

## Appendix C. Additional Monitoring Results

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## **C.0 Additional Monitoring Results**

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This appendix contains additional information on monitoring results and supplements data summarized in the main body of the report.

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C.1 Onsite Pond

Table C-1. Selected Radionuclide Concentrations in West Lake Sediment.

Radionuclide	2019				2014-2018						DOE-Derived Concentration Guides
	No. of Samples	Concentration		No. of Samples	Concentration						
		Maximum <sup>a</sup>			Average <sup>b</sup>		Maximum <sup>a</sup>				
		pCi/g <sup>c</sup>	pCi/g <sup>c</sup>		pCi/g <sup>c</sup>	pCi/g <sup>c</sup>	pCi/g <sup>c</sup>	pCi/g <sup>c</sup>	pCi/g <sup>c</sup>		
Cesium-137	2	7.8E-01	± 7.0E-02	18	6.1E-01	± 7.2E-01	1.4E+00	± 1.3E-01	3.1E+03		
Gross Alpha <sup>d</sup>	2	6.3E+00	± 2.9E+00	18	9.5E+00	± 9.5E+00	2.3E+01	± 7.6E+00	N/A		
Gross Beta	2	2.0E+01	± 2.1E+00	18	2.4E+01	± 6.9E+00	3.0E+01	± 2.4E+00	N/A		
Strontium-90 <sup>d</sup>	2	2.6E-01	± 6.6E-02	18	1.6E-01	± 2.8E-01	4.4E-01	± 9.9E-02	5.8E+02		
Technetium-99 <sup>d</sup>	2	2.3E-01	± 4.4E-01	18	5.6E-02	± 4.5E-01	6.0E-01	± 2.8E-01	4.2E+04		
Uranium-234	2	1.1E+00	± 1.8E-01	18	3.1E+00	± 5.3E+00	9.6E+00	± 1.6E+00	5.3E+03		
Uranium-235 <sup>d</sup>	2	7.2E-02	± 4.2E-02	18	1.9E-01	± 3.0E-01	6.5E-01	± 1.6E-01	3.7E+03		
Uranium-238	2	1.0E+00	± 1.7E-01	18	2.9E+00	± 4.9E+00	9.3E+00	± 1.5E+00	2.5E+03		

<sup>a</sup> Result and maximum values are ± total propagated analytical uncertainty.  
<sup>b</sup> Averages are ±2 standard deviations of the mean.  
<sup>c</sup> 1 pCi = 0.037 Bq.  
<sup>d</sup> Results include concentrations below detection limit.  
Note: DOE-Derived Biota Concentration Guide values shown for Riparian Animal Receptor (DOE/EH-0676).

Table C-2. Radionuclide Concentrations in West Lake Surface Water.

Radionuclide	2019					2014-2018					DOE-Derived Concentration Guides
	No. of Samples	Concentration				No. of Samples	Concentration				
		Average pCi/L		Maximum pCi/L			Average pCi/L		Maximum pCi/L		
Technetium <sup>c,e</sup>	2	4.3E+00	± 1.5E+00	5.1E+00	± 8.8E+00	2	3.3E+02	± 6.4E+02	6.5E+02	± 9.8E+01	6.7E+05
Tritium <sup>d,e</sup>	2	4.8E+01	± 2.5E+01	6.1E+01	± 1.5E+02	19	5.2E+01	± 1.9E+02	3.1E+02	± 1.4E+02	2.7E+08
Uranium-234 <sup>d</sup>	2	1.1E+02	± 1.8E+02	2.0E+02	± 2.6E+01	18	1.3E+03	± 5.4E+03	1.1E+04	± 4.4E+03	2.0E+02
Uranium-235 <sup>d</sup>	2	7.1E+00	± 1.2E+01	1.3E+01	± 4.4E+00	18	1.1E+02	± 6.4E+02	1.4E+03	± 1.6E+03	2.2E+02
Uranium-238 <sup>d</sup>	2	1.1E+02	± 1.8E+02	2.0E+02	± 2.5E+01	18	1.5E+03	± 6.6E+03	1.4E+04	± 5.2E+03	2.2E+02

<sup>a</sup> Averages are ±2 standard deviations of the mean.  
<sup>b</sup> Maximum values are ± total propagated analytical uncertainty.  
<sup>c</sup> Biota Concentration Guide value for Riparian Animal receptor (DOE/EH-0676)  
<sup>d</sup> Biota Concentration Guide value for Aquatic Animal receptor (DOE/EH-0676)  
<sup>e</sup> Results include concentrations below detection limit.

## C.2 Ambient Air

Table C-3. Concentrations of Select Radionuclides (pCi/m<sup>3</sup>)<sup>a</sup> in Onsite Air Samples. (4 Pages)

Radionuclide	Site	2019					2014 - 2018					EPA Table 2 <sup>e</sup>
		Number of		Average <sup>c</sup>	Maximum <sup>d</sup>	Sampler	Number of		Average <sup>c</sup>	Maximum <sup>d</sup>	Sampler	
		Samples	Detects <sup>b</sup>				Samples	Detects <sup>b</sup>				
gross α	100	208	206	1.7E-03 ± 2.3E-03	7.7E-03 ± 1.2E-03	N576	932	910	1.6E-03 ± 2.2E-03	7.8E-03 ± 1.3E-03	N534	
	200-E	690	686	1.7E-03 ± 2.1E-03	7.0E-03 ± 1.0E-03	N969	3291	3195	1.5E-03 ± 2.1E-03	9.1E-03 ± 2.1E-03	N957	
	200-W	570	565	1.8E-03 ± 2.4E-03	8.1E-03 ± 1.2E-03	N974	2977	2939	1.9E-03 ± 5.8E-03	8.4E-02 ± 7.7E-03	N956	
	300	206	205	1.4E-03 ± 1.8E-03	6.1E-03 ± 9.4E-04	N130	1005	900	1.1E-03 ± 1.6E-03	5.7E-03 ± 1.2E-03	N918	
	400	49	49	1.3E-03 ± 1.5E-03	4.0E-03 ± 7.7E-04	N911	257	229	9.6E-04 ± 1.5E-03	5.7E-03 ± 1.4E-03	N912	
	600	118	116	1.4E-03 ± 2.0E-03	8.0E-03 ± 1.5E-03	N587	370	310	8.8E-04 ± 1.3E-03	3.9E-03 ± 8.1E-04	N587	
	ERDF	130	130	1.6E-03 ± 1.9E-03	6.7E-03 ± 1.1E-03	N168	655	654	1.4E-03 ± 1.9E-03	9.3E-03 ± 1.3E-03	N963	
	Perimeter	279	274	1.2E-03 ± 1.6E-03	5.5E-03 ± 9.6E-04	N939	1426	1257	9.4E-04 ± 1.7E-03	7.7E-03 ± 1.2E-03	N934	
	Nearby Comm.	181	180	1.2E-03 ± 1.4E-03	5.2E-03 ± 9.8E-04	N949	803	705	9.0E-04 ± 1.4E-03	6.0E-03 ± 9.2E-04	N948	
	Dist. Comm.	25	25	1.2E-03 ± 1.3E-03	3.4E-03 ± 6.8E-04	N909	131	105	8.3E-04 ± 1.5E-03	4.2E-03 ± 8.5E-04	N909	
gross β	100	208	208	1.8E-02 ± 2.1E-02	5.6E-02 ± 5.1E-03	N476	934	934	1.7E-02 ± 2.1E-02	6.1E-02 ± 4.8E-03	N900	
	200-E	690	690	1.8E-02 ± 2.2E-02	7.1E-02 ± 5.5E-03	N973	3291	3290	1.6E-02 ± 2.1E-02	1.8E-01 ± 1.3E-02	N158	
	200-W	570	569	1.7E-02 ± 2.0E-02	7.4E-02 ± 5.9E-03	N442	2977	2977	1.6E-02 ± 1.9E-02	7.5E-02 ± 6.2E-03	N304	
	300	206	206	1.9E-02 ± 2.0E-02	4.9E-02 ± 5.2E-03	N557	1005	1005	1.9E-02 ± 2.2E-02	7.3E-02 ± 6.3E-03	N903	
	400	49	49	1.9E-02 ± 2.0E-02	5.5E-02 ± 4.4E-03	N911	257	257	1.9E-02 ± 2.2E-02	6.2E-02 ± 5.1E-03	N911	
	600	118	118	1.8E-02 ± 2.4E-02	7.1E-02 ± 7.3E-03	N587	370	370	1.8E-02 ± 2.2E-02	7.5E-02 ± 6.6E-03	N929	
	ERDF	130	130	1.6E-02 ± 1.8E-02	5.5E-02 ± 4.4E-03	N963	655	655	1.5E-02 ± 1.9E-02	5.8E-02 ± 8.4E-03	N482	
	Perimeter	279	279	1.9E-02 ± 2.2E-02	6.6E-02 ± 5.1E-03	N935	1426	1426	1.9E-02 ± 2.2E-02	8.0E-02 ± 6.4E-03	N939	
	Nearby Comm.	181	181	1.9E-02 ± 2.3E-02	7.0E-02 ± 7.1E-03	N945	905	905	1.9E-02 ± 2.4E-02	1.6E-01 ± 1.6E-02	N949	
	Dist. Comm.	25	25	1.7E-02 ± 1.7E-02	3.8E-02 ± 3.1E-03	N909	131	131	1.7E-02 ± 2.0E-02	5.6E-02 ± 4.6E-03	N909	
<sup>3</sup> H	100	13	0	9.9E-01 ± 3.7E+00	3.3E+00 ± 2.9E+00	N900	66	10	3.1E+00 ± 1.3E+01	4.0E+01 ± 8.5E+00	N900	1.5E+03
	200-E	38	1	1.6E+00 ± 1.0E+01	3.0E+01 ± 9.0E+00	N584	143	19	2.9E+00 ± 7.0E+00	2.2E+01 ± 5.0E+00	N920	
	300	78	2	3.6E+00 ± 7.3E+00	2.4E+01 ± 6.5E+00	N918	360	162	8.7E+00 ± 2.4E+01	1.4E+02 ± 3.0E+01	N130	
	400	13	0	3.1E+00 ± 5.4E+00	8.9E+00 ± 6.5E+00	N912	66	11	3.5E+00 ± 7.8E+00	1.5E+01 ± 3.8E+00	N912	
	Perimeter	91	0	1.1E+00 ± 5.7E+00	7.1E+00 ± 7.5E+00	N934	454	88	3.8E+00 ± 1.1E+01	6.7E+01 ± 1.5E+01	N937	
	Nearby Comm.	26	0	9.7E-01 ± 5.8E+00	9.4E+00 ± 6.5E+00	N943	130	27	6.6E+00 ± 5.6E+01	3.2E+02 ± 6.4E+01	N944	
	Dist Comm	13	0	1.8E+00 ± 5.3E+00	6.5E+00 ± 6.1E+00	N909	65	8	2.8E+00 ± 1.1E+01	2.9E+01 ± 6.5E+00	N909	
<sup>60</sup> Co	100	16	0	3.4E-06 ± 8.2E-05	6.5E-05 ± 7.8E-05	N900	72	1	1.3E-04 ± 1.9E-03	8.1E-03 ± 3.1E-03	N588	1.7E-02
	200-E	55	0	9.0E-06 ± 1.0E-04	1.4E-04 ± 1.5E-04	N969	292	0	1.0E-05 ± 3.1E-04	3.9E-04 ± 4.1E-04	N985	
	200-W	46	0	-5.1E-06 ± 9.8E-05	1.2E-04 ± 1.4E-04	N168	230	0	5.6E-06 ± 3.3E-04	6.6E-04 ± 6.1E-04	N975	
	300	14	0	1.7E-05 ± 8.9E-05	1.2E-04 ± 1.3E-04	N919	68	1	8.6E-05 ± 1.9E-03	7.6E-03 ± 2.5E-03	N905	
	400	4	0	-2.6E-05 ± 9.6E-05	3.3E-05 ± 9.2E-05	N912	20	0	4.5E-05 ± 4.4E-04	4.3E-04 ± 4.4E-04	N912	

Table C-3. Concentrations of Select Radionuclides (pCi/m<sup>3</sup>)<sup>a</sup> in Onsite Air Samples. (4 Pages)

Radionuclide	Site	2019					2014 - 2018					EPA Table 2 <sup>e</sup>
		Number of		Average <sup>c</sup>	Maximum <sup>d</sup>	Sampler	Number of		Average <sup>c</sup>	Maximum <sup>d</sup>	Sampler	
		Samples	Detects <sup>b</sup>				Samples	Detects <sup>b</sup>				
<sup>90</sup> Sr	600	10	0	-3.8E-06 ± 8.6E-05	6.3E-05 ± 1.3E-04	N587	31	0	-1.4E-07 ± 2.4E-04	2.9E-04 ± 2.9E-04	N930	1.9E-02
	ERDF	10	0	3.3E-05 ± 9.5E-05	1.2E-04 ± 1.4E-04	N168	50	0	-1.6E-05 ± 2.6E-04	2.0E-04 ± 2.0E-04	N517	
	Perimeter	22	0	-5.3E-06 ± 9.5E-05	8.6E-05 ± 1.3E-04	N935	114	1	3.2E-05 ± 7.6E-04	3.1E-03 ± 1.1E-03	N934	
	Nearby Comm.	14	0	3.0E-05 ± 9.5E-05	8.1E-05 ± 1.1E-04	N944	70	0	9.3E-05 ± 1.5E-03	6.1E-03 ± 2.1E-03	N945	
	Dist. Comm.	2	0	-1.4E-05 ± 5.0E-05	1.2E-05 ± 9.8E-05	N909	10	0	8.0E-05 ± 3.7E-04	4.3E-04 ± 5.4E-04	N909	
	100	16	0	7.2E-05 ± 5.9E-04	6.5E-04 ± 6.1E-04	N900	72	0	-2.9E-05 ± 5.1E-04	7.5E-04 ± 6.3E-04	N576	
	200-E	55	0	9.9E-06 ± 6.2E-04	6.0E-04 ± 6.1E-04	N985	246	1	2.6E-05 ± 8.1E-04	5.2E-03 ± 2.1E-03	N158	
	200-W	46	0	-2.2E-05 ± 8.6E-04	1.8E-03 ± 2.0E-03	N987	220	0	-8.7E-06 ± 4.8E-04	7.8E-04 ± 7.2E-04	N956	
	300	14	0	2.2E-05 ± 4.6E-04	2.9E-04 ± 4.3E-04	N919	68	0	-8.0E-06 ± 5.5E-04	1.0E-03 ± 8.3E-04	N557	
<sup>137</sup> Cs	400	4	0	-1.2E-04 ± 5.6E-04	2.3E-04 ± 4.2E-04	N912	20	0	-3.9E-05 ± 5.1E-04	6.2E-04 ± 4.9E-04	N911	1.9E-02
	600	10	0	2.5E-05 ± 4.3E-04	3.8E-04 ± 4.5E-04	N930	28	0	-1.2E-05 ± 3.8E-04	4.3E-04 ± 5.1E-04	N928	
	ERDF	10	0	6.5E-05 ± 4.2E-04	4.0E-04 ± 4.6E-04	N517	50	0	7.3E-05 ± 5.0E-04	6.8E-04 ± 5.2E-04	N517	
	Perimeter	18	0	-9.9E-06 ± 4.4E-04	3.5E-04 ± 4.0E-04	N941	90	0	-2.6E-05 ± 4.9E-04	7.8E-04 ± 6.6E-04	N941	
	Nearby Comm.	6	0	-5.4E-05 ± 6.2E-04	4.2E-04 ± 4.3E-04	N944	32	0	3.0E-07 ± 3.2E-04	4.8E-04 ± 5.1E-04	N946	
	Dist. Comm.	2	0	3.0E-05 ± 7.1E-04	3.8E-04 ± 4.5E-04	N909	10	0	-8.6E-07 ± 2.0E-04	2.1E-04 ± 2.9E-04	N909	
	100	16	2	5.2E-05 ± 1.4E-04	2.6E-04 ± 1.6E-04	N576	72	0	4.7E-05 ± 3.3E-04	4.9E-04 ± 9.2E-04	N588	
	200-E	54	6	1.4E-04 ± 1.1E-03	3.8E-03 ± 1.2E-03	N582	284	3	7.5E-05 ± 4.7E-04	2.1E-03 ± 8.7E-04	N158	
	200-W	46	0	1.5E-05 ± 9.8E-05	1.3E-04 ± 3.6E-04	N987	226	0	3.8E-05 ± 3.6E-04	6.1E-04 ± 3.8E-04	N966	
<sup>238</sup> Pu	300	14	0	9.9E-06 ± 6.4E-05	6.7E-05 ± 1.3E-04	N905	68	1	6.0E-05 ± 3.6E-04	6.5E-04 ± 5.1E-04	N904	2.1E-03
	400	4	0	6.4E-06 ± 2.6E-05	2.0E-05 ± 8.5E-05	N911	20	0	3.4E-05 ± 4.0E-04	3.2E-04 ± 4.6E-04	N911	
	600	9	1	5.4E-05 ± 1.8E-04	2.9E-04 ± 1.9E-04	N587	31	0	5.4E-05 ± 3.7E-04	6.2E-04 ± 6.1E-04	N928	
	ERDF	9	0	1.2E-05 ± 6.0E-05	6.6E-05 ± 6.9E-05	N482	50	0	3.0E-05 ± 2.7E-04	4.0E-04 ± 4.5E-04	N168	
	Perimeter	22	1	3.0E-05 ± 1.0E-04	1.9E-04 ± 1.4E-04	N933	114	0	3.2E-05 ± 3.3E-04	6.0E-04 ± 6.3E-04	N907	
	Nearby Comm.	14	0	1.7E-05 ± 7.7E-05	1.1E-04 ± 1.5E-04	N948	70	0	3.1E-05 ± 3.2E-04	3.8E-04 ± 5.2E-04	N947	
	Dist. Comm.	2	0	7.1E-06 ± 1.9E-05	1.6E-05 ± 6.7E-05	N909	10	0	4.1E-05 ± 2.6E-04	3.0E-04 ± 3.0E-04	N909	
	100	16	0	2.1E-06 ± 9.7E-06	1.6E-05 ± 2.4E-05	N588	67	0	8.8E-07 ± 1.4E-05	3.9E-05 ± 5.5E-05	N900	
	200-E	55	0	-5.3E-07 ± 6.7E-06	5.9E-06 ± 1.1E-05	N532	236	3	7.8E-06 ± 2.0E-04	1.6E-03 ± 5.1E-04	N583	
<sup>238</sup> Pu	200-W	42	0	9.1E-07 ± 8.2E-06	1.2E-05 ± 1.6E-05	N433	209	10	5.8E-06 ± 6.4E-05	3.7E-04 ± 1.5E-04	N901	2.1E-03
	300	14	0	-1.9E-06 ± 4.7E-06	1.8E-06 ± 1.0E-05	N904	65	0	5.0E-07 ± 1.5E-05	1.9E-05 ± 4.4E-05	N904	
	400	4	0	-1.2E-06 ± 7.0E-06	3.4E-06 ± 9.5E-06	N912	16	0	-2.6E-06 ± 1.7E-05	2.0E-05 ± 3.6E-05	N912	
	600	9	0	-1.4E-06 ± 3.8E-06	2.2E-06 ± 9.7E-06	N928	30	0	3.2E-07 ± 1.2E-05	2.1E-05 ± 2.7E-05	N928	
	ERDF	10	0	-2.4E-08 ± 6.7E-06	6.1E-06 ± 1.3E-05	N963	49	0	2.3E-06 ± 1.0E-05	2.0E-05 ± 3.1E-05	N482	
	Perimeter	22	0	1.1E-06 ± 1.1E-05	1.1E-05 ± 3.4E-05	N933	81	0	6.5E-07 ± 1.6E-05	3.5E-05 ± 3.7E-05	N940	
	Nearby Comm.	12	0	-8.2E-07 ± 1.1E-05	9.5E-06 ± 1.2E-05	N947	40	2	8.1E-07 ± 2.8E-05	5.9E-05 ± 2.8E-05	N944	

Table C-3. Concentrations of Select Radionuclides (pCi/m<sup>3</sup>)<sup>a</sup> in Onsite Air Samples. (4 Pages)

Radionuclide	Site	2019					2014 - 2018					EPA Table 2 <sup>e</sup>
		Number of		Average <sup>c</sup>	Maximum <sup>d</sup>	Sampler	Number of		Average <sup>c</sup>	Maximum <sup>d</sup>	Sampler	
		Samples	Detects <sup>b</sup>				Samples	Detects <sup>b</sup>				
<sup>239/240</sup> Pu	Dist. Comm.	2	0	2.6E-06 ± 7.3E-06	6.2E-06 ± 1.1E-05	N909	9	0	-8.8E-07 ± 6.9E-06	3.8E-06 ± 1.4E-05	N909	2.0E-03
	100	16	0	2.1E-06 ± 7.1E-06	9.6E-06 ± 1.7E-05	N578	68	0	4.2E-07 ± 1.4E-05	2.6E-05 ± 2.4E-05	N900	
	200-E	54	0	-2.0E-07 ± 8.8E-06	1.0E-05 ± 2.0E-05	N499	242	1	8.0E-07 ± 2.1E-05	9.7E-05 ± 8.4E-05	N976	
	200-W	46	8	1.4E-05 ± 6.6E-05	1.9E-04 ± 8.2E-05	N165	223	38	7.0E-05 ± 6.8E-04	3.2E-03 ± 1.0E-03	N155	
	300	14	0	-6.1E-07 ± 4.3E-06	2.9E-06 ± 6.7E-06	N902	65	0	-1.9E-06 ± 1.3E-05	1.5E-05 ± 2.5E-05	N902	
	400	4	0	-1.4E-06 ± 2.8E-06	-3.0E-07 ± 3.1E-06	N911	18	0	-2.4E-06 ± 1.4E-05	8.4E-06 ± 4.7E-05	N911	
	600	10	0	1.5E-06 ± 1.2E-05	1.9E-05 ± 3.8E-05	N930	31	0	-1.3E-06 ± 1.8E-05	2.9E-05 ± 3.5E-05	N928	
	ERDF	10	0	2.8E-06 ± 1.3E-05	1.9E-05 ± 2.3E-05	N517	48	4	8.6E-06 ± 4.2E-05	1.2E-04 ± 7.4E-05	N518	
	Perimeter	22	0	1.5E-06 ± 1.4E-05	2.1E-05 ± 5.1E-05	N935	88	1	-7.5E-07 ± 1.3E-05	1.8E-05 ± 1.9E-05	N938	
Nearby Comm.	12	0	-4.0E-07 ± 8.4E-06	8.2E-06 ± 3.6E-05	N949	41	2	-1.5E-06 ± 2.2E-05	1.5E-05 ± 2.1E-05	N946		
<sup>234</sup> U	Dist. Comm.	2	0	1.5E-06 ± 1.2E-06	2.2E-06 ± 6.0E-06	N909	10	0	8.4E-08 ± 9.4E-06	1.2E-05 ± 4.7E-05	N909	7.7E-03
	100	16	0	4.2E-06 ± 1.3E-05	1.9E-05 ± 1.7E-05	N900	62	12	1.2E-05 ± 3.1E-05	8.4E-05 ± 8.1E-05	N576	
	200-E	55	9	8.5E-06 ± 1.5E-05	2.9E-05 ± 2.2E-05	N583	254	85	2.3E-05 ± 5.2E-05	1.7E-04 ± 6.6E-05	N924	
	200-W	46	2	6.9E-06 ± 1.5E-05	4.0E-05 ± 2.3E-05	N901	229	51	1.4E-05 ± 3.6E-05	9.9E-05 ± 7.9E-05	N901	
	300	14	4	1.3E-05 ± 1.9E-05	3.4E-05 ± 2.9E-05	N918	68	45	4.8E-05 ± 5.5E-05	1.2E-04 ± 7.6E-05	N919	
	600	10	2	1.2E-05 ± 1.6E-05	2.6E-05 ± 1.8E-05	N929	28	17	4.1E-05 ± 6.3E-05	1.7E-04 ± 1.4E-04	N929	
	ERDF	10	0	5.2E-06 ± 1.4E-05	2.4E-05 ± 4.7E-05	N482	46	11	9.6E-06 ± 1.7E-05	3.3E-05 ± 3.6E-05	N482	
	Perimeter	8	4	2.9E-05 ± 3.1E-05	4.8E-05 ± 2.1E-05	N935	40	34	6.2E-05 ± 5.7E-05	1.6E-04 ± 1.1E-04	N937	
	Nearby Comm.	10	5	2.6E-05 ± 2.3E-05	5.0E-05 ± 2.5E-05	N946	52	40	6.2E-05 ± 4.7E-05	1.5E-04 ± 1.4E-04	N943	
<sup>235</sup> U	Dist. Comm.	2	1	1.3E-05 ± 9.2E-06	1.7E-05 ± 1.2E-05	N909	10	7	4.6E-05 ± 3.9E-05	8.8E-05 ± 5.6E-05	N909	7.1E-03
	100	15	0	5.5E-07 ± 2.8E-06	2.4E-06 ± 6.8E-06	N534	53	1	4.6E-06 ± 1.7E-05	4.5E-05 ± 7.3E-05	N575	
	200-E	48	1	1.7E-06 ± 7.1E-06	1.4E-05 ± 1.2E-05	N957	227	7	5.6E-06 ± 1.9E-05	7.6E-05 ± 8.1E-05	N582	
	200-W	41	0	1.7E-06 ± 6.5E-06	1.8E-05 ± 3.1E-05	N987	204	5	5.7E-06 ± 1.9E-05	6.9E-05 ± 5.0E-05	N161	
	300	11	0	7.0E-07 ± 5.4E-06	6.4E-06 ± 1.2E-05	N905	64	6	1.2E-05 ± 3.1E-05	6.7E-05 ± 6.2E-05	N919	
	600	7	0	4.5E-06 ± 1.3E-05	1.7E-05 ± 2.9E-05	N928	25	5	1.6E-05 ± 3.1E-05	6.5E-05 ± 4.7E-05	N928	
	ERDF	7	0	-1.2E-06 ± 4.4E-06	3.6E-06 ± 7.2E-06	N963	40	1	2.5E-06 ± 7.6E-06	1.4E-05 ± 1.1E-05	N963	
	Perimeter	6	0	3.3E-06 ± 1.0E-05	1.4E-05 ± 2.7E-05	N934	40	7	1.1E-05 ± 3.4E-05	8.4E-05 ± 8.0E-05	N937	
	Nearby Comm.	8	0	3.1E-06 ± 9.0E-06	1.3E-05 ± 2.6E-05	N943	52	10	1.5E-05 ± 4.2E-05	8.9E-05 ± 9.2E-05	N944	
<sup>238</sup> U	Dist. Comm.	2	0	-9.2E-07 ± 7.2E-07	-5.6E-07 ± 5.6E-06	N909	9	1	1.2E-05 ± 2.6E-05	3.3E-05 ± 3.0E-05	N909	8.3E-03
	100	16	2	7.9E-06 ± 1.0E-05	2.1E-05 ± 1.7E-05	N900	62	11	7.6E-06 ± 2.5E-05	7.1E-05 ± 7.6E-05	N578	
	200-E	55	13	8.4E-06 ± 1.5E-05	3.1E-05 ± 1.8E-05	N957	253	82	1.8E-05 ± 4.7E-05	1.6E-04 ± 6.0E-05	N984	
	200-W	46	4	7.6E-06 ± 1.3E-05	3.8E-05 ± 2.1E-05	N901	228	51	9.1E-06 ± 2.1E-05	6.6E-05 ± 6.1E-05	N901	
	300	14	8	1.9E-05 ± 2.4E-05	5.2E-05 ± 2.9E-05	N918	68	44	4.0E-05 ± 4.4E-05	1.0E-04 ± 6.5E-05	N902	
	600	10	3	8.6E-06 ± 1.0E-05	1.7E-05 ± 1.3E-05	N929	28	16	3.7E-05 ± 3.6E-05	9.0E-05 ± 5.9E-05	N929	
ERDF	10	0	7.0E-06 ± 1.9E-05	2.4E-05 ± 4.0E-05	N517	49	13	1.0E-05 ± 2.2E-05	5.3E-05 ± 7.9E-05	N518		



Table C-3. Concentrations of Select Radionuclides (pCi/m<sup>3</sup>)<sup>a</sup> in Onsite Air Samples. (4 Pages)

Radionuclide	Site	2019					2014 - 2018					EPA Table 2 <sup>e</sup>
		Number of		Average <sup>c</sup>	Maximum <sup>d</sup>	Sampler	Number of		Average <sup>c</sup>	Maximum <sup>d</sup>	Sampler	
		Samples	Detects <sup>b</sup>				Samples	Detects <sup>b</sup>				
	Perimeter	8	4	2.6E-05 ± 2.2E-05	4.4E-05 ± 2.3E-05	N934	40	32	5.2E-05 ± 4.7E-05	1.7E-04 ± 1.0E-04	N935	
	Nearby Comm.	10	6	2.6E-05 ± 3.2E-05	4.8E-05 ± 2.4E-05	N946	52	43	5.7E-05 ± 4.7E-05	1.5E-04 ± 8.1E-05	N945	
	Dist Comm	2	1	1.4E-05 ± 2.5E-05	2.6E-05 ± 1.5E-05	N909	10	6	3.3E-05 ± 2.6E-05	5.6E-05 ± 2.5E-05	N909	
<sup>241</sup> Am	100	15	0	3.1E-06 ± 5.9E-06	9.7E-06 ± 1.5E-05	N534	65	0	2.4E-05 ± 3.3E-04	9.0E-04 ± 2.5E-03	N900	1.9E-03
	200-E	22	0	3.0E-06 ± 6.0E-06	8.9E-06 ± 1.1E-05	N924	225	0	1.8E-05 ± 1.5E-03	4.0E-03 ± 3.2E-03	N920	
	200-W	24	4	6.8E-06 ± 1.7E-05	2.8E-05 ± 2.0E-05	N165	208	21	-6.3E-05 ± 1.4E-03	2.4E-03 ± 2.3E-03	N965	
	600	2	0	-6.7E-07 ± 4.8E-07	-4.3E-07 ± 4.3E-06	N587	26	0	-5.0E-05 ± 1.7E-03	2.2E-03 ± 2.7E-03	N929	
	ERDF	4	0	3.9E-06 ± 7.5E-06	1.0E-05 ± 1.3E-05	N168	20	0	-1.4E-04 ± 1.2E-03	1.1E-03 ± 1.7E-03	N168	
	Perimeter	20	0	1.5E-06 ± 8.3E-06	9.9E-06 ± 3.3E-05	N933	107	0	-6.8E-06 ± 1.3E-03	2.1E-03 ± 2.1E-03	N937	
	Nearby Comm.	12	0	3.4E-06 ± 1.3E-05	1.4E-05 ± 3.6E-05	N943	68	0	2.2E-06 ± 1.1E-03	2.8E-03 ± 2.1E-03	N949	
	Dist. Comm.	2	0	-1.3E-06 ± 5.6E-07	-1.0E-06 ± 4.6E-06	N909	10	0	-4.3E-06 ± 1.5E-04	1.6E-04 ± 1.6E-03	N909	
<sup>241</sup> Pu	100	14	0	1.8E-04 ± 7.7E-04	9.5E-04 ± 7.6E-04	N578	60	0	-2.4E-05 ± 1.1E-03	2.7E-03 ± 3.3E-03	N534	1.0E-01
	200-E	4	0	1.1E-04 ± 4.0E-04	4.0E-04 ± 7.0E-04	N481	20	0	-1.4E-04 ± 9.9E-04	6.2E-04 ± 9.7E-04	N481	
	200-W	24	0	1.4E-04 ± 5.4E-04	7.1E-04 ± 6.4E-04	N964	58	5	2.3E-04 ± 1.9E-03	4.3E-03 ± 1.8E-03	N975	
	600	2	0	3.6E-04 ± 5.7E-04	6.5E-04 ± 7.4E-04	N587	2	0	6.8E-05 ± 7.5E-04	4.4E-04 ± 8.5E-04	N587	
	ERDF	4	0	3.6E-04 ± 3.1E-04	5.4E-04 ± 6.7E-04	N963	3	0	3.0E-04 ± 7.5E-04	8.2E-04 ± 9.0E-04	N168	

<sup>a</sup> 1 pCi = 0.037 Bq<sup>b</sup> Number of samples with measurable concentrations of contaminant.<sup>c</sup> Average ± two standard deviations of all samples analyzed.<sup>d</sup> Maximum ± analytical uncertainty<sup>e</sup> EPA values are based on an effective dose equivalent of 10 mrem/yr (40 CFR 61, Appendix E, Table 2)

ERDF = Environmental Restoration Disposal Facility

## C.3 Surface Soil

Table C-4. Concentrations of Select Radionuclides (pCi/g)<sup>a</sup> in Hanford Site Soil Samples. (2 Pages)

Radionuclide	Hanford Area	2019							2014 - 2018						
		Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)			Location	Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)			Location
		Samples	Detects <sup>b</sup>						Samples	Detects <sup>b</sup>					
<sup>241</sup> Am	200-W	23	15	2.8E-02 ± 7.8E-02	2.0E-01 ± 3.3E-02		D005	54	38	3.7E-02 ± 1.0E-01	2.5E-01 ± 8.3E-02		D032		
<sup>137</sup> Cs	200-E	18	18	3.0E+00 ± 1.0E+01	1.7E+01 ± 1.4E+00		D053	88	87	2.9E+00 ± 8.7E+00	1.8E+01 ± 1.5E+00		D054		
	200-W	24	23	9.9E-01 ± 1.5E+00	2.7E+00 ± 2.3E-01		D035	131	126	1.2E+00 ± 2.6E+00	7.8E+00 ± 6.3E-01		D030		
	300	8	4	2.7E-02 ± 6.1E-02	8.9E-02 ± 2.5E-02		D121	40	23	4.5E-02 ± 1.1E-01	2.9E-01 ± 3.2E-02		D125		
	400	1	1	2.6E-02 <sup>e</sup>	2.6E-02 ± 2.2E-02		D130	5	5	3.4E-02 ± 2.4E-02	5.3E-02 ± 1.5E-02		D130		
	600	16	15	4.6E-01 ± 1.1E+00	2.3E+00 ± 2.1E-01		D091	72	71	4.3E-01 ± 8.3E-01	2.5E+00 ± 2.9E-01		D091		
<sup>238</sup> Pu	200-E	18	0	1.0E-03 ± 7.5E-03	1.3E-02 ± 1.5E-02		D073	86	19	1.2E-03 ± 6.3E-03	1.1E-02 ± 9.9E-03		D461		
	200-W	23	3	1.4E-02 ± 7.5E-02	1.5E-01 ± 4.1E-02		D005	131	58	8.2E-03 ± 3.6E-02	1.4E-01 ± 2.3E-02		D039		
	300	8	0	2.1E-03 ± 7.9E-03	9.5E-03 ± 1.4E-02		D121	40	7	2.0E-03 ± 6.8E-03	1.2E-02 ± 1.1E-02		D123		
	400	1	0	5.7E-03 <sup>e</sup>	5.7E-03 ± 9.7E-03		D130	5	1	2.8E-03 ± 5.9E-03	8.0E-03 ± 2.8E-03		D130		
	600	17	1	5.4E-05 ± 7.8E-03	7.6E-03 ± 5.6E-03		D099	69	17	2.6E-03 ± 9.4E-03	2.4E-02 ± 1.8E-02		D107		
<sup>239/240</sup> Pu	200-E	18	4	1.0E-02 ± 2.7E-02	4.5E-02 ± 1.3E-02		D143	87	56	1.4E-02 ± 3.2E-02	8.4E-02 ± 2.0E-02		D078		
	200-W	24	20	8.5E-02 ± 2.3E-01	5.2E-01 ± 9.0E-02		D005	132	118	1.1E-01 ± 3.6E-01	1.1E+00 ± 1.3E-01		D032		
	300	8	2	9.8E-03 ± 3.4E-02	4.7E-02 ± 2.1E-02		D121	39	19	6.2E-03 ± 2.4E-02	5.4E-02 ± 7.9E-03		D126		
	400	1	0	-1.4E-03 <sup>e</sup>	-1.4E-03 ± 7.4E-03		D130	5	2	1.5E-03 ± 9.6E-04	2.1E-03 ± 7.8E-04		D130		
	600	17	8	5.1E-02 ± 1.8E-01	3.2E-01 ± 4.6E-02		D107	71	52	6.4E-02 ± 4.2E-01	1.6E+00 ± 1.8E-01		D107		
<sup>90</sup> Sr	200-E	18	8	1.3E-01 ± 4.1E-01	7.9E-01 ± 1.5E-01		D059	88	58	2.9E-01 ± 9.7E-01	2.2E+00 ± 4.2E-01		D064		
	200-W	24	12	2.1E-01 ± 1.2E+00	3.1E+00 ± 6.0E-01		D009	113	67	1.2E-01 ± 2.9E-01	6.0E-01 ± 1.3E-01		D051		
	300	8	0	1.8E-03 ± 5.0E-02	4.1E-02 ± 3.1E-02		D120	40	1	7.8E-03 ± 6.1E-02	1.4E-01 ± 4.8E-02		D121		
	400	1	0	1.5E-02 <sup>e</sup>	1.5E-02 ± 2.8E-02		D130	5	0	-9.3E-03 ± 2.1E-02	2.6E-03 ± 1.8E-02		D130		
	600	17	6	3.5E-02 ± 9.2E-02	1.6E-01 ± 4.9E-02		D091	72	28	6.9E-02 ± 2.7E-01	1.0E+00 ± 2.0E-01		D091		
<sup>234</sup> U	200-E	18	18	4.7E-01 ± 2.8E-01	8.8E-01 ± 1.5E-01		D063	88	88	5.4E-01 ± 2.1E-01	1.1E+00 ± 1.9E-01		D060		
	200-W	24	24	4.4E-01 ± 1.7E-01	6.2E-01 ± 1.1E-01		D033	113	113	5.0E-01 ± 2.1E-01	7.5E-01 ± 1.2E-01		D306		
	300	8	8	6.6E-01 ± 7.7E-01	1.5E+00 ± 1.8E-01		D126	40	40	7.9E-01 ± 9.9E-01	2.3E+00 ± 3.7E-01		D126		
	400	1	1	3.3E-01 <sup>e</sup>	3.3E-01 ± 5.7E-02		D130	5	5	4.7E-01 ± 1.2E-01	5.8E-01 ± 1.1E-01		D130		
	600	17	17	4.6E-01 ± 1.0E-01	5.8E-01 ± 7.1E-02		D113	72	72	5.3E-01 ± 2.2E-01	9.3E-01 ± 1.6E-01		D091		
<sup>235</sup> U	200-E	18	15	3.4E-02 ± 3.2E-02	7.0E-02 ± 2.7E-02		D057	87	78	5.9E-02 ± 5.9E-02	1.8E-01 ± 8.9E-02		D460		
	200-W	24	12	2.8E-02 ± 2.6E-02	6.1E-02 ± 3.7E-02		D015	113	92	5.0E-02 ± 4.3E-02	1.1E-01 ± 4.8E-02		D026		
	300	8	6	4.1E-02 ± 4.0E-02	7.6E-02 ± 3.4E-02		D126	40	36	7.3E-02 ± 8.6E-02	1.9E-01 ± 7.5E-02		D126		
	400	1	1	3.1E-02 <sup>e</sup>	3.1E-02 ± 1.8E-02		D130	5	5	4.7E-02 ± 3.5E-02	7.7E-02 ± 4.1E-02		D130		
	600	17	16	3.3E-02 ± 2.0E-02	5.1E-02 ± 2.4E-02		D103	72	59	5.7E-02 ± 5.1E-02	1.2E-01 ± 5.3E-02		D094		
<sup>238</sup> U	200-E	18	18	4.7E-01 ± 3.0E-01	1.0E+00 ± 1.6E-01		D063	88	88	5.4E-01 ± 2.1E-01	1.1E+00 ± 1.9E-01		D060		
	200-W	24	24	4.5E-01 ± 1.5E-01	6.5E-01 ± 1.1E-01		D047	113	113	5.0E-01 ± 2.0E-01	7.0E-01 ± 1.3E-01		D010		
	300	8	8	6.4E-01 ± 6.3E-01	1.2E+00 ± 1.5E-01		D121	40	40	7.5E-01 ± 9.1E-01	2.2E+00 ± 3.5E-01		D126		

Table C-4. Concentrations of Select Radionuclides (pCi/g)<sup>a</sup> in Hanford Site Soil Samples. (2 Pages)

Radionuclide	Hanford Area	2019								2014 - 2018							
		Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)	Location	Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)	Location						
		Samples	Detects <sup>b</sup>				Samples	Detects <sup>b</sup>									
	400	1	1	3.7E-01 <sup>e</sup>		3.7E-01 ± 6.0E-02	D130	5	5	4.5E-01 ± 1.0E-01	5.3E-01 ± 1.0E-01	D130					
	600	17	17	4.7E-01 ± 9.7E-02		6.1E-01 ± 7.3E-02	D113	72	72	5.5E-01 ± 2.3E-01	9.7E-01 ± 1.5E-01	D094					

<sup>a</sup> 1 pCi = 0.037 Bq<sup>b</sup> Number of samples with measurable concentrations of contaminant<sup>c</sup> Average ± two standard deviations of all samples analyzed<sup>d</sup> Maximum ± analytical uncertainty<sup>e</sup> Standard deviation cannot be calculated for one sample.Table C-5. Concentrations of Select Radionuclides (pCi/g)<sup>a</sup> in Offsite Soil Samples.

Radionuclide	Hanford Area	2019								2001, 2004, 2008, and 2015							
		Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)	Location	Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)	Location						
		Samples	Detects <sup>b</sup>				Samples	Detects <sup>b</sup>									
<sup>241</sup> Am	Off Site	3	0	4.4E-03 ± 2.5E-03		5.8E-03 ± 6.8E-03	D493	6	2	4.7E-03 ± 2.6E-03	4.3E-03 ± 9.0E-04	D434					
<sup>137</sup> Cs	Off Site	17	15	1.7E-01 ± 3.0E-01		5.6E-01 ± 7.6E-02	D427	70	67	1.4E-01 ± 2.5E-01	4.8E-01 ± 3.1E-02	D441					
<sup>238</sup> Pu	Off Site	16	0	2.3E-04 ± 7.7E-03		8.6E-03 ± 8.9E-03	D435	67	26	3.1E-04 ± 8.9E-04	2.9E-03 ± 2.4E-03	D437					
<sup>239/240</sup> Pu	Off Site	17	3	5.4E-03 ± 1.8E-02		2.5E-02 ± 1.3E-02	D433	68	60	5.0E-03 ± 1.1E-02	3.0E-02 ± 4.4E-03	D424					
<sup>90</sup> Sr	Off Site	18	0	1.7E-02 ± 4.6E-02		4.7E-02 ± 3.3E-02	D433	70	17	1.7E-02 ± 5.1E-02	1.4E-01 ± 4.6E-02	D437					
<sup>234</sup> U	Off Site	18	18	4.7E-01 ± 1.5E-01		6.2E-01 ± 7.8E-02	D427	70	68	4.5E-01 ± 3.4E-01	1.5E+00 ± 1.8E-01	D429					
<sup>235</sup> U	Off Site	17	6	3.4E-02 ± 2.9E-02		6.0E-02 ± 5.5E-02	D441	70	46	3.8E-02 ± 2.9E-02	1.1E-01 ± 4.7E-02	D427					
<sup>238</sup> U	Off Site	18	18	4.7E-01 ± 1.3E-01		5.6E-01 ± 1.2E-01	D430	70	67	4.7E-01 ± 3.4E-01	1.3E+00 ± 2.0E-01	D427					

<sup>a</sup> 1 pCi = 0.037 Bq<sup>b</sup> Number of samples with measurable concentrations of contaminant<sup>c</sup> Average ± two standard deviations of all samples analyzed<sup>d</sup> Maximum ± analytical uncertaintyTable C-6. Concentrations of Select Radionuclides (pCi/g)<sup>a</sup> in Hanford Site Soil Samples Collected Site-wide and Offsite Soil Samples. (2 Pages)

Location	Radionuclide	2019								2001-2018							
		Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)	Location	Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)	Location						
		Samples	Detects <sup>b</sup>				Samples	Detects <sup>b</sup>									
Site-wide	<sup>241</sup> Am	23	15	2.8E-02 ± 7.8E-02		2.0E-01 ± 3.3E-02	D005	75	47	3.5E-02 ± 9.2E-02	2.5E-01 ± 8.3E-02	D032					
	<sup>137</sup> Cs	67	61	1.3E+00 ± 5.8E+00		1.7E+01 ± 1.4E+00	D053	1397	1324	1.3E+00 ± 1.1E+01	1.4E+02 ± 2.6E+01	D154					
	<sup>238</sup> Pu	67	4	5.5E-03 ± 4.6E-02		1.5E-01 ± 4.1E-02	D005	1392	138	5.5E-03 ± 6.1E-02	7.7E-01 ± 2.2E-01	D088					
	<sup>239/240</sup> Pu	68	26	4.7E-02 ± 1.8E-01		5.2E-01 ± 9.0E-02	D005	1395	783	8.5E-02 ± 9.1E-01	1.2E+01 ± 3.1E+00	D088					
	<sup>90</sup> Sr	68	68	1.2E-01 ± 7.8E-01		3.1E+00 ± 6.0E-01	D009	1379	340	7.7E-02 ± 3.3E+00	5.5E+01 ± 7.1E+00	D125					
	<sup>234</sup> U	68	50	4.8E-01 ± 3.5E-01		1.5E+00 ± 1.8E-01	D126	1378	1369	3.5E-01 ± 1.3E+00	1.2E+01 ± 2.3E+00	D131					
	<sup>235</sup> U	68	68	3.2E-02 ± 2.9E-02		7.6E-02 ± 3.4E-02	D126	1358	878	3.0E-02 ± 8.3E-02	6.5E-01 ± 1.6E-01	D131					

Table C-6. Concentrations of Select Radionuclides (pCi/g)<sup>a</sup> in Hanford Site Soil Samples Collected Sitewide and Offsite Soil Samples. (2 Pages)

Location	Radionuclide	2019								2001-2018							
		Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)	Location	Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)	Location						
		Samples	Detects <sup>b</sup>				Samples	Detects <sup>b</sup>									
	<sup>238</sup> U	23	15	4.8E-01 ± 3.1E-01	1.2E+00 ± 1.5E-01	D121	1379	1368	3.5E-01 ± 1.3E+00	1.2E+01 ± 2.3E+00	D131						
Offsite	<sup>241</sup> Am	3	0	4.4E-03 ± 2.5E-03	5.8E-03 ± 6.8E-03	D493	6	2	4.7E-03 ± 2.6E-03	4.3E-03 ± 9.0E-04	D434						
	<sup>137</sup> Cs	17	15	1.7E-01 ± 3.0E-01	5.6E-01 ± 7.6E-02	D427	70	67	1.4E-01 ± 2.5E-01	4.8E-01 ± 3.1E-02	D441						
	<sup>238</sup> Pu	16	0	2.3E-04 ± 7.7E-03	8.6E-03 ± 8.9E-03	D435	67	26	3.1E-04 ± 8.9E-04	2.9E-03 ± 2.4E-03	D437						
	<sup>239/240</sup> Pu	17	3	5.4E-03 ± 1.8E-02	2.5E-02 ± 1.3E-02	D433	68	60	5.0E-03 ± 1.1E-02	3.0E-02 ± 4.4E-03	D424						
	<sup>90</sup> Sr	18	0	1.7E-02 ± 4.6E-02	4.7E-02 ± 3.3E-02	D433	70	17	1.7E-02 ± 5.1E-02	1.4E-01 ± 4.6E-02	D437						
	<sup>234</sup> U	18	18	4.7E-01 ± 1.5E-01	6.2E-01 ± 7.8E-02	D427	70	68	4.5E-01 ± 3.4E-01	1.5E+00 ± 1.8E-01	D429						
	<sup>235</sup> U	17	6	3.4E-02 ± 2.9E-02	6.0E-02 ± 5.5E-02	D441	70	46	3.8E-02 ± 2.9E-02	1.1E-01 ± 4.7E-02	D427						
	<sup>238</sup> U	18	18	4.7E-01 ± 1.3E-01	5.6E-01 ± 1.2E-01	D430	70	67	4.7E-01 ± 3.4E-01	1.3E+00 ± 2.0E-01	D427						

<sup>a</sup> 1 pCi = 0.037 Bq<sup>b</sup> Number of samples with measurable concentrations of contaminant<sup>c</sup> Average ± two standard deviations of all samples analyzed<sup>d</sup> Maximum ± analytical uncertainty

C.4 Columbia River Water

Table C-7. Radionuclide Concentrations in Columbia River Water (Richland, Washington).

Radionuclide	2019								2014-2018								WA Ambient Surface Water Quality Standard <sup>d</sup>
	Number of		Concentration <sup>a</sup>				Number of		Concentration <sup>a</sup>								
	Samples	Detects	Maximum (pCi/L) <sup>c</sup>	Average(pCi/L)	Standard Deviation (pCi/L)	Standard Error (pCi/L)	Samples	Detects	Maximum (pCi/L) <sup>c</sup>	Average(pCi/L)	Standard Deviation (pCi/L)	Standard Error (pCi/L)					
<b>Composite System</b>																	
Cesium-137 <sup>e</sup>	--	--	--	--	--	--	--	12	0	1.6E+00	± 2.1E+00	2.5E-01	± 1.6E+00	200			
Strontium-90	14	0	5.8E-02	± 3.9E-02	2.0E-02	± 4.2E-02	66	0	5.6E-02	± 3.7E-02	8.8E-03	± 4.4E-02	8				
Tritium	14	14	4.4E+01	± 1.4E+01	3.0E+01	± 1.4E+01	66	66	6.3E+01	± 9.7E+00	2.6E+01	± 2.1E+01	20000				
Technetium-99	14	0	1.6E+00	± 1.0E+00	1.4E-01	± 1.3E+00	66	2	1.2E+00	± 7.8E-01	1.6E-01	± 7.1E-01	900				
Plutonium-238 <sup>e</sup>	--	--	--	--	--	--	12	0	6.7E-03	± 9.5E-03	8.8E-04	± 6.5E-03	--				
Plutonium-239/240 <sup>e</sup>	--	--	--	--	--	--	12	0	5.8E-03	± 6.9E-03	-1.6E-03	± 1.3E-02	--				
Uranium-234	14	14	3.7E-01	± 6.9E-02	3.0E-01	± 7.5E-02	66	66	4.1E-01	± 8.0E-02	2.8E-01	± 1.1E-01	--				
Uranium-235	14	5	4.5E-02	± 2.8E-02	1.9E-02	± 2.7E-02	66	25	7.9E-02	± 3.0E-02	2.2E-02	± 3.4E-02	--				
Uranium-238	14	14	2.9E-01	± 5.8E-02	2.3E-01	± 7.8E-02	66	65	3.0E-01	± 8.2E-02	2.2E-01	± 7.6E-02	--				
<b>Continuous System</b>																	
Cesium-137	D <sup>b</sup>	14	0	9.1E-04	± 1.8E-03	2.4E-05	± 1.3E-03	49	0	2.4E-03	± 2.3E-03	2.4E-05	± 2.1E-03	200			
	P <sup>b</sup>	14	0	2.5E-03	± 3.4E-03	8.9E-05	± 2.7E-03	49	0	6.9E-03	± 3.4E-03	8.9E-05	± 5.0E-03				
Plutonium-238 <sup>f</sup>	D <sup>b</sup>	14	0	4.3E-05	± 6.7E-05	-3.6E-07	± 5.2E-05	41	0	8.7E-05	± 7.4E-05	-3.7E-06	± 6.9E-05	600			
	P <sup>b</sup>	14	0	1.0E-04	± 1.1E-04	-5.1E-06	± 8.3E-05	41	2	7.9E-04	± 3.1E-04	3.4E-05	± 2.7E-04				
Plutonium-239/240 <sup>f</sup>	D <sup>b</sup>	14	0	2.4E-05	± 7.2E-05	-1.4E-05	± 5.5E-05	41	0	9.7E-05	± 1.9E-04	7.1E-06	± 8.5E-05	--			
	P <sup>b</sup>	14	0	7.9E-05	± 9.3E-05	-1.3E-05	± 1.0E-04	41	1	1.8E-04	± 9.8E-05	1.2E-05	± 1.3E-04				

<sup>a</sup> Maximum values are ± total propagated analytical uncertainty (2 sigma). Averages are ±2 standard deviations of the mean.  
<sup>b</sup> Radionuclides measured using the continuous system show the particulate (P) and dissolved (D) fractions separately. Other radionuclides are based on unfiltered water samples collected by the composite system (see Section 7.2).  
<sup>c</sup> 1 pCi = 0.037 Bq.  
<sup>d</sup> WAC 173-201A-250 and EPA-570/9-76-003; WAC 246-290; 40 CFR 141.  
<sup>e</sup> Richland composite water was analyzed from July of 2017 through June of 2018 as the continuous system was down; No filter/resin data is available for this time.  
<sup>f</sup> Plutonium-238 and plutonium-239/240 were analyzed quarterly in 2014.  
Note: Dashes indicate no analytical concentrations or concentration guides available.  
WA = Washington State.

**Table C-8. Radionuclide Concentrations in Columbia River Water (Priest Rapids Dam, Washington).**

Radionuclide		2019								2014-2018								WA Ambient Surface Water Quality Standard <sup>d</sup>
		Number of		Concentration <sup>a</sup>						Number of		Concentration <sup>a</sup>						
		Samples	Detects	Maximum (pCi/L) <sup>c</sup>			Average(pCi/L) <sup>c</sup>			Samples	Detects	Maximum (pCi/L) <sup>c</sup>			Average(pCi/L) <sup>c</sup>			
<b>Composite System</b>																		
Strontium-90		14	1	1.8E-01	±	5.4E-02	1.9E-02	±	1.0E-01	66	0	1.8E-01	±	5.4E-02	1.9E-02	±	1.0E-01	8
Tritium		14	14	2.2E+01	±	8.2E+00	1.8E+01	±	6.0E+00	66	64	3.0E+01	±	6.9E+00	1.6E+01	±	9.6E+00	20000
Technetium-99		14	0	1.7E+00	±	1.1E+00	1.6E-01	±	1.3E+00	66	0	1.5E+00	±	1.0E+00	1.2E-01	±	7.8E-01	900
Uranium-234		14	14	3.2E-01	±	5.9E-02	2.7E-01	±	6.1E-02	66	66	4.4E-01	±	8.7E-02	2.6E-01	±	2.3E-02	--
Uranium-235		14	4	5.7E-02	±	4.3E-02	1.7E-02	±	2.8E-02	66	28	7.4E-02	±	5.9E-02	2.4E-02	±	8.4E-03	--
Uranium-238		14	14	2.6E-01	±	5.0E-02	2.2E-01	±	4.7E-02	66	66	2.9E-01	±	5.9E-02	2.0E-01	±	1.2E-02	--
<b>Continuous System</b>																		
Cesium-137	D <sup>b</sup>	14	0	1.4E-03	±	3.3E-03	-3.9E-04	±	1.4E-03	64	0	2.2E-03	±	2.1E-03	2.0E-04	±	1.9E-03	200
	P <sup>b</sup>	14	0	2.0E-03	±	4.4E-03	-7.7E-06	±	2.5E-03	62	0	5.1E-03	±	2.9E-03	9.0E-04	±	3.9E-03	
Plutonium-238 <sup>f</sup>	D <sup>b</sup>	14	0	6.9E-05	±	1.1E-04	-7.3E-07	±	9.1E-05	56	0	2.3E-04	±	3.5E-05	4.7E-06	±	8.5E-05	600
	P <sup>b</sup>	14	0	1.3E-04	±	2.8E-04	-3.9E-06	±	9.8E-05	54	0	5.2E-04	±	1.7E-04	2.0E-05	±	2.4E-04	
Plutonium-239/240 <sup>f</sup>	D <sup>b</sup>	14	0	1.3E-04	±	1.2E-04	-8.4E-06	±	1.2E-04	56	1	9.9E-05	±	7.8E-05	-1.0E-06	±	6.5E-05	--
	P <sup>b</sup>	14	0	1.1E-04	±	1.1E-04	2.0E-05	±	7.7E-05	54	1	2.4E-04	±	2.4E-04	3.2E-05	±	1.2E-04	

<sup>a</sup> Maximum values are ± total propagated analytical uncertainty. Averages are ±2 standard deviations of the mean.  
<sup>b</sup> Radionuclides measured using the continuous system show the particulate (P) and dissolved (D) fractions separately. Other radionuclides are based on unfiltered water samples collected by the composite system (see Section 7.2).  
<sup>c</sup> 1 pCi = 0.037 Bq.  
<sup>d</sup> WAC 173-201A-250 and EPA-570/9-76-003; WAC 246-290; 40 CFR 141.  
<sup>e</sup> Does not apply to the Priest Rapids composite/continuous water system.  
<sup>f</sup> Plutonium-238 and plutonium-239/240 were analyzed quarterly in 2014.  
 Note: Dashes indicate no concentration guides available.  
 WA = Washington State.

**Table C-9. 2019 Radionuclide Concentrations in Columbia River Transect Water Samples. (3 Pages)**

Transect/Radionuclide	No. of Detections	No. of Samples	Concentration <sup>a</sup>					
			Maximum pCi/L <sup>b</sup>			Average pCi/L <sup>b</sup>		
<b>Vernita Bridge (HRM 0.3)</b>								
Strontium-90 <sup>c</sup>	0	8	5.92E-02	±	3.94E-02	1.84E-02	±	4.59E-02
Technetium-99	1	8	1.46E+00	±	8.38E-01	3.22E-01	±	1.01E+00

**Table C-9. 2019 Radionuclide Concentrations in Columbia River Transect Water Samples. (3 Pages)**

Transect/Radionuclide	No. of Detections	No. of Samples	Concentration <sup>a</sup>			
			Maximum pCi/L <sup>b</sup>		Average pCi/L <sup>b</sup>	
Tritium	8	8	1.96E+01	± 7.18E+00	1.71E+01	± 3.64E+00
Uranium-234	8	8	3.02E-01	± 5.48E-02	2.55E-01	± 4.41E-02
Uranium-235	1	8	1.75E-02	± 1.39E-02	1.16E-02	± 9.76E-03
Uranium-238	8	8	2.29E-01	± 4.54E-02	2.04E-01	± 2.85E-02
<b>100-H Area (HRM 15.3)</b>						
Strontium-90 <sup>c</sup>	0	5	5.38E-02	± 3.71E-02	4.42E-03	± 3.58E+00
Tritium	5	5	1.75E+01	± 6.82E+00	1.60E+01	± 3.58E+00
Uranium-234	5	5	2.64E-01	± 5.51E-02	2.29E-01	± 6.04E-02
Uranium-235	1	5	5.20E-02	± 2.62E-02	2.39E-02	± 2.88E-02
Uranium-238	5	5	2.12E-01	± 4.95E-02	1.89E-01	± 3.78E-02
<b>100-N Area (HRM 9.5)</b>						
Strontium-90 <sup>c</sup>	0	6	5.28E-02	± 3.66E-02	3.73E-02	± 2.68E-02
Tritium	6	6	2.30E+01	± 8.17E+00	1.72E+01	± 5.66E+00
Uranium-234	6	6	2.94E-01	± 6.86E-02	2.35E-01	± 7.70E-02
Uranium-235 <sup>c</sup>	0	6	1.92E-02	± 1.68E-02	1.20E-02	± 9.83E-03
Uranium-238	6	6	1.97E-01	± 5.26E-02	1.83E-01	± 1.58E-02
<b>Hanford Townsite (HRM 28.7)</b>						
Strontium-90 <sup>c</sup>	0	5	3.07E-02	± 3.53E-02	-2.55E-03	± 5.20E-02
Tritium	5	5	8.65E+01	± 2.63E+01	3.09E+01	± 5.56E+01
Uranium-234	5	5	2.89E-01	± 6.86E-02	2.45E-01	± 5.41E-02
Uranium-235	3	5	4.72E-02	± 2.64E-02	3.11E-02	± 2.51E-02
Uranium-238	3	5	2.52E-01	± 6.33E-02	2.00E-01	± 6.43E-02
<b>300 Area (HRM 43.1)</b>						
Strontium-90 <sup>c</sup>	0	5	4.53E-02	± 3.61E-02	1.77E-02	± 6.74E-02
Tritium	5	5	1.96E+01	± 7.37E+00	1.70E+01	± 5.00E+00
Uranium-234	5	5	3.12E-01	± 7.16E-02	2.77E-01	± 6.54E-02
Uranium-235	2	5	3.96E-02	± 2.79E-02	3.14E-02	± 1.46E-02
Uranium-238	5	5	2.34E-01	± 5.56E-02	2.14E-01	± 3.22E-02
<b>Richland (HRM 46.4)</b>						
Strontium-90 <sup>c</sup>	0	11	4.31E-02	± 3.62E-02	1.93E-03	± 6.30E-02
Technetium-99 <sup>c</sup>	0	11	1.15E+00	± 7.65E-01	1.48E-01	± 8.67E-01
Tritium	11	11	4.43E+01	± 1.39E+01	2.46E+01	± 2.02E+01
Uranium-234	11	11	3.95E-01	± 6.92E-02	3.20E-01	± 5.41E-02
Uranium-235	3	11	2.24E-02	± 1.71E-02	1.44E-02	± 9.65E-03
Uranium-238	11	11	3.46E-01	± 1.01E-01	2.47E-01	± 1.22E-01



**Table C-9. 2019 Radionuclide Concentrations in Columbia River Transect Water Samples. (3 Pages)**

Transect/Radionuclide	No. of Detections	No. of Samples	Concentration <sup>a</sup>	
			Maximum pCi/L <sup>b</sup>	Average pCi/L <sup>b</sup>
<sup>a</sup> Maximum values ± total propagated analytical uncertainty; Average values ± 2stdv. <sup>b</sup> 1 pCi = 0.037 Bq. <sup>c</sup> All value(s) reported are non-detects. HRM = Hanford river marker.				

**Table C-10. Dissolved Metal Concentrations in Columbia River Transect Water Near Hanford Site. (3 Pages)**

Metal	No. of Samples	No. of Detections	Maximum (µg/L) <sup>a</sup>	Minimum (µg/L) <sup>a</sup>	Average (µg/L) <sup>a,c</sup>	Minimum Detectable Concentrations (µg/L)	Washington State Ambient Surface Water Quality Chronic Toxicity Level <sup>b</sup>
<b>Vernita Bridge</b>							
Antimony	8	0	—	—	—	1	N/A
Arsenic	8	4	2.40	2.36	2.28	2	190
Beryllium	8	0	—	—	—	0.2	N/A
Cadmium	8	0	—	—	—	0.3	N/A
Chromium	8	0	—	—	—	3	10
Copper	8	8	0.57	0.48	0.52	0.3	6
Hexavalent Chromium	8	0	—	—	—	1.5	10
Lead	8	0	—	—	—	0.5	1.1
Nickel	8	0	—	—	—	0.6	83
Selenium	8	0	—	—	—	2	5
Silver	8	0	—	—	—	0.3	N/A
Thallium	8	1	0.71	0.71	0.71	0.6	N/A
Uranium	8	8	0.72	0.53	0.62	0.067	30 <sup>d</sup>
Zinc	8	3	3.51	3.42	3.46	3.3	55
<b>100-N Area</b>							
Antimony	6	0	—	—	—	1	N/A
Arsenic	6	0	—	—	—	2	190
Beryllium	6	0	—	—	—	0.2	N/A
Cadmium	6	0	—	—	—	0.3	N/A
Chromium	6	0	—	—	—	3	10
Copper	6	6	0.64	0.49	0.56	0.3	6
Hexavalent Chromium	6	0	—	—	—	1.5	10
Lead	6	0	—	—	—	0.5	1.1
Nickel	6	0	—	—	—	0.6	83
Selenium	6	0	—	—	—	2	5
Silver	6	0	—	—	—	0.3	N/A



**Table C-10. Dissolved Metal Concentrations in Columbia River Transect Water Near Hanford Site. (3 Pages)**

Metal	No. of Samples	No. of Detections	Maximum (µg/L) <sup>a</sup>	Minimum (µg/L) <sup>a</sup>	Average (µg/L) <sup>a,c</sup>	Minimum Detectable Concentrations (µg/L)	Washington State Ambient Surface Water Quality Chronic Toxicity Level <sup>b</sup>
Thallium	6	0	—	—	—	0.6	N/A
Uranium	6	6	0.54	0.50	0.52	0.067	30 <sup>d</sup>
Zinc	6	6	6.84	3.68	4.78	3.3	55
<b>100-H Area</b>							
Antimony	5	0	—	—	—	1	N/A
Arsenic	5	3	3.15	2.96	3.03	2	190
Beryllium	5	0	—	—	—	0.2	N/A
Cadmium	5	0	—	—	—	0.3	N/A
Chromium	5	0	—	—	—	3	10
Copper	5	5	0.89	0.48	0.62	0.3	6
Hexavalent Chromium	5	0	—	—	—	1.5	10
Lead	5	0	—	—	—	0.5	1.1
Nickel	5	0	—	—	—	0.6	83
Selenium	5	0	—	—	—	2	5
Silver	5	0	—	—	—	0.3	N/A
Thallium	5	1	0.61	0.61	0.61	0.6	N/A
Uranium	5	5	35.80	1.55	13.77	0.067	30 <sup>d</sup>
Zinc	5	5	7.84	5.76	6.82	3.3	55
<b>Hanford Townsite</b>							
Antimony	5	0	—	—	—	1	N/A
Arsenic	5	0	—	—	—	2	190
Beryllium	5	0	—	—	—	0.2	N/A
Cadmium	5	0	—	—	—	0.3	N/A
Chromium	5	0	—	—	—	3	10
Copper	5	5	0.75	0.54	0.61	0.3	6
Hexavalent Chromium	5	0	—	—	—	1.5	10
Lead	5	0	—	—	—	0.5	1.1
Nickel	5	0	—	—	—	0.6	83
Selenium	5	0	—	—	—	2	5
Silver	5	0	—	—	—	0.3	N/A
Thallium	5	0	—	—	—	0.6	N/A
Uranium	5	5	0.56	0.51	0.53	0.067	30 <sup>d</sup>
Zinc	5	5	7.88	4.53	6.13	3.3	55
<b>300 Area</b>							
Antimony	5	0	—	—	—	1	N/A
Arsenic	5	5	2.61	2.18	2.44	2	190
Beryllium	5	0	—	—	—	0.2	N/A

**Table C-10. Dissolved Metal Concentrations in Columbia River Transect Water Near Hanford Site. (3 Pages)**

Metal	No. of Samples	No. of Detections	Maximum ( $\mu\text{g/L}$ ) <sup>a</sup>	Minimum ( $\mu\text{g/L}$ ) <sup>a</sup>	Average ( $\mu\text{g/L}$ ) <sup>a,c</sup>	Minimum Detectable Concentrations ( $\mu\text{g/L}$ )	Washington State Ambient Surface Water Quality Chronic Toxicity Level <sup>b</sup>
Cadmium	5	0	—	—	—	0.3	N/A
Chromium	5	0	—	—	—	3	10
Copper	5	5	0.65	0.55	0.61	0.3	6
Hexavalent Chromium	5	0	—	—	—	1.5	10
Lead	5	0	—	—	—	0.5	1.1
Nickel	5	0	—	—	—	0.6	83
Selenium	5	0	—	—	—	2	5
Silver	5	0	—	—	—	0.3	N/A
Thallium	5	0	—	—	—	0.6	N/A
Uranium	5	5	0.65	0.57	0.62	0.067	30 <sup>d</sup>
Zinc	5	1	4.38	4.38	4.38	3.3	55
Richland							
Antimony	11	0	—	—	—	1	N/A
Arsenic	11	6	2.72	2.26	2.48	2	190
Beryllium	11	0	—	—	—	0.2	N/A
Cadmium	11	0	—	—	—	0.3	N/A
Chromium	11	0	—	—	—	3	10
Copper	11	11	0.62	0.47	0.55	0.3	6
Hexavalent Chromium	11	0	—	—	—	1.5	10
Lead	11	0	—	—	—	0.5	1.1
Nickel	11	0	—	—	—	0.6	83
Selenium	11	0	—	—	—	2	5
Silver	11	0	—	—	—	0.3	N/A
Thallium	11	0	—	—	—	0.6	N/A
Uranium	11	11	0.93	0.55	0.73	0.067	30 <sup>d</sup>
Zinc	11	7	32.00	3.46	8.20	3.3	55

<sup>a</sup> Dashes indicate results at or below minimum detectable concentrations.

<sup>b</sup> WAC 173-201A-240, and WAC 173-201A-250. Table 240(3) Toxic Substances Criteria for the protection of aquatic life. For hardness—dependent criteria, the minimum value of 47 mg CaCO<sub>3</sub>/L, for 1992 through 2000 water samples collected near Vernita Bridge by the U.S. Geological Survey was used. Parts per million (ppm) values are equivalent to the reported micrograms per liter ( $\mu\text{g/L}$ ) concentrations shown.

<sup>c</sup> Average calculated using reporting limit values for all results above minimum detectable concentrations.

<sup>d</sup> EPA drinking water standard applied.

**Table C-11. Columbia River Organic Concentrations in Transect Water (2019).**

Location	No. of Samples	1,1,1-Trichloroethane (mg/L) <sup>b</sup>	1,2-Dichloroethane (mg/L) <sup>b</sup>	Regulatory Standard <sup>a</sup> (mg/L)
Richland Pumphouse-1 HRM 46.4	3	0.003	0.003	0.2 ; 0.005
Richland Pumphouse-3 HRM 46.4	2	0.003	0.003	0.2 ; 0.005
Richland Pumphouse-5 HRM 46.4	2	0.003	0.003	0.2 ; 0.005
Richland Pumphouse-7 HRM 46.4	2	0.003	0.003	0.2 ; 0.005
Richland Pumphouse-9 HRM 46.4	2	0.003	0.003	0.2 ; 0.005
300 Area-1 HRM 43.1	1	0.003	0.003	0.2 ; 0.005
300 Area-3 HRM 43.1	1	0.003	0.003	0.2 ; 0.005
300 Area-5 HRM 43.1	1	0.003	0.003	0.2 ; 0.005
300 Area-7 HRM 43.1	1	0.003	0.003	0.2 ; 0.005
300 Area-9 HRM 43.1	1	0.003	0.003	0.2 ; 0.005
Vernita-1 HRM 0.3	2	0.003	0.003	0.2 ; 0.005
Vernita-2 HRM 0.3	2	0.003	0.003	0.2 ; 0.005
Vernita-3 HRM 0.3	2	0.003	0.003	0.2 ; 0.005
Vernita-4 HRM 0.3	2	0.003	0.003	0.2 ; 0.005

<sup>a</sup>EPA National Primary Drinking Water Regulation Standard.  
<sup>b</sup>Maximum concentration reported was a non-detect.

## C.5 Shoreline Seep Water

**Table C-12. Columbia River Organic Concentrations in Shoreline Seep Water (2019)**

Location	No. of Samples	1,1,1-Trichloroethane (mg/L) <sup>b</sup>	1,2-Dichloroethane (mg/L) <sup>b</sup>	Regulatory Standard <sup>a</sup> (mg/L)
300 Area Spring DR 42-2	1	0.003	0.003	0.2 ; 0.005
300 Area Spring 42-2	1	0.003	0.003	0.2 ; 0.005
Hanford Townsite 25-4	1	0.003	0.003	0.2 ; 0.005
100F Spring 107-1	1	0.003	0.003	0.2 ; 0.005
100K Spring 63-1	1	0.003	0.003	0.2 ; 0.005
100B Spring 39-2	1	0.003	0.003	0.2 ; 0.005
100B Spring 38-3	1	0.003	0.003	0.2 ; 0.005

<sup>a</sup>EPA National Primary Drinking Water Regulation Standard.  
<sup>b</sup>Maximum concentration reported was a non-detect.

**Table C-13. Radionuclide Concentrations in Columbia River and Shoreline Sediment (Near Hanford Site) (2014-2019). (3 Pages)**

Sediment Location	Radionuclide	2019					2014-2018				
		No. of Samples	No. of Detects	Maximum Concentration <sup>a</sup> pCi/g			No. of Samples	No. of Detects	Average Concentration <sup>a</sup> pCi/g		
Adjacent to Locke Island	Cesium-137 <sup>b</sup>	1	0	-4.33E-04	±	2.00E-02	6	0	7.13E-03	±	1.11E-02
	Plutonium-239/240 <sup>b</sup>	1	0	-5.12E-04	±	3.58E-03	6	0	-6.89E-04	±	5.39E-03
	Uranium-234	1	1	1.40E+00	±	2.06E-01	6	6	1.26E+00	±	2.42E-01
	Uranium-235	1	1	1.00E-01	±	4.83E-02	6	6	1.22E-01	±	7.20E-02
	Uranium-238	1	1	1.32E+00	±	1.98E-01	6	6	1.20E+00	±	2.50E-01
Adjacent to Savage Island	Cesium-137 <sup>b</sup>	1	0	3.16E-02	±	2.13E-02	5	5	4.35E-02	±	1.67E-02
	Plutonium-239/240 <sup>b</sup>	1	0	6.73E-04	±	1.24E-03	5	0	-7.82E-04	±	7.18E-03
	Uranium-234	1	1	6.81E-01	±	1.26E-01	5	5	7.73E-01	±	3.06E-01
	Uranium-235 <sup>b</sup>	1	0	4.77E-02	±	3.99E-02	5	5	8.42E-02	±	6.40E-02
	Uranium-238	1	1	6.37E-01	±	1.19E-01	5	5	7.46E-01	±	2.54E-01
100-D Spring 102-1	Cesium-137	2	2	9.79E-02	±	2.01E-02	9	9	1.08E-01	±	2.25E-02
	Plutonium-239/240 <sup>b</sup>	2	0	2.15E-03	±	2.82E-03	9	3	3.56E-03	±	9.35E-03
	Uranium-234	2	2	4.42E-01	±	8.62E-02	9	9	5.11E-01	±	1.30E-01
	Uranium-235	2	1	5.31E-02	±	3.01E-02	9	9	5.09E-02	±	4.04E-02
	Uranium-238	2	2	4.97E-01	±	9.72E-02	9	9	4.99E-01	±	8.07E-02
100-F Slough	Cesium-137	1	1	8.76E-02	±	1.89E-02	6	6	1.80E-01	±	5.31E-02

**Table C-13. Radionuclide Concentrations in Columbia River and Shoreline Sediment (Near Hanford Site) (2014-2019). (3 Pages)**

Sediment Location	Radionuclide	2019					2014-2018				
		No. of Samples	No. of Detects	Maximum Concentration <sup>a</sup> pCi/g			No. of Samples	No. of Detects	Average Concentration <sup>a</sup> pCi/g		
	Plutonium-239/240 <sup>b</sup>	1	0	6.30E-04	±	1.24E-03	6	2	1.55E-03	±	3.90E-03
	Uranium-234	1	1	8.50E-01	±	1.39E-01	6	6	5.68E-01	±	1.83E-01
	Uranium-235 <sup>b</sup>	1	0	4.93E-02	±	3.86E-02	6	6	5.84E-02	±	2.31E-02
	Uranium-238	1	1	6.78E-01	±	1.18E-01	6	6	5.33E-01	±	1.56E-01
100-H Spring 145-1	Cesium-137	1	1	1.44E-01	±	3.55E-02	4	4	1.52E-01	±	7.76E-02
	Plutonium-239/240 <sup>b</sup>	1	0	2.98E-03	±	2.15E-03	4	0	3.58E-03	±	2.15E-03
	Uranium-234	1	1	4.83E-01	±	1.25E-01	4	4	7.99E-01	±	2.25E-01
	Uranium-235	1	1	7.48E-02	±	5.54E-02	4	4	6.15E-02	±	4.53E-02
	Uranium-238	1	1	5.93E-01	±	1.38E-01	4	4	7.14E-01	±	9.54E-02
100-K Spring 63-1	Cesium-137	1	1	2.38E-02	±	1.88E-02	5	5	9.54E-02	±	4.82E-02
	Plutonium-239/240 <sup>b</sup>	1	0	2.39E-03	±	2.26E-03	5	1	2.32E-03	±	8.61E-03
	Uranium-234	1	1	8.09E-01	±	1.59E-01	5	5	1.14E+00	±	2.00E-01
	Uranium-235	1	1	4.89E-02	±	3.82E-02	5	4	6.85E-02	±	3.84E-02
	Uranium-238	1	1	7.87E-01	±	1.51E-01	5	5	1.03E+00	±	2.27E-01
Hanford Slough	Cesium-137	1	1	2.82E-01	±	4.73E-02	6	6	2.42E-01	±	4.20E-02
	Plutonium-239/240 <sup>b</sup>	1	0	4.28E-03	±	4.49E-03	6	4	3.79E-03	±	8.94E-03
	Uranium-234	1	1	7.46E-01	±	1.14E-01	6	6	6.92E-01	±	1.59E-01
	Uranium-235	1	1	7.55E-02	±	3.37E-02	6	6	6.86E-02	±	5.31E-02
	Uranium-238	1	1	8.05E-01	±	1.18E-01	6	6	7.10E-01	±	1.28E-01
McNary Dam	Cesium-137	2	2	1.94E-01	±	2.75E-02	10	10	2.19E-01	±	6.62E-02
	Plutonium-239/240	2	2	1.07E-02	±	3.83E-03	10	4	6.77E-03	±	1.03E-02
	Uranium-234	2	2	1.52E+00	±	2.91E-01	10	10	1.48E+00	±	2.81E-01
	Uranium-235	2	1	7.96E-02	±	4.47E-02	10	10	1.10E-01	±	6.06E-02
	Uranium-238	2	2	1.32E+00	±	2.65E-01	10	10	1.21E+00	±	1.84E-01
Priest Rapids Dam	Cesium-137	2	2	2.25E-01	±	3.19E-02	10	10	2.44E-01	±	6.04E-02
	Plutonium-239/240	2	2	8.01E-03	±	6.32E-03	10	7	1.01E-02	±	6.22E-03
	Uranium-234	2	2	1.37E+00	±	1.93E-01	10	10	1.30E+00	±	3.05E-01
	Uranium-235	2	2	1.11E-01	±	4.28E-02	10	10	1.05E-01	±	3.07E-02
	Uranium-238	2	2	1.31E+00	±	1.86E-01	10	10	1.14E+00	±	2.42E-01
White Bluffs Slough	Cesium-137	1	1	1.45E-01	±	4.48E-02	5	5	3.07E-01	±	1.12E-01
	Plutonium-239/240 <sup>b</sup>	1	0	2.19E-03	±	3.24E-03	5	1	4.10E-03	±	4.94E-03

**Table C-13. Radionuclide Concentrations in Columbia River and Shoreline Sediment (Near Hanford Site) (2014-2019). (3 Pages)**

Sediment Location	Radionuclide	2019					2014-2018				
		No. of Samples	No. of Detects	Maximum Concentration <sup>a</sup> pCi/g			No. of Samples	No. of Detects	Average Concentration <sup>a</sup> pCi/g		
	Uranium-234	1	1	1.07E+00	±	1.56E-01	5	5	9.83E-01	±	3.01E-01
	Uranium-235	1	1	8.33E-02	±	4.07E-02	5	5	1.03E-01	±	6.24E-02
	Uranium-238	1	1	7.92E-01	±	1.25E-01	5	5	9.41E-01	±	2.28E-01

<sup>a</sup>Maximum Concentrations ± Analytical Uncertainty; Average Concentrations ± 2stdv.  
<sup>b</sup>Maximum value reported as a non-detect.

**Table C-14. Radionuclide Concentrations in Columbia River Shoreline Seep Water. (2 Pages)**

Location/Radionuclide	2019			2014-2018					Washington State Ambient Surface Water Quality Standard pCi/L <sup>a, b</sup>
	No. of Samples	No. of Detects	Concentration pCi/L <sup>a</sup> Maximum <sup>c</sup>	No. of Samples	No. of Detects	Concentration pCi/L <sup>a</sup> Average <sup>d</sup>			
<b>100-B Area (100-B Spring 38-3 and 100-B Spring 39-2)</b>									
Strontium-90	2	1	1.2E+00 ± 2.0E-01	9	4	5.6E-01 ± 2.8E+00	8		
Tritium	2	2	8.0E+02 ± 2.3E+02	9	8	1.0E+03 ± 1.3E+03	20,000		
<b>100-D Area (Spring 110-1)</b>									
Alpha (gross) <sup>e</sup>	1	0	9.3E-01 ± 1.5E+00	6	0	2.1E+00 ± 2.6E+00	15		
Beta (gross) <sup>e</sup>	1	0	1.7E+00 ± 2.1E+00	6	6	7.1E+00 ± 9.2E+00	50		
Strontium-90	1	1	1.9E-01 ± 5.4E-02	6	5	1.6E+00 ± 1.8E+00	8		
Technetium-99 <sup>e</sup>	1	0	4.7E-01 ± 4.4E-01	6	0	-6.0E-01 ± 3.7E+00	900		
Tritium	1	1	4.3E+02 ± 1.8E+02	6	6	1.9E+03 ± 1.5E+03	20,000		
Uranium-234	1	1	3.0E-01 ± 7.8E-02	6	6	9.4E-01 ± 5.9E-01	-		
Uranium-235 <sup>e</sup>	1	0	3.6E-02 ± 3.2E-02	6	5	6.4E-02 ± 5.5E-02	-		
Uranium-238	1	1	2.8E-01 ± 7.4E-02	6	6	8.3E-01 ± 7.2E-01	-		
<b>100-F Area (100F Spring 207-1 and 100-F Spring 211-1)</b>									
Strontium-90 <sup>e</sup>	2	0	2.1E-02 ± 3.2E-02	13	0	-8.7E-02 ± 5.9E-01	8		
Tritium	2	2	2.5E+02 ± 1.3E+02	13	8	2.8E+02 ± 3.4E+02	900		
<b>100-H Area (100-H Spring 145-1 and 100-H Spring 152-2)</b>									
Strontium-90	1	1	6.5E-01 ± 1.1E-01	3	2	1.5E+00 ± 3.2E+00	8		
Tritium <sup>e</sup>	1	0	4.3E+01 ± 1.5E+02	4	0	1.1E+02 ± 1.5E+02	900		
<b>100-K Area (Spring 63-1)</b>									
Alpha (gross) <sup>e</sup>	1	0	1.4E-01 ± 1.7E+00	6	1	6.0E-01 ± 1.9E+00	15		
Beta (gross)	1	1	6.2E+00 ± 2.7E+00	6	5	4.6E+00 ± 3.2E+00	50		
Carbon-14	1	1	1.4E+02 ± 2.8E+01	13	10	1.4E+02 ± 2.6E+02	2,000		
Strontium-90 <sup>e</sup>	1	0	5.7E-02 ± 3.8E-02	6	0	-1.4E-01 ± 6.4E-01	8		
Technetium-99	1	1	5.3E+00 ± 9.3E-01	6	4	3.6E+00 ± 6.4E+00	-		
Tritium <sup>e</sup>	1	0	1.4E+02 ± 1.7E+02	6	1	4.7E+02 ± 1.7E+03	20,000		

**Table C-14. Radionuclide Concentrations in Columbia River Shoreline Seep Water. (2 Pages)**

Location/Radionuclide	2019			2014-2018			Washington State Ambient Surface Water Quality Standard pCi/L <sup>a, b</sup>
	No. of Samples	No. of Detects	Concentration pCi/L <sup>a</sup> Maximum <sup>c</sup>	No. of Samples	No. of Detects	Concentration pCi/L <sup>a</sup> Average <sup>d</sup>	
<b>100-N Area (Spring 8-13)</b>							
Alpha (gross) <sup>e</sup>	1	0	1.9E+00 ± 2.1E+00	5	0	2.8E-01 ± 1.0E+00	15
Beta (gross)	1	1	4.0E+00 ± 2.4E+00	5	3	2.6E+00 ± 2.3E+00	50
Strontium-90 <sup>e</sup>	1	0	-6.6E-05 ± 3.3E-02	5	0	-1.3E-01 ± 5.5E-01	8
Tritium	1	1	3.7E+03 ± 7.6E+02	5	5	4.0E+03 ± 2.1E+03	20,000
<b>100-N Area (Spring 89-1)</b>							
Strontium-90	1	1	5.5E+01 ± 8.7E+00	5	5	3.7E+01 ± 5.1E+01	8
Tritium	1	1	1.1E+03 ± 2.9E+02	5	3	7.9E+02 ± 1.6E+03	20,000
<b>Hanford Townsite (Hanford Spring 25-4)</b>							
Alpha (gross)	1	1	4.1E+00 ± 2.6E+00	5	0	3.8E-01 ± 8.8E-01	15
Beta (gross)	1	1	6.5E+00 ± 2.4E+00	5	1	2.4E+00 ± 4.3E+00	50
Iodine <sup>e</sup>	1	0	1.8E-01 ± 5.7E-01	N/A	N/A	N/A	–
Strontium-90 <sup>e</sup>	1	0	5.6E-02 ± 3.8E-02	5	0	-5.0E-02 ± 1.7E-01	8
Technetium-99 <sup>e</sup>	1	0	1.8E-01 ± 5.1E-01	5	0	2.9E-01 ± 7.4E-01	–
Tritium <sup>e</sup>	1	0	-3.7E+01 ± 1.4E+02	5	0	1.2E+01 ± 2.1E+02	20000
<b>Hanford Townsite (Hanford Spring 28-2)</b>							
Alpha (gross) <sup>e</sup>	1	0	5.2E-01 ± 1.5E+00	5	3	3.5E+00 ± 3.9E+00	15
Beta (gross)	1	1	4.5E+01 ± 4.8E+00	5	5	3.2E+01 ± 2.5E+01	50
Iodine <sup>e</sup>	1	0	1.4E-01 ± 3.1E-01	5	0	6.1E-02 ± 4.9E-01	–
Tritium	1	1	2.4E+04 ± 4.7E+03	5	5	1.7E+04 ± 1.2E+04	20,000
<b>300 Area (300 Area Spring 42-2 and 300 Area Spring DR 42-2)</b>							
Alpha (gross)	3	3	1.5E+01 ± 4.4E+00	11	11	3.0E+01 ± 3.2E+01	15
Beta (gross)	3	3	1.1E+01 ± 2.9E+00	11	11	2.0E+01 ± 1.5E+01	50
Tritium	3	3	2.4E+03 ± 5.0E+02	11	11	3.8E+03 ± 2.1E+03	20,000
Uranium-234	3	3	7.5E+00 ± 8.4E-01	11	11	2.0E+01 ± 2.0E+01	–
Uranium-235	3	3	4.7E-01 ± 1.0E-01	11	11	1.7E+00 ± 1.8E+00	–
Uranium-236 <sup>e</sup>	3	0	1.5E-01 ± 1.3E-02	4	2	3.1E-01 ± 2.6E-01	–
Uranium-238	3	3	7.1E+00 ± 7.9E-01	11	12	1.9E+01 ± 2.0E+01	–

<sup>a</sup> 1 pCi = 0.037 Bq.  
<sup>b</sup> WAC 246-290, 40 CFR 141; WAC 173-201A-250; EPA-570/9-76-003; Appendix Table D.4  
<sup>c</sup> Maximum values are ± total propagated analytical uncertainty.  
<sup>d</sup> Averages are ± 2 standard deviations of the mean.  
<sup>e</sup>Maximum value reported for 2019 is a non-detect.  
N/A = Not Applicable (Samples not analyzed for contaminant).  
Note: Dashes indicate no concentration guides available.

**Table C-15. Metal and Anion Concentrations in Columbia River Shoreline Seeps. (6 Pages)**

Location	Analyte	# of samples	Detects	Filtered/Unfiltered <sup>a</sup>	Range (min-max) <sup>b</sup>	Unit	Regulatory limit <sup>c</sup> (µg/L)
100-B (39-2 and 38-3)	<b>Metals</b>						
	Antimony	2	0	Filtered	1.00E+00	µg/L	12
		2	0	Unfiltered			
	Arsenic	2	2	Filtered	2.36E+00 - 2.87E+00	µg/L	10
		2	2	Unfiltered	2.51E+00 - 2.61E+00		
	Cadmium	2	0	Filtered	3.00E-01	µg/L	0.59
		2	0	Unfiltered			
	Chromium	2	2	Filtered	4.34E+00 - 8.32E+00	µg/L	10 <sup>d</sup>
		2	2	Unfiltered	6.16E+00 - 6.16E+00		96 <sup>e</sup>
	Copper	2	2	Filtered	2.99E+00 - 1.23E+01	µg/L	1300
		2	2	Unfiltered	1.94E+00 - 2.09E+00		
	Lead	2	1	Filtered	5.00E-01 - 2.11E+00	µg/L	1.1
		2	2	Unfiltered	1.25E+00 - 1.59E+00		
	Nickel	2	1	Filtered	6.00E-01 - 2.41E+00	µg/L	150
		2	2	Unfiltered	1.07E+00 - 1.50E+00		
	Selenium	2	0	Filtered	2.00E+00	µg/L	120
		2	0	Unfiltered			
Thallium	2	1	Filtered	6.00E-01 - 7.71E-01	µg/L	0.24	
	2	0	Unfiltered	6.00E-01			
Zinc	2	2	Filtered	8.02E+00 - 3.04E+01	µg/L	2,300	
	2	2	Unfiltered	1.73E+01 - 2.25E+01			
100-D (110-1)	<b>Anions</b>						
	Nitrate	2	2	Unfiltered	3.02E+03 - 6.51E+03	µg/L	10 <sup>f</sup>
100-D (110-1)	<b>Metals</b>						
	Antimony	1	0	Filtered	1.00E+00	µg/L	12
		1	0	Unfiltered			
	Arsenic	1	0	Filtered	2.00E+00	µg/L	10
		1	0	Unfiltered			
	Cadmium	1	0	Filtered	3.00E-01	µg/L	0.59
		1	0	Unfiltered			
	Chromium	1	0	Filtered	3.00E+00	µg/L	10 <sup>d</sup>
		1	0	Unfiltered			96 <sup>e</sup>
	Copper	1	1	Filtered	9.36E-01	µg/L	1300
		1	1	Unfiltered	5.13E-01		
	Lead	1	0	Filtered	5.00E-01	µg/L	1.1
		1	0	Unfiltered			
	Nickel	1	0	Filtered	6.00E-01	µg/L	150
		1	0	Unfiltered			



Table C-15. Metal and Anion Concentrations in Columbia River Shoreline Seeps. (6 Pages)

Location	Analyte	# of samples	Detects	Filtered/Unfiltered <sup>a</sup>	Range (min-max) <sup>b</sup>	Unit	Regulatory limit <sup>c</sup> (µg/L)	
	Selenium	1	0	Filtered	2.00E+00	µg/L	120	
		1	0	Unfiltered				
	Thallium	1	0	Filtered	6.00E-01	µg/L	0.24	
		1	0	Unfiltered				
	Zinc	1	1	Filtered	7.49E+00	µg/L	2,300	
		1	1	Unfiltered	1.01E+01			
<b>Anions</b>								
	Nitrate	1	1	Unfiltered	1.95E+03	µg/L	10 <sup>f</sup>	
100-F (207-1 and 211-1)	<b>Metals</b>							
	Antimony	2	0	Filtered	1.00E+00	µg/L	12	
		2	0	Unfiltered				
	Arsenic	2	2	Filtered	2.70E+00 - 3.11E+00	µg/L	10	
		2	2	Unfiltered	3.26E+00 - 6.50E+00			
	Cadmium	2	0	Filtered	3.00E-01	µg/L	0.59	
		2	1	Unfiltered	3.00E-01 - 4.22E-01			
	Chromium	2	2	Filtered	6.13E+00 - 6.20E+00	µg/L	10 <sup>d</sup>	
		2	2	Unfiltered	6.36E+00 - 1.94E+01		96 <sup>e</sup>	
	Copper	2	1	Filtered	3.00E-01 - 4.68E-01	µg/L	1300	
		2	2	Unfiltered	8.26E-01 - 1.45E+01			
	Lead	2	0	Filtered	5.00E-01	µg/L	1.1	
		2	2	Unfiltered	9.23E-01 - 1.92E+01			
	Nickel	2	0	Filtered	6.00E-01	µg/L	150	
		2	2	Unfiltered	7.36E-01 - 7.05E+00			
	Selenium	2	0	Filtered	2.00E+00	µg/L	120	
		2	0	Unfiltered				
	Thallium	2	1	Filtered	6.00E-01 - 8.89E-01	µg/L	0.24	
		2	0	Unfiltered	6.00E-01			
	Zinc	2	2	Filtered	9.17E+00 - 1.05E+01	µg/L	2,300	
2		2	Unfiltered	1.42E+01 - 9.75E+01				
<b>Anions</b>								
	Nitrate	2	2	Unfiltered	2.68E+04 - 3.13E+04	µg/L	10 <sup>f</sup>	
100-H (152-2)	<b>Metals</b>							
	Antimony	1	0	Filtered	1.00E+00	µg/L	12	
		1	0	Unfiltered				
	Arsenic	1	1	Filtered	2.67E+00	µg/L	10	
		1	1	Unfiltered	3.48E+00			
	Cadmium	1	0	Filtered	3.00E-01	µg/L	0.59	
1		1	Unfiltered	3.70E-01				

**Table C-15. Metal and Anion Concentrations in Columbia River Shoreline Seeps. (6 Pages)**

Location	Analyte	# of samples	Detects	Filtered/Unfiltered <sup>a</sup>	Range (min-max) <sup>b</sup>	Unit	Regulatory limit <sup>c</sup> (µg/L)	
	Chromium	1	0	Filtered	3.00E+00	µg/L	10 <sup>d</sup>	
		1	1	Unfiltered	5.02E+00		96 <sup>e</sup>	
	Copper	1	1	Filtered	1.74E+00	µg/L	1300	
		1	1	Unfiltered	5.63E+00			
	Lead	1	0	Filtered	5.00E-01	µg/L	1.1	
		1	1	Unfiltered	3.46E+00			
	Nickel	1	1	Filtered	1.11E+00	µg/L	150	
		1	1	Unfiltered	3.21E+00			
	Selenium	1	0	Filtered	2.00E+00	µg/L	120	
		1	0	Unfiltered				
	Thallium	1	0	Filtered	6.00E-01	µg/L	0.24	
		1	0	Unfiltered				
	Zinc	1	1	Filtered	1.64E+01	µg/L	2,300	
		1	1	Unfiltered	4.36E+01			
<b>Anions</b>								
	Nitrate	1	1	Unfiltered	1.24E+03	µg/L	10 <sup>f</sup>	
100-K (63-1)	<b>Metals</b>							
	Antimony	1	0	Filtered	1.00E+00	µg/L	12	
		1	0	Unfiltered				
	Arsenic	1	1	Filtered	2.17E+00	µg/L	10	
		1	1	Unfiltered	4.32E+00			
	Cadmium	1	0	Filtered	3.00E-01	µg/L	0.59	
		1	1	Unfiltered	4.26E-01			
	Chromium	1	0	Filtered	3.00E+00	µg/L	10 <sup>d</sup>	
		1	1	Unfiltered	1.24E+01		96 <sup>e</sup>	
	Copper	1	1	Filtered	7.26E-01	µg/L	1300	
		1	1	Unfiltered	1.23E+01			
	Lead	1	0	Filtered	5.00E-01	µg/L	1.1	
		1	1	Unfiltered	1.02E+01			
	Nickel	1	0	Filtered	6.00E-01	µg/L	150	
		1	1	Unfiltered	6.25E+00			
	Selenium	1	0	Filtered	2.00E+00	µg/L	120	
		1	0	Unfiltered				
	Thallium	1	1	Filtered	7.09E-01	µg/L	0.24	
		1	0	Unfiltered	6.00E-01			
	Zinc	1	1	Filtered	1.23E+01	µg/L	2,300	
1		1	Unfiltered	7.56E+01				
<b>Anions</b>								

**Table C-15. Metal and Anion Concentrations in Columbia River Shoreline Seeps. (6 Pages)**

Location	Analyte	# of samples	Detects	Filtered/Unfiltered <sup>a</sup>	Range (min-max) <sup>b</sup>	Unit	Regulatory limit <sup>c</sup> (µg/L)		
	Nitrate	1	1	Unfiltered	4.35E+03	µg/L	10 <sup>f</sup>		
100-N (8-13 and 89-1 <sup>g</sup> )	<b>Metals</b>								
	Antimony	2	0	Filtered	1.00E+00	µg/L	12		
		2	0	Unfiltered					
	Arsenic	2	2	Filtered	2.14E+00	-	2.35E+00	µg/L	10
		2	2	Unfiltered	2.27E+00	-	3.99E+00		
	Cadmium	2	0	Filtered	3.00E-01	µg/L	0.59		
		2	0	Unfiltered					
	Chromium	2	1	Filtered	3.00E+00	-	4.67E+00	µg/L	10 <sup>d</sup>
		2	1	Unfiltered	3.00E+00	-	5.06E+00		96 <sup>e</sup>
	Copper	2	2	Filtered	4.55E-01	-	3.41E+00	µg/L	1300
		2	1	Unfiltered	3.00E-01	-	5.79E+00		
	Lead	2	0	Filtered	5.00E-01		µg/L	1.1	
		2	1	Unfiltered	5.00E-01	-			2.43E+00
	Nickel	2	1	Filtered	6.00E-01	-	1.02E+00	µg/L	150
		2	1	Unfiltered	6.00E-01	-	1.88E+00		
	Selenium	2	0	Filtered	2.00E+00		µg/L	120	
		2	0	Unfiltered					
	Thallium	2	1	Filtered	6.00E-01	-	1.34E+00	µg/L	0.24
		2	0	Unfiltered	6.00E-01				
	Zinc	2	2	Filtered	1.00E+01	-	1.81E+01	µg/L	2,300
2		2	Unfiltered	4.47E+00	-	3.37E+01			
	<b>Anions</b>								
	Nitrate	2	2	Unfiltered	2.54E+04	-	2.64E+04	µg/L	10 <sup>f</sup>
Hanford Townsite (25-4)	<b>Metals</b>								
	Antimony	1	0	Filtered	1.00E+00	µg/L	12		
		1	0	Unfiltered					
	Arsenic	1	1	Filtered	2.15E+00	µg/L	10		
		1	1	Unfiltered	2.33E+00				
	Cadmium	1	0	Filtered	3.00E-01	µg/L	0.59		
		1	0	Unfiltered					
	Chromium	1	0	Filtered	3.00E+00	µg/L	10 <sup>d</sup>		
		1	0	Unfiltered			96 <sup>e</sup>		
	Copper	1	1	Filtered	6.56E-01	µg/L	1300		
		1	1	Unfiltered	1.68E+00				
	Lead	1	0	Filtered	5.00E-01		µg/L	1.1	
		1	1	Unfiltered	1.19E+00				
Nickel	1	0	Filtered	6.00E-01		µg/L	150		

**Table C-15. Metal and Anion Concentrations in Columbia River Shoreline Seeps. (6 Pages)**

Location	Analyte	# of samples	Detects	Filtered/Unfiltered <sup>a</sup>	Range (min-max) <sup>b</sup>	Unit	Regulatory limit <sup>c</sup> (µg/L)	
		1	1	Unfiltered	8.13E-01			
	Selenium	1	0	Filtered	2.00E+00	µg/L	120	
		1	0	Unfiltered				
	Thallium	1	0	Filtered	6.00E-01	µg/L	0.24	
		1	0	Unfiltered				
	Zinc	1	1	Filtered	1.11E+01	µg/L	2,300	
		1	1	Unfiltered	1.85E+01			
<b>Anions</b>								
	Nitrate	1	1	Unfiltered	7.44E+03	µg/L	10 <sup>f</sup>	
Hanford Spring (28-2)	<b>Metals</b>							
	Antimony	1	0	Filtered	1.00E+00	µg/L	12	
		1	0	Unfiltered				
	Arsenic	1	1	Filtered	4.27E+00	µg/L	10	
		1	1	Unfiltered	4.61E+00			
	Cadmium	1	0	Filtered	3.00E-01	µg/L	0.59	
		1	0	Unfiltered				
	Chromium	1	0	Filtered	3.00E+00	µg/L	10 <sup>d</sup>	
		1	0	Unfiltered			96 <sup>e</sup>	
	Copper	1	1	Filtered	4.10E-01	µg/L	1300	
		1	1	Unfiltered	5.14E-01			
	Lead	1	0	Filtered	5.00E-01	µg/L	1.1	
		1	0	Unfiltered				
	Nickel	1	1	Filtered	2.80E+00	µg/L	150	
		1	0	Unfiltered	6.00E-01			
	Selenium	1	0	Filtered	2.00E+00	µg/L	120	
		1	0	Unfiltered				
	Thallium	1	0	Filtered	6.00E-01	µg/L	0.24	
		1	0	Unfiltered				
	Zinc	1	1	Filtered	7.53E+00	µg/L	2,300	
		1	1	Unfiltered	8.70E+00			
<b>Anions</b>								
	Nitrate	1	1	Unfiltered	2.22E+04	µg/L	10 <sup>f</sup>	
300 Area (28-2 and DR 28-2)	<b>Metals</b>							
	Antimony	3	0	Filtered	1.00E+00	µg/L	12	
		3	0	Unfiltered				
	Arsenic	3	3	Filtered	2.23E+00 - 1.11E+01	µg/L	10	
		3	3	Unfiltered	2.69E+00 - 1.22E+01			
Cadmium	3	0	Filtered	3.00E-01	µg/L	0.59		

**Table C-15. Metal and Anion Concentrations in Columbia River Shoreline Seeps. (6 Pages)**

Location	Analyte	# of samples	Detects	Filtered/Unfiltered <sup>a</sup>	Range (min-max) <sup>b</sup>	Unit	Regulatory limit <sup>c</sup> (µg/L)
		3	0	Unfiltered			
	Chromium	3	0	Filtered	3.00E+00	µg/L	10 <sup>d</sup>
		3	0	Unfiltered			96 <sup>e</sup>
	Copper	3	3	Filtered	3.68E-01 - 8.02E-01	µg/L	1300
		3	3	Unfiltered	4.91E-01 - 4.46E+00		
	Lead	3	0	Filtered	5.00E-01	µg/L	1.1
		3	0	Unfiltered			
	Nickel	3	1	Filtered	6.00E-01 - 1.07E+00	µg/L	150
		3	1	Unfiltered	6.00E-01 - 1.26E+00		
	Selenium	3	0	Filtered	2.00E+00	µg/L	120
		3	0	Unfiltered			
	Thallium	3	0	Filtered	6.00E-01	µg/L	0.24
		3	0	Unfiltered			
	Zinc	3	3	Filtered	7.71E+00 - 9.56E+00	µg/L	2,300
		3	3	Unfiltered	6.35E+00 - 9.78E+00		
<b>Anions</b>							
	Nitrate	3	3	Unfiltered	1.46E+03 - 2.01E+04	µg/L	10 <sup>f</sup>

<sup>a</sup> Dissolved concentrations are associated with filtered samples; Recoverable concentrations are associated with unfiltered samples.  
<sup>b</sup> For non-detects, one value is shown for the method detection limit (MDL); Multiple values are shown on non-detects if the laboratory method detection limit differed during the analyses process.  
<sup>c</sup> Ambient water quality criteria values or chronic toxicity unless otherwise noted (WAC 173-201A-240).  
<sup>d</sup> Value for hexavalent chromium.  
<sup>e</sup> Value for trivalent chromium.  
<sup>f</sup> Washington State drinking water standard utilized (WAC 246-290).  
<sup>g</sup> Laboratory holding time for nitrate analysis was exceeded.

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**Table C-16. Dissolved Metal Concentration Ranges in Columbia River Sediment (Near Hanford Site)**

<b>Metal</b>	<b>Priest Rapids Dam (mg/kg dry weight)</b>	<b>Hanford Reach <sup>a</sup> (mg/kg dry weight)</b>	<b>McNary Dam (mg/kg dry weight)</b>
Antimony	1.72 - 2.44	0.47 - 7.30	0.71 - 0.79
Arsenic	5.82 - 9.67	2.09 - 11.3	4.84 - 7.56
Beryllium	1.11 - 1.36	0.82 - 2.11	1.87 - 1.92
Cadmium	1.67 - 5.15	0.11 - 0.71	0.73 - 1.33
Chromium	36.7 - 40.7	11.3 - 47.3	25.0 - 30.4
Copper	39.1 - 56.9	6.43 - 27.8	28.2 - 31.2
Lead	41.4 - 49.2	4.06 - 54.9	17.7 - 21.8
Mercury	0.12 - 0.21	0.005 - 0.06	0.06 - 0.10
Nickel	38.3 - 40.8	8.52 - 18.3	22.9 - 28.3
Selenium	1.40 - 1.61	5.90 - 13.5	17.3 - 18.1
Silver	0.28 - 0.32	0.10 - 0.14	0.22 - 0.24
Thallium	30.8 - 39.8	0.98 - 28.5	34.2 - 37.0
Zinc	328 - 503	40.9 - 418	170 - 249
<b>No. of Samples</b>	<b>2</b>	<b>10</b>	<b>2</b>

<sup>a</sup> 100-F Slough (n=1), Hanford Slough (n=1), White Bluffs Slough (n=1), Adjacent to Locke Island (n=1), Adjacent to Savage Island (n=1), 100-H 145-1 (n=1), 100-D Spring 102-1 (n=2), 100-K 63-1 (n=1), 300 Area (n=1); where n = number of samples.

**Table C-17. Columbia River Hexavalent Chromium in Sediment Samples.  
(2 Pages)**

<b>Location</b>	<b>No. of Samples</b>	<b>No. of Detects</b>	<b>2019 Max Concentration (ug/Kg)</b>	<b>No. of Samples</b>	<b>No. of Detects</b>	<b>2014-2018 Max Concentration (ug/Kg)</b>
300 Area Spring DR 42-2 (shoreline)	1	0	137	5	1	4420
Adjacent to Savage Island (shoreline)	1	0	181	5	3	772
Hanford Slough	1	0	169	6	3	530
White Bluffs Slough	1	0	149	5	2	1700
100F Slough	1	0	156	6	3	461

**Table C-17. Columbia River Hexavalent Chromium in Sediment Samples.  
(2 Pages)**

Location	No. of Samples	No. of Detects	2019 Max Concentration (ug/Kg)	No. of Samples	No. of Detects	2014-2018 Max Concentration (ug/Kg)
100H Spring 145-1 (shoreline)	1	0	105	4	1	611
Adjacent to Locke Island (shoreline)	1	0	125	6	2	643
100D 102-1	2	0	188	9	9	5850
100K Spring 63-1 (shoreline)	1	0	115	5	3	2430
Priest Rapids Dam (Grant Side)	1	0	490	5	2	2670
Priest Rapids Dam (Yakima Side)	1	0	278	5	1	2870
McNary Dam (WA Side)	1	0	244	5	2	125000
McNary Dam (OR Side)	1	0	250	5	2	88200

**Table C-18. Total Organic Carbon in Columbia River Sediment (2014-2019). (2 Pages)**

Sediment Location	2019				2014-2018		
	No. of Samples	Concentration <sup>a</sup>			No. of Samples	Concentration <sup>a</sup>	
		Minimum mg/kg	Maximum mg/kg			Minimum mg/kg	Maximum mg/kg
Adjacent to Locke Island <sup>b,c</sup>	0	N/A	N/A		1	1.17E+03	
Adjacent to Savage Island <sup>b,c</sup>	0	N/A	N/A		1	2.24E+03	



**Table C-18. Total Organic Carbon in Columbia River Sediment  
(2014-2019). (2 Pages)**

Sediment Location	2019				2014-2018		
	No. of Samples	Concentration <sup>a</sup>			No. of Samples	Concentration <sup>a</sup>	
		Minimum mg/kg	Maximum mg/kg			Minimum mg/kg	Maximum mg/kg
100-D Spring 102-1	2	3.89E+03	5.61E+03		9	1.88E+03	4.35E+03
100-F Slough <sup>c</sup>	1	8.05E+03			6	1.50E+03	6.59E+03
100-H Spring 145-1 <sup>c</sup>	1	1.10E+04			4	7.25E+03	1.59E+04
100-K Spring 63-1 <sup>c</sup>	1	2.10E+03			5	1.40E+03	1.81E+04
300 Area DR 42-2 <sup>c</sup>	1	1.72E+03			4	1.77E+03	7.78E+03
Hanford Slough <sup>c</sup>	1	7.19E+03			6	8.58E+03	1.48E+04
McNary Dam	2	1.86E+04	2.50E+04		10	1.25E+04	2.52E+04
Priest Rapids Dam	2	2.67E+04			10	1.51E+04	3.95E+04
White Bluffs Slough <sup>c</sup>	1	8.76E+03			5	8.35E+03	1.68E+04
<sup>a</sup> 1 mg/kg = ug/kg divided by 1000 <sup>b</sup> Adjacent to Locke and Savage Island sediment was analyzed for TOC in 2013 only. <sup>c</sup> Only one sample was collected so minimum and maximum values are equivalent.							

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Table C-19. Horn Rapids Irrigation Water Sample Results.

Radionuclide	2019							2014-2018								
	Number of		Average <sup>a</sup> (pCi/L)			Maximum <sup>b</sup> (pCi/L)		Number of		Average <sup>a</sup> (pCi/L)			Maximum <sup>b</sup> (pCi/L)			
	Samples	Detects		±			±		Samples	Detects		±			±	
Antimony-125	4	0	-3.0E-01	±	3.3E+00	2.0E+00	±	3.6E+00	18	0	-4.9E-02	±	4.5E+00	4.7E+00	±	6.8E+00
Cesium-134 <sup>c</sup>	4	0	-6.1E-01	±	1.8E+00	5.9E-01	±	1.6E+00	18	0	6.5E-02	±	2.2E+00	2.3E+00	±	2.8E+00
Cesium-137 <sup>c</sup>	4	0	5.5E-01	±	9.9E-01	1.2E+00	±	1.5E+00	18	0	4.8E-01	±	1.4E+00	2.2E+00	±	2.0E+00
Cobalt-60 <sup>c</sup>	4	0	-4.2E-03	±	6.0E-01	3.0E-01	±	1.4E+00	18	0	6.7E-03	±	2.0E+00	2.4E+00	±	2.1E+00
Europium-152 <sup>c</sup>	4	0	-6.9E-01	±	1.1E+00	-1.5E-01	±	4.1E+00	18	0	-6.4E-02	±	5.6E+00	5.1E+00	±	6.9E+00
Europium-154 <sup>c</sup>	4	0	-1.1E+00	±	1.9E+00	4.6E-01	±	4.4E+00	18	0	-6.6E-01	±	7.0E+00	3.1E+00	±	4.1E+00
Europium-155 <sup>c</sup>	4	0	5.8E-01	±	1.6E+00	1.1E+00	±	5.9E+00	18	0	2.1E+00	±	7.5E+00	7.6E+00	±	7.7E+00
Ruthenium-106 <sup>c</sup>	4	0	-3.9E+00	±	2.8E+01	1.4E+01	±	2.7E+01	18	0	-2.0E+00	±	2.1E+01	2.0E+01	±	2.0E+01
Strontium-90 <sup>c</sup>	4	0	1.7E-02	±	2.5E-02	3.0E-02	±	3.6E-02	18	0	8.8E-03	±	4.4E-02	4.8E-02	±	3.7E-02
Tritium	4	4	3.0E+01	±	1.8E+01	3.9E+01	±	1.3E+01	18	18	1.9E+01	±	9.4E+00	2.7E+01	±	7.2E+00

<sup>a</sup> Averages are ±2 standard deviations.  
<sup>b</sup> Maximum values are ± analytical uncertainty.  
<sup>c</sup> Results include concentrations below detection limit.

Table C-20. Riverview Irrigation Water Sample Results

Radionuclide	2019							2014-2018								
	Number of		Average <sup>a</sup> (pCi/L)			Maximum <sup>b</sup> (pCi/L)		Number of		Average <sup>a</sup> (pCi/L)			Maximum <sup>b</sup> (pCi/L)			
	Samples	Detects		±			±		Samples	Detects		±			±	
Antimony-125	3	0	9.0E-01	±	4.0E+00	2.8E+00	±	5.4E+00	17	0	1.1E+00	±	6.0E+00	8.0E+00	±	1.1E+01
Cesium-134 <sup>c</sup>	3	0	3.1E-01	±	1.6E+00	1.4E+00	±	1.9E+00	17	0	1.4E-01	±	2.4E+00	2.6E+00	±	2.6E+00
Cesium-137 <sup>c</sup>	3	0	-7.8E-01	±	1.5E+00	1.8E-01	±	1.9E+00	17	0	6.1E-02	±	2.4E+00	2.5E+00	±	1.8E+00
Cobalt-60 <sup>c</sup>	3	0	9.2E-01	±	5.6E-01	1.3E+00	±	1.3E+00	17	0	6.8E-01	±	2.5E+00	3.9E+00	±	3.2E+00
Europium-152 <sup>c</sup>	3	0	-2.3E+00	±	7.0E+00	1.7E-01	±	4.1E+00	17	0	-6.1E-01	±	6.0E+00	3.8E+00	±	5.0E+00
Europium-154 <sup>c</sup>	3	0	-6.5E-01	±	1.0E+01	6.5E+00	±	6.7E+00	17	0	5.4E-02	±	4.5E+00	4.0E+00	±	7.1E+00
Europium-155 <sup>c</sup>	3	0	-3.3E-01	±	1.6E+00	7.6E-01	±	5.4E+00	17	0	1.5E+00	±	7.5E+00	8.1E+00	±	8.0E+00
Ruthenium-106 <sup>c</sup>	3	0	-3.8E+00	±	2.0E+01	9.3E+00	±	1.8E+01	17	0	4.3E-01	±	1.8E+01	1.7E+01	±	1.9E+01
Strontium-90 <sup>c</sup>	3	0	2.1E-02	±	1.6E-02	2.9E-02	±	3.5E-02	17	0	5.8E-03	±	4.5E-02	4.4E-02	±	3.7E-02
Tritium	3	3	1.5E+01	±	2.2E+00	1.6E+01	±	6.3E+00	17	16	1.5E+01	±	1.0E+02	2.3E+02	±	1.3E+02

<sup>a</sup> Averages are ±2 standard deviations.  
<sup>b</sup> Maximum values are ± analytical uncertainty.  
<sup>c</sup> Results include concentrations below detection limit.

**Table C-21. Sagemoor Irrigation Water Sample Results**

Radionuclide	2019							2014-2018						
	Number of		Average <sup>a</sup> (pCi/L)		Maximum <sup>b</sup> (pCi/L)			Number of		Average <sup>a</sup> (pCi/L)		Maximum <sup>b</sup> (pCi/L)		
	Samples	Detects						Samples	Detects					
Antimony-125	3	0	-3.3E-04	± 3.0E+00	1.1E+00	±	3.8E+00	3	0	-5.2E-01	± 3.2E+00	9.6E-01	±	4.3E+00
Cesium-134 <sup>c</sup>	3	0	-1.9E-01	± 7.8E-01	1.6E-01	±	2.0E+00	3	0	9.0E-01	± 4.7E+00	4.1E+00	±	2.7E+00
Cesium-137 <sup>c</sup>	3	0	4.6E-01	± 8.8E-01	8.6E-01	±	1.5E+00	3	0	5.5E-01	± 6.4E-01	8.7E-01	±	1.6E+00
Cobalt-60 <sup>c</sup>	3	0	-2.4E-02	± 1.2E+00	4.9E-01	±	1.9E+00	3	0	-1.1E-01	± 1.5E+00	5.5E-01	±	1.6E+00
Europium-152 <sup>c</sup>	3	0	-2.0E-01	± 4.6E+00	2.1E+00	±	6.0E+00	3	0	1.6E+00	± 3.5E+00	3.5E+00	±	5.1E+00
Europium-154 <sup>c</sup>	3	0	2.9E+00	± 3.7E+00	5.2E+00	±	3.8E+00	3	0	1.0E-01	± 2.6E+00	1.9E+00	±	4.7E+00
Europium-155 <sup>c</sup>	3	0	-2.6E-01	± 7.2E+00	2.4E+00	±	4.9E+00	3	0	1.4E+00	± 1.2E+01	9.2E+00	±	8.6E+00
Ruthenium-106 <sup>c</sup>	3	0	8.2E-01	± 9.5E+00	4.9E+00	±	1.3E+01	3	0	1.9E-01	± 1.4E+01	8.0E+00	±	1.7E+01
Strontium-90 <sup>c</sup>	3	0	3.3E-03	± 3.0E-02	1.6E-02	±	3.4E-02	3	0	1.3E-02	± 3.5E-02	3.1E-02	±	2.7E-02
Tritium	3	3	1.5E+01	± 6.2E+00	1.9E+01	±	6.9E+00	3	3	1.5E+01	± 2.5E+00	1.7E+01	±	6.3E+00

<sup>a</sup> Averages are ±2 standard deviations.  
<sup>b</sup> Maximum values are ± analytical uncertainty.  
<sup>c</sup> Results include concentrations below detection limit.

## C.6 Vegetation Monitoring

Table C-22. Concentrations of Select Radionuclides (pCi/g)<sup>a</sup> in Hanford Site Vegetation Samples. (2 Pages)

Radionuclide	Hanford Area	2019								2014 - 2018							
		Number of		Average <sup>c</sup> (pCi/g)		Maximum <sup>d</sup> (pCi/g)		Location	Number of		Average <sup>c</sup> (pCi/g)		Maximum <sup>d</sup> (pCi/g)		Location		
		Samples	Detects <sup>b</sup>						Samples	Detects <sup>b</sup>							
<sup>241</sup> Am	200-W	4	2	3.8E-03	± 2.8E-03	5.3E-03	± 4.7E-03	V009	12	2	1.5E-02	± 5.60E-02	1.1E-01	± 2.5E-02	V034		
<sup>137</sup> Cs	100	2	0	-3.9E-03	± 4.4E-02	1.8E-02	± 2.5E-02	Y719	12	0	7.2E-03	± 2.90E-02	2.2E-02	± 5.9E-02	Y724		
	200-E	8	1	5.0E-03	± 4.6E-02	3.6E-02	± 3.3E-02	V055	44	9	5.0E-02	± 2.40E-01	8.0E-01	± 5.9E-02	V076		
	200-W	15	2	1.9E-02	± 4.2E-02	7.4E-02	± 5.2E-02	V037	80	7	1.7E-02	± 3.80E-02	8.6E-02	± 2.9E-02	V036		
	300	2	0	3.1E-02	± 1.0E-02	3.6E-02	± 3.3E-02	V123	8	1	2.0E-02	± 3.90E-02	4.4E-02	± 4.7E-02	V132		
	600	15	3	9.1E-03	± 5.4E-02	6.3E-02	± 3.1E-02	V089	62	6	1.5E-02	± 4.70E-02	1.3E-01	± 3.5E-02	V086		
<sup>238</sup> Pu	100	2	0	-7.1E-03	± 7.0E-03	-3.6E-03	± 3.9E-03	Y719	10	0	-6.2E-05	± 7.40E-04	7.9E-04	± 6.7E-04	Y724		
	200-E	8	0	-4.7E-04	± 5.1E-03	3.7E-03	± 5.8E-03	V063	43	2	1.2E-03	± 6.00E-03	1.1E-02	± 8.1E-03	V060		
	200-W	15	0	5.8E-04	± 2.4E-03	3.1E-03	± 9.4E-03	V019	79	8	1.9E-03	± 1.10E-02	4.5E-02	± 1.4E-02	V034		
	300	2	0	2.7E-03	± 6.5E-04	3.0E-03	± 6.5E-03	V132	8	0	3.5E-04	± 1.20E-03	1.7E-03	± 6.4E-03	V132		
	600	14	0	-2.5E-03	± 6.5E-03	4.6E-03	± 1.1E-02	V083	62	0	5.2E-04	± 4.30E-03	8.8E-03	± 1.2E-02	V092		
<sup>239/240</sup> Pu	100	2	0	1.8E-03	± 2.4E-03	3.0E-03	± 7.3E-03	Y724	9	1	7.1E-04	± 1.60E-03	2.2E-03	± 3.8E-03	Y719		
	200-E	8	0	-2.2E-04	± 5.6E-03	6.4E-03	± 8.9E-03	V057	45	10	1.1E-03	± 4.40E-03	9.9E-03	± 8.5E-03	V060		
	200-W	15	5	5.2E-03	± 8.8E-03	1.4E-02	± 1.5E-02	V025	82	54	1.2E-02	± 1.40E-01	6.3E-01	± 7.8E-02	V034		
	300	2	0	4.7E-03	± 7.1E-03	8.2E-03	± 7.1E-03	V132	8	0	-8.4E-04	± 4.60E-03	4.0E-04	± 6.1E-04	V123		
	600	14	0	2.4E-05	± 3.8E-03	3.2E-03	± 5.1E-03	V099	62	12	7.7E-04	± 5.10E-03	9.7E-03	± 9.0E-03	V098		
<sup>90</sup> Sr	100	2	2	1.5E-01	± 1.3E-01	2.2E-01	± 6.0E-02	Y724	12	11	7.0E-01	± 1.20E+00	1.8E+00	± 3.4E-01	Y724		
	200-E	9	4	3.5E-02	± 7.7E-02	8.1E-02	± 2.1E-02	V065	46	17	7.7E-02	± 2.50E-01	5.0E-01	± 1.2E-01	V063		
	200-W	15	0	7.9E-03	± 4.1E-02	4.5E-02	± 3.1E-02	V037	82	9	1.8E-02	± 8.20E-02	1.7E-01	± 4.9E-02	V045		
	300	2	0	1.2E-02	± 4.9E-02	3.6E-02	± 2.5E-02	V123	8	1	2.5E-02	± 1.80E-01	2.6E-01	± 6.0E-02	V123		
	600	15	0	3.6E-03	± 3.3E-02	3.0E-02	± 2.9E-02	V103	63	4	1.1E-02	± 4.50E-02	7.3E-02	± 3.6E-02	V091		
<sup>234</sup> U	100	2	0	-4.6E-03	± 7.8E-03	-6.8E-04	± 6.8E-03	Y719	12	7	3.7E-02	± 9.90E-02	1.8E-01	± 1.4E-01	Y724		
	200-E	9	1	3.4E-03	± 8.8E-03	1.2E-02	± 9.0E-03	V065	46	37	5.6E-02	± 1.60E-01	3.6E-01	± 1.8E-01	V315		
	200-W	15	2	8.8E-03	± 1.2E-02	2.5E-02	± 1.7E-02	V051	82	52	2.8E-02	± 1.20E-01	3.4E-01	± 1.7E-01	V305		
	300	2	0	5.9E-03	± 4.1E-04	6.1E-03	± 6.2E-03	V132	8	6	3.0E-02	± 4.00E-02	7.9E-02	± 9.5E-02	V123		
	600	15	2	3.4E-03	± 8.3E-03	1.1E-02	± 8.5E-03	V091	63	45	2.7E-02	± 8.50E-02	1.4E-01	± 4.7E-02	V108		
<sup>235</sup> U	100	2	0	1.8E-03	± 6.7E-03	5.1E-03	± 6.0E-03	Y719	12	5	1.5E-02	± 2.10E-02	4.4E-02	± 1.1E-01	Y724		
	200-E	6	0	-8.4E-04	± 6.6E-03	3.4E-03	± 5.1E-03	V077	46	26	2.7E-02	± 8.00E-02	1.6E-01	± 1.3E-01	V062		
	200-W	15	1	2.3E-03	± 7.2E-03	8.5E-03	± 6.2E-03	V009	76	26	1.2E-02	± 9.10E-02	1.6E-01	± 1.2E-01	V304		
	300	2	0	2.1E-03	± 2.3E-03	3.3E-03	± 5.7E-03	V123	8	4	6.7E-03	± 2.80E-02	2.3E-02	± 1.2E-02	V123		
	600	11	0	2.0E-03	± 2.8E-03	4.6E-03	± 6.8E-03	V097	62	32	1.2E-02	± 6.20E-02	7.7E-02	± 3.9E-02	V108		
<sup>238</sup> U	100	2	0	-1.8E-03	± 6.8E-03	1.6E-03	± 6.1E-03	Y719	12	6	2.6E-02	± 6.10E-02	1.0E-01	± 1.2E-01	Y724		
	200-E	9	2	5.5E-03	± 6.4E-03	1.2E-02	± 8.2E-03	V065	46	33	3.6E-02	± 6.90E-02	1.4E-01	± 1.3E-01	V312		
	200-W	15	3	6.7E-03	± 8.4E-03	1.2E-02	± 7.5E-03	V045	81	46	1.8E-02	± 6.70E-02	1.4E-01	± 1.1E-01	V304		

Table C-22. Concentrations of Select Radionuclides (pCi/g)<sup>a</sup> in Hanford Site Vegetation Samples. (2 Pages)

Radionuclide	Hanford Area	2019								2014 - 2018									
		Number of		Average <sup>c</sup> (pCi/g)		Maximum <sup>d</sup> (pCi/g)		Location	Number of		Average <sup>c</sup> (pCi/g)		Maximum <sup>d</sup> (pCi/g)		Location				
		Samples	Detects <sup>b</sup>						Samples	Detects <sup>b</sup>									
	300	2	0	4.1E-03	±	2.8E-03	5.5E-03	±	7.0E-03	V132	8	8	3.4E-02	±	6.70E-02	1.2E-01	±	1.1E-01	V123
	600	14	4	4.8E-03	±	7.6E-03	9.9E-03	±	5.6E-03	V081	62	43	1.9E-02	±	9.10E-02	1.6E-01	±	2.5E-01	V308

<sup>a</sup> 1 pCi = 0.037 Bq<sup>b</sup> Number of samples with measurable concentrations of contaminant<sup>c</sup> Average ± two standard deviations of all samples analyzed<sup>d</sup> Maximum ± analytical uncertaintyTable C-23. Concentrations of Select Radionuclides (pCi/g)<sup>a</sup> in Offsite Vegetation Samples.

Radionuclide	Hanford Area	2019								2001, 2004, 2008, and 2015									
		Number of		Average <sup>c</sup> (pCi/g)		Maximum <sup>d</sup> (pCi/g)		Location	Number of		Average <sup>c</sup> (pCi/g)		Maximum <sup>d</sup> (pCi/g)		Location				
		Samples	Detects <sup>b</sup>						Samples	Detects <sup>b</sup>									
<sup>137</sup> Cs	Offsite	8	0	-1.5E-02	±	5.2E-02	1.1E-02	±	3.6E-02	V440	50	1	5.9E-03	±	2.4E-02	5.5E-02	±	2.9E-02	V412
<sup>238</sup> Pu	Offsite	8	0	-8.5E-04	±	2.8E-03	1.1E-03	±	4.5E-03	V434	46	5	7.5E-05	±	2.1E-04	5.0E-04	±	2.8E-04	V441
<sup>239/240</sup> Pu	Offsite	8	0	-1.7E-03	±	2.7E-03	-2.4E-04	±	2.4E-03	V431	46	24	8.9E-04	±	3.2E-03	7.7E-03	±	1.3E-03	V412
<sup>90</sup> Sr	Offsite	8	0	-1.6E-03	±	2.4E-02	1.7E-02	±	2.8E-02	V439	48	3	2.1E-02	±	7.6E-02	2.0E-01	±	4.4E-02	V430
<sup>234</sup> U	Offsite	8	5	1.7E-02	±	1.4E-02	2.9E-02	±	1.2E-02	V427	49	23	1.5E-02	±	3.4E-02	8.9E-02	±	5.6E-02	V430
<sup>235</sup> U	Offsite	8	4	9.1E-03	±	8.9E-03	1.9E-02	±	9.7E-03	V440	48	9	4.8E-03	±	1.7E-02	5.1E-02	±	4.8E-02	V430
<sup>238</sup> U	Offsite	8	7	1.5E-02	±	1.8E-02	3.3E-02	±	1.2E-02	V440	50	20	9.6E-03	±	2.0E-02	3.6E-02	±	3.8E-02	V434

<sup>a</sup> 1 pCi = 0.037 Bq<sup>b</sup> Number of samples with measurable concentrations of contaminant<sup>c</sup> Average ± two standard deviations of all samples analyzed<sup>d</sup> Maximum ± analytical uncertaintyTable C-24. Concentrations of Select Radionuclides (pCi/g)<sup>a</sup> in Hanford Site Vegetation Samples Collected Sitewide and Offsite Vegetation Samples. (2 Pages)

Location	Radionuclide	2019								2001-2018									
		Number of		Average <sup>c</sup> (pCi/g)		Maximum <sup>d</sup> (pCi/g)		Location	Number of		Average <sup>c</sup> (pCi/g)		Maximum <sup>d</sup> (pCi/g)		Location				
		Samples	Detects <sup>b</sup>						Samples	Detects <sup>b</sup>									
Sitewide	<sup>241</sup> Am	4	2	3.8E-03	±	2.8E-03	5.3E-03	±	4.7E-03	V009	12	2	1.5E-02	±	5.6E-02	1.1E-01	±	2.5E-02	V034
	<sup>137</sup> Cs	42	6	1.2E-02	±	4.9E-02	7.4E-02	±	5.2E-02	V037	1010	173	5.0E-02	±	4.9E-01	6.0E+00	±	4.3E+00	V045
	<sup>238</sup> Pu	41	0	-9.5E-04	±	6.4E-03	4.6E-03	±	1.1E-02	V083	1004	32	1.4E-03	±	1.8E-02	8.7E-02	±	4.7E-02	V120
	<sup>239/240</sup> Pu	41	5	2.2E-03	±	8.2E-03	1.4E-02	±	1.5E-02	V025	1010	227	6.8E-03	±	9.9E-02	1.3E+00	±	2.8E-01	V019
	<sup>90</sup> Sr	43	6	1.9E-02	±	8.4E-02	2.2E-01	±	6.0E-02	Y724	1015	233	3.9E-01	±	7.0E+00	6.8E+01	±	8.2E+00	Y719
	<sup>234</sup> U	43	5	5.0E-03	±	1.2E-02	2.5E-02	±	1.7E-02	V051	1015	819	2.3E-02	±	8.5E-02	5.4E-01	±	1.1E-01	V119
	<sup>235</sup> U	36	1	1.7E-03	±	6.3E-03	8.5E-03	±	6.2E-03	V009	1007	279	7.3E-03	±	7.3E-02	1.0E+00	±	0.0E+00	V079
<sup>238</sup> U	42	9	5.3E-03	±	8.3E-03	1.2E-02	±	8.2E-03	V065	1013	786	1.8E-02	±	7.3E-02	5.7E-01	±	1.1E-01	V120	
Offsite	<sup>137</sup> Cs	8	0	-1.5E-02	±	5.2E-02	1.1E-02	±	3.6E-02	V440	50	1	5.9E-03	±	2.4E-02	5.5E-02	±	2.9E-02	V412

**Table C-24. Concentrations of Select Radionuclides (pCi/g)<sup>a</sup> in Hanford Site Vegetation Samples Collected Sitewide and Offsite Vegetation Samples. (2 Pages)**

Location	Radionuclide	2019							2001-2018						
		Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)	Location	Number of		Average <sup>c</sup> (pCi/g)	Maximum <sup>d</sup> (pCi/g)	Location				
		Samples	Detects <sup>b</sup>				Samples	Detects <sup>b</sup>							
	<sup>238</sup> Pu	8	0	-8.5E-04 ± 2.8E-03	1.1E-03 ± 4.5E-03	V434	46	5	7.5E-05 ± 2.1E-04	5.0E-04 ± 2.8E-04	V441				
	<sup>239/240</sup> Pu	8	0	-1.7E-03 ± 2.7E-03	-2.4E-04 ± 2.4E-03	V431	46	24	8.9E-04 ± 3.2E-03	7.7E-03 ± 1.3E-03	V412				
	<sup>90</sup> Sr	8	0	-1.6E-03 ± 2.4E-02	1.7E-02 ± 2.8E-02	V439	48	3	2.1E-02 ± 7.6E-02	2.0E-01 ± 4.4E-02	V430				
	<sup>234</sup> U	8	5	1.7E-02 ± 1.4E-02	2.9E-02 ± 1.2E-02	V427	49	23	1.5E-02 ± 3.4E-02	8.9E-02 ± 5.6E-02	V430				
	<sup>235</sup> U	8	4	9.1E-03 ± 8.9E-03	1.9E-02 ± 9.7E-03	V440	48	9	4.8E-03 ± 1.7E-02	5.1E-02 ± 4.8E-02	V430				
	<sup>238</sup> U	8	7	1.5E-02 ± 1.8E-02	3.3E-02 ± 1.2E-02	V440	50	20	9.6E-03 ± 2.0E-02	3.6E-02 ± 3.8E-02	V434				

<sup>a</sup> 1 pCi = 0.037 Bq  
<sup>b</sup> Number of samples with measurable concentrations of contaminant  
<sup>c</sup> Average ± two standard deviations of all samples analyzed  
<sup>d</sup> Maximum ± analytical uncertainty

**Table C-25. Radionuclide Concentrations in Liquid Effluents. (2 Pages)**

Facility	Sample Location	Radionuclide or Analysis	Number of		Average Concentration (μCi/mL)	DCS (μCi/mL)	DCS Fraction (%)
			Samples	Samples >MDA			
ETF	Verification Tank	americium-241	7	0	--	--	--
ETF	Verification Tank	curium-243/244	7	0	--	--	--
ETF	Verification Tank	gamma energy	6	0	--	--	--
ETF	Verification Tank	gross alpha	10	2	5.8E-10	1.7E-07 <sup>a</sup>	0.3%
ETF	Verification Tank	gross beta	10	3	2.3E-09	3.0E-06 <sup>b</sup>	0.1%
ETF	Verification Tank	iodine-129	7	0	--	--	--
ETF	Verification Tank	neptunium-237	7	0	--	--	--
ETF	Verification Tank	plutonium-238	7	0	--	--	--
ETF	Verification Tank	plutonium-239/240	7	0	--	--	--
ETF	Verification Tank	radium-226	7	2	3.1E-10	8.7E-08	0.4%
ETF	Verification Tank	strontium-90	7	0	--	--	--
ETF	Verification Tank	technetium-99	7	0	--	--	--
ETF	Verification Tank	tritium	7	7	3.9E-04	1.9E-03	20.3%
ETF Sum of Fractions =							21.1%
TEDF	Building 6653	gross alpha	13	1	1.8E-09	1.7E-07 <sup>a</sup>	1.1%
TEDF	Building 6653	gross beta	13	2	4.1E-09	3.0E-06 <sup>b</sup>	0.1%
TEDF	Building 6653	tritium	5	0	--	--	--
TEDF Sum of Fractions =							1.2%

**Table C-25. Radionuclide Concentrations in Liquid Effluents. (2 Pages)**

<sup>a</sup> DCS value for americium-241  
<sup>b</sup> DCS value for cesium-137  
ETF = Effluent Treatment Facility  
TEDF = Treated Effluent Disposal Facility  
MDA = minimum detectable activity  
DCS = derived concentration standard for ingested water from DOE-STD-1196-2011



## C.7 References

- 40 CFR 61. Appendix E, “Compliance Procedures Methods for Determining Compliance with Subpart I,” Table 2, “Concentration Levels for Environmental Compliance.” *Code of Federal Regulations*, as amended. Online at [http://www.ecfr.gov/cgi-bin/text-idx?SID=da9d22320b65cc64e47ba92143fafad7&mc=true&node=ap40.10.61\\_1359.e&rgn=div9](http://www.ecfr.gov/cgi-bin/text-idx?SID=da9d22320b65cc64e47ba92143fafad7&mc=true&node=ap40.10.61_1359.e&rgn=div9).
- 40 CFR 141. “National Primary Drinking Water Regulations.” *Code of Federal Regulations*, as amended. Online at [http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr141\\_main\\_02.tpl](http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr141_main_02.tpl).
- WAC 173-201A-240. “Toxic Substances.” *Washington Administrative Code*, as amended. Online at <http://apps.leg.wa.gov/wac/default.aspx?cite=173-201a-240>.
- WAC 173-201A-250. “Radioactive Substances.” *Washington Administrative Code*, as amended. Online at <http://apps.leg.wa.gov/WAC/default.aspx?cite=173-201A-250>.
- WAC 246-290. “Group A Public Water Supplies.” *Washington Administrative Code*, as amended. Online at <http://apps.leg.wa.gov/wac/default.aspx?cite=246-290>.

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