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## C. 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.

**Table C.1. Radionuclide Concentrations in West Lake Sediment**

| Radionuclide  | 2015           |                                   | 2010–2014      |                                    |                    |
|---------------|----------------|-----------------------------------|----------------|------------------------------------|--------------------|
|               | No. of Samples | Concentration (pCi/g)*<br>Result† | No. of Samples | Concentration (pCi/g)*<br>Average‡ | Maximum†           |
| Antimony-125  | 4              | 6.1E-04 ± 2.3E-02§                | 5              | 5.6E-03 ± 5.2E-02§                 | 3.6E-02 ± 4.6E-02§ |
| Cesium-134    | 4              | 4.1E-02 ± 2.7E-02§                | 5              | 4.8E-02 ± 6.0E-02§                 | 4.0E-02 ± 4.0E-02§ |
| Cesium-137    | 4              | 3.4E-01 ± 4.9E-02                 | 5              | 9.5E-01 ± 9.1E-01                  | 1.7E+00 ± 1.6E-01  |
| Cobalt-60     | 4              | 1.1E-02 ± 1.2E-02§                | 5              | -3.0E-03 ± 9.0E-03§                | 5.3E-03 ± 1.7E-02§ |
| Europium-152  | 4              | 2.5E-02 ± 2.8E-02§                | 5              | 4.6E-03 ± 6.7E-02§                 | 5.4E-02 ± 8.0E-02§ |
| Europium-154  | 4              | -2.7E-02 ± 3.6E-02§               | 5              | -1.3E-02 ± 1.0E-01§                | 4.7E-02 ± 6.0E-02§ |
| Europium-155  | 4              | 6.8E-02 ± 3.8E-02                 | 5              | 3.2E-02 ± 7.0E-02§                 | 8.5E-02 ± 8.6E-02§ |
| Gross Alpha   | 4              | 9.0E+00 ± 3.7E+00                 | 5              | 8.1E+00 ± 7.9E+00                  | 12.2E+00 ± 3.1E+00 |
| Gross Beta    | 4              | 29.2E+00 ± 2.4E+00                | 5              | 2.32E+01 ± 12.8E+00                | 2.7E+01 ± 6.4E+00  |
| Potassium-40  | 4              | 19.3E+00 ± 1.7E+00                | 5              | 1.5E+01 ± 9.3E+00                  | 1.9E+01 ± 2.0E+00  |
| Ruthenium-106 | 4              | -1.5E-04 ± 1.5E-01§               | 5              | -2.3E-02 ± 2.5E-01§                | 1.2E-01 ± 1.5E-01§ |
| Strontium-90  | 4              | 4.5E-02 ± 3.1E-02§                | 5              | 2.6E-01 ± 3.4E-01§                 | 4.9E-01 ± 9.7E-02§ |
| Technetium-99 | 4              | 4.8E-01 ± 3.2E-01§                | 5              | -1.7E-01 ± 3.8E-01§                | 3.9E-02 ± 3.7E-01§ |
| Uranium-234   | 4              | 4.1E+00 ± 5.5E-01                 | 5              | 3.2E+00 ± 5.0E+00                  | 7.6E+00 ± 1.1E+00  |
| Uranium-235   | 4              | 2.9E-01 ± 7.8E-02                 | 5              | 1.6E-01 ± 1.9E-01                  | 3.2E-01 ± 8.9E-02  |
| Uranium-238   | 4              | 4.2E+00 ± 5.5E-01                 | 5              | 3.0E+00 ± 4.4E+00                  | 6.8E+00 ± 1.0E+00  |

\*1 pCi = 0.037 Bq

†Result and maximum values are ± total propagated analytical uncertainty (2 Sigma).

‡Averages are ±2 standard deviations of the mean. Average values calculated using reporting limit values for all results at or below minimum detectable concentrations.

§Result was below detection limit.

**Table C.2. Radionuclide Concentrations in West Lake Seep Water**

| Radionuclide | 2015           |                |                     | 2012–2014      |                     |                     | DOE-Derived Concentration Guides/Standards | WA State Ambient Surface Water Quality Standard§ |
|--------------|----------------|----------------|---------------------|----------------|---------------------|---------------------|--|--|
|              | No. of Samples | Concentration* |                     | No. of Samples | Concentration*      |                     |  |  |
|              |                | Average†       | Maximum‡            |                | Average†            | Maximum‡            |  |  |
|              |                | pCi/L          |                     |                | pCi/L               |                     |  |  |
| Tritium      | 1              | ††             | 41E+00 ± 15.0E+01   | 2              | 43.3E+01 ± 51.1E+01 | 6.9E+02 ± 20.8+01   | 2,000,000                                  | 20,000§**  |
| Uranium-234  | 1              | ††             | 25.0E+01 ± 40.0E+00 | 3              | 19.4E+01 ± 18.6E+01 | 26.3E+01 ± 38.1E+00 | 500  | —  |
| Uranium-235  | 1              | ††             | 1.9E+01 ± 1.3E+01   | 3              | 9.7E+00 ± 9.4E+00   | 13.8E+00 ± 4.3E+00  | 600  | —  |
| Uranium-238  | 1              | ††             | 1.9E+02 ± 33.4E+00  | 3              | 18.2E+01 ± 17.5E+01 | 25.0E+01 ± 69.2E+00 | 600  | —  |

\*1 pCi = 0.037 Bq  
 †Averages are ±2 standard deviations of the mean.  
 ‡Maximum values are ± total propagated analytical uncertainty.  
 §WAC 246-290 and 40 CFR 141. Dashes indicate no concentration guides available.  
 \*\*WAC 173-201A-250 and EPA-570/9-76-003.  
 ††Average values are not calculated when only one sample was analyzed; 2012 West Lake Seep Water did not have tritium analyses performed.

**Table C.3. Radionuclide Concentrations in West Lake Surface Water**

| Radionuclide | 2015           |                     |                     | 2012–2014      |                     |                     | DOE-Derived Concentration Guides/Standards | WA State Ambient Surface Water Quality Standard§ |
|--------------|----------------|---------------------|---------------------|----------------|---------------------|---------------------|--|--|
|              | No. of Samples | Concentration*      |                     | No. of Samples | Concentration*      |                     |  |  |
|              |                | Average†            | Maximum‡            |                | Average†            | Maximum‡            |  |  |
|              |                | pCi/L               |                     |                | pCi/L               |                     |  |  |
| Tritium      | 4              | 22.3E+00 ± 14.3E+01 | 12.2E+01 ± 12.5E+01 | 3              | 4.8E+01 ± 6.9E+01   | 9.6E+01 ± 14.9+01   | 2,000,000                                  | 20,000§**  |
| Uranium-234  | 4              | 43.0E+01 ± 14.0E+02 | 16.5E+02 ± 23.3E+00 | 3              | 34.8E+02 ± 53.9E+02 | 65.8E+02 ± 10.7E+02 | 500  | —  |
| Uranium-235  | 4              | 2.3E+01 ± 7.4E+01   | 8.7E+01 ± 1.5E+01   | 3              | 13.2E+01 ± 20.3E+01 | 24.8E+01 ± 93.7E+00 | 600  | —  |
| Uranium-238  | 4              | 40.9E+01 ± 13.4E+02 | 15.7E+02 ± 22.3E+01 | 3              | 33.5E+02 ± 52.2E+02 | 63.8E+02 ± 10.4E+02 | 600  | —  |

\*1 pCi = 0.037 Bq  
 †Averages are ±2 standard deviations of the mean.  
 ‡Maximum values are ± total propagated analytical uncertainty.  
 §WAC 246-290 and 40 CFR 141. Dashes indicate no concentration guides available.  
 \*\*WAC 173-201A-250 and EPA-570/9-76-003.

**Table C.4. Concentrations of Select Radionuclides (pCi/m<sup>3</sup>)\* in On-site Air Samples**

| Radionuclide          | Site       | 2015              |             |                    |                    |         | 2010–2014         |             |                    |                   | EPA Table 2**,†† |
|-----------------------|------------|-------------------|-------------|--------------------|--------------------|---------|-------------------|-------------|--------------------|-------------------|------------------|
|                       |            | Number of Samples | Detections† | Average‡           | Maximum§           | Sampler | Number of Samples | Detections† | Average‡           | Maximum§          |                  |
| gross α               | 100-K Area | 188               | 185         | 1.7E-03 ± 2.5E-03  | 7.8E-03 ± 1.3E-03  | N534    | 1100              | 1032        | 1.1E-03 ± 1.4E-03  | 6.8E-03 ± 9.9E-04 | 2.0E-02          |
|                       | 200-East   | 565               | 562         | 1.8E-03 ± 2.5E-03  | 7.6E-03 ± 1.1E-03  | N532    | 2724              | 2615        | 1.3E-03 ± 1.5E-03  | 6.6E-03 ± 1.1E-03 |                  |
|                       | 200-West   | 614               | 613         | 1.8E-03 ± 2.6E-03  | 9.9E-03 ± 1.4E-03  | N165    | 3062              | 2915        | 1.3E-03 ± 1.7E-03  | 1.4E-02 ± 2.0E-03 |                  |
|                       | 300 D4     | 151               | 139         | 1.0E-03 ± 1.4E-03  | 4.3E-03 ± 8.0E-04  | N918    | 774               | 703         | 8.5E-04 ± 1.1E-03  | 4.1E-03 ± 8.0E-04 |                  |
|                       | 618-10 BG  | 108               | 108         | 1.5E-03 ± 1.9E-03  | 7.5E-03 ± 1.7E-03  | N548    | 434               | 407         | 1.2E-03 ± 2.3E-03  | 1.6E-02 ± 2.3E-03 |                  |
|                       | ERDF       | 135               | 135         | 1.4E-03 ± 1.9E-03  | 5.8E-03 ± 9.7E-04  | N963    | 650               | 611         | 1.1E-03 ± 1.4E-03  | 5.5E-03 ± 9.2E-04 |                  |
| gross β               | 100-K Area | 188               | 188         | 1.8E-02 ± 2.1E-02  | 5.4E-02 ± 5.3E-03  | N534    | 1102              | 1101        | 1.7E-02 ± 2.4E-02  | 1.5E-01 ± 1.2E-02 | 9.0E+00          |
|                       | 200-East   | 565               | 565         | 1.7E-02 ± 2.0E-02  | 7.3E-02 ± 6.1E-03  | N967    | 2724              | 2723        | 1.7E-02 ± 2.2E-02  | 1.2E-01 ± 9.0E-03 |                  |
|                       | 200-West   | 614               | 614         | 1.7E-02 ± 2.1E-02  | 7.5E-02 ± 6.2E-03  | N304    | 3062              | 3061        | 1.6E-02 ± 2.2E-02  | 1.0E-01 ± 2.3E-02 |                  |
|                       | 300 D4     | 151               | 151         | 2.0E-02 ± 2.0E-02  | 4.9E-02 ± 4.6E-03  | N903    | 779               | 779         | 2.0E-02 ± 2.7E-02  | 1.1E-01 ± 1.2E-02 |                  |
|                       | 618-10 BG  | 108               | 108         | 2.1E-02 ± 2.6E-02  | 1.0E-01 ± 1.8E-02  | N548    | 434               | 433         | 1.7E-02 ± 2.5E-02  | 1.1E-01 ± 9.0E-03 |                  |
|                       | ERDF       | 135               | 135         | 1.7E-02 ± 1.9E-02  | 4.7E-02 ± 8.0E-03  | N518    | 650               | 649         | 1.5E-02 ± 2.0E-02  | 7.6E-02 ± 5.8E-03 |                  |
| <sup>90</sup> Sr      | 100-K Area | 14                | 0           | -6.4E-05 ± 6.2E-04 | 7.5E-04 ± 6.3E-04  | N576    | 94                | 10          | 1.2E-05 ± 8.6E-04  | 3.1E-03 ± 9.4E-04 | 1.9E-02          |
|                       | 200-East   | 42                | 0           | -2.5E-05 ± 5.0E-04 | 6.3E-04 ± 6.4E-04  | N499    | 210               | 37          | 4.5E-05 ± 3.9E-04  | 1.7E-03 ± 5.7E-04 |                  |
|                       | 200-West   | 46                | 0           | -8.9E-05 ± 4.4E-04 | 5.2E-04 ± 4.1E-04  | N555    | 239               | 24          | -1.5E-05 ± 3.2E-04 | 5.5E-04 ± 4.7E-04 |                  |
|                       | 300 D4     | 12                | 0           | 1.4E-04 ± 8.8E-04  | 1.0E-03 ± 8.3E-04  | N557    | 61                | 2           | -2.8E-05 ± 3.6E-04 | 4.1E-04 ± 3.0E-04 |                  |
|                       | 618-10 BG  | 8                 | 2           | 1.6E-04 ± 3.0E-04  | 4.7E-04 ± 2.6E-04  | N548    | 40                | 4           | -5.4E-06 ± 5.0E-04 | 3.7E-04 ± 3.2E-04 |                  |
|                       | ERDF       | 10                | 0           | -4.1E-05 ± 2.4E-04 | 1.0E-04 ± 1.6E-04  | N482    | 50                | 5           | 1.1E-05 ± 2.9E-04  | 3.3E-04 ± 3.6E-04 |                  |
| <sup>137</sup> Cs     | 100-K Area | 14                | 0           | 6.8E-05 ± 3.6E-04  | 4.0E-04 ± 4.6E-04  | N535    | 94                | 27          | 3.0E-04 ± 2.8E-03  | 1.3E-02 ± 4.0E-03 | 1.9E-02          |
|                       | 200-East   | 42                | 0           | 9.0E-05 ± 4.1E-04  | 6.6E-04 ± 6.2E-04  | N973    | 210               | 41          | 2.6E-04 ± 2.7E-03  | 1.9E-02 ± 6.2E-03 |                  |
|                       | 200-West   | 46                | 0           | 3.8E-05 ± 4.4E-04  | 6.1E-04 ± 3.8E-04  | N966    | 239               | 25          | 5.6E-05 ± 3.1E-04  | 7.6E-04 ± 3.8E-04 |                  |
|                       | 300 D4     | 12                | 0           | 7.3E-05 ± 3.4E-04  | 4.4E-04 ± 5.1E-04  | N904    | 62                | 3           | 8.8E-05 ± 3.7E-04  | 6.5E-04 ± 5.1E-04 |                  |
|                       | 618-10 BG  | 8                 | 0           | -5.4E-06 ± 1.8E-04 | 1.0E-04 ± 1.3E-04  | N549    | 40                | 4           | 6.8E-05 ± 4.7E-04  | 1.2E-03 ± 4.0E-04 |                  |
|                       | ERDF       | 10                | 0           | 4.1E-05 ± 2.3E-04  | 2.5E-04 ± 3.5E-04  | N963    | 50                | 5           | 6.2E-05 ± 2.1E-04  | 4.0E-04 ± 4.5E-04 |                  |
| <sup>238</sup> Pu     | 100-K Area | 13                | 0           | 4.4E-06 ± 2.0E-05  | 3.9E-05 ± 5.5E-05  | N900    | 90                | 0           | 1.9E-06 ± 1.3E-05  | 2.9E-05 ± 3.3E-05 | 2.1E-03          |
|                       | 200-East   | 36                | 0           | -2.8E-07 ± 5.4E-06 | 4.0E-06 ± 3.8E-06  | N972    | 204               | 3           | 8.3E-07 ± 7.1E-06  | 2.2E-05 ± 2.2E-05 |                  |
|                       | 200-West   | 38                | 0           | -9.1E-07 ± 6.3E-06 | 8.0E-06 ± 7.5E-06  | N165    | 229               | 8           | 1.3E-06 ± 9.5E-06  | 3.7E-05 ± 1.9E-05 |                  |
|                       | 300 D4     | 11                | 0           | 1.2E-06 ± 1.6E-05  | 1.4E-05 ± 5.3E-05  | N919    | 59                | 4           | 1.7E-06 ± 1.0E-05  | 2.3E-05 ± 2.8E-05 |                  |
|                       | 618-10 BG  | 8                 | 0           | 7.6E-06 ± 1.6E-05  | 2.4E-05 ± 2.9E-05  | N580    | 40                | 2           | 3.2E-06 ± 1.7E-05  | 4.6E-05 ± 2.2E-05 |                  |
|                       | ERDF       | 9                 | 0           | -1.6E-06 ± 2.4E-06 | -3.5E-07 ± 3.5E-06 | N518    | 50                | 0           | 1.0E-06 ± 6.1E-06  | 8.5E-06 ± 9.1E-06 |                  |
| <sup>239/240</sup> Pu | 100-K Area | 12                | 0           | -1.0E-06 ± 1.6E-05 | 1.1E-05 ± 1.7E-05  | N578    | 92                | 31          | 1.2E-05 ± 4.5E-05  | 1.7E-04 ± 7.0E-05 | 2.0E-03          |
|                       | 200-East   | 42                | 0           | 5.9E-07 ± 7.0E-06  | 1.1E-05 ± 1.8E-05  | N973    | 204               | 18          | 1.5E-06 ± 4.6E-06  | 1.2E-05 ± 6.9E-06 |                  |
|                       | 200-West   | 44                | 2           | 5.8E-06 ± 4.3E-05  | 1.2E-04 ± 3.7E-05  | N165    | 237               | 71          | 1.6E-05 ± 1.1E-04  | 4.5E-04 ± 1.6E-04 |                  |
|                       | 300 D4     | 11                | 0           | -2.8E-06 ± 1.5E-05 | 7.7E-06 ± 3.5E-05  | N918    | 59                | 0           | 1.1E-06 ± 5.4E-06  | 1.2E-05 ± 1.2E-05 |                  |
|                       | 618-10 BG  | 8                 | 5           | 5.5E-05 ± 1.0E-04  | 1.7E-04 ± 9.3E-05  | N548    | 40                | 22          | 6.9E-05 ± 2.7E-04  | 6.8E-04 ± 2.6E-04 |                  |
|                       | ERDF       | 10                | 0           | 6.9E-07 ± 1.1E-05  | 1.4E-05 ± 3.8E-05  | N518    | 50                | 18          | 6.0E-06 ± 2.1E-05  | 6.1E-05 ± 2.4E-05 |                  |
| <sup>234</sup> U      | 100-K Area | 12                | 2           | 6.7E-06 ± 6.6E-06  | 1.2E-05 ± 1.7E-05  | N534    | 78                | 47          | 9.7E-06 ± 1.5E-05  | 4.7E-05 ± 3.0E-05 | 7.7E-03          |
|                       | 200-East   | 42                | 12          | 1.0E-05 ± 1.4E-05  | 2.6E-05 ± 1.9E-05  | N984    | 210               | 132         | 8.4E-06 ± 1.0E-05  | 4.4E-05 ± 2.0E-05 |                  |
|                       | 200-West   | 46                | 12          | 1.1E-05 ± 1.4E-05  | 3.4E-05 ± 3.9E-05  | N965    | 239               | 150         | 2.3E-05 ± 2.9E-04  | 2.2E-03 ± 7.4E-04 |                  |
|                       | 300 D4     | 12                | 7           | 4.3E-05 ± 5.4E-05  | 1.2E-04 ± 7.6E-05  | N919    | 61                | 50          | 3.9E-05 ± 4.0E-05  | 8.8E-05 ± 2.1E-05 |                  |

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**Table C.4. Concentrations of Select Radionuclides (pCi/m<sup>3</sup>)\* in On-site Air Samples**

| Radionuclide      | Site       | 2015              |             |                    |                   |         | 2010–2014         |             |                    |                   | EPA Table 2**, †† |
|-------------------|------------|-------------------|-------------|--------------------|-------------------|---------|-------------------|-------------|--------------------|-------------------|-------------------|
|                   |            | Number of Samples | Detections† | Average‡           | Maximum§          | Sampler | Number of Samples | Detections† | Average‡           | Maximum§          |                   |
| <sup>235</sup> U  | 618-10 BG  | 8                 | 3           | 2.8E-05 ± 5.5E-05  | 9.2E-05 ± 5.2E-05 | N548    | 40                | 22          | 1.3E-05 ± 1.6E-05  | 3.0E-05 ± 1.5E-05 | 7.1E-03           |
|                   | ERDF       | 9                 | 2           | 1.2E-05 ± 1.9E-05  | 3.3E-05 ± 3.6E-05 | N482    | 50                | 34          | 2.4E-05 ± 1.2E-04  | 4.3E-04 ± 1.7E-04 |                   |
|                   | 100-K Area | 11                | 0           | 3.3E-06 ± 5.4E-06  | 9.7E-06 ± 1.8E-05 | N534    | 73                | 8           | 2.0E-06 ± 8.1E-06  | 2.6E-05 ± 2.1E-05 |                   |
|                   | 200-East   | 39                | 0           | 3.2E-06 ± 8.5E-06  | 1.7E-05 ± 2.1E-05 | N978    | 201               | 12          | 1.5E-06 ± 3.7E-06  | 7.3E-06 ± 7.4E-06 |                   |
|                   | 200-West   | 43                | 2           | 3.8E-06 ± 6.9E-06  | 1.2E-05 ± 1.4E-05 | N457    | 230               | 24          | 3.5E-06 ± 3.1E-05  | 2.1E-04 ± 7.8E-05 |                   |
|                   | 300 D4     | 12                | 1           | 5.4E-06 ± 1.2E-05  | 1.8E-05 ± 4.0E-05 | N557    | 56                | 10          | 3.2E-06 ± 5.1E-06  | 1.2E-05 ± 4.9E-06 |                   |
|                   | 618-10 BG  | 7                 | 0           | 4.0E-06 ± 6.5E-06  | 8.0E-06 ± 1.2E-05 | N549    | 35                | 2           | 1.8E-06 ± 7.5E-06  | 1.0E-05 ± 1.1E-05 |                   |
|                   | ERDF       | 9                 | 0           | 4.1E-06 ± 8.8E-06  | 1.3E-05 ± 2.8E-05 | N517    | 46                | 6           | 3.1E-06 ± 1.5E-05  | 5.3E-05 ± 2.3E-05 |                   |
| <sup>238</sup> U  | 100-K Area | 12                | 3           | 6.4E-06 ± 1.0E-05  | 1.7E-05 ± 9.3E-06 | N578    | 78                | 45          | 7.8E-06 ± 1.1E-05  | 2.5E-05 ± 2.1E-05 | 8.3E-03           |
|                   | 200-East   | 41                | 11          | 1.0E-05 ± 1.3E-05  | 3.0E-05 ± 2.9E-05 | N999    | 210               | 132         | 6.7E-06 ± 7.5E-06  | 2.3E-05 ± 1.1E-05 |                   |
|                   | 200-West   | 46                | 12          | 7.6E-06 ± 8.4E-06  | 1.5E-05 ± 8.7E-06 | N956    | 239               | 153         | 1.9E-05 ± 2.6E-04  | 1.9E-03 ± 6.6E-04 |                   |
|                   | 300 D4     | 12                | 9           | 4.6E-05 ± 5.1E-05  | 9.3E-05 ± 6.5E-05 | N919    | 61                | 54          | 3.7E-05 ± 4.0E-05  | 8.1E-05 ± 1.9E-05 |                   |
|                   | 618-10 BG  | 8                 | 4           | 1.9E-04 ± 5.8E-04  | 7.6E-04 ± 2.6E-04 | N548    | 40                | 27          | 2.1E-05 ± 5.6E-05  | 1.6E-04 ± 7.1E-05 |                   |
|                   | ERDF       | 10                | 5           | 2.2E-05 ± 2.9E-05  | 5.3E-05 ± 7.9E-05 | N518    | 49                | 34          | 2.2E-05 ± 1.0E-04  | 3.7E-04 ± 1.4E-04 |                   |
| <sup>241</sup> Am | 100-K Area | 13                | 0           | -1.8E-05 ± 8.1E-04 | 6.8E-04 ± 2.3E-03 | N576    | 89                | 23          | 1.4E-05 ± 2.8E-04  | 7.3E-04 ± 7.3E-04 | 1.9E-03           |
|                   | 200-East   | 42                | 0           | -9.6E-05 ± 1.8E-03 | 1.8E-03 ± 2.5E-03 | N019    | 58                | 1           | -3.0E-05 ± 1.1E-03 | 1.0E-03 ± 2.8E-03 |                   |
|                   | 200-West   | 46                | 0           | -2.8E-04 ± 1.6E-03 | 1.6E-03 ± 2.7E-03 | N441    | 54                | 8           | -1.8E-04 ± 1.7E-03 | 2.4E-03 ± 2.3E-03 |                   |
|                   | 300 D4     | 10                | 0           | 5.4E-07 ± 8.2E-06  | 9.1E-06 ± 4.1E-05 | N918    | 44                | 3           | 4.7E-05 ± 1.2E-03  | 1.9E-03 ± 2.7E-03 |                   |
|                   | 618-10 BG  | 8                 | 3           | 2.6E-05 ± 5.4E-05  | 8.7E-05 ± 6.8E-05 | N548    | 32                | 19          | 3.8E-05 ± 1.1E-04  | 2.4E-04 ± 9.4E-05 |                   |
|                   | ERDF       | 4                 | 0           | -4.5E-04 ± 8.2E-04 | 1.3E-04 ± 1.3E-03 | N963    | 4                 | 0           | -5.0E-04 ± 1.2E-03 | 2.9E-04 ± 2.6E-03 |                   |
| <sup>241</sup> Pu | 200-East   | 4                 | 0           | -5.6E-05 ± 8.3E-04 | 4.7E-04 ± 5.8E-04 | N481    | 20                | 0           | 8.6E-05 ± 5.5E-04  | 7.7E-04 ± 1.1E-03 | 1.0E-01           |
|                   | 200-West   | 6                 | 0           | -2.6E-04 ± 7.1E-04 | 4.3E-04 ± 7.7E-04 | N975    | 8                 | 2           | 4.9E-04 ± 1.2E-03  | 1.5E-03 ± 8.8E-04 |                   |

BG=Burial Ground project; D4=deactivation, decontamination, decommissioning, and demolition; DOE=U.S. Department of Energy; EPA=U.S. Environmental Protection Agency; ERDF=Environmental Restoration Disposal Facility

\*1 pCi = 0.037 Bq

†Number of samples with measurable concentrations of contaminant.

‡Average ± two standard deviations of all samples analyzed.

§Maximum ± analytical uncertainty

\*\*DOE derived concentration guides are shown for gross alpha and gross beta

††EPA values are based on an effective dose equivalent of 10 mrem/yr (40 CFR 61, Appendix E, Table 2)

C.4

**Table C.5. Concentrations of Selected Radionuclides (pCi/m<sup>3</sup>)\* in Ambient Air Samples**

| Radionuclide      | Site               | 2015              |             |                    |                    |         | 2010–2014         |             |                   |                   | EPA Table 2**, †† |
|-------------------|--------------------|-------------------|-------------|--------------------|--------------------|---------|-------------------|-------------|-------------------|-------------------|-------------------|
|                   |                    | Number of Samples | Detections† | Average‡           | Maximum§           | Sampler | Number of Samples | Detections† | Average‡          | Maximum§          |                   |
| gross α           | Onsite             | 550               | 506         | 1.1E-03 ± 1.8E-03  | 8.1E-03 ± 1.1E-03  | N920    | 2602              | 2317        | 7.9E-04 ± 1.2E-03 | 6.8E-03 ± 9.9E-04 | 2.0E-02           |
|                   | Perimeter          | 293               | 274         | 1.1E-03 ± 2.2E-03  | 7.7E-03 ± 1.2E-03  | N934    | 1408              | 1256        | 7.9E-04 ± 1.2E-03 | 8.2E-03 ± 1.6E-03 |                   |
|                   | Nearby Communities | 188               | 180         | 1.1E-03 ± 1.7E-03  | 6.0E-03 ± 9.2E-04  | N948    | 392               | 360         | 8.1E-04 ± 1.2E-03 | 4.2E-03 ± 8.3E-04 |                   |
|                   | Distant Community  | 27                | 23          | 9.0E-04 ± 1.5E-03  | 3.1E-03 ± 6.4E-04  | N909    | 128               | 105         | 7.0E-04 ± 1.2E-03 | 4.2E-03 ± 8.5E-04 |                   |
| gross β           | Onsite             | 550               | 550         | 2.1E-02 ± 2.4E-02  | 8.4E-02 ± 7.7E-03  | N932    | 2609              | 2609        | 2.0E-02 ± 2.7E-02 | 1.3E-01 ± 1.0E-02 | 9.0E+00           |
|                   | Perimeter          | 293               | 293         | 2.1E-02 ± 2.5E-02  | 7.6E-02 ± 7.5E-03  | N937    | 1409              | 1409        | 2.0E-02 ± 2.5E-02 | 9.5E-02 ± 8.8E-03 |                   |
|                   | Nearby Communities | 188               | 188         | 2.2E-02 ± 2.6E-02  | 7.2E-02 ± 6.6E-03  | N943    | 898               | 898         | 2.0E-02 ± 2.7E-02 | 1.6E-01 ± 1.6E-02 |                   |
|                   | Distant Community  | 27                | 27          | 1.8E-02 ± 1.8E-02  | 4.5E-02 ± 4.1E-03  | N909    | 128               | 128         | 1.8E-02 ± 2.4E-02 | 9.5E-02 ± 7.4E-03 |                   |
| <sup>3</sup> H    | Onsite             | 125               | 52          | 6.9E+00 ± 1.1E+01  | 2.5E+01 ± 6.9E+00  | P918    | 534               | 355         | 9.0E+00 ± 2.7E+01 | 1.1E+02 ± 1.1E+01 | 1.5E+03           |
|                   | Perimeter          | 98                | 22          | 3.7E+00 ± 7.2E+00  | 1.7E+01 ± 5.0E+00  | P937    | 446               | 232         | 6.2E+00 ± 2.0E+01 | 9.4E+01 ± 8.9E+00 |                   |
|                   | Nearby Communities | 28                | 6           | 5.2E+00 ± 2.2E+01  | 5.8E+01 ± 1.3E+01  | P944    | 128               | 69          | 6.0E+00 ± 1.5E+01 | 4.8E+01 ± 1.1E+01 |                   |
|                   | Distant Community  | 14                | 4           | 3.7E+00 ± 5.5E+00  | 9.9E+00 ± 4.0E+00  | P909    | 65                | 26          | 5.1E+00 ± 2.1E+01 | 7.1E+01 ± 1.2E+01 |                   |
| <sup>90</sup> Sr  | Onsite             | 33                | 0           | 1.3E-05 ± 5.6E-04  | 9.7E-04 ± 7.9E-04  | N918    | 135               | 2           | 1.4E-05 ± 2.0E-04 | 3.8E-04 ± 2.8E-04 | 1.9E-02           |
|                   | Perimeter          | 18                | 0           | 4.2E-05 ± 6.2E-04  | 6.5E-04 ± 6.4E-04  | N938    | 111               | 2           | 1.3E-05 ± 2.1E-04 | 4.2E-04 ± 3.3E-04 |                   |
|                   | Nearby Communities | 7                 | 0           | 2.9E-05 ± 3.5E-04  | 4.0E-04 ± 5.0E-04  | N945    | 39                | 1           | 3.9E-05 ± 3.3E-04 | 7.2E-04 ± 1.9E-04 |                   |
|                   | Distant Community  | 2                 | 0           | -6.4E-05 ± 9.1E-05 | -1.9E-05 ± 1.9E-04 | N909    | 15                | 0           | 4.1E-05 ± 2.0E-04 | 2.8E-04 ± 2.5E-04 |                   |
| <sup>137</sup> Cs | Onsite             | 40                | 0           | 7.8E-05 ± 3.7E-04  | 4.4E-04 ± 5.1E-04  | N904    | 203               | 2           | 6.7E-05 ± 5.5E-04 | 1.2E-03 ± 1.0E-03 | 1.9E-02           |
|                   | Perimeter          | 22                | 0           | 8.4E-05 ± 4.3E-04  | 6.0E-04 ± 6.3E-04  | N907    | 145               | 3           | 8.9E-05 ± 1.4E-03 | 6.9E-03 ± 2.0E-03 |                   |
|                   | Nearby Communities | 14                | 0           | 8.0E-05 ± 2.5E-04  | 3.8E-04 ± 5.2E-04  | N947    | 105               | 1           | 8.3E-05 ± 7.4E-04 | 1.2E-03 ± 7.0E-04 |                   |
|                   | Distant Community  | 2                 | 0           | -2.6E-05 ± 5.2E-05 | -3.3E-07 ± 3.3E-06 | N909    | 16                | 0           | 1.1E-04 ± 7.0E-04 | 7.7E-04 ± 9.1E-04 |                   |
| <sup>234</sup> U  | Onsite             | 27                | 20          | 4.2E-05 ± 4.0E-05  | 1.2E-04 ± 7.6E-05  | N919    | 148               | 136         | 4.0E-05 ± 3.0E-05 | 8.8E-05 ± 2.1E-05 | 7.7E-03           |
|                   | Perimeter          | 8                 | 8           | 5.7E-05 ± 2.2E-05  | 6.9E-05 ± 2.7E-05  | N936    | 68                | 61          | 4.7E-05 ± 3.9E-05 | 8.9E-05 ± 2.1E-05 |                   |
|                   | Nearby Communities | 11                | 11          | 5.7E-05 ± 2.0E-05  | 8.0E-05 ± 3.2E-05  | N946    | 73                | 64          | 4.5E-05 ± 2.9E-05 | 8.7E-05 ± 1.9E-05 |                   |
|                   | Distant Community  | 2                 | 1           | 4.1E-05 ± 1.1E-05  | 4.6E-05 ± 2.2E-05  | N909    | 15                | 13          | 3.7E-05 ± 3.1E-05 | 7.2E-05 ± 3.5E-05 |                   |
| <sup>238</sup> U  | Onsite             | 27                | 24          | 4.5E-05 ± 3.4E-05  | 9.3E-05 ± 6.5E-05  | N919    | 148               | 145         | 4.2E-05 ± 2.5E-05 | 8.7E-05 ± 5.8E-05 | 8.3E-03           |
|                   | Perimeter          | 8                 | 8           | 4.8E-05 ± 1.6E-05  | 6.2E-05 ± 2.6E-05  | N935    | 68                | 64          | 5.1E-05 ± 3.7E-05 | 1.2E-04 ± 6.4E-05 |                   |
|                   | Nearby Communities | 11                | 11          | 5.5E-05 ± 1.8E-05  | 7.6E-05 ± 4.6E-05  | N949    | 73                | 71          | 4.9E-05 ± 2.2E-05 | 8.0E-05 ± 6.9E-05 |                   |

C.5

**Table C.5. Concentrations of Selected Radionuclides (pCi/m<sup>3</sup>)\* in Ambient Air Samples**

| Radionuclide          | Site               | 2015              |             |                    |                    |         | 2010–2014         |             |                    |                   | EPA Table 2**,†† |
|-----------------------|--------------------|-------------------|-------------|--------------------|--------------------|---------|-------------------|-------------|--------------------|-------------------|------------------|
|                       |                    | Number of Samples | Detections† | Average‡           | Maximum§           | Sampler | Number of Samples | Detections† | Average‡           | Maximum§          |                  |
| <sup>239/240</sup> Pu | Distant Community  | 2                 | 1           | 3.4E-05 ± 4.3E-05  | 5.6E-05 ± 2.5E-05  | N909    | 15                | 14          | 3.8E-05 ± 2.0E-05  | 6.0E-05 ± 2.5E-05 |                  |
|                       | Onsite             | 37                | 0           | -1.4E-07 ± 1.9E-05 | 2.9E-05 ± 3.5E-05  | N928    | 184               | 12          | 1.4E-06 ± 2.4E-05  | 1.6E-04 ± 5.2E-05 |                  |
|                       | Perimeter          | 17                | 0           | 1.1E-06 ± 1.4E-05  | 1.8E-05 ± 1.9E-05  | N938    | 103               | 4           | 7.8E-07 ± 1.1E-05  | 5.5E-05 ± 1.3E-05 |                  |
|                       | Nearby Communities | 8                 | 1           | -3.3E-06 ± 1.3E-05 | 7.4E-06 ± 4.3E-06  | N945    | 53                | 5           | 4.9E-07 ± 3.9E-06  | 1.0E-05 ± 3.7E-06 | 2.0E-03          |
|                       | Distant Community  | 2                 | 0           | 2.4E-07 ± 3.9E-06  | 2.2E-06 ± 2.6E-06  | N909    | 15                | 0           | -5.6E-08 ± 2.6E-06 | 2.7E-06 ± 2.6E-06 |                  |
| <sup>241</sup> Am     | Onsite             | 2                 | 0           | -6.7E-05 ± 6.5E-05 | -3.5E-05 ± 3.5E-04 | N909    | 16                | 0           | -7.2E-04 ± 3.1E-03 | 1.8E-03 ± 2.1E-03 |                  |
|                       | Perimeter          | 14                | 0           | -4.9E-05 ± 1.4E-03 | 1.2E-03 ± 2.3E-03  | N946    | 105               | 0           | -3.6E-04 ± 3.1E-03 | 5.1E-03 ± 5.3E-03 |                  |
|                       | Nearby Communities | 40                | 0           | -1.3E-04 ± 1.4E-03 | 1.3E-03 ± 2.5E-03  | N931    | 203               | 3           | -5.0E-05 ± 2.1E-03 | 4.0E-03 ± 3.2E-03 | 1.9E-03          |
|                       | Distant Community  | 22                | 0           | -2.8E-04 ± 2.0E-03 | 1.2E-03 ± 1.6E-03  | N941    | 145               | 0           | -1.7E-04 ± 2.3E-03 | 3.3E-03 ± 4.1E-03 |                  |

\*1 pCi = 0.037 Bq

†Number of samples with measurable concentrations of contaminant. Detection is defined as a value reported above the minimum detectable activity and above the total propagated analytical uncertainty.

‡Average ± two standard deviations of all samples analyzed.

§Maximum ± analytical uncertainty.

\*\*DOE derived concentration guides are shown for gross alpha and gross beta.

††EPA values are based on an effective dose equivalent of 10 mrem/yr (40 CFR 61, Appendix E, Table 2).



**Table C.6. Radionuclide Concentrations in Columbia River Water (Richland, WA)**

| Radionuclide <sup>†</sup>            | 2015           |         |                      |                     | 2010-2014            |         |                      |                     | WA Ambient Surface Water Quality Standard <sup>§</sup> |     |
|--------------------------------------|----------------|---------|----------------------|---------------------|----------------------|---------|----------------------|---------------------|--|-----|
|                                      | Number of      |         | Concentration*       |                     | Number of            |         | Concentration*       |                     |  |     |
|                                      | Samples        | Detects | Maximum              | Average             | Samples              | Detects | Maximum              | Average             |  |     |
|                                      |                |         | (pCi/L) <sup>‡</sup> |                     |                      |         | (pCi/L) <sup>‡</sup> |                     |  |     |
| <b>Composite System</b>              |                |         |                      |                     |                      |         |                      |                     |  |     |
| Strontium-90                         | 13             | 0       | 4.83E-02 ± 3.63E-02  | 1.83E-02 ± 3.97E-02 | 60                   | 0       | 5.58E-02 ± 3.70E-02  | 1.59E-02 ± 4.75E-02 | 8  |     |
| Tritium                              | 13             | 13      | 4.18E+01 ± 7.30E+00  | 3.00E+01 ± 1.17E+01 | 62                   | 60      | 1.08E+02 ± 1.70E+01  | 3.17E+01 ± 3.02E+01 | 20000  |     |
| Technetium-99                        | 13             | 0       | 5.01E-01 ± 4.30E-01  | 1.32E-01 ± 3.81E-01 | 60                   | 0       | 6.18E-01 ± 4.48E-01  | 2.06E-02 ± 4.88E-01 | 900  |     |
| Uranium-234                          | 13             | 13      | 3.13E-01 ± 9.4E-02   | 2.73E-01 ± 4.62E-02 | 60                   | 60      | 3.46E-01 ± 7.32E-02  | 2.60E-01 ± 7.35E-02 | --**   |     |
| Uranium-235                          | 13             | 5       | 7.81E-02 ± 3.46E-02  | 2.74E-02 ± 3.76E-02 | 60                   | 18      | 3.70E-02 ± 2.43E-02  | 1.36E-02 ± 1.98E-02 | --   |     |
| Uranium-238                          | 13             | 13      | 2.55E-01 ± 6.15E-02  | 2.21E-01 ± 3.79E-02 | 60                   | 0       | 2.90E-01 ± 6.46E-02  | 2.14E-01 ± 6.37E-02 | --   |     |
| <b>Continuous System</b>             |                |         |                      |                     |                      |         |                      |                     |  |     |
| Cesium-137                           | D <sup>†</sup> | 12      | 0                    | 6.09E-04 ± 1.44E-03 | -3.67E-04 ± 1.41E-03 | 32      | 0                    | 1.67E-03 ± 3.08E-03 | -3.06E-05 ± 1.90E-03                                   | 200 |
|                                      | P <sup>†</sup> | 12      | 0                    | 3.82E-03 ± 3.05E-03 | 2.37E-04 ± 3.82E-03  | 32      | 0                    | 5.98E-03 ± 4.71E-03 | 1.02E-03 ± 4.10E-03                                    |     |
| Plutonium-238 <sup>††</sup>          | D <sup>†</sup> | 12      | 0                    | 6.85E-05 ± 7.45E-05 | -1.3E-06 ± 6.17E-05  | 11      | 0                    | 8.71E-05 ± 9.27E-05 | 1.75E-05 ± 5.65E-05                                    | 600 |
|                                      | P <sup>†</sup> | 12      | 0                    | 1.64E-04 ± 1.67E-04 | 1.94E-05 ± 1.41E-04  | 11      | 1                    | 3.59E-04 ± 1.57E-04 | 6.54E-05 ± 2.07E-04                                    |     |
| Plutonium-239/<br>-240 <sup>††</sup> | D <sup>†</sup> | 12      | 0                    | 6.31E-05 ± 8.33E-05 | 7.84E-06 ± 4.97E-05  | 11      | 0                    | 3.12E-05 ± 1.06E-04 | 6.01E-06 ± 2.91E-05                                    | --  |
|                                      | P <sup>†</sup> | 12      | 0                    | 7.02E-05 ± 2.47E-04 | -5.17E-06 ± 2.24E-04 | 11      | 0                    | 1.35E-04 ± 1.26E-04 | 3.41E-05 ± 1.09E-04                                    |     |

\*Maximum values are ± total propagated analytical uncertainty (2 sigma). Averages are ±2 standard deviations of the mean.

<sup>†</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>‡</sup>1 pCi = 0.037 Bq

<sup>§</sup>WAC 173-201A-250 and EPA-570/9-76-003; WAC 246-290; 40 CFR 141.

\*\*Dashes indicate no concentration guides available.

<sup>††</sup>Plutonium-238 and Plutonium 239/240 were analyzed quarterly in previous years resulting in less samples.

C.7

**Table C.7. Radionuclide Concentrations in Columbia River Water (Priest Rapids Dam, WA)**

| Radionuclide†            | 2015      |         |                     |                      | 2010-2014 |         |                     |                      | WA Ambient Surface Water Quality Standard§ |
|--------------------------|-----------|---------|---------------------|----------------------|-----------|---------|---------------------|----------------------|--|
|                          | Number of |         | Concentration*      |                      | Number of |         | Concentration*      |                      |  |
|                          | Samples   | Detects | Maximum             | Average              | Samples   | Detects | Maximum             | Average              |  |
|                          |           |         | (pCi/L)‡            | (pCi/L)‡             |           |         | (pCi/L)‡            | (pCi/L)‡             |  |
| <b>Composite System</b>  |           |         |                     |                      |           |         |                     |                      |  |
| Strontium-90             | 13        | 0       | 3.34E-02 ± 2.95E-02 | -1.41E-03 ± 4.27E-02 | 60        | 1       | 1.30E-01 ± 5.04E-02 | 1.82E-02 ± 5.19E-02  | 8  |
| Tritium                  | 13        | 13      | 2.98E+01 ± 6.72E+00 | 1.65E+01 ± 1.12E+01  | 63        | 60      | 4.21E+01 ± 5.47E+01 | 1.82E+01 ± 1.16E+01  | 20000                                      |
| Technetium-99            | 13        | 0       | 6.01E-01 ± 4.18E-01 | -1.06E-01 ± 4.79E-01 | 60        | 0       | 4.76E-01 ± 4.56E-01 | -1.35E-02 ± 4.60E-01 | 900  |
| Uranium-234              | 13        | 13      | 3.23E-01 ± 5.92E-02 | 2.51E-01 ± 6.27E-02  | 60        | 60      | 3.18E-01 ± 7.18E-02 | 2.20E-01 ± 6.79E-02  | --**                                       |
| Uranium-235              | 13        | 7       | 7.37E-02 ± 3.25E-02 | 2.88E-02 ± 3.97E-02  | 60        | 13      | 2.93E-02 ± 2.15E-02 | 1.02E-02 ± 1.52E-02  | --   |
| Uranium-238              | 13        | 13      | 2.22E-01 ± 5.40E-02 | 1.94E-01 ± 3.58E-02  | 60        | 60      | 2.41E-01 ± 6.19E-02 | 1.81E-01 ± 5.82E-02  | --   |
| <b>Continuous System</b> |           |         |                     |                      |           |         |                     |                      |  |
| Cesium-137               | D†        | 13      | 1.10E-03 ± 1.21E-03 | 2.85E-05 ± 1.3E-03   | 34        | 0       | 4.00E-03 ± 2.73E-03 | 4.92E-04 ± 1.89E-03  | 200  |
|                          | P†        | 12      | 5.14E-03 ± 2.94E-03 | 4.64E-04 ± 4.28E-03  | 33        | 0       | 3.84E-03 ± 4.00E-03 | 6.50E-04 ± 4.04E-03  |  |
| Plutonium-238            | D†        | 13      | 5.35E-05 ± 6.97E-05 | 1.72E-06 ± 4.75E-05  | 11        | 0       | 4.46E-05 ± 7.36E-05 | 7.04E-06 ± 3.05E-05  | 600  |
|                          | P†        | 12      | 5.15E-04 ± 1.69E-04 | 1.74E-05 ± 3.76E-04  | 11        | 1       | 1.86E-04 ± 1.46E-04 | 2.96E-05 ± 1.12E-04  |  |
| Plutonium-239/-240       | D†        | 13      | 8.76E-05 ± 7.32E-05 | 1.07E-05 ± 5.65E-05  | 11        | 0       | 2.54E-05 ± 6.30E-05 | 2.46E-06 ± 3.56E-05  | --   |
|                          | P†        | 12      | 2.42E-04 ± 2.35E-04 | 4.37E-05 ± 1.56E-04  | 11        | 0       | 6.78E-05 ± 1.21E-04 | 9.56E-06 ± 7.83E-05  |  |

\*Maximum values are ± total propagated analytical uncertainty (2 sigma). Averages are ±2 standard deviations of the mean.

†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).

‡1 pCi = 0.037 Bq

§WAC 173-201A-250 and EPA-570/9-76-003; WAC 246-290; 40 CFR 141.

\*\*Dashes indicate no concentration guides available.

††Plutonium-238 and Plutonium 239/240 were analyzed quarterly in previous years resulting in less samples.

**Table C.8. Radionuclide Concentrations in Columbia River Transect Water Samples**

| Transect/Radionuclide                                  | No. of<br>Detections | No. of<br>Samples | Concentration*     |              |
|--|----------------------|-------------------|--------------------|--------------|
|  |                      |                   | Maximum            | Average      |
|  |                      |                   | Maximum            | Average      |
|  |                      |                   | pCi/L <sup>†</sup> |              |
| <b>Vernita Bridge (Hanford River Marker [HRM] 0.3)</b> |                      |                   |                    |              |
| Strontium-90   | 0                    | 9                 | 0.45 ± 0.04        | 0.01 ± 0.05  |
| Technitium-99  | 0                    | 9                 | 0.46 ± 0.39        | 0.15 ± 0.37  |
| Tritium  | 9                    | 9                 | 19.0 ± 5.7         | 14.9 ± 4.8   |
| Uranium-234  | 9                    | 9                 | 0.28 ± 0.07        | 0.24 ± 0.07  |
| Uranium-235  | 6                    | 9                 | 0.06 ± 0.03        | 0.03 ± 0.03  |
| Uranium-238  | 9                    | 9                 | 0.20 ± 0.05        | 0.17 ± 0.04  |
| <b>100—N Area (HRM 9.5)</b>                            |                      |                   |                    |              |
| Strontium-90   | 0                    | 5                 | 0.03 ± 0.03        | 0.02 ± 0.03  |
| Tritium  | 5                    | 5                 | 54.2 ± 9.0         | 22.1 ± 32.6  |
| Uranium-234  | 5                    | 5                 | 0.26 ± 0.06        | 0.22 ± 0.05  |
| Uranium-235  | 0                    | 5                 | 0.02 ± 0.02        | 0.01 ± 0.01  |
| Uranium-238  | 5                    | 5                 | 0.18 ± 0.05        | 0.17 ± 0.01  |
| <b>Hanford Townsite (HRM 28.7)</b>                     |                      |                   |                    |              |
| Strontium-90   | 0                    | 5                 | 0.018 ± 0.03       | 0.01 ± 0.008 |
| Tritium  | 5                    | 5                 | 79.5 ± 12.3        | 30.9 ± 48.9  |
| Uranium-234  | 5                    | 5                 | 0.24 ± 0.06        | 0.22 ± 0.04  |
| Uranium-235  | 3                    | 5                 | 0.02 ± 0.02        | 0.01 ± 0.02  |
| Uranium-238  | 5                    | 5                 | 0.19 ± 0.05        | 0.18 ± 0.02  |
| <b>300 Area (HRM 43.1)</b>                             |                      |                   |                    |              |
| Strontium-90   | 0                    | 6                 | 0.04 ± 0.03        | 0.02 ± 0.02  |
| Tritium  | 6                    | 6                 | 22.2 ± 5.7         | 15.9 ± 6.4   |
| Uranium-234  | 6                    | 6                 | 0.30 ± 0.07        | 0.23 ± 0.10  |
| Uranium-235  | 4                    | 6                 | 0.03 ± 0.02        | 0.02 ± 0.15  |
| Uranium-238  | 6                    | 6                 | 0.23 ± 0.06        | 0.19 ± 0.04  |
| <b>Richland (HRM 46.4)</b>                             |                      |                   |                    |              |
| Strontium-90   | 0                    | 12                | 0.04 ± 0.03        | -0.01 ± 0.05 |
| Technitium-99  | 1                    | 12                | 0.62 ± 0.38        | 0.33 ± 0.29  |
| Tritium  | 12                   | 12                | 24.9 ± 6.7         | 17.4 ± 8.0   |
| Uranium-234  | 12                   | 12                | 0.29 ± 0.11        | 0.25 ± 0.04  |
| Uranium-235  | 5                    | 12                | 0.06 ± 0.06        | 0.02 ± 0.03  |
| Uranium-238  | 12                   | 12                | 0.24 ± 0.05        | 0.20 ± 0.06  |

\*Maximum and minimum values are ± total propagated analytical uncertainty (2 sigma).

<sup>†</sup>1 pCi = 0.037 Bq

**Table C.9.** Dissolved Metal Concentrations in Columbia River Transect Water Near the Hanford Site

| Metal                   | No. of Samples | No. of Detections | Maximum (µg/L) | Minimum (µg/L) | Average (±2 standard deviation) (µg/L) |       | Minimum Detectable Concentrations | WA State Ambient Surface Water Quality Chronic Toxicity Level† |
|-------------------------|----------------|-------------------|----------------|----------------|--|-------|-----------------------------------|--|
|                         |                |                   |                |                |  |       |                                   |  |
| <b>Vernita Bridge</b>   |                |                   |                |                |  |       |                                   |  |
| Antimony                | 9              | 0                 | —*             | —              | —                                      | —     | 1                                 | N/A  |
| Arsenic                 | 9              | 0                 | —              | —              | —                                      | —     | 1.7                               | 190  |
| Beryllium               | 9              | 0                 | —              | —              | —                                      | —     | 0.2                               | N/A  |
| Cadmium                 | 9              | 0                 | —              | —              | —                                      | —     | 0.11                              | N/A  |
| Chromium                | 9              | 0                 | —              | —              | —                                      | —     | 2                                 | 10   |
| Copper                  | 9              | 9                 | 0.64           | 0.45           | 0.54                                   | 0.13  | 0.35                              | 6  |
| Lead                    | 9              | 0                 | —              | —              | —                                      | —     | 0.5                               | 1.1  |
| Nickel                  | 9              | 0                 | —              | —              | —                                      | —     | 0.5                               | 83   |
| Selenium                | 9              | 0                 | —              | —              | —                                      | —     | 1.5                               | 5  |
| Silver                  | 9              | 0                 | —              | —              | —                                      | —     | 0.2                               | N/A  |
| Thallium                | 9              | 0                 | —              | —              | —                                      | —     | 0.45                              | N/A  |
| Uranium                 | 9              | 9                 | 0.57           | 0.47           | 0.51                                   | 0.073 | 0.067                             | N/A  |
| Zinc                    | 9              | 4                 | 6.1            | 3.5            | 4.3                                    | 2.04  | 3.5                               | 55   |
| <b>100-N Area</b>       |                |                   |                |                |  |       |                                   |  |
| Antimony                | 5              | 0                 | —              | —              | —                                      | —     | 1                                 | N/A  |
| Arsenic                 | 5              | 0                 | —              | —              | —                                      | —     | 1.7                               | 190  |
| Beryllium               | 5              | 0                 | —              | —              | —                                      | —     | 0.2                               | N/A  |
| Cadmium                 | 5              | 0                 | —              | —              | —                                      | —     | 0.11                              | N/A  |
| Chromium                | 5              | 0                 | —              | —              | —                                      | —     | 2                                 | 10   |
| Copper                  | 5              | 5                 | 0.57           | 0.5            | 0.53                                   | 0.047 | 0.35                              | 6  |
| Lead                    | 5              | 0                 | —              | —              | —                                      | —     | 0.5                               | 1.1  |
| Nickel                  | 5              | 0                 | —              | —              | —                                      | —     | 0.5                               | 83   |
| Selenium                | 5              | 0                 | —              | —              | —                                      | —     | 1.5                               | 5  |
| Silver                  | 5              | 0                 | —              | —              | —                                      | —     | 0.2                               | N/A  |
| Thallium                | 5              | 0                 | —              | —              | —                                      | —     | 0.45                              | N/A  |
| Uranium                 | 5              | 5                 | 0.5            | 0.47           | 0.48                                   | 0.02  | 0.067                             | N/A  |
| Zinc                    | 5              | 0                 | —              | —              | —                                      | —     | 3.5                               | 55   |
| <b>Hanford Townsite</b> |                |                   |                |                |  |       |                                   |  |
| Antimony                | 5              | 0                 | —              | —              | —                                      | —     | 1                                 | N/A  |
| Arsenic                 | 5              | 2                 | 1.8            | 1.7            | 1.73                                   | 0.078 | 1.7                               | 190  |
| Beryllium               | 5              | 0                 | —              | —              | —                                      | —     | 0.2                               | N/A  |
| Cadmium                 | 5              | 0                 | —              | —              | —                                      | —     | 0.11                              | N/A  |
| Chromium                | 5              | 0                 | —              | —              | —                                      | —     | 2                                 | 10   |
| Copper                  | 5              | 5                 | 0.55           | 0.47           | 0.5                                    | 0.063 | 0.35                              | 6  |
| Lead                    | 5              | 0                 | —              | —              | —                                      | —     | 0.5                               | 1.1  |
| Nickel                  | 5              | 0                 | —              | —              | —                                      | —     | 0.5                               | 83   |
| Selenium                | 5              | 0                 | —              | —              | —                                      | —     | 1.5                               | 5  |
| Silver                  | 5              | 0                 | —              | —              | —                                      | —     | 0.2                               | N/A  |
| Thallium                | 5              | 0                 | —              | —              | —                                      | —     | 0.45                              | N/A  |
| Uranium                 | 5              | 5                 | 0.65           | 0.46           | 0.51                                   | 0.15  | 0.067                             | N/A  |
| Zinc                    | 5              | 0                 | —              | —              | —                                      | —     | 3.5                               | 55   |
| <b>300 Area</b>         |                |                   |                |                |  |       |                                   |  |
| Antimony                | 6              | 0                 | —              | —              | —                                      | —     | 1                                 | N/A  |
| Arsenic‡                | 6              | 1                 | 1.73           | 1.7            | 1.71                                   | 0.022 | 1.7                               | 190  |
| Beryllium               | 6              | 0                 | —              | —              | —                                      | —     | 0.2                               | N/A  |
| Cadmium                 | 6              | 0                 | —              | —              | —                                      | —     | 0.11                              | N/A  |
| Chromium                | 6              | 0                 | —              | —              | —                                      | —     | 2                                 | 10   |

**Table C.9.** Dissolved Metal Concentrations in Columbia River Transect Water Near the Hanford Site

| Metal           | No. of Samples | No. of Detections | Maximum (µg/L) | Minimum (µg/L) | Average (±2 standard deviation) (µg/L) |       | Minimum Detectable Concentrations | WA State Ambient Surface Water Quality Chronic Toxicity Level <sup>†</sup> |
|-----------------|----------------|-------------------|----------------|----------------|--|-------|-----------------------------------|--|
|                 |                |                   |                |                |  |       |                                   |  |
| Copper          | 6              | 6                 | 0.77           | 0.48           | 0.57                                   | 0.19  | 0.35                              | 6  |
| Lead            | 6              | 0                 | —              | —              | —                                      | —     | 0.5                               | 1.1  |
| Nickel          | 6              | 0                 | —              | —              | —                                      | —     | 0.5                               | 83   |
| Selenium        | 6              | 0                 | —              | —              | —                                      | —     | 1.5                               | 5  |
| Silver          | 6              | 0                 | —              | —              | —                                      | —     | 0.2                               | N/A  |
| Thallium        | 6              | 0                 | —              | —              | —                                      | —     | 0.45                              | N/A  |
| Uranium         | 6              | 6                 | 0.54           | 0.48           | 0.5                                    | 0.053 | 0.067                             | N/A  |
| Zinc            | 6              | 0                 | —              | —              | —                                      | —     | 3.5                               | 55   |
| <b>Richland</b> |                |                   |                |                |  |       |                                   |  |
| Antimony        | 12             | 0                 | —              | —              | —                                      | —     | 1                                 | N/A  |
| Arsenic         | 12             | 0                 | —              | —              | —                                      | —     | 1.7                               | 190  |
| Beryllium       | 12             | 0                 | —              | —              | —                                      | —     | 0.2                               | N/A  |
| Cadmium         | 12             | 0                 | —              | —              | —                                      | —     | 0.11                              | N/A  |
| Chromium        | 12             | 0                 | —              | —              | —                                      | —     | 2                                 | 10   |
| Copper          | 12             | 12                | 0.96           | 0.44           | 0.6                                    | 0.26  | 0.35                              | 6  |
| Lead            | 12             | 0                 | —              | —              | —                                      | —     | 0.5                               | 1.1  |
| Nickel          | 12             | 0                 | —              | —              | —                                      | —     | 0.5                               | 83   |
| Selenium        | 12             | 0                 | —              | —              | —                                      | —     | 1.5                               | 5  |
| Silver          | 12             | 0                 | —              | —              | —                                      | —     | 0.2                               | N/A  |
| Thallium        | 12             | 0                 | —              | —              | —                                      | —     | 0.45                              | N/A  |
| Uranium         | 12             | 12                | 0.63           | 0.47           | 0.54                                   | 0.093 | 0.067                             | N/A  |
| Zinc            | 12             | 6                 | 5.2            | 3.5            | 4                                      | 1.2   | 3.5                               | 55   |

\*Dashes indicate results at or below minimum detectable concentrations.

<sup>†</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, minimum USGS value of 47 mg CaCO<sub>3</sub>/L was used for 1992–2000 water samples collected near Vernita Bridge. Ppm values are equivalent to reported µg/L concentrations shown.

<sup>‡</sup>Single detected value.

**Table C.10. Radionuclide Concentrations in Columbia River and Shoreline Sediment Near the Hanford Site**

| Sediment Location           | Radionuclide       | 2015           |                |                                 |   |          | 2010–2014      |                |                                 |   |           |
|-----------------------------|--------------------|----------------|----------------|---------------------------------|---|----------|----------------|----------------|---------------------------------|---|-----------|
|                             |                    | No. of Samples | No. of Detects | Maximum Concentration*<br>pCi/g |   |          | No. of Samples | No. of Detects | Average Concentration*<br>pCi/g |   |           |
| Adjacent to Locke Island†   | Cesium-137         | 1              | 0              | 4.02E-03                        | ± | 1.70E-02 | 2              | 0              | 9.33E-03                        | ± | 2.14E-02  |
|                             | Cobalt-60          | 1              | 0              | 6.25E-03                        | ± | 1.44E-02 | 2              | 0              | -9.72E-03                       | ± | 1.82E-02  |
|                             | Europium-152       | 1              | 0              | -1.05E-02                       | ± | 3.60E-02 | 2              | 0              | -1.42E-02                       | ± | 1.21E-02  |
|                             | Europium-155‡      | 1              | 0              |                                 |   | N/A      | 2              | 0              |                                 |   | N/A       |
|                             | Plutonium-239/-240 | 1              | 0              | 5.49E-04                        | ± | 7.39E-04 | 2              | 0              | 2.40E-03                        | ± | 4.29E-03  |
|                             | Uranium-234        | 1              | 1              | 1.47E+00                        | ± | 3.10E-01 | 2              | 2              | 1.35E+00                        | ± | 2.00E-02  |
|                             | Uranium-235        | 1              | 1              | 8.84E-02                        | ± | 6.71E-02 | 2              | 2              | 9.11E-02                        | ± | 3.00E-04  |
|                             | Uranium-238        | 1              | 1              | 1.23E+00                        | ± | 2.74E-01 | 2              | 2              | 1.40E+00                        | ± | 9.00E-02  |
| Adjacent to Salvage Island† | Cesium-137         | 1              | 1              | 2.85E-02                        | ± | 1.84E-02 | 2              | 2              | 4.07E-02                        | ± | 8.80E-03  |
|                             | Cobalt-60          | 1              | 0              | 7.05E-03                        | ± | 1.55E-02 | 2              | 0              | 5.48E-03                        | ± | 1.28E-02  |
|                             | Europium-152       | 1              | 0              | -7.95E-03                       | ± | 3.56E-02 | 2              | 0              | -1.68E-02                       | ± | -3.35E-02 |
|                             | Europium-155‡      | 1              | 0              |                                 |   | N/A      | 2              | 0              | 3.24E-02                        | ± | 5.60E-02  |
|                             | Plutonium-239/-240 | 1              | 0              | 3.88E-04                        | ± | 6.48E-04 | 2              | 0              | 1.60E-03                        | ± | 3.37E-03  |
|                             | Uranium-234        | 1              | 1              | 1.03E+00                        | ± | 2.39E-01 | 2              | 2              | 7.23E-01                        | ± | 1.07E-01  |
|                             | Uranium-235        | 1              | 1              | 8.65E-02                        | ± | 6.56E-02 | 2              | 2              | 5.42E-02                        | ± | 1.82E-02  |
|                             | Uranium-238        | 1              | 1              | 9.01E-01                        | ± | 2.18E-01 | 2              | 2              | 6.80E-01                        | ± | 1.51E-01  |
| 100-D Spring 102-1          | Cesium-137         | 1              | 1              | 1.25E-01                        | ± | 1.95E-02 | 3              | 3              | 1.43E-01                        | ± | 9.35E-02  |
|                             | Cobalt-60          | 1              | 1              | 6.17E-02                        | ± | 1.91E-02 | 3              | 0              | 9.27E-04                        | ± | 1.06E-02  |
|                             | Europium-152       | 1              | 0              | 2.99E-02                        | ± | 2.98E-02 | 3              | 0              | 1.20E-02                        | ± | 5.98E-02  |
|                             | Europium-155‡      | 1              | 0              |                                 |   | N/A      | 3              | 0              | 4.25E-02                        | ± | 8.82E-03  |
|                             | Plutonium-239/-240 | 1              | 1              | 2.29E-03                        | ± | 9.40E-04 | 3              | 1              | 8.62E-04                        | ± | 3.07E-03  |
|                             | Uranium-234        | 1              | 1              | 5.04E-01                        | ± | 9.04E-02 | 3              | 3              | 4.56E-01                        | ± | 1.33E-01  |
|                             | Uranium-235        | 1              | 1              | 6.20E-02                        | ± | 3.61E-02 | 3              | 3              | 4.48E-02                        | ± | 1.69E-02  |
|                             | Uranium-238        | 1              | 1              | 5.51E-01                        | ± | 9.41E-02 | 3              | 3              | 4.76E-01                        | ± | 4.20E-02  |
| 100F Slough                 | Cesium-137         | 2              | 2              | 1.66E-01                        | ± | 2.74E-02 | 4              | 4              | 2.08E-01                        | ± | 4.74E-02  |
|                             | Cobalt-60          | 2              | 0              | -4.64E-04                       | ± | 1.07E-02 | 4              | 0              | 9.35E-03                        | ± | 1.68E-02  |
|                             | Europium-152       | 2              | 0              | 1.21E-02                        | ± | 2.91E-02 | 4              | 0              | 5.09E-03                        | ± | 5.57E-02  |
|                             | Europium-155       | 2              | 0              | 3.02E-02                        | ± | 4.23E-02 | 4              | 0              | 5.25E-02                        | ± | 4.21E-02  |
|                             | Plutonium-239/-240 | 2              | 2              | 1.83E-03                        | ± | 7.65E-04 | 4              | 0              | 2.23E-03                        | ± | 2.56E-03  |
|                             | Uranium-234        | 2              | 2              | 7.17E-01                        | ± | 1.67E-01 | 4              | 4              | 4.66E-01                        | ± | 1.61E-01  |
|                             | Uranium-235        | 2              | 2              | 7.38E-02                        | ± | 5.61E-02 | 4              | 4              | 5.08E-02                        | ± | 2.45E-02  |
|                             | Uranium-238        | 2              | 2              | 6.08E-01                        | ± | 1.51E-01 | 4              | 4              | 4.27E-01                        | ± | 2.43E-02  |
| 100-K Spring 63-1           | Cesium-137         | 1              | 1              | 1.16E-01                        | ± | 2.55E-02 | 2              | 2              | 6.99E-02                        | ± | 8.62E-02  |
|                             | Cobalt-60          | 1              | 0              | -2.17E-03                       | ± | 1.48E-02 | 2              | 0              | 1.84E-03                        | ± | 2.27E-03  |
|                             | Europium-152       | 1              | 0              | -3.06E-02                       | ± | 5.15E-02 | 2              | 0              | 2.38E-02                        | ± | 5.09E-02  |
|                             | Europium-155‡      | 1              | 0              |                                 |   | N/A      | 2              | 0              | 5.70E-02                        | ± | 3.68E-02  |
|                             | Plutonium-239/-240 | 1              | 1              | 2.47E-03                        | ± | 7.88E-04 | 0              | 0              |                                 |   | N/A       |
|                             | Uranium-234        | 1              | 1              | 1.09E+00                        | ± | 1.50E-01 | 2              | 2              | 6.02E-01                        | ± | 2.28E-01  |
|                             | Uranium-235        | 1              | 1              | 5.44E-02                        | ± | 3.14E-02 | 2              | 2              | 4.22E-02                        | ± | 1.37E-02  |
|                             | Uranium-238        | 1              | 1              | 9.36E-01                        | ± | 1.34E-01 | 2              | 2              | 5.79E-01                        | ± | 2.22E-01  |

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**Table C.10. Radionuclide Concentrations in Columbia River and Shoreline Sediment Near the Hanford Site**

| Sediment Location   | Radionuclide       | 2015           |                |                                 |            | 2010–2014      |                |                                 |            |
|---------------------|--------------------|----------------|----------------|---------------------------------|------------|----------------|----------------|---------------------------------|------------|
|                     |                    | No. of Samples | No. of Detects | Maximum Concentration*<br>pCi/g |            | No. of Samples | No. of Detects | Average Concentration*<br>pCi/g |            |
| Hanford Slough      | Cesium-137         | 1              | 1              | 2.69E-01                        | ± 6.29E-02 | 6              | 6              | 2.49E-01                        | ± 4.41E-02 |
|                     | Cobalt-60          | 1              | 0              | -5.21E-03                       | ± 3.18E-02 | 6              | 0              | 1.33E-03                        | ± 5.49E-02 |
|                     | Europium-152       | 1              | 0              | 3.16E-02                        | ± 4.78E-02 | 6              | 0              | 4.12E-02                        | ± 5.82E-02 |
|                     | Europium-155†      | 1              | 0              |                                 | N/A        | 6              | 0              | 4.43E-02                        | ± 1.06E-01 |
|                     | Plutonium-239/-240 | 1              | 1              | 2.49E-03                        | ± 7.88E-04 | 6              | 3              | 2.89E-03                        | ± 1.66E-03 |
|                     | Uranium-234        | 1              | 1              | 7.47E-01                        | ± 1.50E-01 | 6              | 6              | 1.31E+00                        | ± 2.50E+00 |
|                     | Uranium-235        | 1              | 1              | 9.23E-02                        | ± 6.57E-02 | 6              | 5              | 7.86E-02                        | ± 1.73E-01 |
|                     | Uranium-238        | 1              | 1              | 7.84E-01                        | ± 1.95E-01 | 6              | 6              | 7.52E-01                        | ± 4.04E-01 |
| McNary Dam          | Cesium-137         | 2              | 2              | 2.59E-01                        | ± 3.26E-02 | 10             | 10             | 2.31E-01                        | ± 4.26E-02 |
|                     | Cobalt-60          | 2              | 0              | 9.67E-03                        | ± 1.62E-02 | 10             | 0              | 5.06E-03                        | ± 4.20E-02 |
|                     | Europium-152       | 2              | 0              | 3.42E-02                        | ± 4.93E-02 | 10             | 0              | 5.18E-02                        | ± 8.06E-02 |
|                     | Europium-155†      | 2              | 0              |                                 | N/A        | 10             | 0              | 8.71E-02                        | ± 3.33E-02 |
|                     | Plutonium-239/-240 | 2              | 2              | 9.22E-03                        | ± 1.82E-03 | 10             | 7              | 9.00E-03                        | ± 8.71E-03 |
|                     | Uranium-234        | 2              | 2              | 1.38E+00                        | ± 2.81E-01 | 10             | 10             | 1.45E+00                        | ± 2.54E-01 |
|                     | Uranium-235        | 2              | 2              | 9.54E-02                        | ± 6.41E-02 | 10             | 10             | 7.57E-02                        | ± 2.61E-02 |
|                     | Uranium-238        | 2              | 2              | 1.32E+00                        | ± 2.71E-01 | 10             | 10             | 1.23E+00                        | ± 1.77E-01 |
| Priest Rapids Dam   | Cesium-137         | 2              | 2              | 2.46E-01                        | ± 3.45E-02 | 10             | 10             | 2.75E-01                        | ± 8.69E-02 |
|                     | Cobalt-60          | 2              | 0              | 1.03E-02                        | ± 1.53E-02 | 10             | 0              | -6.87E-03                       | ± 1.33E-02 |
|                     | Europium-152       | 2              | 2              | -2.42E-02                       | ± 4.08E-02 | 10             | 10             | -2.84E-03                       | ± 8.31E-02 |
|                     | Europium-155       | 2              | 0              | 3.76E-02                        | ± 4.19E-02 | 10             | 0              | 6.84E-02                        | ± 5.49E-02 |
|                     | Plutonium-239/-240 | 2              | 2              | 1.00E-02                        | ± 1.76E-03 | 10             | 10             | 9.76E-03                        | ± 2.36E-03 |
|                     | Uranium-234        | 2              | 2              | 1.34E+00                        | ± 2.88E-01 | 10             | 10             | 1.18E+00                        | ± 2.93E-01 |
|                     | Uranium-235        | 2              | 2              | 9.96E-02                        | ± 6.70E-02 | 10             | 10             | 6.60E-02                        | ± 4.51E-02 |
|                     | Uranium-238        | 2              | 2              | 1.09E+00                        | ± 2.40E-01 | 10             | 10             | 1.08E+00                        | ± 2.59E-01 |
| White Bluffs Slough | Cesium-137         | 1              | 1              | 2.94E-01                        | ± 3.66E-02 | 5              | 5              | 4.06E-01                        | ± 1.09E-01 |
|                     | Cobalt-60          | 1              | 0              | 4.60E-03                        | ± 1.13E-02 | 5              | 0              | 4.32E-03                        | ± 2.37E-02 |
|                     | Europium-152†      | 1              | 0              |                                 | N/A        | 5              | 0              | 1.06E-01                        | ± 1.53E-01 |
|                     | Europium-155†      | 1              | 0              |                                 | N/A        | 5              | 0              | 8.31E-02                        | ± 3.28E-02 |
|                     | Plutonium-239/-240 | 1              | 1              | 3.76E-03                        | ± 1.09E-03 | 5              | 2              | 3.05E-03                        | ± 2.54E-03 |
|                     | Uranium-234        | 1              | 1              | 7.36E-01                        | ± 1.83E-01 | 5              | 5              | 9.15E-01                        | ± 2.96E-01 |
|                     | Uranium-235        | 1              | 1              | 1.15E-01                        | ± 7.02E-02 | 5              | 5              | 4.51E-02                        | ± 9.00E-03 |
|                     | Uranium-238        | 1              | 1              | 7.98E-01                        | ± 1.91E-01 | 5              | 5              | 8.78E-01                        | ± 3.81E-01 |

\*1 mg/kg = ug/kg divided by 1000

†Adjacent to Locke and Savage Island sediment was analyzed in 2013 and 2014 but testing did not include TOC analyses.

‡These samples were rejected by the analytical laboratory due to low abundance.

**Table C.11.** Dissolved Metal Concentrations in Columbia River Sediment Near the Hanford Site

| Metal                 | Priest Rapids Dam<br>(mg/kg dry weight) | Hanford Reach*<br>(mg/kg dry weight) | McNary Dam<br>(mg/kg dry weight) |
|-----------------------|---|--------------------------------------|----------------------------------|
| Antimony              | 1.46–1.79                               | 0.52–5.5                             | 0.79–0.98                        |
| Arsenic               | 10.2–12.2                               | 2.4–8.2                              | 9.6–10.5                         |
| Beryllium             | 1.27–1.40                               | 0.45–1.28                            | 1.4–1.6                          |
| Cadmium               | 4.1–6.5                                 | 0.16–2.1                             | 1.3–1.6                          |
| Chromium              | 35.5–40.3                               | 12.9–96.5                            | 25.8–25.8                        |
| Copper                | 43.6–58.3                               | 9.7–23.9                             | 29.6–33.6                        |
| Lead                  | 42.4–45.8                               | 9.1–48.6                             | 22.9–24.5                        |
| Mercury               | 0.12–0.13                               | 0.01–0.05                            | 0.007–0.087                      |
| Nickel                | 39.1–43.7                               | 10.1–20.9                            | 24.7–25.1                        |
| Selenium              | 9.2–9.6                                 | 0.72–8.5                             | 9.2–9.8                          |
| Silver                | 0.25–0.31                               | 0.12–0.74                            | 0.29–0.31                        |
| Thallium              | 1.5–2.2                                 | 0.61–0.92                            | 1.1–1.2                          |
| Zinc                  | 428–547                                 | 47.0–362                             | 215–257                          |
| <b>No. of Samples</b> | <b>2</b>                                | <b>8</b>                             | <b>2</b>                         |

\*100-F Slough (n=2), Hanford Slough (n=1), White Bluffs Slough (n=1), 100-D Spring 102-1 (n=1), 100-K 63-1 (n=1), Adjacent to Locke Island (n=1), Adjacent to Savage Island (n=1); where n = number of samples.

**Table C.12.** Total Organic Carbon in Columbia River Sediment

| Sediment Location           | No. of<br>Samples | 2015<br>Concentration* |                  | No. of<br>Samples | 2010-2014<br>Concentration* |                  |
|-----------------------------|-------------------|------------------------|------------------|-------------------|-----------------------------|------------------|
|                             |                   | Minimum<br>mg/kg       | Maximum<br>mg/kg |                   | Minimum<br>mg/kg            | Maximum<br>mg/kg |
| Adjacent to Locke Island†   | 1                 | N/A                    | 1.17E+03         | 0                 | N/A                         | N/A              |
| Adjacent to Salvage Island† | 1                 | N/A                    | 2.24E+03         | 0                 | N/A                         | N/A              |
| 100-D Spring 102-1          | 1                 | N/A                    | 2.37E+03         | 3                 | 1.59E+03                    | 5.87E+03         |
| 100F Slough                 | 2                 | 1.75E+03               | 2.61E+03         | 4                 | 1.25E+03                    | 2.52E+03         |
| 100-K Spring 63-1           | 1                 | N/A                    | 1.39E+04         | 0                 | N/A                         | N/A              |
| Hanford Slough              | 1                 | N/A                    | 1.48E+04         | 6                 | 5.29E+03                    | 1.70E+04         |
| McNary Dam                  | 2                 | 1.58E+04               | 1.80E+04         | 10                | 4.45E+03                    | 2.42E+04         |
| Priest Rapids Dam           | 2                 | 2.47E+04               | 3.70E+04         | 10                | 1.47E+04                    | 3.95E+04         |
| White Bluffs Slough         | 1                 | N/A                    | 1.68E+04         | 6                 | 5.26E+03                    | 3.37E+04         |

\*1 mg/kg = ug/kg ÷ 1000

†Adjacent to Locke and Salvage Island sediment was analyzed in 2013 and 2014 but testing did not include TOC analyses.



Table C.13. Radionuclide Concentrations in Columbia River Shoreline Seep Water

| Location/<br>Radionuclide  | No. of<br>Samples | No. of<br>Detects | 2015<br>Concentration pCi/L* |                   | 2010–2014<br>Concentration pCi/L* |                      | WA State<br>Ambient Surface<br>Water Quality<br>Standard<br>(pCi/L)*† |
|--|-------------------|-------------------|------------------------------|-------------------|-----------------------------------|----------------------|---|
|  |                   |                   | Maximum‡                     | No. of<br>Samples | No. of<br>Detects                 | Average§             |   |
| <b>100-B Area (Spring 38-3)</b>                                    |                   |                   |                              |                   |                                   |                      |   |
| Strontium-90   | 1                 | 0                 | -6.92E-02 ± 2.85E-02         | 5                 | 0                                 | 2.68E-02 ± 3.89E-02  | 8   |
| Tritium  | 1                 | 1                 | 6.27E+02 ± 1.87E+02          | 5                 | 5                                 | 1.20E+03 ± 4.16E+02  | 20,000  |
| <b>100-B Area (Spring 39-2)</b>                                    |                   |                   |                              |                   |                                   |                      |   |
| Strontium-90   | 1                 | 1                 | 2.59E+00 ± 4.15E-01          | 2                 | 2                                 | 1.88E+00 ± 4.60E-01  | 8   |
| Tritium  | 1                 | 1                 | 1.90E+03 ± 4.09E+02          | 2                 | 2                                 | 2.10E+03 ± 9.00E+01  | 20,000  |
| <b>100-D Area (Spring 110-1)</b>                                   |                   |                   |                              |                   |                                   |                      |   |
| Alpha (gross)  | 1                 | 0                 | 1.98E-01 ± 8.91E-01          | 6                 | 1                                 | 1.32E+00 ± 2.33E+00  | 15  |
| Beta (gross)   | 1                 | 1                 | 1.39E+00 ± 7.34E-01          | 6                 | 3                                 | 5.94E+00 ± 6.77E+00  | 50  |
| Strontium-90   | 1                 | 1                 | 2.70E-01 ± 6.99E-02          | 6                 | 3                                 | 1.18E+00 ± 2.56E+00  | 8   |
| Technetium-99  | 1                 | 0                 | 0.161 ± 0.446                | 4                 | 0                                 | 2.49E-01 ± 5.22E-01  | 900   |
| Tritium  | 1                 | 1                 | 3.40E+02 ± 1.51E+02          | 6                 | 5                                 | 1.36E+03 ± 2.23E+03  | 20,000  |
| Uranium-234  | 1                 | 1                 | 0.297 ± 0.0674               | 4                 | 4                                 | 6.62E-01 ± 8.58E-01  | —**   |
| Uranium-235  | 1                 | 1                 | 2.61E-02 ± 1.94E-02          | 4                 | 2                                 | 3.40E-02 ± 4.23E-02  | —   |
| Uranium-238  | 1                 | 1                 | 0.255 ± 0.0613               | 4                 | 4                                 | 5.49E-01 ± 7.06E-01  | —   |
| <b>100-F (Spring 207-1)</b>  |                   |                   |                              |                   |                                   |                      |   |
| Strontium-90   | 1                 | 0                 | -2.38E-02 ± 2.38E-02         | 3                 | 0                                 | -9.23E-03 ± 4.58E-02 | 8   |
| Tritium  | 1                 | 1                 | 352 ± 154                    | 3                 | 3                                 | 539 ± 298.77528      | 900   |
| <b>100-H Area (Spring 152-2)</b>                                   |                   |                   |                              |                   |                                   |                      |   |
| Tritium  | 1                 | 0                 | 1.67E+02 ± 1.17E+02          | 1                 | 1                                 | 5.66E+02 ± 1.96E+02  | 900   |
| <b>100-K Area (Spring 63-1)</b>                                    |                   |                   |                              |                   |                                   |                      |   |
| Alpha (gross)  | 1                 | 0                 | 1.14E+00 ± 1.00E+00          | 4                 | 2                                 | 2.35E+00 ± 2.45E+00  | 15  |
| Beta (gross)   | 1                 | 1                 | 2.28E+00 ± 8.41E-01          | 4                 | 4                                 | 1.22E+01 ± 1.09E+01  | 50  |
| Carbon-14  | 5                 | 3                 | 3.41E+02 ± 7.01E+01          | 2                 | 2                                 | 1.28E+03 ± 1.74E+03  | 2,000   |
| Strontium-90   | 1                 | 0                 | -2.87E-02 ± 2.56E-02         | 4                 | 0                                 | 6.11E-03 ± 3.84E-02  | 8   |
| Tritium  | 1                 | 0                 | -6.42E-01 ± 1.24E+02         | 4                 | 3                                 | 9.03E+02 ± 8.79E+02  | 20,000  |
| <b>100-N Area (Spring 8-13)</b>                                    |                   |                   |                              |                   |                                   |                      |   |
| Alpha (gross)  | 1                 | 0                 | 5.27E-02 ± 1.05E+00          | 5                 | 1                                 | 3.29E+00 ± 7.27E+00  | 15  |
| Beta (gross)   | 1                 | 1                 | 4.01E+00 ± 1.34E+00          | 5                 | 2                                 | 5.39E+00 ± 1.25E+01  | 50  |
| Strontium-90   | 1                 | 0                 | 1.02E-02 ± 1.49E-02          | 4                 | 0                                 | 2.12E-02 ± 2.81E-02  | 8   |
| Tritium  | 1                 | 1                 | 5.84E+03 ± 1.16E+03          | 5                 | 5                                 | 2.56E+03 ± 2.84E+03  | 20,000  |
| <b>100-N Area (Spring 89-1)</b>                                    |                   |                   |                              |                   |                                   |                      |   |
| Strontium-90   | 1                 | 1                 | 1.66E+01 ± 2.60E+00          | 3                 | 3                                 | 2.03E+01 ± 3.37E+01  | 8   |
| Tritium  | 1                 | 0                 | 1.06E+02 ± 1.27E+02          | 3                 | 3                                 | 8.83E+02 ± 1.01E+03  | 20,000  |
| <b>Hanford Town Site (Hanford Spring 28-2)</b>                     |                   |                   |                              |                   |                                   |                      |   |
| Alpha (gross)  | 1                 | 0                 | 2.08E+00 ± 2.38E+00          | 4                 | 0                                 | 2.78E+00 ± 1.39E+00  | 15  |
| Beta (gross)   | 1                 | 1                 | 1.11E+01 ± 3.00E+00          | 4                 | 4                                 | 3.29E+01 ± 1.89E+01  | 50  |
| Tritium  | 1                 | 1                 | 5.75E+03 ± 1.14E+03          | 4                 | 4                                 | 2.59E+04 ± 9.52E+03  | 20,000  |
| <b>300 Area (300 Area Spring 42-2 and 300 Area Spring DR 42-2)</b> |                   |                   |                              |                   |                                   |                      |   |
| Alpha (gross)  | 3                 | 3                 | 4.79E+01 ± 7.15E+00          | 9                 | 9                                 | 4.53E+01 ± 5.93E+01  | 15  |
| Beta (gross)   | 3                 | 3                 | 2.99E+01 ± 4.28E+00          | 9                 | 9                                 | 2.54E+01 ± 2.51E+01  | 50  |
| Tritium  | 3                 | 3                 | 4.35E+03 ± 8.76E+02          | 9                 | 9                                 | 4.29E+03 ± 1.44E+03  | 20,000  |
| Uranium-234  | 3                 | 3                 | 3.00E+01 ± 3.98E+00          | 9                 | 9                                 | 2.24E+01 ± 2.72E+01  | —   |
| Uranium-235  | 3                 | 3                 | 2.75E+00 ± 5.64E-01          | 9                 | 9                                 | 1.81E+00 ± 2.28E+00  | —   |
| Uranium-238  | 3                 | 3                 | 2.97E+01 ± 5.05E+00          | 9                 | 9                                 | 2.18E+01 ± 2.61E+01  | —   |

\*1 pCi = 0.037 Bq

†WAC 246-290, 40 CFR 141; WAC 173-201A-250; EPA-570/9-76-003; Appendix Table D.4

‡Maximum values are ± total propagated analytical uncertainty.

§Averages are ± 2 standard deviations of the mean. Maximum values ± total propagated analytical uncertainty reported as average if only one sample was collected.

\*\*Dashes indicate no concentration guides available.

**Table C.14. Metals and Anions in Columbia River Shoreline Seep Water**

| Location | Analyte       | No. of Samples | Detects | Filtered/<br>Unfiltered* | Range (min-max) <sup>†</sup> | Unit | Regulatory Limit <sup>‡</sup> |
|----------|---------------|----------------|---------|--------------------------|------------------------------|------|-------------------------------|
| 100B     | <b>Metals</b> |                |         |                          |                              |      |                               |
|          | Antimony      | 2              | 0       | Filtered                 | 1.00E+00                     | µg/L | N/A                           |
|          | Arsenic       | 2              | 2       | Filtered                 | 1.84E+00 - 2.10E+00          | µg/L | 190                           |
|          | Cadmium       | 2              | 0       | Filtered                 | 1.10E-01                     | µg/L | 0.59                          |
|          | Chromium      | 2              | 1       | Filtered                 | 2.00E+00 - 1.19E+01          | µg/L | 10§                           |
|          | Chromium      | 2              | 1       | Unfiltered               | 2.00E+00 - 1.17E+01          | µg/L | 96**                          |
|          | Copper        | 2              | 1       | Filtered                 | 3.50E-01 - 6.37E-01          | µg/L | 6                             |
|          | Lead          | 2              | 0       | Filtered                 | 5.00E-01                     | µg/L | 1.1                           |
|          | Nickel        | 2              | 0       | Filtered                 | 5.00E-01                     | µg/L | 83                            |
|          | Selenium      | 2              | 0       | Unfiltered               | 1.50E+00                     | µg/L | 5                             |
|          | Thallium      | 2              | 0       | Filtered                 | 4.50E-01                     | µg/L | N/A                           |
|          | Zinc          | 2              | 2       | Filtered                 | 2.37E+01 - 2.43E+01          | µg/L | 55                            |
|          |               | <b>Anion</b>   |         |                          |                              |      |                               |
|          | Nitrate       | 2              | 2       | Unfiltered               | 8.15E+02 - 3.52E+03          | mg/L | 45 <sup>††</sup>              |
| 100D     | <b>Metals</b> |                |         |                          |                              |      |                               |
|          | Antimony      | 1              | 0       | Filtered                 | 1.00E+00                     | µg/L | N/A                           |
|          | Arsenic       | 1              | 0       | Filtered                 | 1.70E+00                     | µg/L | 190                           |
|          | Cadmium       | 1              | 0       | Filtered                 | 1.10E-01                     | µg/L | 0.59                          |
|          | Chromium      | 1              | 1       | Filtered                 | 3.54E+00                     | µg/L | 10§                           |
|          | Chromium      | 1              | 1       | Unfiltered               | 3.82E+00                     | µg/L | 96**                          |
|          | Copper        | 1              | 1       | Filtered                 | 7.24E-01                     | µg/L | 6                             |
|          | Lead          | 1              | 0       | Filtered                 | 5.00E-01                     | µg/L | 1.1                           |
|          | Nickel        | 1              | 1       | Filtered                 | 7.82E-01                     | µg/L | 83                            |
|          | Selenium      | 1              | 0       | Unfiltered               | 1.50E+00                     | µg/L | 5                             |
|          | Thallium      | 1              | 0       | Filtered                 | 4.50E-01                     | µg/L | N/A                           |
|          | Zinc          | 1              | 1       | Filtered                 | 1.56E+01                     | µg/L | 55                            |
|          |               | <b>Anion</b>   |         |                          |                              |      |                               |
|          | Nitrate       | 1              | 1       | Unfiltered               | 4.65E+03                     | mg/L | 45 <sup>††</sup>              |
| 100F     | <b>Metals</b> |                |         |                          |                              |      |                               |
|          | Antimony      | 2              | 0       | Filtered                 | 1.00E+00                     | µg/L | N/A                           |
|          | Arsenic       | 2              | 2       | Filtered                 | 3.39E+00 - 4.22E+00          | µg/L | 190                           |
|          | Cadmium       | 2              | 1       | Filtered                 | 1.10E-01 - 3.19E-01          | µg/L | 0.59                          |
|          | Chromium      | 2              | 2       | Filtered                 | 7.27E+00 - 1.14E+01          | µg/L | 10§                           |
|          | Chromium      | 2              | 2       | Unfiltered               | 7.48E+00 - 2.07E+01          | µg/L | 96**                          |
|          | Copper        | 2              | 1       | Filtered                 | 3.50E-01 - 4.52E+00          | µg/L | 6                             |
|          | Lead          | 2              | 1       | Filtered                 | 5.00E-01 - 5.16E+00          | µg/L | 1.1                           |
|          | Nickel        | 2              | 1       | Filtered                 | 5.00E-01 - 1.77E+00          | µg/L | 83                            |
|          | Selenium      | 2              | 1       | Unfiltered               | 1.50E+00 - 1.63E+00          | µg/L | 5                             |
|          | Thallium      | 2              | 0       | Filtered                 | 4.50E-01                     | µg/L | N/A                           |
|          | Zinc          | 2              | 2       | Filtered                 | 1.51E+01 - 4.93E+01          | µg/L | 55                            |
|          |               | <b>Anion</b>   |         |                          |                              |      |                               |
|          | Nitrate       | 2              | 2       | Unfiltered               | 2.61E+04 - 3.59E+04          | mg/L | 45 <sup>††</sup>              |
| 100H     | <b>Metals</b> |                |         |                          |                              |      |                               |
|          | Antimony      | 1              | 0       | Filtered                 | 1.00E+00                     | µg/L | N/A                           |
|          | Arsenic       | 1              | 1       | Filtered                 | 2.02E+00                     | µg/L | 190                           |
|          | Cadmium       | 1              | 0       | Filtered                 | 1.10E-01                     | µg/L | 0.59                          |
|          | Chromium      | 1              | 1       | Filtered                 | 2.84E+00                     | µg/L | 10§                           |
|          | Chromium      | 1              | 1       | Unfiltered               | 2.96E+00                     | µg/L | 96**                          |
|          | Copper        | 1              | 1       | Filtered                 | 3.50E-01                     | µg/L | 6                             |
|          | Lead          | 1              | 0       | Filtered                 | 5.00E-01                     | µg/L | 1.1                           |
|          | Nickel        | 1              | 0       | Filtered                 | 5.00E-01                     | µg/L | 83                            |
|          | Selenium      | 1              | 0       | Unfiltered               | 1.50E+00                     | µg/L | 5                             |
|          | Thallium      | 1              | 0       | Filtered                 | 4.50E-01                     | µg/L | N/A                           |
|          | Zinc          | 1              | 1       | Filtered                 | 2.45E+01                     | µg/L | 55                            |
|          |               | <b>Anion</b>   |         |                          |                              |      |                               |
|          | Nitrate       | 1              | 1       | Unfiltered               | 2.37E+03                     | mg/L | 45 <sup>††</sup>              |

**Table C.14. Metals and Anions in Columbia River Shoreline Seep Water**

| Location                          | Analyte       | No. of Samples | Detects | Filtered/<br>Unfiltered* | Range (min-max) <sup>†</sup> | Unit | Regulatory Limit <sup>‡</sup> |
|-----------------------------------|---------------|----------------|---------|--------------------------|------------------------------|------|-------------------------------|
| 100K                              | <b>Metals</b> |                |         |                          |                              |      |                               |
|                                   | Antimony      | 1              | 0       | Filtered                 | 1.00E+00                     | µg/L | N/A                           |
|                                   | Arsenic       | 1              | 0       | Filtered                 | 1.70E+00                     | µg/L | 190                           |
|                                   | Cadmium       | 1              | 0       | Filtered                 | 1.10E-01                     | µg/L | 0.59                          |
|                                   | Chromium      | 1              | 0       | Filtered                 | 2.00E+00                     | µg/L | 10§                           |
|                                   | Chromium      | 1              | 0       | Unfiltered               | 2.00E+00                     | µg/L | 96**                          |
|                                   | Copper        | 1              | 1       | Filtered                 | 6.64E-01                     | µg/L | 6                             |
|                                   | Lead          | 1              | 0       | Filtered                 | 5.00E-01                     | µg/L | 1.1                           |
|                                   | Nickel        | 1              | 0       | Filtered                 | 5.00E-01                     | µg/L | 83                            |
|                                   | Selenium      | 1              | 0       | Unfiltered               | 1.50E+00                     | µg/L | 5                             |
|                                   | Thallium      | 1              | 0       | Filtered                 | 4.50E-01                     | µg/L | N/A                           |
|                                   | Zinc          | 1              | 1       | Filtered                 | 5.79E+01                     | µg/L | 55                            |
|                                   |               | <b>Anion</b>   |         |                          |                              |      |                               |
|                                   | Nitrate       | 1              | 1       | Unfiltered               | 1.71E+03                     | mg/L | 45 <sup>††</sup>              |
| 100N                              | <b>Metals</b> |                |         |                          |                              |      |                               |
|                                   | Antimony      | 2              | 1       | Filtered                 | 1.00E+00 - 1.11E+00          | µg/L | N/A                           |
|                                   | Arsenic       | 2              | 2       | Filtered                 | 2.19E+00 - 8.69E+00          | µg/L | 190                           |
|                                   | Cadmium       | 2              | 0       | Filtered                 | 1.10E-01                     | µg/L | 0.59                          |
|                                   | Chromium      | 2              | 1       | Filtered                 | 2.00E+00 - 6.59E+00          | µg/L | 10§                           |
|                                   | Chromium      | 2              | 1       | Unfiltered               | 2.00E+00 - 6.99E+00          | µg/L | 96**                          |
|                                   | Copper        | 2              | 2       | Filtered                 | 5.13E-01 - 1.33E+00          | µg/L | 6                             |
|                                   | Lead          | 2              | 0       | Filtered                 | 5.00E-01                     | µg/L | 1.1                           |
|                                   | Nickel        | 2              | 0       | Filtered                 | 5.00E-01                     | µg/L | 83                            |
|                                   | Selenium      | 2              | 1       | Unfiltered               | 1.50E+00 - 2.10E+00          | µg/L | 5                             |
|                                   | Thallium      | 2              | 0       | Filtered                 | 4.50E-01                     | µg/L | N/A                           |
|                                   | Zinc          | 2              | 2       | Filtered                 | 1.74E+01 - 2.04E+01          | µg/L | 55                            |
|                                   |               | <b>Anion</b>   |         |                          |                              |      |                               |
|                                   | Nitrate       | 2              | 2       | Unfiltered               | 3.25E+03 - 2.59E+04          | mg/L | 45 <sup>††</sup>              |
| Hanford<br>Townsite <sup>‡‡</sup> | <b>Anion</b>  |                |         |                          |                              |      |                               |
|                                   | Nitrate       | 1              | 1       | Unfiltered               | 4.43E+03                     | mg/L | 45 <sup>††</sup>              |
| 300 Area <sup>‡‡</sup>            | <b>Anion</b>  |                |         |                          |                              |      |                               |
|                                   | Nitrate       | 3              | 3       | Unfiltered               | 1.40E+04 - 2.08E+04          | mg/L | 45 <sup>††</sup>              |

\*All dissolved concentrations are associated with filtered samples; all recoverable concentrations are associated with unfiltered samples.  
<sup>†</sup>One value is shown if only one sample was collected or if the minimum and maximum concentrations were the same.  
<sup>‡</sup>Ambient water quality criteria values or chronic toxicity unless otherwise noted (WAC 173-201A-240).  
<sup>§</sup>Value for hexavalent chromium.  
<sup>\*\*</sup>Value for trivalent chromium.  
<sup>††</sup>Washington State drinking water standard utilized (WAC 246-290).  
<sup>‡‡</sup>Hanford Townsite and 300 Area seeps did not have metals analyses performed during 2015.

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