

decreasing trend of the same significance for uranium at well 37405. The associated trend plots are provided in Appendix B.

**Areas Monitored for Plutonium and Americium:** Groundwater immediately downgradient of the former B371 and B771 complexes is monitored for Pu and Am. Abundant technical research (much of which focused specifically on Rocky Flats) indicated that the groundwater regime does not constitute a meaningful migration pathway for these constituents at Rocky Flats. Therefore, as in previous years, it is not surprising that the groundwater monitoring wells that are sampled for Pu and Am consistently report results for these constituents that are qualified by the analytical laboratory as nondetects. Despite a lack of technical justification for these analyses, due to the production-era missions of these buildings and to provide stakeholder assurance, Pu and Am were included in the RFLMA monitoring for these wells.

In 2014, just as in previous years, the five wells monitored for Pu and Am (Sentinel wells 20205, 20505, and 20705 at former B771; and 37405 and 37705 at former B371) only reported values qualified as nondetects for these radionuclides. The RFLMA value is 0.15 pCi/L, and reported values in 2014 ranged from  $-0.0123$  pCi/L to 0.0177 pCi/L, again all qualified as nondetects. (As an activity-based analysis that is compared against the activity in a laboratory blank, the analysis always generates a number.) In fact, the only Pu or Am results reported since Site closure that are not qualified as nondetects have been three J-qualified results in samples collected in December 2005, the highest activity of which was 0.0238 pCi/L (representing Am in a sample from well 20705).

### **3.1.6 High-Resolution Uranium Isotopic Analyses**

Previous reports have presented data summaries and discussions of specialized uranium analyses performed on selected samples. These high-resolution isotopic analyses are performed by experts who then use the data to estimate the relative fraction of the uranium in a sample that represents naturally occurring uranium vs. anthropogenic uranium. This distinction is important because the former Rocky Flats Plant only worked with anthropogenic (depleted and enriched) uranium, not natural uranium. Therefore, if uranium in a given sample is natural, it does not represent Site-related uranium contamination.

The annual report for 2013 (DOE 2014c) described the change in service providers for this type of analysis. The Lawrence Berkeley National Laboratory (LBNL) now performs these analyses for Rocky Flats, and uses the same model that was used by the Los Alamos National Laboratory (LANL), the previous provider of this service) to estimate natural vs. anthropogenic content.

Three batches of surface water samples were submitted to LBNL in 2014 for high-resolution uranium analysis. These samples were selected to support the geochemistry study, and include many from WALPOC as well as locations farther upstream on North and South Walnut Creeks. As noted in the 2013 Annual Report (DOE 2014c), a batch of samples was being identified for LBNL analysis as 2013 ended. The data provided here and the corresponding reports from LBNL, attached in Appendix F, include two samples that date to 2013. These results were not available for inclusion in the annual report for that year.

Table 88 provides a summary of results from those samples submitted or collected in 2014 and analyzed by LBNL. Most of these samples are flow-paced composite samples, but several are grab samples. Refer to Appendix F for the reports from LBNL.

Results for WALPOC are consistent with those reported in the 2013 Annual Report (DOE 2014c) and continue to display a fairly uniform isotopic distribution. Of the 21 samples collected at this location through 2014, the uranium has ranged from 72.4 percent to 82.6 percent natural. In contrast, location GS10, farther upstream on South Walnut Creek, has reported natural uranium content ranging from 43.29 percent to 77.8 percent. Note that most of the data for location GS10 are closer to 70 percent natural—in 2014, ranging from 68.5 percent to 74.7 percent natural—but three results from 2011 and 2012 skew the average significantly lower.

Location SW093, which monitors North Walnut Creek near the SPPTS, reported very different isotopic distributions in 2014 than in the three previous results. Those earlier results (from 2007 to 2011) were all between approximately 91 percent to 93 percent natural—yet the result obtained in 2014 is about 72 percent natural (Table 88). Causes for this change are not known. It may relate to a natural flushing mechanism associated with the heavy precipitation in September 2013 (which is also discussed elsewhere in this report, in the context of groundwater contaminant plumes): the elevated water levels associated with this groundwater recharge event might have mobilized residual contamination higher in the soil column in the SEP source area. However, the total uranium content of this SW093 sample, 4.7  $\mu\text{g/L}$ , does not suggest that a significant surge of uranium contamination has reached North Walnut Creek; nor do results from WALPOC and other locations between these two monitoring points suggest the occurrence of such a surge. Additional samples from SW093 may be analyzed for isotopic uranium to help inform this evaluation. Currently, however, the cause(s) for anomalous isotopic distributions in previous years at GS10 and in 2014 at SW093 are not known.

Table 88. Summary of LBNL High-Resolution Uranium Isotopic Results for Samples Collected from Late 2013 Through 2014

Sample Location	Date Collected	Total U (µg/L) <sup>a</sup>	Percent Natural	Percent Anthropogenic	Previous Number of Sample Events	Average Natural Percentage of Past Samples
WALPOC	10/25/2013–12/18/2013	16.75	74.99	25.01	12	77.67
WALPOC	12/18/2013–1/16/2014	18.75	78.11	21.9		
WALPOC	1/16/2014–2/18/2014	22.5	77.34	22.66		
WALPOC	2/18/2014–3/6/2014	18.5	79.01	21		
WALPOC	3/6/2014–3/10/2014	22.85	78.45	21.55		
WALPOC	3/10/2014–3/24/2014	21.1	78.54	21.46		
WALPOC	3/24/2014–4/8/2014	20.6	77.8	22.19		
WALPOC	4/8/2014–4/15/2014	20	78.15	21.85		
WALPOC	2/13/2014	15	82.6	17.39		
GS12	4/2/2014–4/16/2014	23	73.68	26.31	2	72.5
GS11	4/2/2014–4/16/2014	29	73.65	26.35	N/A	N/A
GS11	2/13/2014	27	74.27	25.73		
A4 POND	2/13/2014	20	74.88	25.12	2	74.4
B5INFLOW	4/2/2014–4/16/2014	16	75.85	24.15	2	77.8
GS08	4/2/2014–4/16/2014	18	75.79	24.21	N/A	N/A
GS08	2/13/2014	16	79.97	20.04		
B5 POND	2/13/2014	4.6	80.32	19.68	1	78.8
GS10	4/8/2014–4/22/2014	23.6	68.5	31.48	15	66.2
GS10	7/10/2014–7/30/2014	8.2	71	28.97		
GS10	10/2/2014–10/23/2014	10.6	74.7	25.36		
WALPOC	5/14/2014–5/21/2014	15.4	75.2	24.79	21	77.96
WALPOC	8/12/2014–10/23/2014	8.6	81.1	18.86		
WALPOC	10/23/2014–1/6/2015	13.3	81.6	18.36		
SW093	10/2/2014–11/19/2014	4.7	72.4	27.67	3	91.87

**Notes:**

<sup>a</sup> Total uranium content as reported for split submitted to contract laboratory. LBNL is tasked with providing isotopic data and associated interpretation, not total uranium data.

Samples representing an extended (multi-day) period of time are flow-paced composites, whereas those listing a single date are grab samples. Previous samples representing some locations may represent pre-closure conditions. Average natural percentages provided incorporate all high-resolution uranium data for the given location received prior to the samples summarized in this table (including duplicates, and results generated by LANL as well as LBNL). Percent natural data are as reported by LBNL, and percent anthropogenic is sum of enriched and depleted percentages reported by LBNL; total may differ slightly from 100 percent. Refer to previous reports for data for samples collected in earlier years.

**Abbreviations:**

N/A = No previous data available

## 3.2 Ecological Monitoring at RFS

### 3.2.1 Introduction

The Ecology group conducts ecological monitoring of the Site’s ecological resources to ensure regulatory compliance and to preserve, protect, and manage those resources. Ecological monitoring is an integral aspect of determining whether the management objectives and goals for the natural resources at the Site are being achieved. This report summarizes the results of the vegetation, revegetation, wetland, and wildlife monitoring conducted at the Site during 2014. It