaining isotopes. The samples were counted on 11/28/2018 for the gamma spec isotopes and between 12/4/2018 and 12/6/2018 for the remaining isotopes. The preparation and analysis times were acceptable as no short-lived target radionuclides were requested as target isotopes in these air filter samples.

III.2. CALIBRATION

Calibration verification was reviewed and found to be acceptable.

III.3. QUALITY CONTROL SAMPLES

III.3.1. METHOD BLANKS

Target isotopes were not detected in the method blanks above the MDA. However, a comparison normalized absolute difference of the sample results and the method blank results indicated the method blank and the sample results were not significantly different at the 1% level of confidence. All detected sample results were qualified as nondetects (U).

III.3.2. BLANK SPIKES AND LABORATORY CONTROL SAMPLES

The recoveries were within laboratory-established control limits with the exception of plutonium-241 in the LCSD. Plutonium-241 was recovered below the control limits of 75-125% at 71.6%. Nondetects for plutonium-241 in the site samples were qualified as estimated nondetects (UJ).

III.3.3. LABORATORY DUPLICATES

Laboratory duplicate analyses were performed on sample 20181113-BOEING-4 for the gamma spec method isotopes. The duplicate results were considered acceptable.

III.3.4. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

No MS/MSD analyses were performed on the samples in this SDG due to limited sample volume. Method accuracy and precision were evaluated based on the LCS/LCSD or LCS/DUP results.

III.3.5. SAMPLE RESULT VERIFICATION

Sample results were evaluated based upon the raw data. All samples were reported on an "As Received" basis. Reported nondetect values and MDAs are to be utilized in conjunction with the counting errors and TPU when assessing the data usability and interpretation.



Lead-210 in sample 111318-BOEING-5 exhibited high counting uncertainty resulting in lead-210 in the sample being flagged as a false positive by the laboratory. The reviewer verified the high counting uncertainty and qualified the sample as an estimated nondetect (UJ).

Several sample results and QC sample results were reported from recounts due to various counting anomalies. The reviewer verified the anomalies and supported the reporting of the recount data.

The air filter samples were collected over a five-day sampling period. Approximately 2.5E5 liters of air were passed through the filter. The filters visually appeared black and caked with smoke, ash and particulate matter. It could not be determined by the reviewer if enough mass was present on the filters to require self-absorption correction. It did not appear to the reviewer that a self-absorption correction factor was utilized by the laboratory.

III.4. FIELD QC SAMPLES

Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

III.4.1. FIELD BLANKS AND EQUIPMENT BLANKS

Field blank, 11132018-BOEING-BLANK, was free from target compound contamination.

III.4.2. FIELD DUPLICATES

Field duplicate samples were not identified in this SDG.

Validated Sample Result Forms: 465305

Analysis Method

Sample Name 20181113-BOEING-4 **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305001 **Sample Date:** 11/13/2018 10:30:00 AM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
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Radium-226	13982633	1.12	+/-1.24	1.89	pCi/Filter	U	U	
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Sample Name 20181113-BOEING-5 **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305002 **Sample Date:** 11/13/2018 11:00:00 AM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
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Radium-226	13982633	0.58	+/-0.93	1.55	pCi/Filter	U	U	
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Sample Name 20181113-BOEING-BLA **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305003 **Sample Date:** 11/13/2018 3:00:00 PM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
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Radium-226	13982633	0.705	+/-0.874	1.27	pCi/Filter	U	U	
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Analysis Method 905

Sample Name 20181113-BOEING-4 **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305001 **Sample Date:** 11/13/2018 10:30:00 AM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
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Strontium-90	10098972	0.257	+/-0.936	1.67	pCi/Filter	U	U	
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Sample Name 20181113-BOEING-5 **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305002 **Sample Date:** 11/13/2018 11:00:00 AM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
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Strontium-90	10098972	-0.319	+/-0.771	1.47	pCi/Filter	U	U	
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Sample Name 20181113-BOEING-BLA **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305003 **Sample Date:** 11/13/2018 3:00:00 PM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
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Strontium-90	10098972	-0.349	+/-0.871	1.66	pCi/Filter	U	U	
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Analysis Method EH300 M

Sample Name 20181113-BOEING-4 **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305001 **Sample Date:** 11/13/2018 10:30:00 AM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
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Uranium-233/234	E-13230	0.23	+/-0.231	0.31	pCi/Filter	U	U	
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Analysis Method *EH300 M*

Uranium-235	15117961	0.0611	+/-0.168	0.292	pCi/Filter	U	U
Thorium-232	7440291-R	0.148	+/-0.0842	0.0479	pCi/Filter		U B
Thorium-230	14269637	0.108	+/-0.11	0.169	pCi/Filter	U	U
Thorium-228	14274829	0.0317	+/-0.0888	0.159	pCi/Filter	U	U
Polonium-210	13981527	1.84	+/-1.28	1.11	pCi/Filter		U B
Plutonium-241	14119325	-8.14	+/-11.8	20.4	pCi/Filter	U	UJ L
Plutonium-239/240	OER10070	0.0279	+/-0.185	0.379	pCi/Filter	U	U
Plutonium-238	13981163	0.00431	+/-0.218	0.473	pCi/Filter	U	U
Americium-241	14596102	0.0181	+/-0.117	0.24	pCi/Filter	U	U
Uranium-238	7440611-R	0.0402	+/-0.137	0.254	pCi/Filter	U	U

Sample Name 20181113-BOEING-5 **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305002 **Sample Date:** 11/13/2018 11:00:00 AM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Thorium-230	14269637	0.146	+/-0.0917	0.112	pCi/Filter		U B	
Plutonium-239/240	OER10070	-0.0449	+/-0.183	0.432	pCi/Filter	U	U	
Americium-241	14596102	-0.0201	+/-0.0891	0.232	pCi/Filter	U	U	
Plutonium-238	13981163	0.0333	+/-0.149	0.292	pCi/Filter	U	U	
Thorium-228	14274829	0.037	+/-0.0917	0.163	pCi/Filter	U	U	
Thorium-232	7440291-R	0.101	+/-0.0709	0.0738	pCi/Filter		U B	
Uranium-233/234	E-13230	0.0872	+/-0.156	0.26	pCi/Filter	U	U	
Uranium-235	15117961	0.177	+/-0.19	0.216	pCi/Filter	U	U	
Uranium-238	7440611-R	0.137	+/-0.169	0.245	pCi/Filter	U	U	
Plutonium-241	14119325	-9.52	+/-11.5	19.9	pCi/Filter	U	UJ L	
Polonium-210	13981527	2.43	+/-1.65	1.55	pCi/Filter		U B	

Sample Name 20181113-BOEING-BLA **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305003 **Sample Date:** 11/13/2018 3:00:00 PM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Americium-241	14596102	0.0998	+/-0.208	0.367	pCi/Filter	U	U	
Uranium-233/234	E-13230	0.0327	+/-0.29	0.613	pCi/Filter	U	U	
Thorium-232	7440291-R	0.0157	+/-0.0429	0.0708	pCi/Filter	U	U	
Thorium-230	14269637	0.0659	+/-0.0912	0.151	pCi/Filter	U	U	
Thorium-228	14274829	-0.0104	+/-0.0694	0.14	pCi/Filter	U	U	
Polonium-210	13981527	0.494	+/-0.802	1.14	pCi/Filter	U	U	
Plutonium-241	14119325	-13.2	+/-11.7	20.4	pCi/Filter	U	UJ L	
Plutonium-238	13981163	0.00153	+/-0.113	0.252	pCi/Filter	U	U	
Uranium-238	7440611-R	0.2	+/-0.33	0.475	pCi/Filter	U	U	
Uranium-235	15117961	0.066	+/-0.29	0.525	pCi/Filter	U	U	
Plutonium-239/240	OER10070	-0.119	+/-0.101	0.362	pCi/Filter	U	U	

Analysis Method HASL 300-GA-01-R

Sample Name	20181113-BOEING-4	Matrix Type:	FILTER	Result Type:	Primary Result			
Lab Sample Name:	465305001	Sample Date:	11/13/2018 10:30:00 AM	Validation Level:	IV			
Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Cerium-144	14762788	-0.149	+/-3.22	5.63	pCi/Filter	U	U	
Thallium-208	14913509	0.629	+/-1.18	1.25	pCi/Filter	U	U	
Thorium-234	15065108	1.87	+/-16.5	29.9	pCi/Filter	U	U	
Tin-113	13966068	0.558	+/-0.841	1.69	pCi/Filter	U	U	
Iron-59	14596124	0.923	+/-2.05	4.36	pCi/Filter	U	U	
Uranium-238	7440611-R	1.87	+/-16.5	29.9	pCi/Filter	U	U	
Radium-228	15262201	-2.67	+/-3.65	6.5	pCi/Filter	U	U	
Zinc-65	13982393	-0.334	+/-2.07	3.51	pCi/Filter	U	U	
Zirconium-95	13967710	0.133	+/-1.44	2.77	pCi/Filter	U	U	
Chromium-51	14392020	-2.84	+/-7	11.3	pCi/Filter	U	U	
Cesium-137	10045973	-0.49	+/-0.715	1.19	pCi/Filter	U	U	
Sodium-22	13966320	-0.643	+/-0.808	1.35	pCi/Filter	U	U	
Cesium-134	13967709	-0.537	+/-0.726	1.17	pCi/Filter	U	U	
Uranium-235	15117961	-1.53	+/-3.98	5.98	pCi/Filter	U	U	
Cerium-141	13967743	-0.998	+/-1.09	1.73	pCi/Filter	U	U	
Cerium-139	13982304	0.356	+/-0.454	0.862	pCi/Filter	U	U	
Bismuth-214	14733030	-0.251	+/-2.07	3.61	pCi/Filter	U	U	
Bismuth-212	14913496	-1.73	+/-10.5	19.1	pCi/Filter	U	U	
Beryllium-7	13966024	26.9	+/-11.7	11	pCi/Filter		U	B
Barium-140	14798084	2.78	+/-4.36	9.2	pCi/Filter	U	U	
Barium-133	13981414	0.934	+/-1.06	1.62	pCi/Filter	U	U	
Antimony-125	14234356	0.947	+/-1.6	3.25	pCi/Filter	U	U	
Antimony-124	14683104	0.0949	+/-2.07	4.43	pCi/Filter	U	U	
Actinium-228	14331830	-2.67	+/-3.65	6.5	pCi/Filter	U	U	
Cesium-136	14234298	-1.79	+/-2.24	3.86	pCi/Filter	U	U	
Promethium-146	14834743	-1.07	+/-0.797	1.23	pCi/Filter	U	U	
Mercury-203	13982780	0.619	+/-0.712	1.34	pCi/Filter	U	U	
Neodymium-147	14269740	-1.79	+/-9.34	17.4	pCi/Filter	U	U	
Neptunium-239	13968597	-2.67	+/-4.13	6.83	pCi/Filter	U	U	
Niobium-94	14681631	0.196	+/-0.779	1.49	pCi/Filter	U	U	
Niobium-95	13967765	0.549	+/-0.88	1.8	pCi/Filter	U	U	
Yttrium-88	13982360	-0.0756	+/-0.648	1.44	pCi/Filter	U	U	
Promethium-144	14834732	0.293	+/-0.846	1.62	pCi/Filter	U	U	
Silver-110m	378784248	-0.764	+/-1.01	1.6	pCi/Filter	U	U	
Iridium-192	14694690	-0.21	+/-0.582	1.07	pCi/Filter	U	U	
Europium-155	14391163	1.86	+/-1.52	3	pCi/Filter	U	U	
Cobalt-60	10198400	-0.388	+/-1.04	1.75	pCi/Filter	U	U	
Cobalt-56	14093039	0.502	+/-0.923	1.87	pCi/Filter	U	U	

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Potassium-40	13966002	5.84	+/-14.5	30.8	pCi/Filter	U	U
Europium-154	15585101	-1.82	+/-2.29	3.82	pCi/Filter	U	U
Ruthenium-106	13967481	0.167	+/-7.58	12.7	pCi/Filter	U	U
Cobalt-58	13981389	-0.39	+/-1.06	1.73	pCi/Filter	U	U
Europium-152	14683239	-0.495	+/-1.62	2.98	pCi/Filter	U	U
Lead-210	14255040	-13.2	+/-31.7	53.2	pCi/Filter	U	U
Lead-212	15092941	0.868	+/-1.68	1.5	pCi/Filter	U	U
Lead-214	15067284	-0.514	+/-1.88	3.1	pCi/Filter	U	U
Manganese-54	13966319	0.0502	+/-0.748	1.43	pCi/Filter	U	U
Cobalt-57	13981505	-0.0923	+/-0.375	0.648	pCi/Filter	U	U

Sample Name 20181113-BOEING-5 **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305002 **Sample Date:** 11/13/2018 11:00:00 AM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Actinium-228	14331830	-0.287	+/-3.43	6.72	pCi/Filter	U	U	
Cerium-139	13982304	0.00371	+/-0.586	0.94	pCi/Filter	U	U	
Bismuth-214	14733030	0.26	+/-2.03	3.56	pCi/Filter	U	U	
Cerium-141	13967743	-2.28	+/-1.35	1.76	pCi/Filter	U	U	
Bismuth-212	14913496	-8.2	+/-11.3	18.7	pCi/Filter	U	U	
Beryllium-7	13966024	22.2	+/-12.4	12.5	pCi/Filter		U	B
Barium-140	14798084	2.07	+/-6.86	12.4	pCi/Filter	U	U	
Barium-133	13981414	0.137	+/-0.851	1.64	pCi/Filter	U	U	
Antimony-124	14683104	1.18	+/-2.44	5.82	pCi/Filter	U	U	
Europium-152	14683239	-0.692	+/-2.19	3.67	pCi/Filter	U	U	
Cerium-144	14762788	0.606	+/-3.91	6.92	pCi/Filter	U	U	
Antimony-125	14234356	0.429	+/-1.76	3.47	pCi/Filter	U	U	
Thallium-208	14913509	-0.122	+/-0.882	1.6	pCi/Filter	U	U	
Niobium-95	13967765	-0.813	+/-1.22	1.73	pCi/Filter	U	U	
Potassium-40	13966002	-1.44	+/-12.7	27.1	pCi/Filter	U	U	
Promethium-144	14834732	0.181	+/-0.879	1.69	pCi/Filter	U	U	
Promethium-146	14834743	-0.256	+/-0.86	1.58	pCi/Filter	U	U	
Radium-228	15262201	-0.287	+/-3.43	6.72	pCi/Filter	U	U	
Ruthenium-106	13967481	-2.76	+/-6.51	11.6	pCi/Filter	U	U	
Niobium-94	14681631	0.143	+/-0.856	1.64	pCi/Filter	U	U	
Sodium-22	13966320	-0.00893	+/-0.854	1.81	pCi/Filter	U	U	
Tin-113	13966068	-0.372	+/-0.968	1.75	pCi/Filter	U	U	
Thorium-234	15065108	6.65	+/-41.1	70.8	pCi/Filter	U	U	
Uranium-235	15117961	-0.435	+/-4.41	7.06	pCi/Filter	U	U	
Yttrium-88	13982360	-0.213	+/-0.861	1.78	pCi/Filter	U	U	
Zinc-65	13982393	-0.185	+/-1.76	3.58	pCi/Filter	U	U	
Zirconium-95	13967710	0.793	+/-1.39	2.93	pCi/Filter	U	U	
Cesium-134	13967709	-0.221	+/-0.666	1.23	pCi/Filter	U	U	

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Cobalt-58	13981389	1.11	+/-0.98	1.48	pCi/Filter	U	U
Silver-110m	378784248	0.81	+/-1.18	2.55	pCi/Filter	U	U
Cobalt-57	13981505	-0.194	+/-0.419	0.703	pCi/Filter	U	U
Cesium-136	14234298	1.66	+/-2.15	5.12	pCi/Filter	U	U
Cesium-137	10045973	-0.121	+/-0.897	1.59	pCi/Filter	U	U
Uranium-238	7440611-R	6.65	+/-41.1	70.8	pCi/Filter	U	U
Neptunium-239	13968597	-0.506	+/-5.04	8.78	pCi/Filter	U	U
Cobalt-56	14093039	-0.283	+/-0.796	1.43	pCi/Filter	U	U
Cobalt-60	10198400	0.188	+/-0.8	1.83	pCi/Filter	U	U
Europium-154	15585101	0.474	+/-2.37	5.29	pCi/Filter	U	U
Europium-155	14391163	-1.93	+/-1.97	3.11	pCi/Filter	U	U
Lead-214	15067284	-0.985	+/-1.97	3.27	pCi/Filter	U	U
Iron-59	14596124	-0.0658	+/-1.67	3.53	pCi/Filter	U	U
Lead-210	14255040	0	+/-384	332	pCi/Filter	UI	UJ *III
Lead-212	15092941	1.87	+/-1.8	2	pCi/Filter	U	U
Neodymium-147	14269740	-3.47	+/-11.2	20.5	pCi/Filter	U	U
Iridium-192	14694690	-0.187	+/-0.687	1.27	pCi/Filter	U	U
Mercury-203	13982780	0.889	+/-0.767	1.6	pCi/Filter	U	U
Chromium-51	14392020	5.15	+/-7.61	15.4	pCi/Filter	U	U
Manganese-54	13966319	-0.0178	+/-0.757	1.46	pCi/Filter	U	U

Sample Name 20181113-BOEING-BLA **Matrix Type:** FILTER **Result Type:** Primary Result

Lab Sample Name: 465305003 **Sample Date:** 11/13/2018 3:00:00 PM **Validation Level:** IV

Analyte	CAS No	Result Value	Uncertainty	MDC	Result Units	Lab Qualifier	Validation Qualifier	Validation Notes
Promethium-146	14834743	-0.0764	+/-0.702	1.36	pCi/Filter	U	U	
Promethium-144	14834732	0.539	+/-1.05	2.07	pCi/Filter	U	U	
Potassium-40	13966002	8.77	+/-10.1	25.1	pCi/Filter	U	U	
Niobium-95	13967765	-0.525	+/-1.15	2	pCi/Filter	U	U	
Niobium-94	14681631	0.0708	+/-0.904	1.72	pCi/Filter	U	U	
Neodymium-147	14269740	-3.49	+/-13.1	23.9	pCi/Filter	U	U	
Mercury-203	13982780	-0.208	+/-0.804	1.47	pCi/Filter	U	U	
Radium-228	15262201	-0.105	+/-4.82	8.96	pCi/Filter	U	U	
Uranium-238	7440611-R	52.3	+/-66.5	72.2	pCi/Filter	U	U	
Manganese-54	13966319	0.156	+/-1.01	1.96	pCi/Filter	U	U	
Lead-214	15067284	-0.813	+/-2	3.14	pCi/Filter	U	U	
Neptunium-239	13968597	1.34	+/-5.07	9.78	pCi/Filter	U	U	
Ruthenium-106	13967481	-5.75	+/-7.49	12.4	pCi/Filter	U	U	
Silver-110m	378784248	-0.156	+/-1.37	2.56	pCi/Filter	U	U	
Sodium-22	13966320	-0.562	+/-1.05	1.94	pCi/Filter	U	U	
Thallium-208	14913509	-1.11	+/-1.09	1.62	pCi/Filter	U	U	
Thorium-234	15065108	52.3	+/-66.5	72.2	pCi/Filter	U	U	
Uranium-235	15117961	-0.658	+/-4.52	7.72	pCi/Filter	U	U	

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Yttrium-88	13982360	1.1	+/-1.28	3.28	pCi/Filter U	U
Zinc-65	13982393	-1.4	+/-2.04	3.66	pCi/Filter U	U
Zirconium-95	13967710	1.83	+/-2.56	3.75	pCi/Filter U	U
Lead-212	15092941	0.885	+/-2.2	2.73	pCi/Filter U	U
Bismuth-212	14913496	-2.53	+/-11	20.4	pCi/Filter U	U
Tin-113	13966068	0.39	+/-0.939	1.87	pCi/Filter U	U
Cesium-137	10045973	0.506	+/-0.721	1.61	pCi/Filter U	U
Actinium-228	14331830	-0.105	+/-4.82	8.96	pCi/Filter U	U
Antimony-124	14683104	-0.969	+/-2.13	4.13	pCi/Filter U	U
Antimony-125	14234356	-0.925	+/-2.04	3.62	pCi/Filter U	U
Barium-133	13981414	0.498	+/-1.31	1.9	pCi/Filter U	U
Barium-140	14798084	3.95	+/-5.91	12.4	pCi/Filter U	U
Beryllium-7	13966024	5.63	+/-7.14	15	pCi/Filter U	U
Bismuth-214	14733030	0.418	+/-2.14	3.93	pCi/Filter U	U
Cerium-141	13967743	0.155	+/-1.19	2.26	pCi/Filter U	U
Cerium-144	14762788	1.02	+/-3.93	7.52	pCi/Filter U	U
Cerium-139	13982304	0.333	+/-0.554	1.09	pCi/Filter U	U
Cesium-136	14234298	2.26	+/-2.79	6.24	pCi/Filter U	U
Lead-210	14255040	-84.2	+/-128	207	pCi/Filter U	U
Chromium-51	14392020	7.01	+/-8.92	17.8	pCi/Filter U	U
Cobalt-56	14093039	-0.206	+/-1.02	1.88	pCi/Filter U	U
Cobalt-57	13981505	0.308	+/-0.48	0.95	pCi/Filter U	U
Cobalt-58	13981389	-0.476	+/-1.04	1.69	pCi/Filter U	U
Cobalt-60	10198400	0.387	+/-0.97	2.35	pCi/Filter U	U
Europium-152	14683239	-0.489	+/-2.13	3.7	pCi/Filter U	U
Europium-154	15585101	-1.3	+/-2.85	5.42	pCi/Filter U	U
Europium-155	14391163	1.31	+/-2.22	3.66	pCi/Filter U	U
Iridium-192	14694690	-0.396	+/-0.745	1.32	pCi/Filter U	U
Iron-59	14596124	-0.2	+/-2.15	4.39	pCi/Filter U	U
Cesium-134	13967709	-0.247	+/-0.92	1.69	pCi/Filter U	U



Appendix E

Conversion of Filter Paper Activity to Air Concentrations for Detected Radionuclides



GEL Isotopic Analysis of Samples from Stations #4 and #5 Bounding the Fire Period

Sampling Station	Sampling Period	Laboratory Sample Serial No.	Total Air Volume (mL)*	Radionuclide	Filter Activity (pCi/Filter)			Air Concentration (µCi/mL)		
					Activity	Uncertainty	MDA	Concentration	Uncertainty	MDC
#4	8 to 13 Nov 2018	465305001	2.70E+08	Polonium-210	1.84	1.28	1.11	2.73E-14	1.90E-14	1.64E-14
#4	8 to 13 Nov 2018	465305001	2.70E+08	Thorium-232	0.148	0.0842	0.0479	2.19E-15	1.25E-15	7.10E-16
#4	8 to 13 Nov 2018	465305001	2.70E+08	Beryllium-7	26.9	11.7	11	3.99E-13	1.73E-13	1.63E-13
All other 58 radionuclides, including nuclear by-product materials, were not detected above the MDA or MDC										
#5	8 to 13 Nov 2018	465305002	2.52E+08	Polonium-210	2.43	1.65	1.55	3.86E-14	2.62E-14	2.46E-14
#5	8 to 13 Nov 2018	465305002	2.52E+08	Thorium-230	0.146	0.0917	0.112	2.32E-15	1.46E-15	1.78E-15
#5	8 to 13 Nov 2018	465305002	2.52E+08	Thorium-232	0.101	0.0709	0.0738	1.60E-15	1.13E-15	1.17E-15
#5	8 to 13 Nov 2018	465305002	2.52E+08	Beryllium-7	22.2	12.4	12.5	3.52E-13	1.97E-13	1.98E-13
All other 57 radionuclides, including nuclear by-product materials, were not detected above the MDA or MDC										

* Total air volume reduced to 25% to reflect count of a 2" diameter filter vs a 4" diameter sample station filter