

Rocky Flats, Colorado, Site

**Quarterly Report of Site Surveillance
and Maintenance Activities
First Quarter Calendar Year 2012**

July 2012



U.S. DEPARTMENT OF
ENERGY

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**U.S. Department of Energy
Office of Legacy Management**

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- Appendix A Annual Inspection Checklist, Maps, and Photographs
- Appendix B Landfill Inspection Forms and Survey Data
- Appendix C Analytical Results for Water Samples—First Quarter CY 2012

Abbreviations

Am	americium
AOC	Area of Concern
CAD/ROD	Corrective Action Decision/Record of Decision
CDPHE	Colorado Department of Public Health and Environment
COU	Central Operable Unit
CY	calendar year
DER	duplicate error ratio
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ETPTS	East Trenches Plume Treatment System
IC	institutional control
LANL	Los Alamos National Laboratory
LM	Office of Legacy Management
µg/L	micrograms per liter
M&M	monitoring and maintenance
mL	milliliters
MSPTS	Mound Site Plume Treatment System
OLF	Original Landfill
pCi/L	picocuries per liter
PLF	Present Landfill
PLFTS	Present Landfill Treatment System
PMJM	Preble's meadow jumping mouse
POC	Point of Compliance
POE	Point of Evaluation
Pu	plutonium
RCRA	Resource Conservation and Recovery Act
RFLMA	<i>Rocky Flats Legacy Management Agreement</i>
RFSOG	<i>Rocky Flats Site Operations Guide</i>
Site	Rocky Flats Site
SPPTS	Solar Ponds Plume Treatment System
USFWS	U.S. Fish and Wildlife Service

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1.0 Introduction

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) is responsible for implementing the final response action selected in the *Corrective Action Decision/Record of Decision for Rocky Flats Plant (USDOE) Peripheral Operable Unit and Central Operable Unit (CAD/ROD)* (DOE, EPA, and CDPHE 2006) issued on September 29, 2006, for the Rocky Flats Site (the Site) in Colorado. DOE, the U.S. Environmental Protection Agency (EPA), and the Colorado Department of Public Health and Environment (CDPHE) have chosen to implement the monitoring and maintenance requirements of the CAD/ROD as described in the *Rocky Flats Legacy Management Agreement (RFLMA)* (DOE 2007a). Attachment 2 of the RFLMA defines the Central Operable Unit (COU) remedy surveillance and maintenance requirements, the frequency for each required activity, and the monitoring and maintenance locations. The requirements include environmental monitoring; maintenance of the erosion controls, access controls (signs), landfill covers, and groundwater treatment systems; and operation of the groundwater treatment systems. The RFLMA also requires that the institutional controls, in the form of use restrictions as established in the CAD/ROD, be maintained.

This report is required in accordance with Section 7.0 of RFLMA Attachment 2. The purpose of this report is to inform the regulatory agencies and stakeholders of the remedy-related surveillance, monitoring, and maintenance activities being conducted at the Site. LM provides periodic communications through several means, such as this report, web-based tools, and public meetings.

LM prepared the *Rocky Flats Site Operations Guide (RFSOG)* (DOE 2011b) to serve as the primary internal document to guide work to satisfy the requirements of the RFLMA and to implement best management practices at the Site.

Several other Site-specific documents provide additional detail regarding the requirements described in RFLMA Attachment 2, including all aspects of surveillance, monitoring, and maintenance activities, as well as data evaluation protocols.

Monitoring data and summaries of surveillance and maintenance activities for past quarters are available in the quarterly reports. Extensive discussion and evaluation of surveillance, monitoring, and maintenance activities are presented each calendar year in the annual report of Site surveillance and maintenance activities.

This report addresses remedy-related surveillance, monitoring, and operations and maintenance activities conducted at the Site during the first quarter of calendar year (CY) 2012 (January 1 through March 31). This report describes the following activities:

- Annual Site Inspection
- Maintenance and inspection of the Original Landfill (OLF) and Present Landfill (PLF)
- Maintenance and inspection of the four groundwater treatment systems
- Erosion control and revegetation activities
- Routine (in accordance with the RFLMA and the RFSOG) water monitoring

2.0 Site Operations and Maintenance

2.1 Annual Site Inspection

Annual inspection and monitoring of evidence of significant erosion and violation of institutional controls (ICs) is required in accordance with RFLMA Attachment 2, Sections 5.3.4 and 5.3.6. The inspection was conducted on March 12, 2012.

The following categories were inspected or monitored during the inspection:

- Evidence of significant erosion in the COU, and the proximity of this erosion to subsurface features identified in RFLMA Attachment 2, Figure 3 and Figure 4. This monitoring included observation for precursor evidence of significant erosion, such as cracks, rills, slumping, subsidence, and sediment deposition.
- The effectiveness of ICs as determined through any evidence of the violation of any of these controls.
- Evidence of adverse biological conditions, such as unexpected morbidity or mortality.

As part of the IC inspection, verification that the Environmental Covenant remains in the Administrative Record and on file in Jefferson County records is required annually. In addition, physical controls (i.e., signs placed along the COU fence) were also inspected.

The annual inspection was scheduled so that surface features could be observed adequately after snow cover had melted, once the surface was dry, and before vegetation growth could obscure land surface features.

To conduct this work, knowledgeable DOE, CDPHE, and S.M. Stoller Corporation (Stoller) team staff members (the inspection team) walked down the COU surface to observe the conditions. The areas walked down were designated as Areas A through E and are shown on the maps included in Appendix A. These areas generally coincide with the location of the subsurface features in RFLMA Attachment 2, Figure 3 and Figure 4, or they afforded adequate viewing of the surface in these locations (e.g., sloping areas). Several inspection team members were assigned to walk down a particular area or areas identified on the maps. Reference points, such as monitoring wells and roads, were used to orient the inspection team members within designated inspection areas.

Appendix A of this report also includes the completed inspection checklists and several photographs illustrating noted conditions. Note that the 2012 inspection also included the SW027 drainage area, to look for signs of significant erosion or precursors of significant erosion, such as cracks, rills, slumping, subsidence, and sediment deposition. This area was included pursuant to the revegetation seeding and erosion controls installed as follow-up actions for elevated levels of plutonium (Pu) at SW027 (DOE 2010c). See Contact Record 2010-06, "Monitoring Results at Surface Water Point of Evaluation (POE) SW027," and the 2010 and 2011 Annual Reports (DOE 2011a, 2012a) for a discussion of the SW027 monitoring data and mitigation actions. (Contact records are available on the Rocky Flats website, http://www.lm.doe.gov/Rocky_Flats/ContactRecords.aspx.) There were no signs of significant erosion or precursors to erosion. The compost/wood-chip-filled wattles that were placed on the hillside in 2010 are holding up well and working effectively.

Marker flags were placed where conditions showed evidence of the three condition categories listed above to track their location for follow-up by Site subject matter experts. Areas that required evaluation were documented in the Site Observation Log for evaluation and follow-up.

Several areas were noted as having evidence of erosion, possible depressions, or holes. Because of the deep subsidence-related hole found at former Building 881 during the 2011 annual inspection, discussed in the report for the first quarter of CY 2011 (DOE 2011c), inspections of areas with significant subsurface remnants of former buildings are performed by site operations personnel quarterly. The surface locations coinciding with these subsurface features have also been marked with fence posts for ease of conducting surface observations. Access to these surface locations by Site personnel is also managed using the Site work authorization and approval process.

These areas are associated with the following former buildings:

- 371
- 771
- 881
- 991

As reported in the 2011 Annual Report (DOE 2012a), during the fourth quarter of 2011 it was noted that a minor depression and surface cracking had formed on the gravel road in the vicinity of the southern portion of former Building 771. Based on this observation, the area was fenced with T-posts and rope and this portion of the gravel road was closed. A new gravel roadway around this section will be installed later in 2012, and the former road portion will be filled, graded, and seeded for revegetation.

The area of the deep subsidence hole at former Building 881 was filled in 2011 and fenced by T-posts and rope. During the 2012 inspection a small hole was noted in the filled area, and a small depression on the far eastern side of former Building 881 was also noted. The small hole and the depression will be filled. No other former building areas were noted as having depressions or subsidence.

Most inspection observations were related to metal debris on the surface or trash that was either picked up or marked for subsequent removal and pickup. Rocky Flats field operations subject matter experts will subsequently visit the areas to determine if any observations appear to be significant or require repairs and to collect debris to close out all items in the Site Observation Log.

No evidence of violations of institutional or physical controls was observed.

On March 13, 2012, an inspection team member verified that the Environmental Covenant for the COU remains in the Administrative Record and on file with the Jefferson County land records, which are used by the Planning and Zoning Department.

No adverse biological conditions were noted during the inspection.

2.2 Landfills

2.2.1 Present Landfill

The PLF is inspected quarterly in accordance with the requirements of the PLF Monitoring and Maintenance (M&M) Plan (DOE 2008a) and the RFLMA (DOE 2007a). Vegetation monitoring has been conducted on the PLF according to the requirements in RFLMA Attachment 2, Table 3. The exit strategy for vegetation monitoring, as outlined in Table 3, states that when the PLF M&M Plan grassland success criteria have been met, vegetation monitoring will be no longer required. Based on the vegetation monitoring conducted in 2009 and reported in the 2009 Annual Report (DOE 2010a), these success criteria have been met. Therefore, the specific PLF vegetation monitoring as outlined in the RFLMA will no longer be conducted; rather, the PLF vegetation will be monitored as part of the ongoing general Site vegetation monitoring.

2.2.1.1 Inspection Results

The routine PLF inspection for the first quarter of CY 2012 was performed on February 28, 2012. No significant problems were observed during this inspection. Copies of the landfill inspection forms are presented in Appendix B.

2.2.1.2 Settlement Monuments

The annual settlement monument surveys were performed on December 13, 2011. The 2012 survey of the PLF settlement monuments will be completed at the end of the calendar year. Additional information on the settlement monuments is included in the *Rocky Flats Site Quarterly Report of Site Surveillance and Maintenance Activities, First Quarter Calendar Year 2008* (DOE 2008b).

2.2.2 Original Landfill

The OLF is inspected monthly, in accordance with the requirements in the OLF M&M Plan (DOE 2009a) and the RFLMA. It was anticipated that after the first year, the inspection frequency might be reduced to quarterly for an additional 4 years. However, because of observed localized slumping and seep areas, and investigation and repairs to the OLF cover that were being planned at the time, no change to the monthly inspection frequency was recommended in the second five-year review of the Site (DOE 2007b).

2.2.2.1 Inspection Results

Routine OLF inspections during the first quarter of CY 2012 were performed on January 30, February 28, and March 29, 2012. The landfill cover vegetation was evaluated on March 14, 2012. The completed inspection forms are presented in Appendix A.

2.2.2.2 Settlement Monuments

The OLF settlement monuments were surveyed on March 20, 2012. Survey data indicate that settling at each monument does not exceed the limits published in the OLF M&M Plan (DOE 2009a). The survey results are presented in Appendix B.

2.2.2.3 *Inclinometers*

As discussed in the quarterly report for the second quarter of CY 2009 (DOE 2009b), seven inclinometers were installed in boreholes at the OLF in 2008 as part of the geotechnical investigation of localized areas of instability (Figure 1).

Movement of the inclinometers has been monitored approximately monthly since installation. Inclinometers deflect by lateral movement of the ground in which they are located and can deflect enough to cause the inclinometer tubes to break. Once an inclinometer tube breaks, the inclinometer will no longer be monitored. Inclinometer monitoring data provide information on localized soil movement and serve to focus the periodic inspections of the soil cover surface on signs of potential instability, such as cracking, vertical displacement, and slumping. A deflection of more than 1 inch is used as a trigger for evaluation of the data by a qualified geotechnical engineer. The engineer determines the significance of the deflection in relation to recommendations for maintenance or repairs to address potential instability in accordance with the OLF M&M Plan (DOE 2009a).

Inclinometer measurements were taken on January 23, February 29, and March 15, 2012. The readings showed very little deflection for any inclinometer over this quarter. Very little deflection has been noted over the past approximately 18 months. Based on the geotechnical investigation, maintenance and repairs in 2009 were made to minimize the effects of lubrication of a subsurface organic layer by groundwater and precipitation infiltration. As discussed in the annual report for 2011, routine maintenance to fill any surface cracking noted in inspections to minimize infiltration of precipitation appears an effective course of action to address conditions that may lead to localized instability.

2.2.2.4 *Slumps*

As discussed in the quarterly report for the first quarter of CY 2010 (DOE 2010b), areas where the landfill cover is pushed up or rolling are noticeable on the western end of the OLF between Berms 2 and 3; however, no new slumps were observed during the first quarter of 2012.

Berm 1

No new cracking was observed in the Berm 1 area during the first quarter of CY 2012. Staff continued to perform routine and nonroutine inspections of the Berm 1 area to monitor this location for any changes.

2.2.2.5 *Seeps*

Seeps at the OLF were evaluated during the monthly inspections and during unscheduled visits. Individual seep location flow rates can be found in the monthly inspection reports.

2.3 Groundwater Treatment Systems

Four groundwater treatment systems are operated and maintained in accordance with requirements defined in the RFLMA and the RFSOG. Three of these systems (the Mound Site Plume Treatment System [MSPTS], East Trenches Plume Treatment System [ETPTS], and Solar

Ponds Plume Treatment System [SPPTS]) include a groundwater intercept trench (collection trench), which is similar to a French drain with an impermeable membrane on the downgradient side. Groundwater entering the trench is routed through a drain pipe into one or more treatment cells, where it is treated and then discharged. The fourth system, the PLF Treatment System (PLFTS), treats water from the northern and southern components of the Groundwater Intercept System and flow from the PLF seep.

2.3.1 Mound Site Plume Treatment System

Routine maintenance activities and optimization of the air stripper (a small effluent-polishing unit) continued at the MSPTS through the first quarter of CY 2012. As previously reported, because of the numerous variables and ongoing optimization of the unit, the component that was installed is designed for only half-time operation (during the daytime). Testing is being performed to identify adjustments needed to achieve optimal effectiveness.

Refer to Section 3.1.9.1 for information on water quality sampling.

2.3.2 East Trenches Plume Treatment System

Routine maintenance activities continued at the ETPTS through the first quarter of CY 2012. These activities included checking influent and effluent flow conditions and water levels in the cells.

Refer to Section 3.1.9.2 for information on water quality sampling.

2.3.3 Solar Ponds Plume Treatment System

Routine maintenance activities continued at the SPPTS through the first quarter of CY 2012. These activities included weekly inspections of the solar/battery systems that power the pumps, the operation of the pumps, and influent and effluent flow conditions. In addition, tests were begun on the feasibility of treating uranium with a smaller-scale treatment component, referred to informally as a “microcell.” These tests are expected to continue for the next several months.

Refer to Section 3.1.9.3 for information on water quality sampling.

2.3.4 Present Landfill Treatment System

Routine maintenance activities continued at the PLFTS through the first quarter of CY 2012. These activities generally consisted of inspecting the system for potential problems.

Refer to Section 3.1.9.4 for information on water quality sampling.



Figure 1. Original Landfill Observed Surface Cracking Location and Inclinator Locations

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2.4 Erosion Control and Revegetation

Maintenance of the site erosion control features required continued effort throughout the first quarter of CY 2012, especially following high-wind or precipitation events. Erosion wattles and matting loosened and displaced by high winds or rain were repaired. Erosion controls were installed and maintained for the various projects that were ongoing during the first quarter of CY 2012. Several areas were interseeded with additional native species to increase vegetation cover.

3.0 Environmental Monitoring

This section summarizes the environmental monitoring conducted in accordance with the RFLMA.

3.1 Water Monitoring

This section includes:

- A discussion of analytical results for the Point of Compliance (POC), Point of Evaluation (POE), PLF, and OLF surface-water monitoring objectives.
- A summary of Area of Concern (AOC) well, Evaluation well, and Sentinel well monitoring; treatment system monitoring; and Resource Conservation and Recovery Act (RCRA) groundwater monitoring and Surface Water Support monitoring at the Site.

Monitoring locations, sampling criteria, and evaluation protocols for water monitoring objectives in the following sections are detailed in RFLMA Attachment 2 and the RFSOG. Appendix C provides analytical water quality data for the first quarter of CY 2012. More detailed interpretation and discussion will be provided in the annual report for CY 2012.

3.1.1 Water Monitoring Highlights

During the first quarter of CY 2012, the water monitoring successfully met the targeted monitoring objectives as required by the RFLMA and was in conformance with RFSOG implementation guidance. The RFLMA network consists of 10 automated gaging stations, 12 surface water grab-sampling locations, 8 treatment system locations, 97 wells, and 10 precipitation gages. During the quarter, 41 flow-paced composite samples, 12 surface water grab samples, 10 treatment system samples, and 10 groundwater samples were collected (in accordance with RFLMA protocols) and submitted for analysis.¹ Analysis is pending for three flow-paced composites that were started during the quarter and have been retrieved from the field. Two additional flow-paced composites are still in progress, and analytical data were not available for this report.

¹ Composite samples consist of multiple aliquots (“grabs”) of identical volume. Each grab is delivered by the automatic sampler to the composite container at each predetermined flow volume or time interval. During the first quarter of CY 2012, the 41 flow-paced composites comprised 2,972 individual grabs.

Water quality data at the RFLMA POCs remained well below the applicable standards through the first quarter of CY 2012.

Reportable 12-month rolling average uranium concentrations were observed starting on April 30, 2011, in surface water at RFLMA POE monitoring station GS10, which is located on South Walnut Creek upstream of former Pond B-1. Reportable 12-month rolling average americium (Am) activities were also observed starting on August 31, 2011. As of the end of the first quarter of CY 2012, both analytes were still reportable. GS10 is evaluated in Section 3.1.3.1 of this report.

Except for the two analytes discussed, all other analyte concentrations at POEs remained below reporting levels as of the end of the first quarter of CY 2012.

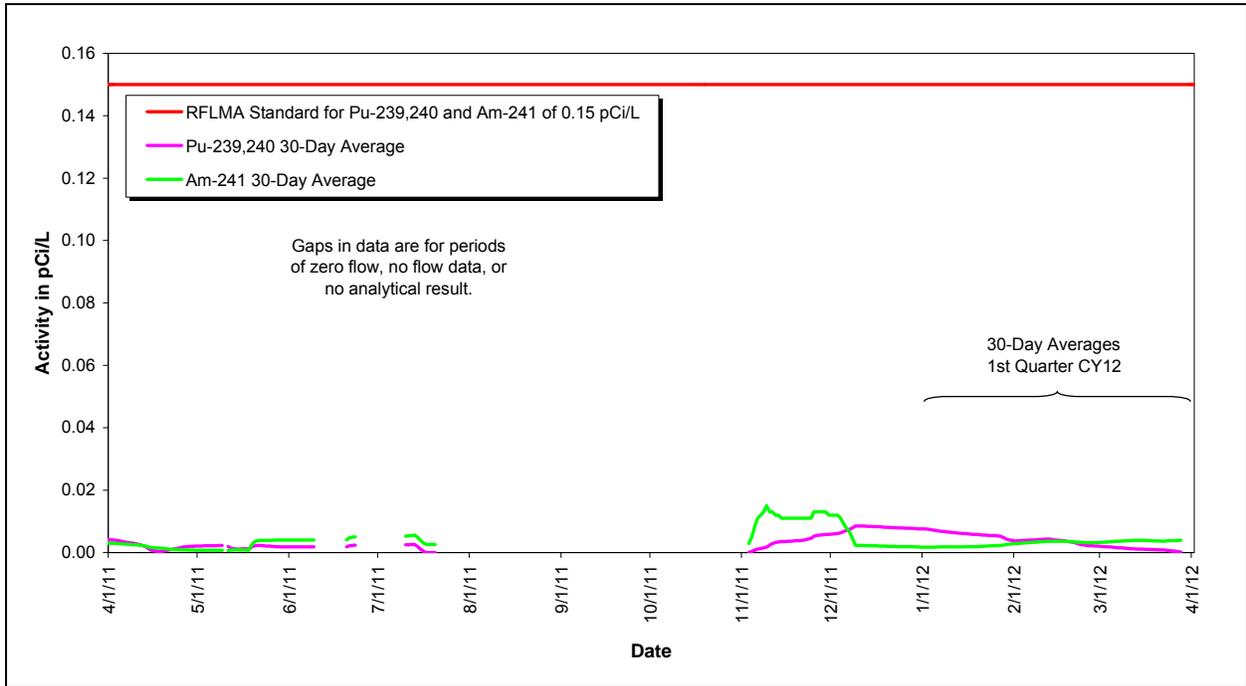
Groundwater monitoring results will be evaluated as part of the annual report for CY 2011.

3.1.2 POC Monitoring

The following sections include summary tables and plots showing the applicable 30-day and 12-month rolling averages for the POC analytes.

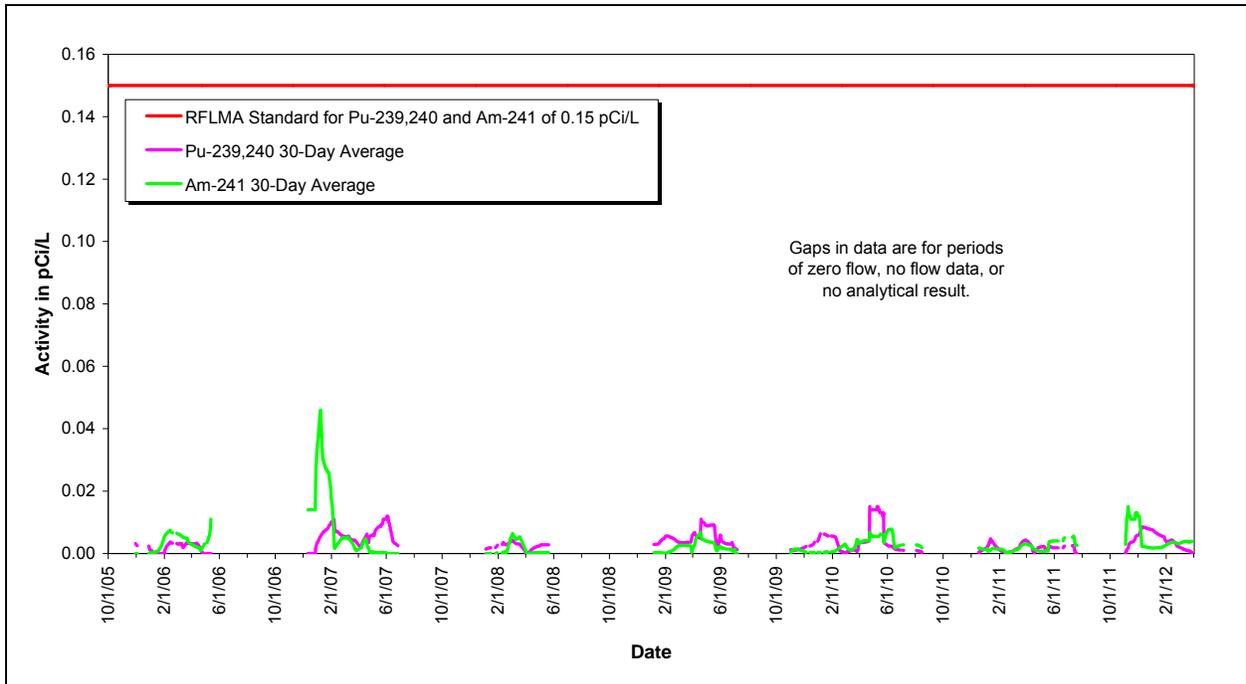
3.1.2.1 *Monitoring Location GS01*

Monitoring location GS01 is on Woman Creek at Indiana Street. Figure 2 and Figure 4 show no occurrences of reportable 30-day averages for the quarter using the available data. Figure 3 and Figure 5 show sampling data from 2005 through the first quarter of CY 2012.



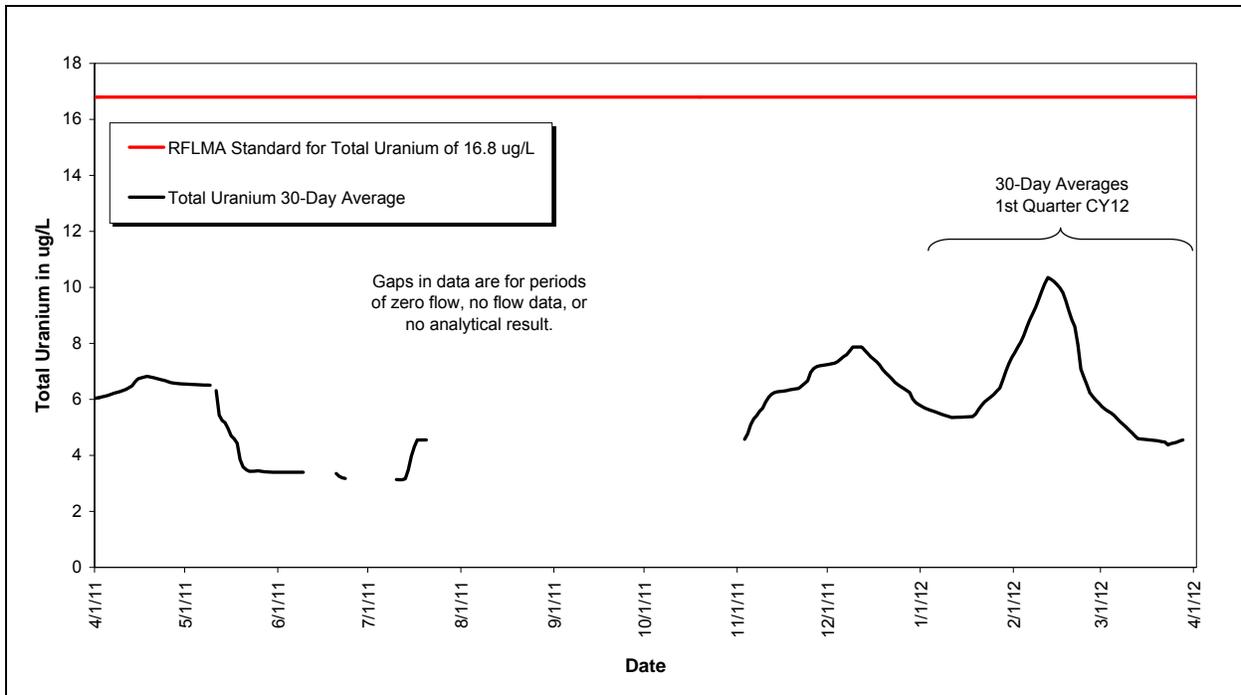
pCi/L = picocuries per liter; as of this report, analysis was pending for the composite sample collected 3/29/12–6/6/12

Figure 2. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS01: Calendar Year Ending First Quarter CY 2012



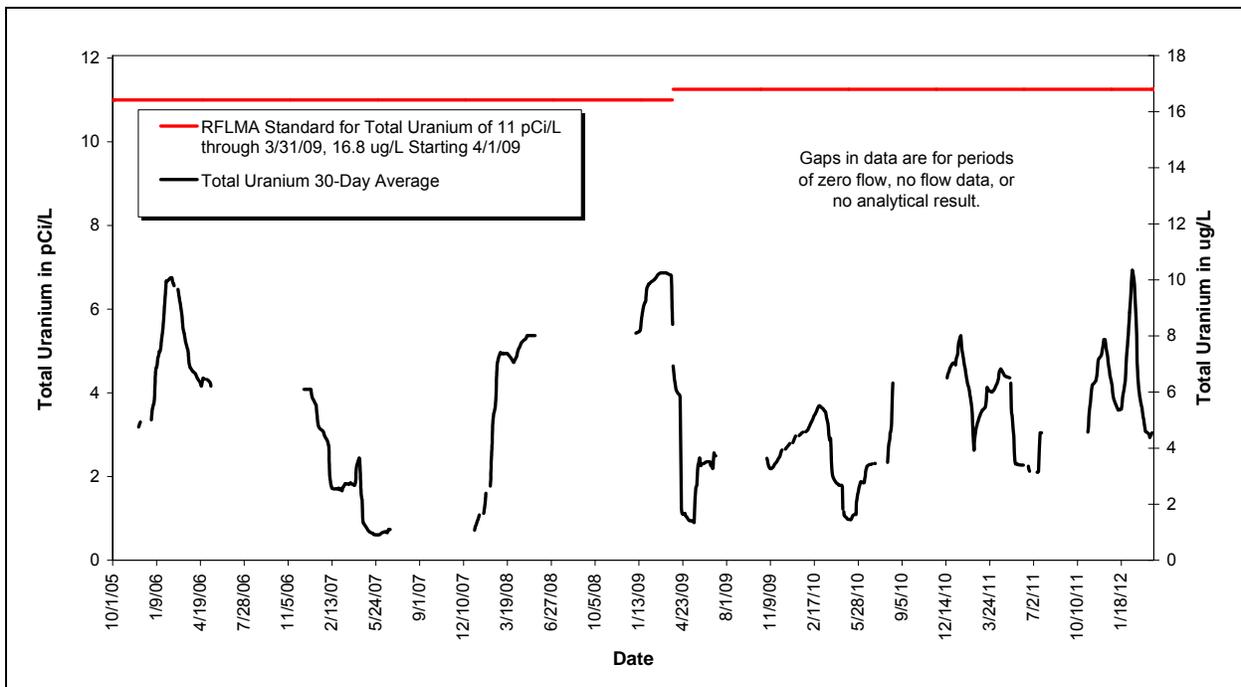
pCi/L = picocuries per liter; as of this report, analysis was pending for the composite sample collected 3/29/12–6/6/12

Figure 3. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS01: Post-Closure Period Ending First Quarter CY 2012



µg/L = micrograms per liter; as of this report, analysis was pending for the composite sample collected 3/29/12–6/6/12

Figure 4. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS01: Calendar Year Ending First Quarter CY 2012



pCi/L = picocuries per liter; µg/L = micrograms per liter; as of this report, analysis was pending for the composite sample collected 3/29/12–6/6/12

Figure 5. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS01: Post-Closure Period Ending First Quarter CY 2012

3.1.2.2 Monitoring Location GS03

Monitoring location GS03 is on Walnut Creek at Indiana Street. Figure 6, Figure 8, and Figure 10 show no occurrences of reportable water quality for the quarter using the available data. Figure 7, Figure 9, and Figure 11 show sampling data from 2005 through the first quarter of CY 2012.

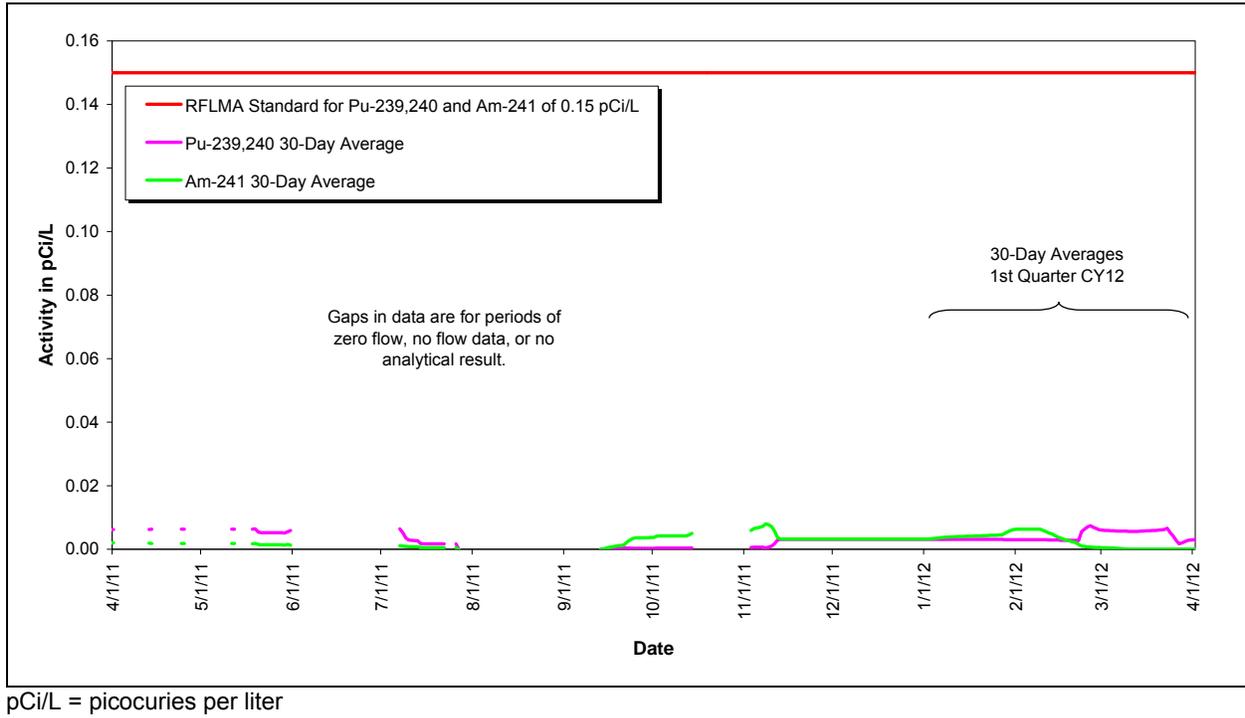
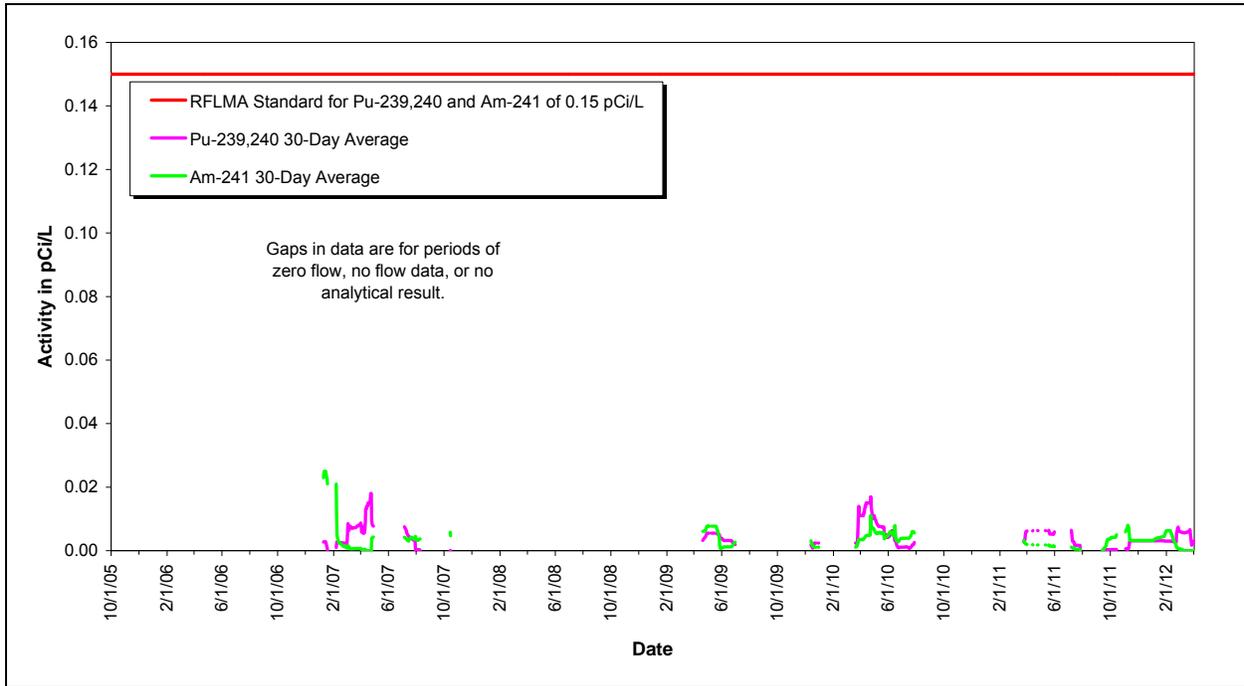
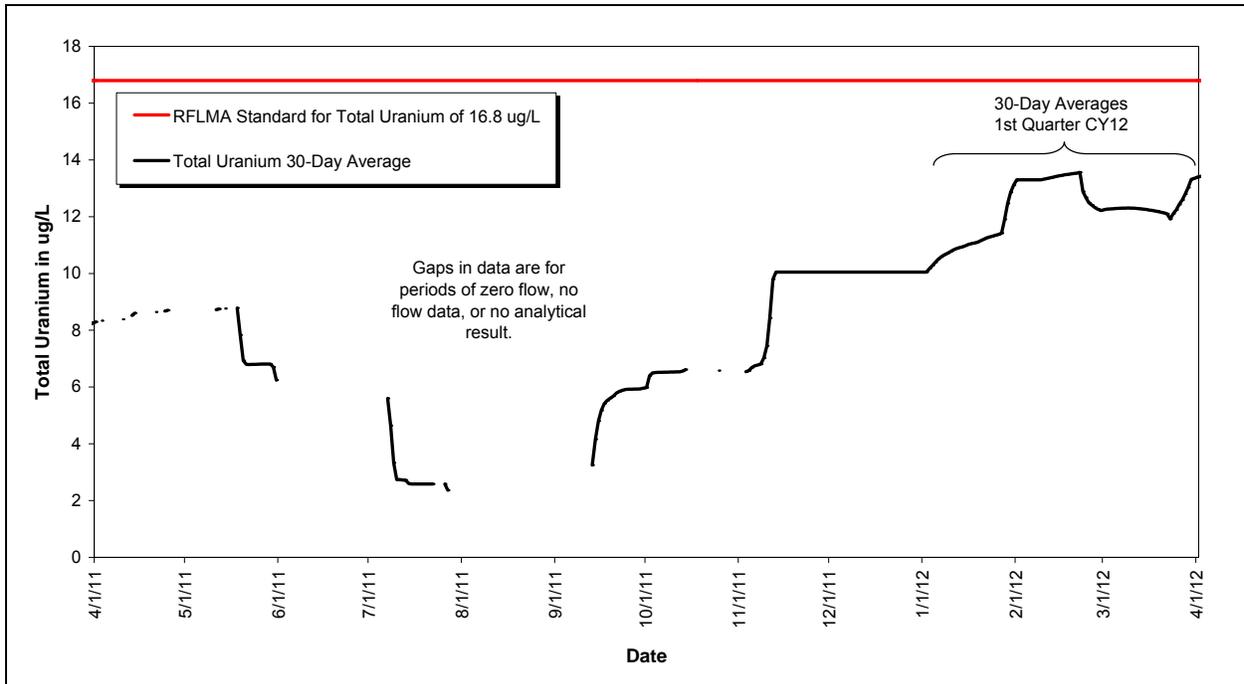


Figure 6. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS03: Calendar Year Ending First Quarter CY 2012



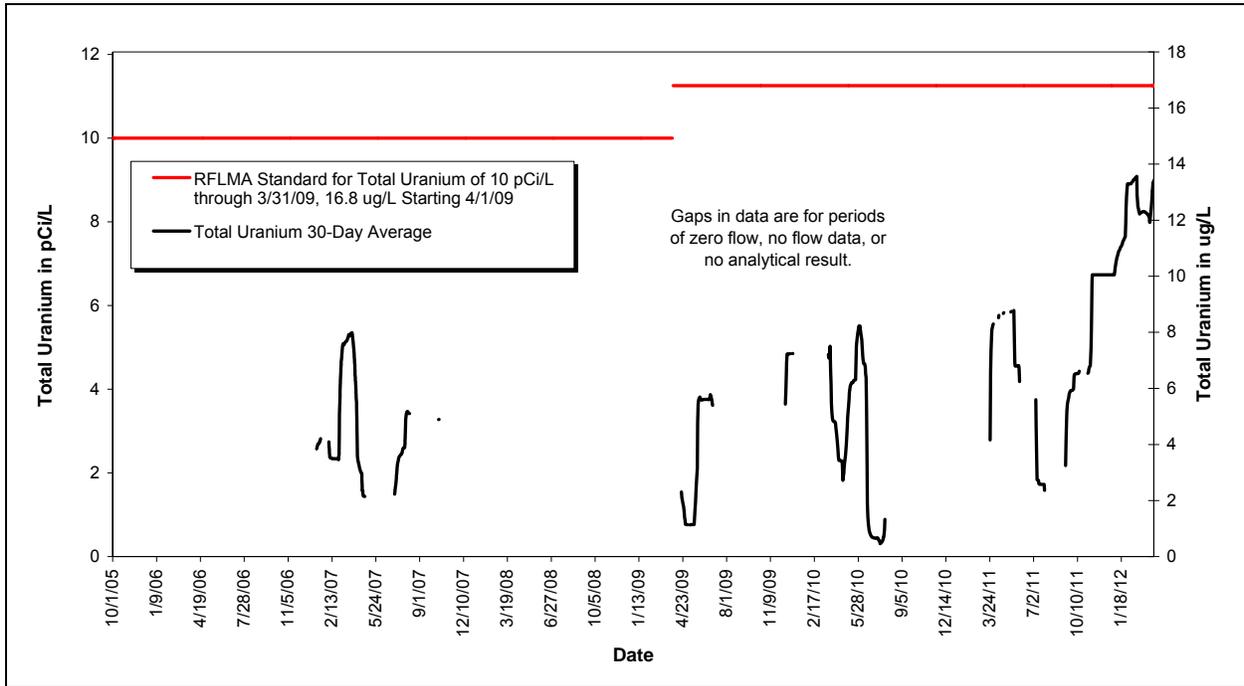
pCi/L = picocuries per liter

Figure 7. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS03: Post-Closure Period Ending First Quarter CY 2012



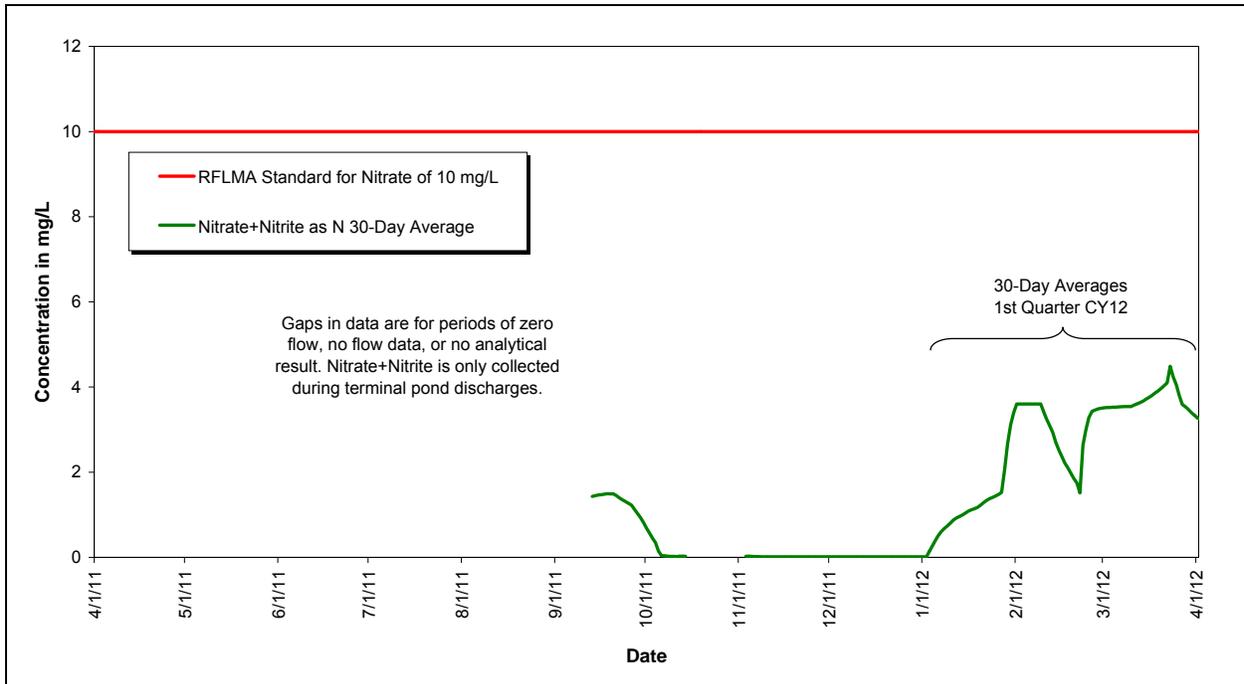
µg/L = micrograms per liter

Figure 8. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS03: Calendar Year Ending First Quarter CY 2012



µg/L = micrograms per liter; pCi/L = picocuries per liter

Figure 9. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS03: Post-Closure Period Ending First Quarter CY 2012



mg/L = milligrams per liter

Figure 10. Volume-Weighted 30-Day Average Nitrate + Nitrite Concentrations at GS03: Calendar Year Ending First Quarter CY 2012

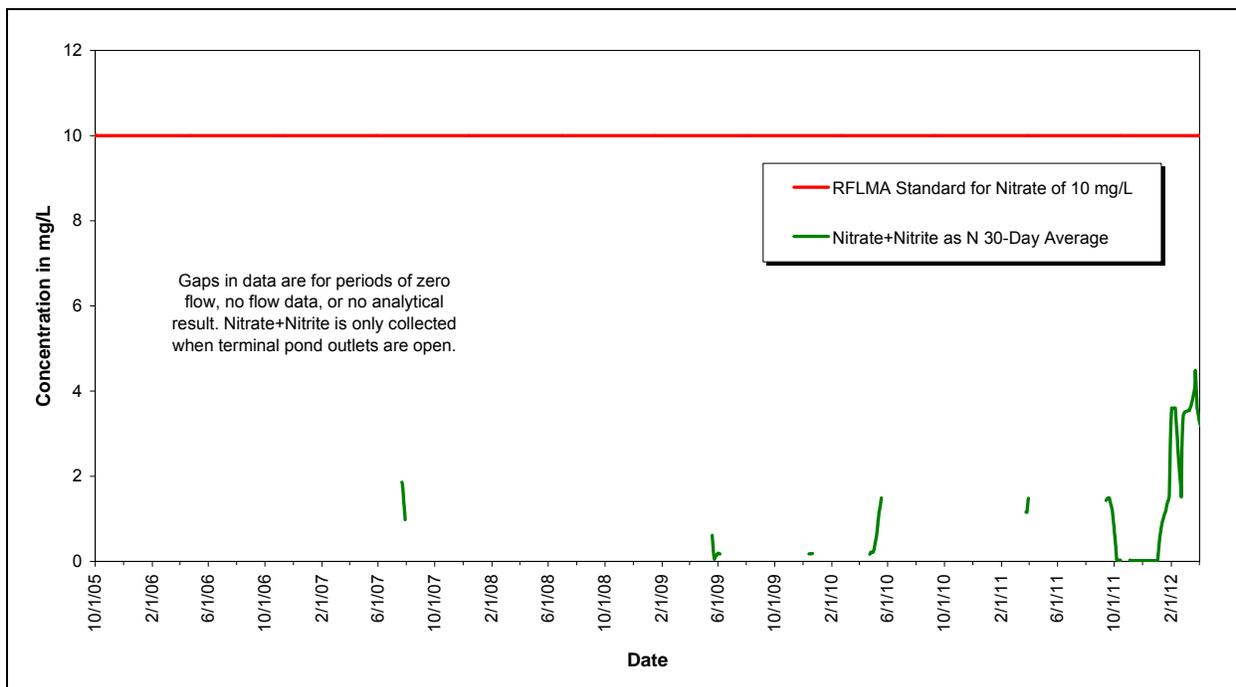
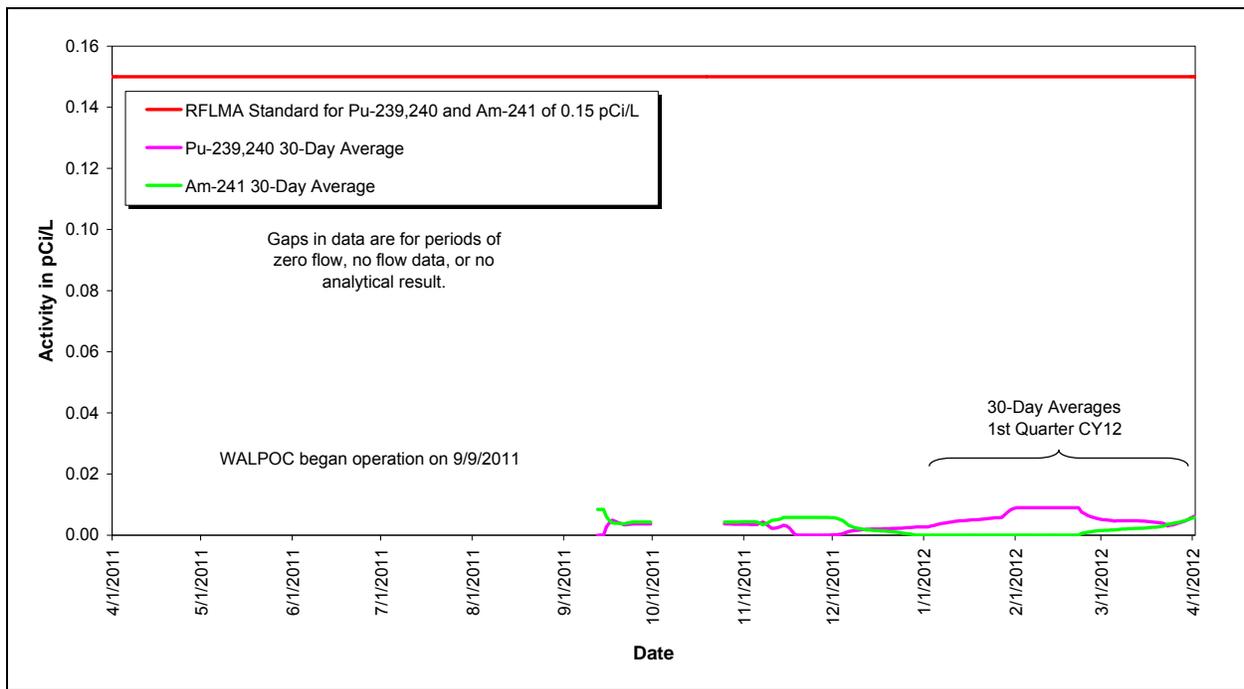


Figure 11. Volume-Weighted 30-Day Average Nitrate + Nitrite Concentrations at GS03: Post-Closure Period Ending First Quarter CY 2012

3.1.2.3 Monitoring Location WALPOC

Monitoring location WALPOC is on Walnut Creek at the eastern COU boundary. Figure 12 through Figure 17 show no occurrences of reportable 12-month rolling or 30-day averages² for the quarter using the available data.

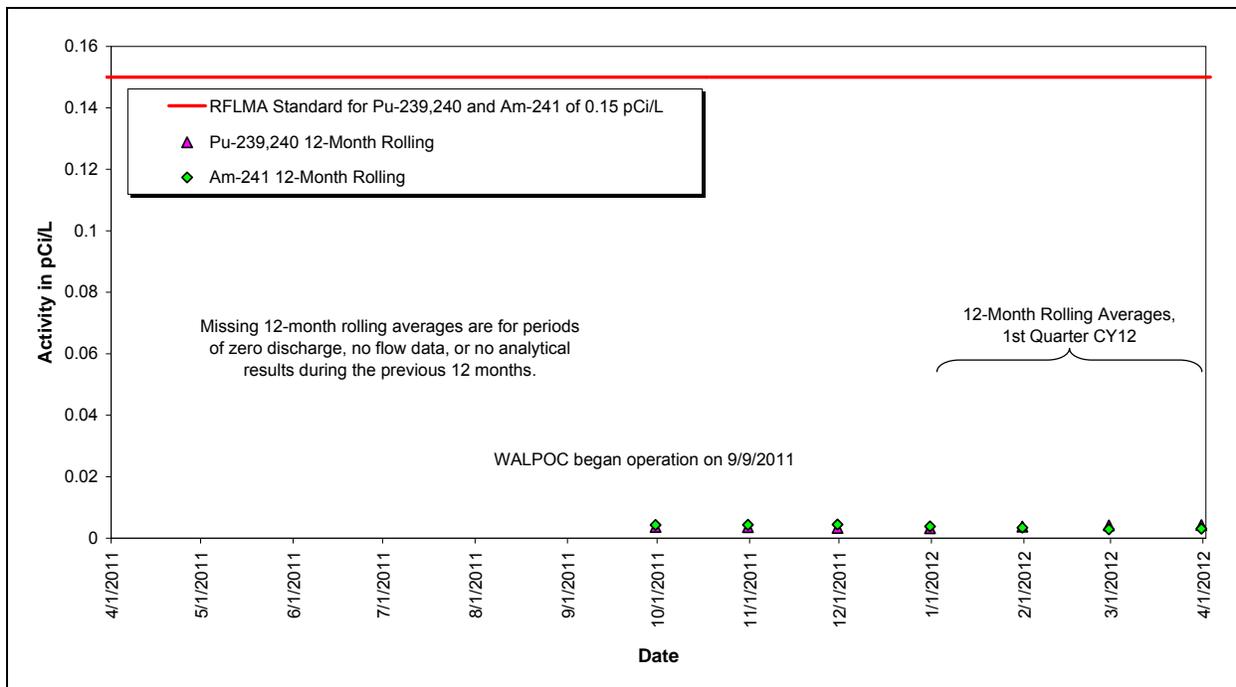
WALPOC began operation as a RFLMA POC on September 9, 2011. The first flow was observed (and sample collection began) at WALPOC on September 12, 2011. Therefore, based on routine data evaluation protocols, a 12-month rolling average cannot be formally calculated until one calendar year has elapsed from the date WALPOC began operation as a RFLMA POC. Since WALPOC began operation as a POC on September 9, 2011, the first formal 12-month rolling average will be calculated on September 8, 2012. Therefore, the values shown here for WALPOC are for information only and use only the available data.



pCi/L = picocuries per liter

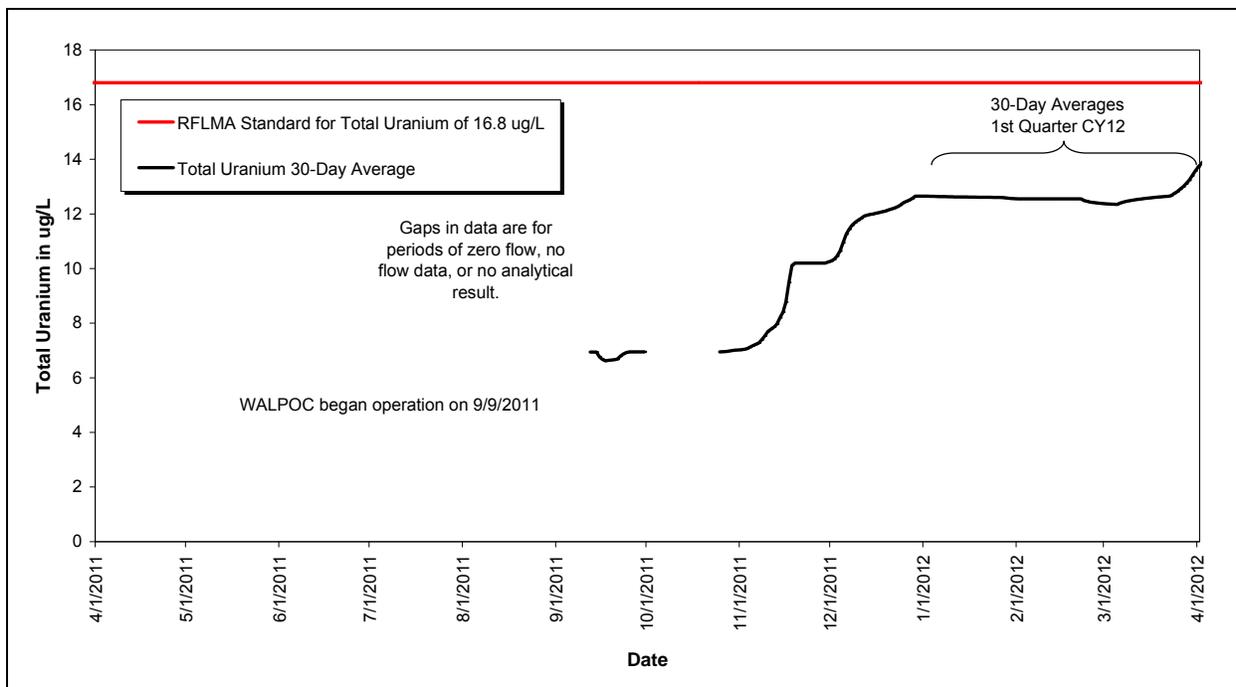
Figure 12. Volume-Weighted 30-Day Average Plutonium and Americium Activities at WALPOC: Calendar Year Ending First Quarter CY 2012

² The first flow was observed (and sample collection began) at WALPOC on September 12, 2011. Therefore, based on the data evaluation protocols, a 12-month rolling average cannot be formally calculated until one calendar year has elapsed from the date WALPOC began operation as a RFLMA POC. Since WALPOC began operation as a POC on September 9, 2011, the first formal 12-month rolling average will be calculated on September 8, 2012. Therefore, the values shown here for WALPOC use only the available data.



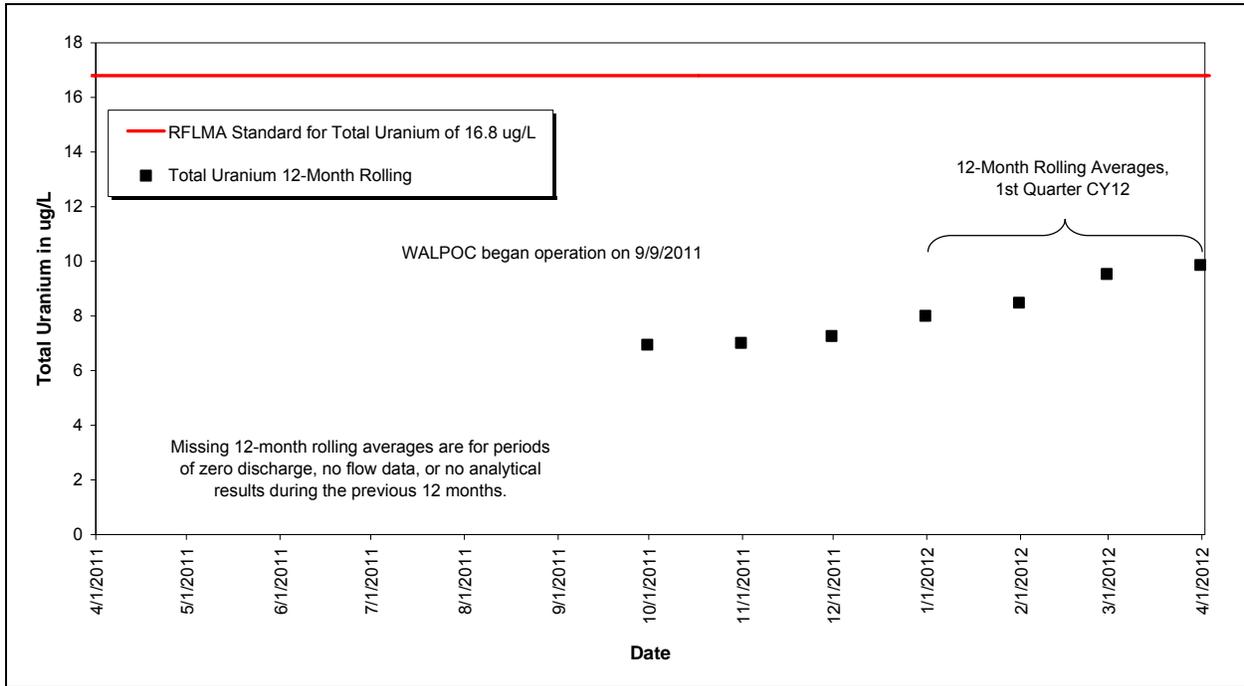
pCi/L = picocuries per liter

Figure 13. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at WALPOC: Calendar Year Ending First Quarter CY 2012



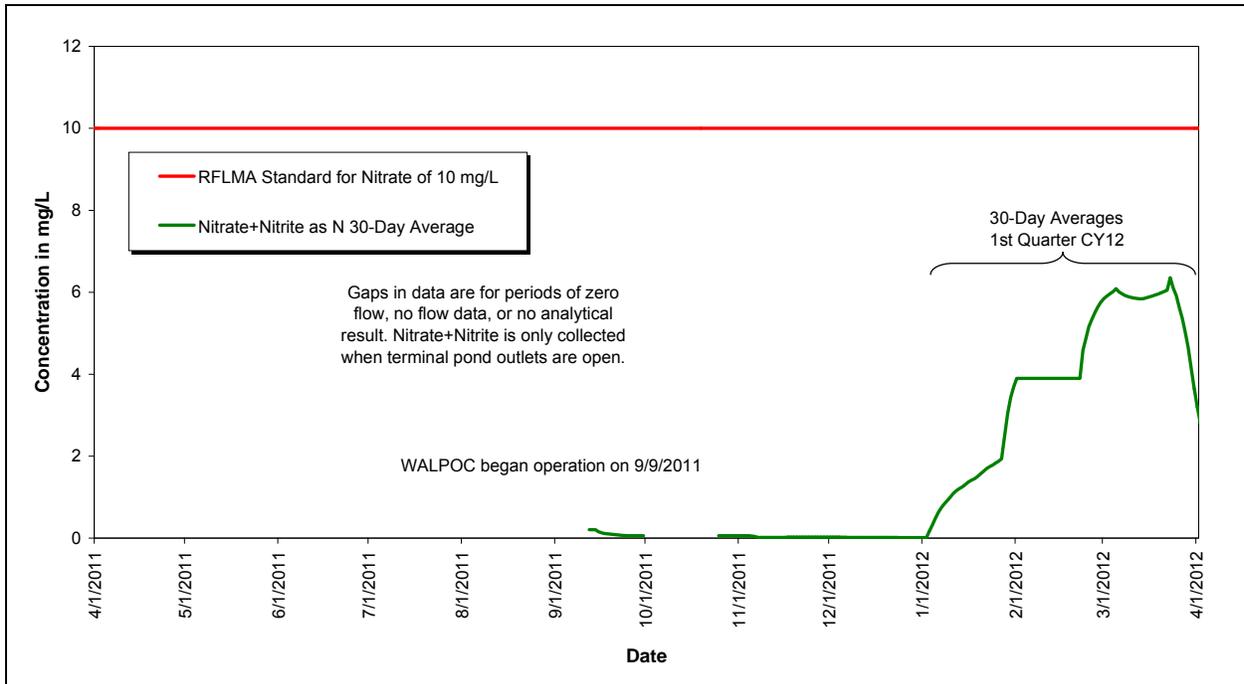
µg/L = micrograms per liter

Figure 14. Volume-Weighted 30-Day Average Total Uranium Concentrations at WALPOC: Calendar Year Ending First Quarter CY 2012



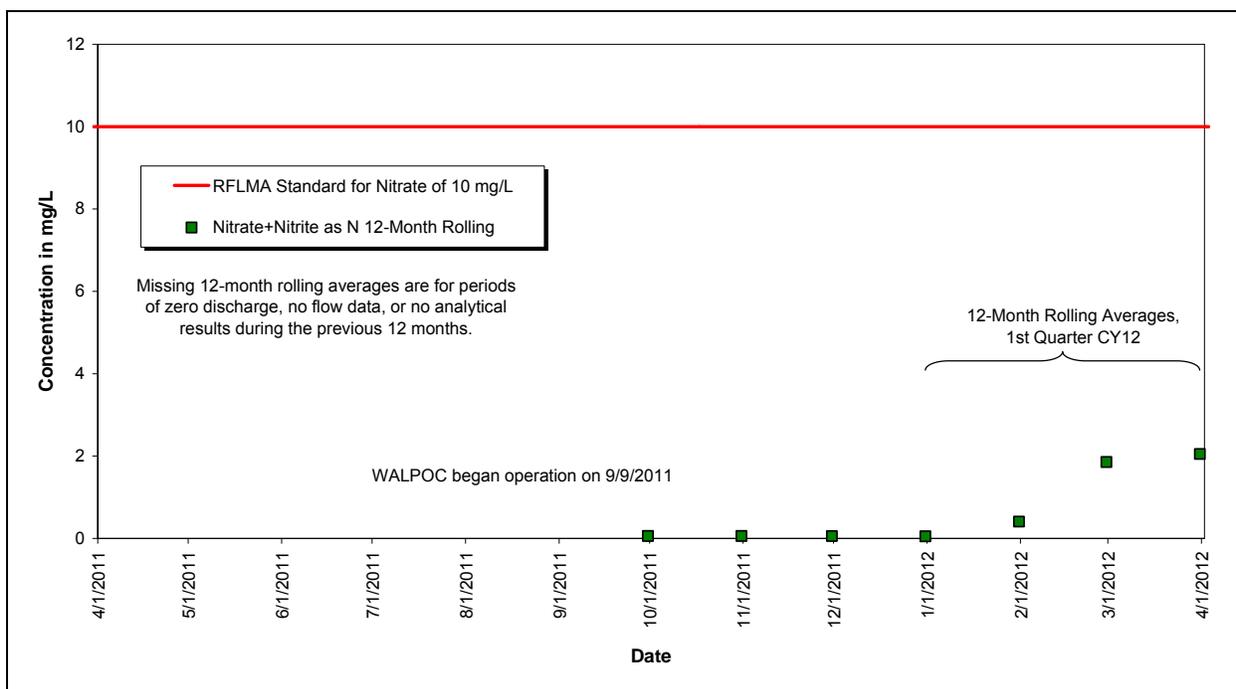
µg/L = micrograms per liter

Figure 15. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at WALPOC: Calendar Year Ending First Quarter CY 2012



mg/L = milligrams per liter

Figure 16. Volume-Weighted 30-Day Average Nitrate + Nitrite Concentrations at WALPOC: Calendar Year Ending First Quarter CY 2012

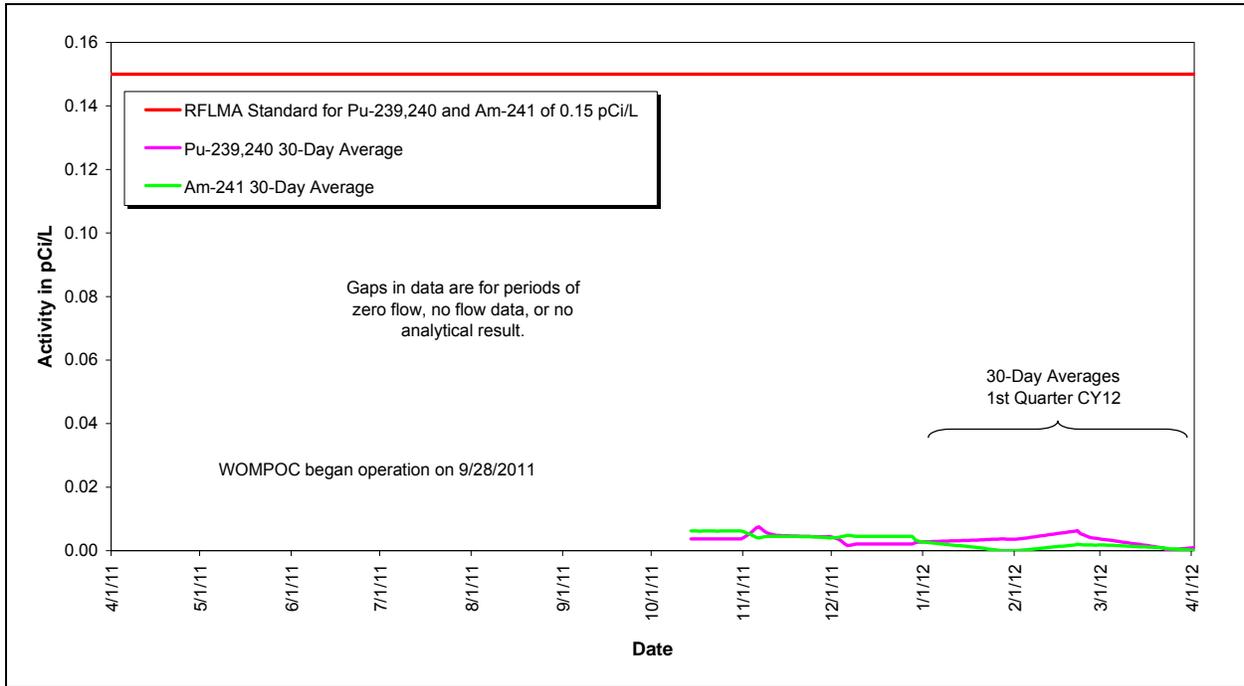


Note: Nitrate + nitrite as nitrogen 12-month averages are conservatively compared to the nitrate standard only. mg/L = milligrams per liter

Figure 17. Volume-Weighted 12-Month Rolling Average Nitrate + Nitrite as Nitrogen Concentrations at WALPOC: Calendar Year Ending First Quarter CY2012

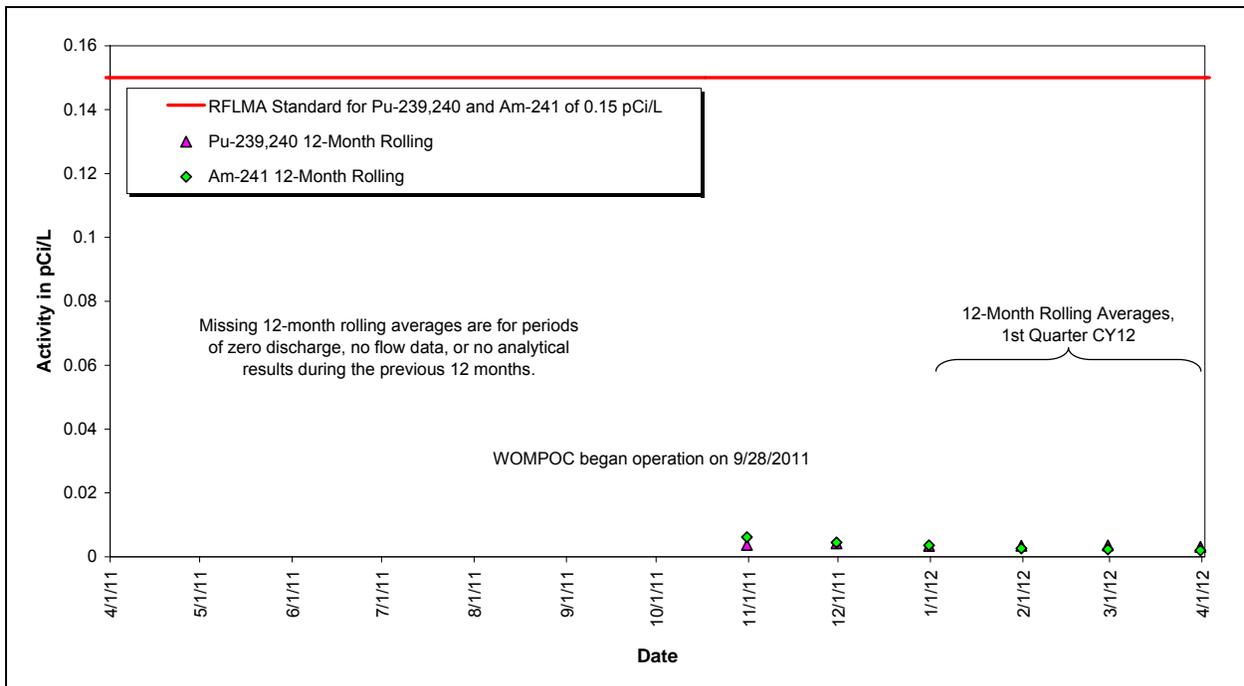
3.1.2.4 Monitoring Location WOMPOC

Monitoring location WOMPOC is on Woman Creek at the eastern COU boundary. WOMPOC began operation as a RFLMA POC on September 28, 2011. The first flow was observed (and sample collection began) at WOMPOC on October 14, 2011. Therefore, based on routine data evaluation protocols, a 12-month rolling average cannot be formally calculated until one calendar year has elapsed from the date WOMPOC began operation as a RFLMA POC. Since WOMPOC began operation as a POC on September 28, 2011, the first formal 12-month rolling average will be calculated on September 27, 2012. Therefore, the values shown here for WOMPOC are for information only and use only the available data.



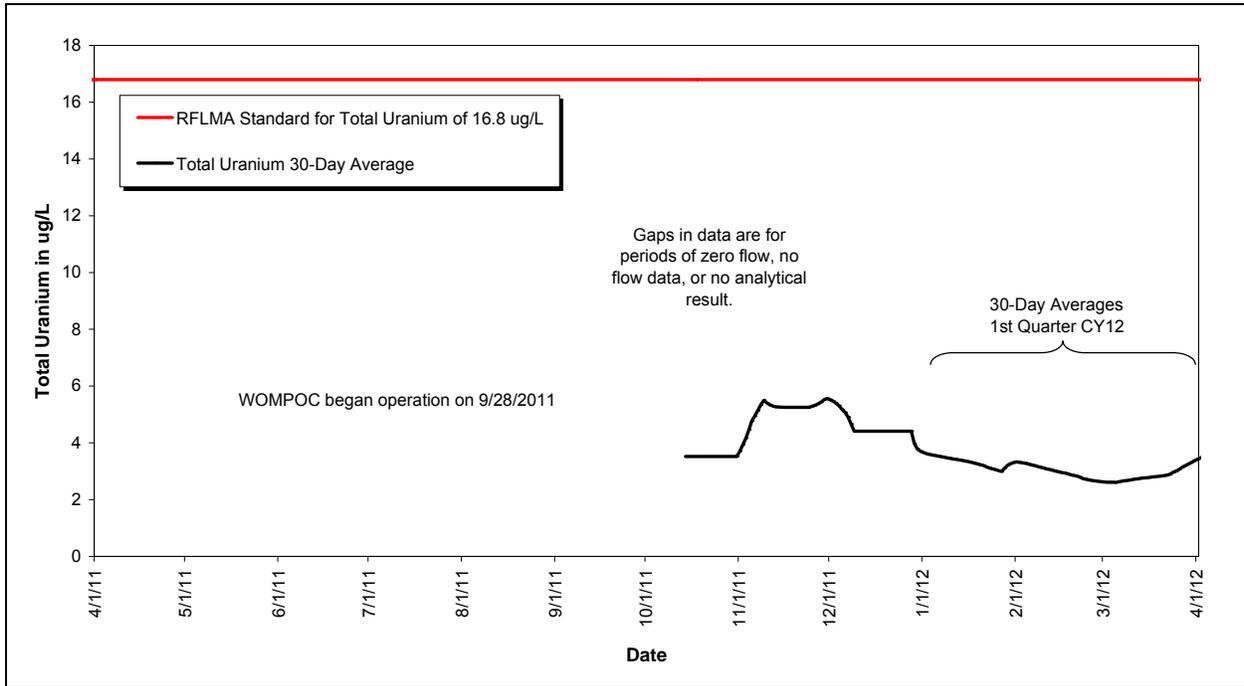
pCi/L = picocuries per liter

Figure 18. Volume-Weighted 30-Day Average Plutonium and Americium Activities at WOMPOC: Calendar Year Ending First Quarter CY 2012



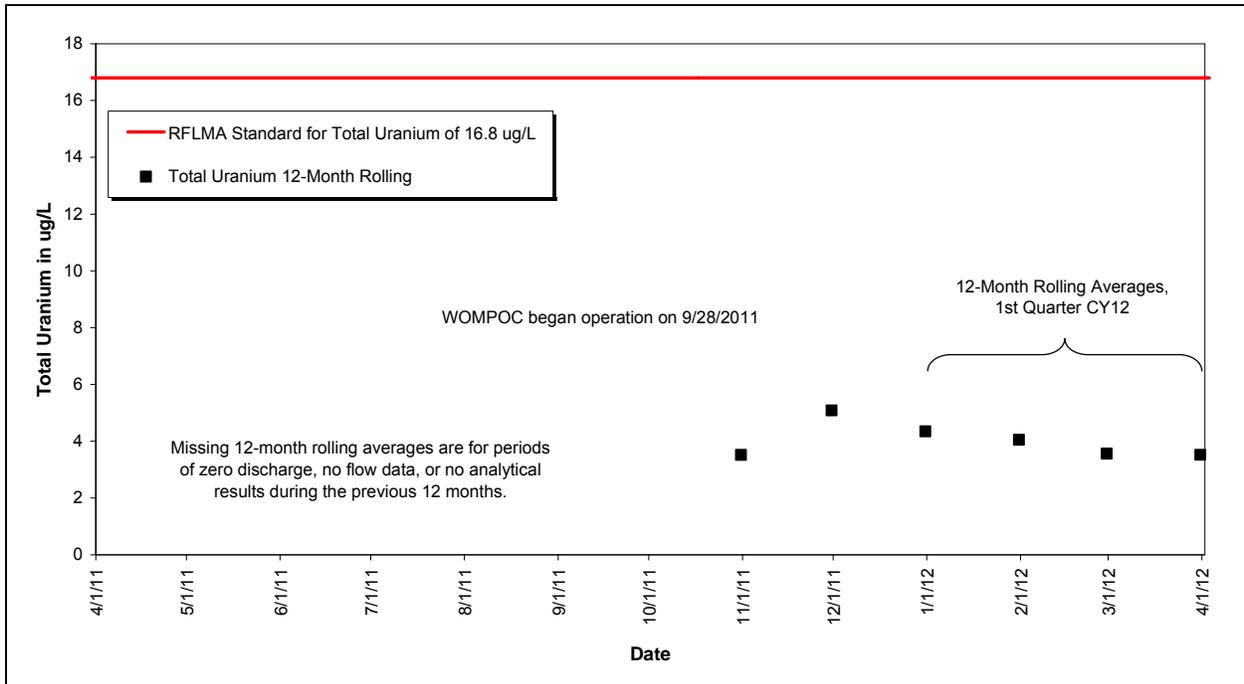
pCi/L = picocuries per liter

Figure 19. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at WOMPOC: Calendar Year Ending First Quarter CY 2012



µg/L = micrograms per liter

Figure 20. Volume-Weighted 30-Day Average Total Uranium Concentrations at WOMPOC: Calendar Year Ending First Quarter CY 2012



µg/L = micrograms per liter

Figure 21. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at WOMPOC: Calendar Year Ending First Quarter CY 2012

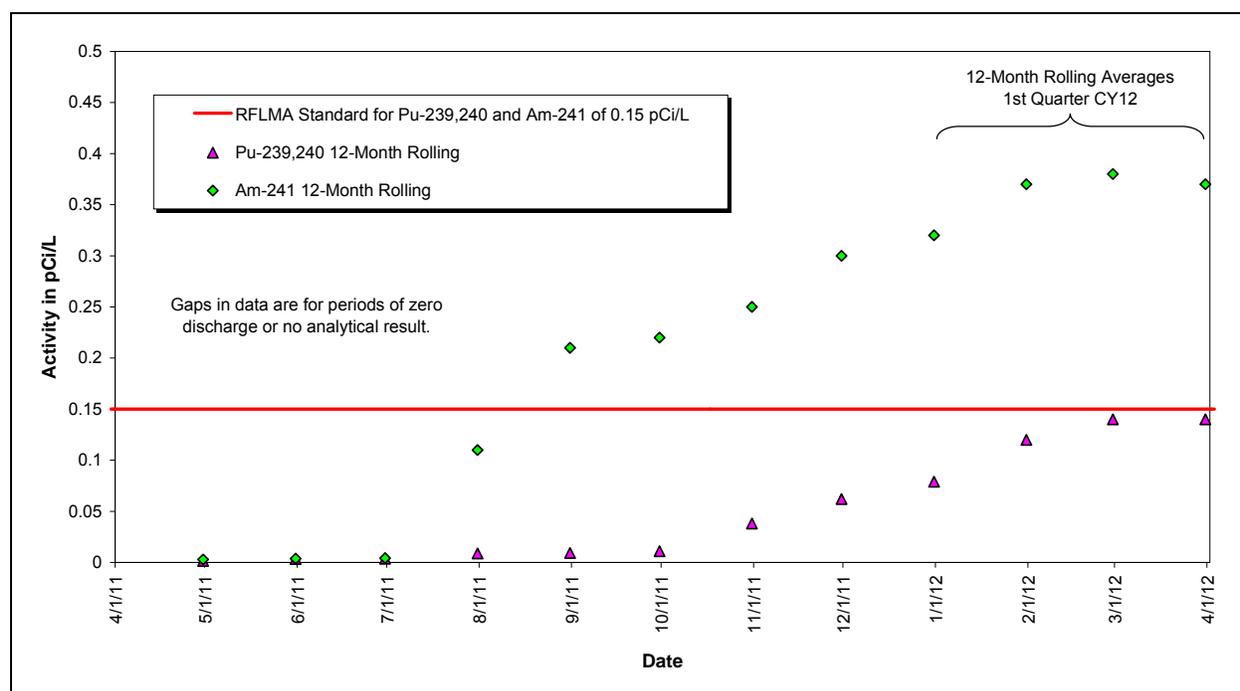
3.1.3 POE Monitoring

The following sections include summary plots showing the applicable 12-month rolling averages for the POE analytes.

3.1.3.1 Monitoring Location GS10

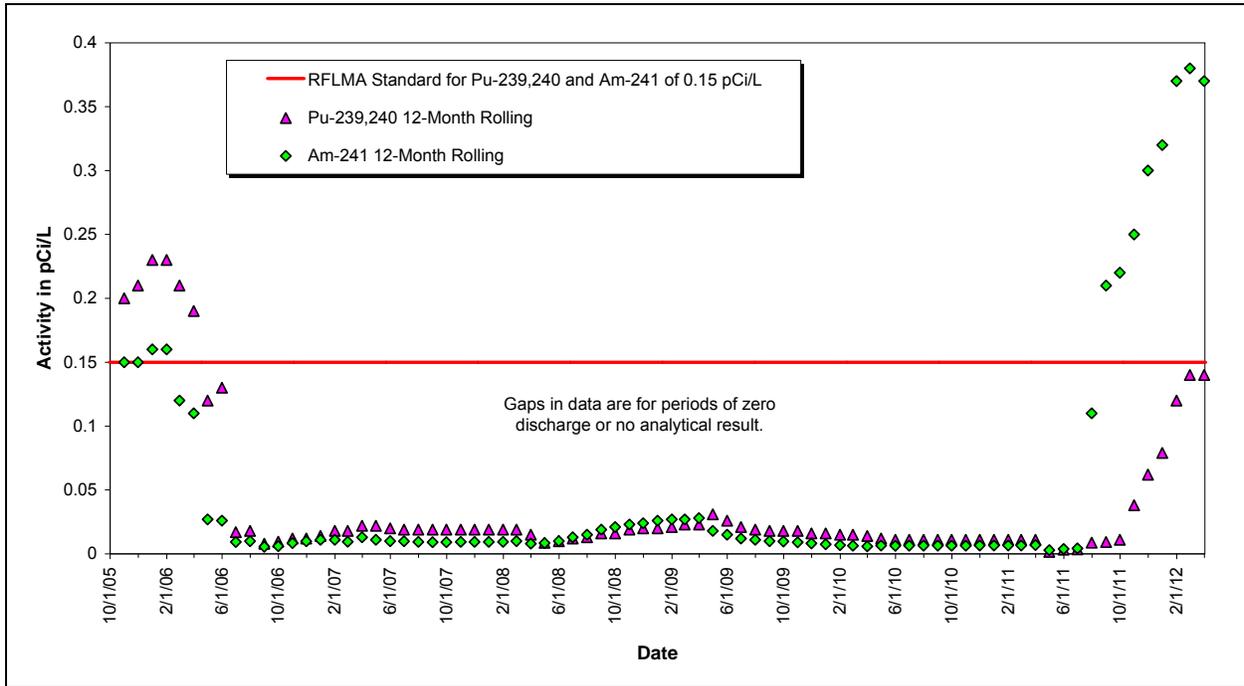
Monitoring location GS10 is on South Walnut Creek just upstream of the B-Series ponds. Figure 22 and Figure 24 show the 12-month rolling averages for plutonium, americium, and total uranium values during the quarter. Figure 23 and Figure 25 show sampling data from 2005 through the first quarter of CY 2012.

Reportable 12-month rolling average uranium concentrations were observed starting on April 30, 2011, in surface water at RFLMA POE monitoring station GS10, which is located on South Walnut Creek upstream of former Pond B-1. Reportable 12-month rolling average americium (Am) activities were also observed starting on August 31, 2011. As of the end of the first quarter of CY 2012, both analytes were still reportable. No other analytes were reportable during the first quarter of CY 2012.



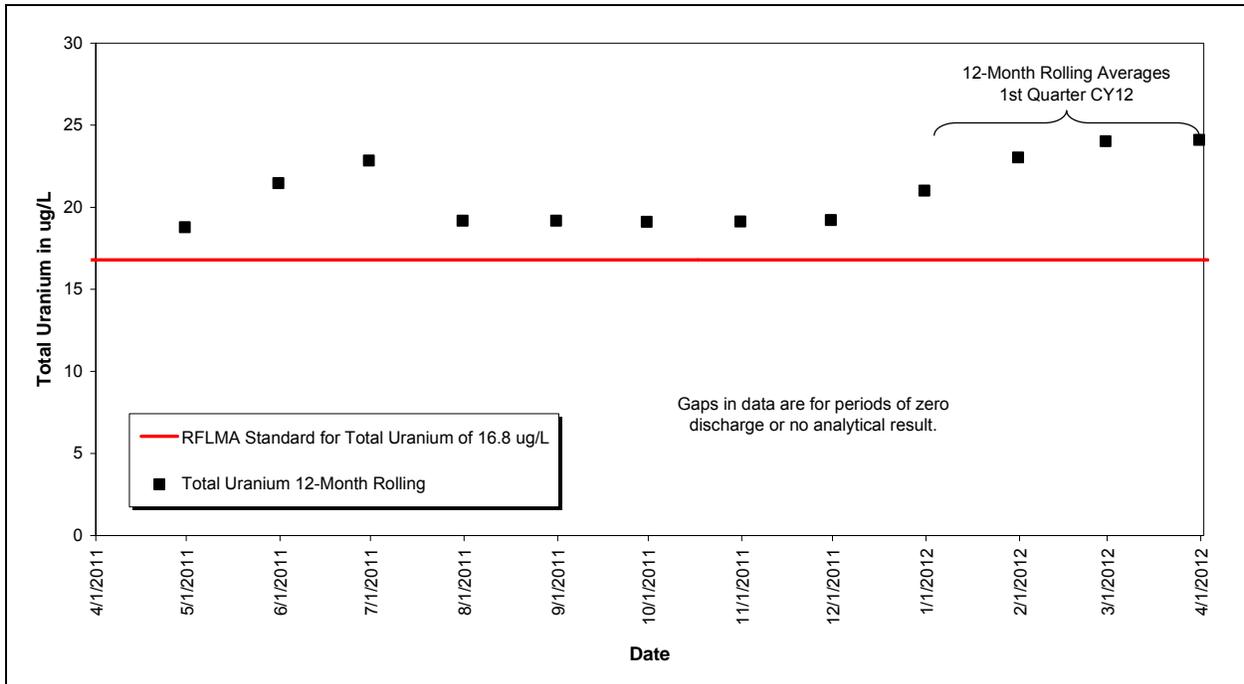
pCi/L = picocuries per liter

Figure 22. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS10: Calendar Year Ending First Quarter CY 2012



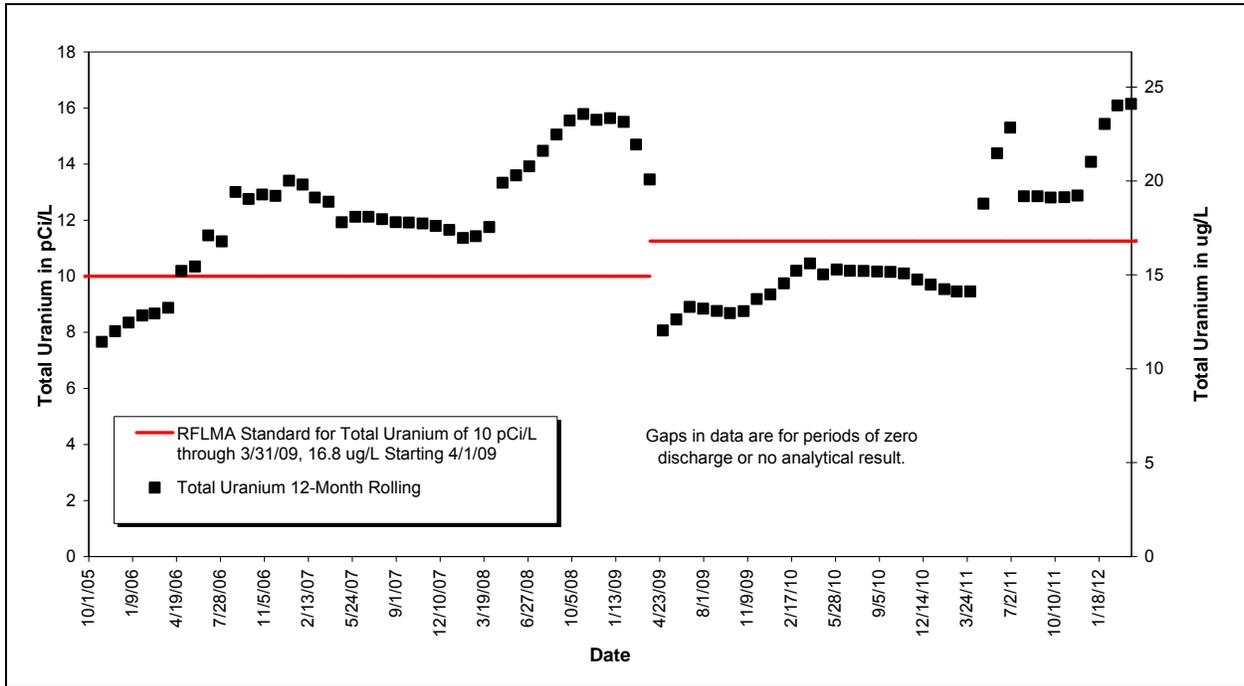
pCi/L = picocuries per liter

Figure 23. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS10: Post-Closure Period Ending First Quarter CY 2012



µg/L = micrograms per liter

Figure 24. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at GS10: Calendar Year Ending First Quarter CY 2012



µg/L = micrograms per liter; pCi/L = picocuries per liter

Figure 25. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at GS10: Post-Closure Period Ending First Quarter CY 2012

The composite sampling results for plutonium, americium, and uranium from composite samples collected at GS10 during calendar years 2011–2012 are given below in Table 1.

Table 1. Calendar Years 2011–2012 Composite Sampling Results at GS10

Date-Time Start	Date-Time End	Am-241 Result (pCi/L)	Pu-239, 240 Result (pCi/L)	Uranium Result (µg/L)
1/3/2011–10:25	2/16/2011–9:47	0.000	0.000	21.8
2/16/2011–9:47	4/11/2011–10:50	0.000	0.013	89.2
4/11/2011–10:50	5/4/2011–11:39	0.023	0.021	71.0
5/4/2011–11:39	5/13/2011–12:25	0.019	0.017	46.5
5/13/2011–12:25	5/20/2011–12:03	0.003	0.007	18.6
5/20/2011–12:03	6/3/2011–10:56	0.004	0.001	35.8
6/3/2011–10:56	6/13/2011–10:22	0.015	0.000	20.1
6/13/2011–10:22	7/1/2011–9:00	0.010	0.004	10.6
7/1/2011–9:00	7/8/2011–11:08	0.008	0.008	7.75
7/8/2011–11:08	7/10/2011–11:05	0.015	0.005	4.36
7/10/2011–11:05	7/11/2011–10:59	0.020	0.011	6.06
7/11/2011–10:59	7/21/2011–8:56	0.058	0.037	11.3
7/21/2011–8:56	8/24/2011–9:41	3.490	^a	7.82
8/24/2011–9:41	9/29/2011–12:35	0.044	0.020	8.16
9/29/2011–12:35	10/25/2011–10:27	0.877	0.658	8.24
10/25/2011–10:27	11/17/2011–10:40	0.904	0.405	16.5
11/17/2011–10:40	12/14/2011–12:17	0.349	0.189	16.4
12/14/2011–12:17	1/5/2012–13:19	0.435	0.238	44.5
1/5/2012–13:19	1/23/2012–10:43	1.140	0.735	49.7
1/23/2012–10:43	2/2/2012–12:36	0.037	0.021	38.3
2/2/2012–12:36	2/21/2012–11:18	0.776	0.466	49.0
2/21/2012–11:18	2/24/2012–9:34	0.214	0.267	25.1
2/24/2012–9:34	3/6/2012–12:04	0.074	0.050	33.9
3/6/2012–12:04	3/21/2012–9:37	0.150	0.114	38.70
3/21/2012–9:37	4/4/2012–10:20	0.318	0.246	35.50
4/4/2012–10:20	4/25/2012–9:31	0.052	0.034	27.60
4/25/2012–9:31	5/9/2012–13:36	0.478	0.264	16.10
5/9/2012–13:36	5/23/2012–9:37	0.159	0.107	12.90
5/23/2012–9:37	6/14/2012–10:06	^b	^b	^b
6/14/2012–10:06	in progress	^c	^c	^c

Notes: Recent results from the second quarter of CY 2012 are not yet validated and are subject to revision.

^a Through data validation, results determined to be unusable

^b Analysis pending

^c Sample in progress

pCi/L = picocuries per liter

Reportable Americium Activities at GS10

Formal notification of a reportable condition for 12-month rolling average americium values at GS10 was made on December 12, 2011. The reportable condition was determined based on evaluation of recently available validated analytical results for americium (Am-241) from the composite samples collected during the period July 21, 2011–October 25, 2011. Following is a synopsis of the initial data that triggered the reportable condition:

- Composite July 21–August 24, 2011 (initial analysis; results validated November 2, 2011) Pu = 0.938 picocuries per liter (pCi/L), Am = 2.97 pCi/L
- Composite July 21–August 24, 2011 (laboratory re-analysis completed November 15, 2011; results validated November 22, 2011) Pu = 4.07 pCi/L, Am = 4.01 pCi/L

- Composite August 24–29, 2011 (results validated November 30, 2011) Pu = 0.020 pCi/L, Am = 0.044 pCi/L
- Composite September 29–October 25, 2011 (results validated November 22, 2011) Pu = 0.658 pCi/L, Am = 0.877 pCi/L

Under routine data validation protocols, the duplicate error ratio (DER) is used to evaluate data pairs (i.e., an initial analysis and a duplicate analysis). If the DER for a data pair is >3 and ≤ 5 , then the results are "J" qualified (estimated). If the DER for a data pair is >5 , then the results are "R" qualified (unusable result). During validation of the July 21–August 24, 2011, analytical results, the Am results were determined to be "J" qualified, while the Pu results were determined to be "R" qualified. Therefore, the arithmetic average of the Am results is used in the calculation of the 12-month rolling average for Am; the Pu results were rejected and not included in calculation of the 12-month rolling average for Pu.

The above evaluation was performed in accordance with RFLMA Attachment 2, Figure 6, "Points of Evaluation," which resulted in 12-month rolling average values for Am of 0.21 pCi/L on August 31, 2011, and 0.22 pCi/L on September 30, 2011. The applicable RFLMA Table 1 Standard for Am and Pu is 0.15 pCi/L. As of March 31, 2012, using validated data, the 12-month rolling average for Am remained above the standard at 0.37 pCi/L; using unvalidated data, americium is reportable through April 30, 2012. The 12-month rolling average for Pu remains below the standard.

While the 12-month rolling average for Pu continues to be not reportable, because Pu and Am behave similarly in the environment, the evaluation of the reportable Am values includes consideration of the Pu results.

Downstream monitoring at GS08, WALPOC, and GS03 continue to show Pu and Am activities well below the RFLMA standard of 0.15 pCi/L. Recent analytical results at downstream locations are given in Table 2. The latest available 12-month rolling and 30-day average Pu/Am activities calculated from flow-paced composite samples are shown on Figure 26 and Figure 27.

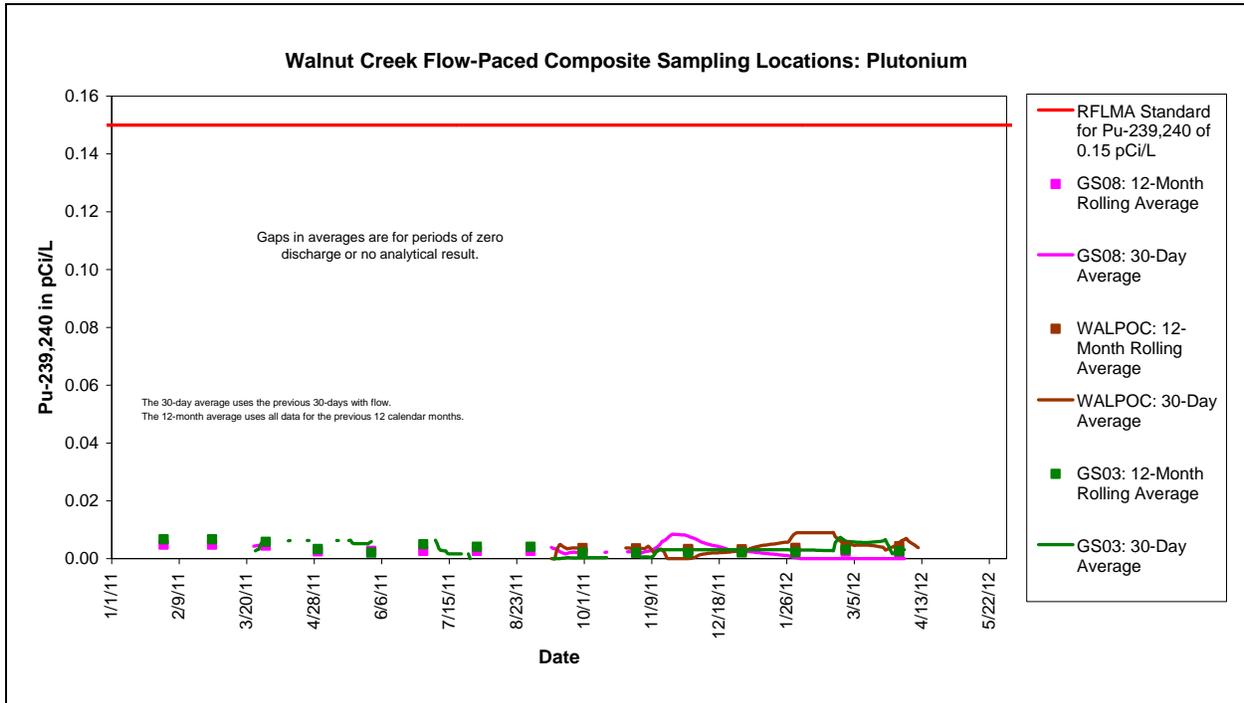
Table 2. Recent Pu and Am Flow-Paced Composite Sample Results

GS08		WALPOC		GS03	
Sample Period	Result Am/Pu (pCi/L)	Sample Period	Result Am/Pu (pCi/L)	Sample Period	Result Am/Pu (pCi/L)
3/24–3/26/11	0.002/0.003			3/24–3/26/11	0.0/0.002
3/26–3/28/11	0.002/0.004			3/26–3/28/11	0.002/0.003
3/28–3/30/11	0.003/0.0			3/28–3/31/11	0.001/0.011
				3/31–5/20/11	0.002/0.007
				5/20–9/12/11	0.0/0.0
9/12–9/15/11	0.002/0.002	9/12–9/15/11	0.008/0.0	9/12–9/15/11	0.0/0.0
9/15–9/18/11	0.001/0.0	9/15–9/18/11	0.0/0.009	9/15–9/18/11	0.002/0.0
9/18–9/21/11	0.0/0.0	9/18–9/22/11	0.003/0.0	9/18–9/22/11	0.003/0.001
9/21–9/27/11	0.0/0.005	9/22–9/27/11	0.006/0.004	9/22–9/27/11	0.009/0.0
9/27–11/9/11	0.0/0.009	9/27–11/30/11	0.006/0.0	9/27/11–1/3/12	0.003/0.003
11/9–11/29/11	0.005/0.008				
11/29/11–1/5/12	0.005/0.003	11/30/11–1/3/12	0.0/0.003		
1/5–2/1/12	0.001/0.0	1/3–2/23/12	0.0/0.009	1/3–2/10/12	0.006/0.003
2/1–4/4/12	0.0/0.0			2/10–2/23/12	0.0/0.003
		2/23–3/6/12	0.003/0.001	2/23–2/27/12	0.0/0.012
				2/27–3/1/12	0.0/0.0
		3/6–3/21/12	0.004/0.009	3/1–3/15/12	0.0/0.002
		3/21–4/13/12	0.018/0.0	3/15–4/4/12	0.0/0.005
4/4/12–	^b	4/13/12–	^b	4/4–6/6/12	^a
				6/6/12–	^b

Notes: Some results are preliminary and subject to revision; negative results are set to zero.

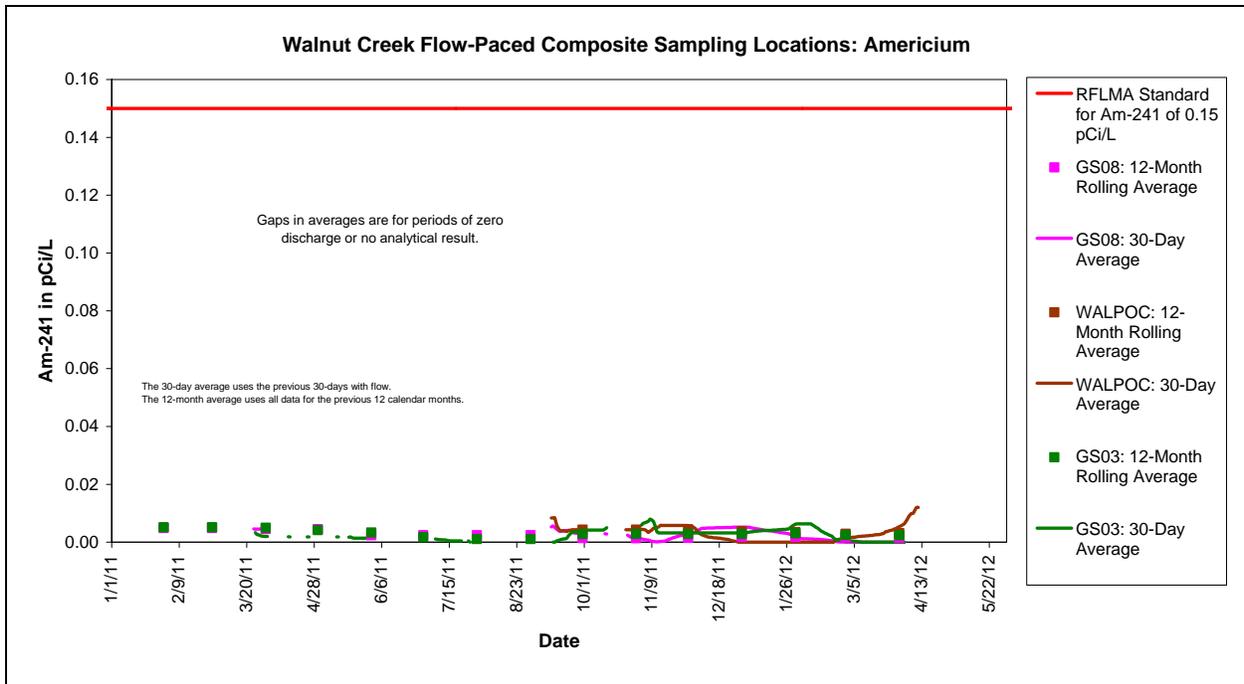
^a Analysis pending

^b Sample in progress



Note: Plot includes data that are preliminary and subject to revision. Values for 12-month and 30-day averages shown here are presented for comparison purposes only.

Figure 26. Average Plutonium Activities at Locations Downstream of GS10



Note: Plot includes data that are preliminary and subject to revision. Values for 12-month and 30-day averages shown here are presented for comparison purposes only.

Figure 27. Average Americium Activities at Locations Downstream of GS10

Although further evaluation and consultation is ongoing, the following list summarizes action to date:

- Rocky Flats staff walked down the GS10 drainage on November 16, 2011, to see if any obvious conditions were promoting potential soil erosion. Some thin vegetation spots were noted on the north side of the riprap upstream of GS10. Some reseeding/erosion matting could be applied in spots, and a map of the areas to be addressed will be prepared. A closer examination of the drainage to focus on seeps and former utility corridors was conducted on November 22, 2011; representatives from DOE and EPA were in attendance.
- Historical Pu and Am well data from wells in the drainage have been reviewed. The review gave no indication that additional well sampling would be informative at this stage.
- The previous GS10 evaluation reports have been reviewed for information that may aid this current evaluation.
- Several of the sampling locations already designated for the evaluation of the reportable condition for uranium at GS10 (FC4991, GS10, and B3OUTFLOW; Figure 28) were grab sampled on November 25, 2011. Several seep sampling locations (SEEP995, SEEP995A, SEEP995B, and SEEP995C; Figure 28) were also grab sampled on November 25, 2011. This Seep 995 area was chosen for sampling for the following reasons:
 - GS10 samples with elevated Pu/Am were collected during low-flow conditions, not during high-flow conditions when soil/sediment would be expected to be transported.
 - Visible surface flow from this seep was observed reaching FC-4.
 - This seep, which has increased in size since closure, is in the same location of the former Wastewater Treatment Plant outfall and a former utility corridor that included Original Process Waste Lines.

The results in Table 3 suggest that the SEEP995 locations could be contributing Pu and Am to GS10. However, activities at GS10 for this grab sample are low.

Table 3. Grab Sampling Results Upstream of GS10: November 25, 2011

Location Code	SEEP995	SEEP995A	SEEP995B	SEEP995C
Pu [pCi/L]	0.096	0.156	0.157	0.105
Am [pCi/L]	0.066	0.127	0.035	0.052



	Upstream	→	Downstream
Location Code	FC4991		GS10 B3OUTFLOW
Pu [pCi/L]	0.006		0.030 0.005
Am [pCi/L]	0.005		0.012 0.005

Note: The arrow from the upper table indicates the relative location of the SEEP995 locations along FC-4.

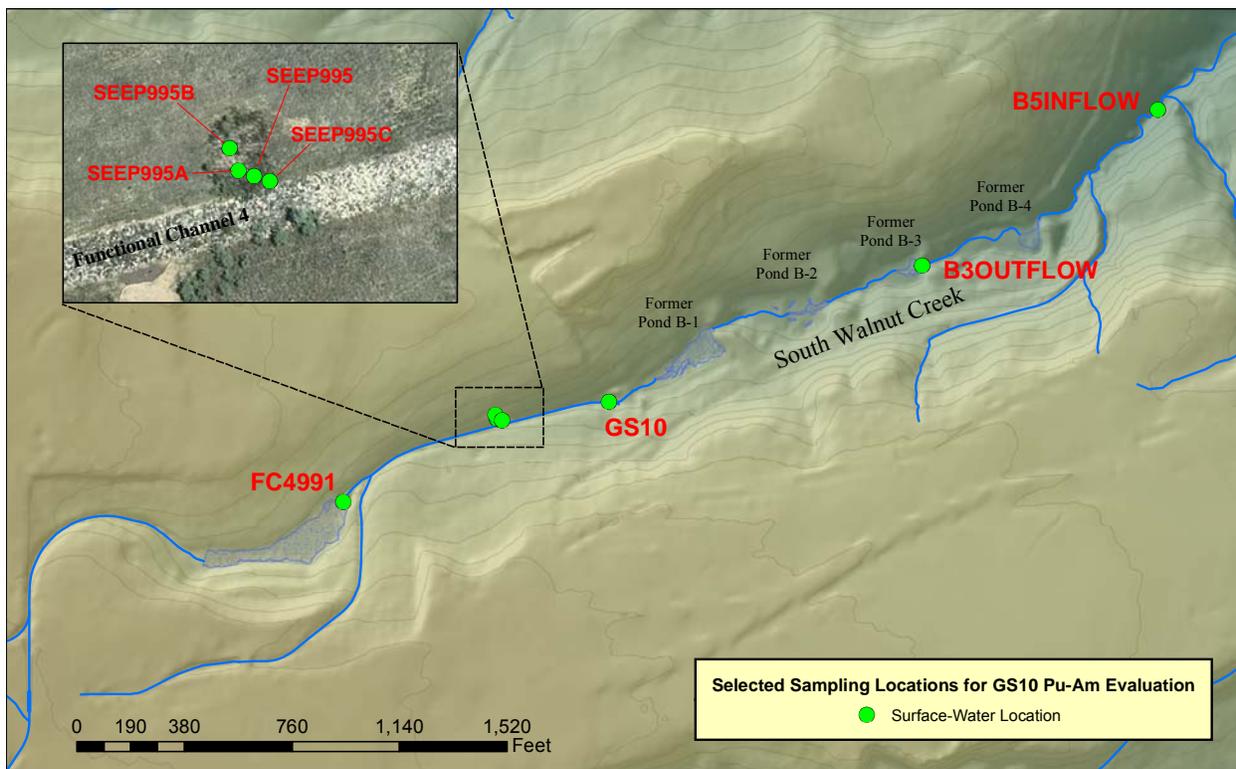


Figure 28. Pu/Am Evaluation Sampling Location Map for GS10 Drainage Area

- An aliquot from each flow-paced composite sample routinely being collected at B5INFLOW (supporting the GS10 uranium evaluation; Figure 28) is also being held for Pu and Am analysis if upstream sample results suggest analysis would inform the evaluation. To date, four Pu/Am results have been obtained and all results are well below the RFLMA standard of 0.15 pCi/L.
- Additional samples have been periodically collected at SEEP995A when water was available (i.e., unfrozen seep flow not affected by surface flow such as snowmelt). Samples were collected on January 6, January 24, and April 13, 2012. For the January 24 sample, analysis was performed for total Pu/Am (unfiltered) and also for filtered Pu/Am (sample filtered with 0.45 micrometer (μm) filter) to evaluate for the possibility of colloidal transport. Table 4 shows some measurable activity for the January 6 and April 13 samples. However, the low activities for the January 24 samples do not provide additional insight into the possibility of colloidal transport.

Table 4. Grab Sampling Results from SEEP995A

SEEP995A	1/6/12 (total)	1/24/12 (total)	1/24/12 (filtered)	4/13/12 (total)
Pu [pCi/L]	0.079	0.007	0.000	0.052
Am [pCi/L]	0.052	0.000	0.000	0.040
U [$\mu\text{g/L}$]	12.3	13.7	NA	7.8

Note: NA = not analyzed.

- To evaluate whether there could be other seep-related contributions along FC-4 that are not visible due to the thick riprap, several sampling locations were established along FC-4 where water could be reached between the rock (Figure 29). These locations were grab-sampled on March 6, 2012, for both total and filtered analytes.

The results in Table 5 show low Pu and Am activities and no significant spatial trends in any of the analytes.

Table 5. Grab Sampling Results in FC-4 Upstream of GS10: March 6, 2012

Location Code	SEEP995A
Pu [pCi/L]	0.004
Am [pCi/L]	0.003
U [ug/L]	11.2
Alk as CaCO3 [mg/L]	143
Hardness as CaCO3 [mg/L]	384
pH	7.84@4.1C
TSS [mg/L]	6

	Upstream		Downstream	
Location Code	FC4988	FC4995	FC4997	FC4EFF
Pu [pCi/L]	0.026	0.000	0.007	0.004
Am [pCi/L]	0.002	0.001	0.002	0.000
U [ug/L]	19.0	19.1	18.7	18.7
Alk as CaCO3 [mg/L]	261	256	246	246
Hardness as CaCO3 [mg/L]	478	468	464	462
pH	7.74@3.5C	7.62@3.2C	7.64@3.5C	7.71@3.7C
TSS [mg/L]	113	2	1	5

Note: The arrow from the upper table indicates the relative location of SEEP995A along FC-4.

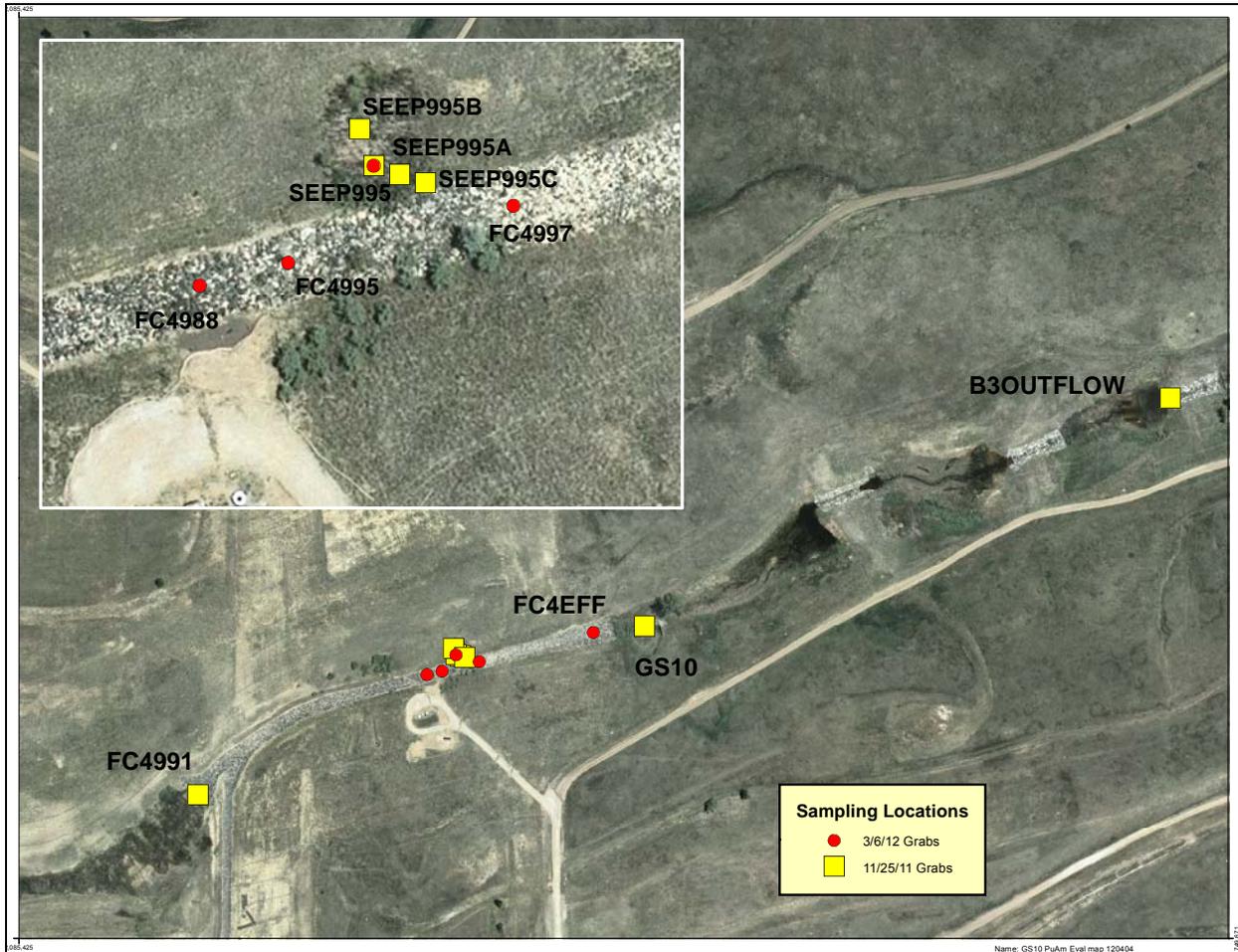


Figure 29. Pu/Am Evaluation Sampling Location Map in FC-4 Upstream of GS10

- To evaluate for Pu and Am transport characteristics, specifically related to the dissolved, colloidal, and particulate mechanisms, water from the routine GS10 composite samples is periodically being analyzed after filtration with a 0.45 μm filter.

A filtered sample is prepared from each composite carboy collected at GS10. The routine RFLMA sample is analyzed for total (unfiltered) Pu, Am, uranium, beryllium, chromium, and hardness. If the analytical results show Pu and Am concentrations above the 0.15 pCi/L standard, then the corresponding filtered sample may be submitted for analysis. To date, two GS10 composite samples have been analyzed as filtered and unfiltered (Table 6).

Table 6. Results for Filtered and Unfiltered Sample Pairs at GS10: 3/21/12 and 4/25/12 Composites

Analyte	3/21–4/4/12 Flow-Paced Composite		4/25–5/9/12 Flow-Paced Composite	
	Unfiltered	Filtered	Unfiltered	Filtered
Am-241 [pCi/L]	0.318	0.00	0.478	0.00
Pu-239, 240 [pCi/L]	0.246	0.00	0.264	0.026
Uranium [$\mu\text{g/L}$]	35.5	34.2	16.1	not analyzed

Table 6 shows that nearly all of the Pu and Am was removed by the 0.45 μm filter. Additionally, nearly all of the uranium passed through the filter. These results support the

conclusions of previous research showing that Pu and Am move in association with particulate, while uranium is dissolved. However, these results only indicate that the Pu and Am is associated with particles larger than 0.45 µm once they reach GS10 and are processed for submittal to the laboratory. It is still possible that Pu and Am could reach surface water in association with sub-0.45 µm colloids, but then adsorb to other geologic materials or simply aggregate.

Additional unfiltered-filtered sample pairs are planned to be collected from seeps and surface water upstream of GS10 once the current extremely dry conditions end and water is available for sampling.

- Numerous grab samples have been collected upstream of GS10 from both seeps and surface water in an attempt to define the spatial variability of Pu and Am activities. However, grab samples have failed to show activities similar to those measured in flow-paced composites collected at GS10. This suggests either that the source of the GS10 Pu/Am is not affecting the grab sample locations, the source could be very close to GS10, the Pu and Am follow a pathway that is difficult to sample (e.g., below the riprap and fill in FC-4), or the source is intermittent, such that grabs have missed the Pu/Am, while the flow-paced composites at GS10 (with up to 100 individual grabs) have been more successful.

Therefore, time-paced automated samplers were deployed at FC4997 and GS10 (Figure 29; the latter is a secondary sampler located at GS10) to collect 72 grabs (200 milliliters [mL] each) at 2-hour intervals over the course of 6 days. Table 7 presents the results, which show very low Pu/Am activities and give practically no indication of spatial variability.

Table 7. Results for Time-Paced Composites at GS10 and FC4997: 5/22/12 to 5/28/12

Analyte	FC4997 (upstream)	GS10 (downstream)
Am-241 [pCi/L]	0.005	0.005
Pu-239, 240 [pCi/L]	0.00	0.00
Uranium [µg/L]	10.4	10.6
Alkalinity as CaCO ₃ [mg/L]	205	246
Hardness as CaCO ₃ [mg/L]	492	517

- Flow-paced composite samples routinely being collected at WALPOC will continue to be requested to be analyzed on a 2-week turnaround. Analyses for flow-paced composite samples routinely being collected at GS10 and GS08 are also currently being requested to be analyzed on a 2-week turnaround.

Updates to the ongoing evaluation for GS10 will periodically be communicated through public meetings, routine reports, and contact records. For additional information, see http://www.lm.doe.gov/Rocky_Flats/ContactRecords.aspx.

Reportable Uranium Concentrations at GS10

The routine GS10 uranium data evaluation is performed in accordance with RFLMA Attachment 2, Figure 6, “Points of Evaluation,” which resulted in a calculated 12-month rolling average concentration for uranium on April 30, 2011, of 18.8 micrograms per liter (µg/L). More recent 12-month rolling averages using validated data through March 31, 2012, continue to exceed the RFLMA applicable Table 1 standard of 16.8 µg/L. Unvalidated data through April 30, 2012, continue to result in 12-month rolling averages above the standard.

Initial notification to the regulatory agencies and the public, in accordance with RFLMA Attachment 2, Figure 6, was made by e-mail on June 16, 2011. RFLMA Contact Record 2011-04 (July 8, 2011), “Reportable Condition for Uranium at Point of Evaluation GS10,” provides a discussion of the monitoring results and recaps the outcome of the RFLMA Parties consultation regarding the evaluation steps to be taken. RFLMA Contact Record 2011-05 (October 4, 2011), “Update for Reportable Condition for Uranium at Point of Evaluation GS10,” provides an update of the monitoring results and provides further discussion of the path forward. Both contact records are available on the Rocky Flats website, http://www.lm.doe.gov/Rocky_Flats/ContactRecords.aspx.

Figure 30 shows the locations sampled during CY 2011 in support of the uranium evaluation for GS10. GS03 is not shown, but is the current POC on Walnut Creek at Indiana Street.

The following items provide an update to the ongoing GS10 uranium evaluation:

- Downstream monitoring at B5INFLOW, GS08, WALPOC, and GS03 (Figure 30) continue to show uranium concentrations below 16.8 µg/L. Recent analytical results at downstream locations are given in Table 8. The latest available 12-month rolling and 30-day average uranium concentrations calculated from flow-paced composite samples are shown in Figure 31.
- Additional sampling and analysis for uranium within the GS10 drainage continues. Following the initial consultation, two temporary surface-water sample locations upstream of GS10 were established for biweekly uranium grab sampling (FC4991 and FC4750; Figure 30). Biweekly sampling at these locations was initiated on June 30, 2011.

These new locations supplement GS10, B3OUTFLOW, B5INFLOW, and B5 POND (Figure 30), which have been sampled biweekly for uranium since January 27, 2010. Data from these six locations are summarized in Table 9. The averages are shown on Figure 32.

- As noted in previous RFLMA quarterly reports, the following samples were sent to Los Alamos National Laboratory (LANL) for isotopic analysis during the spring of 2011. LANL determines the percentages of natural and anthropogenic uranium to compare with percentages in pre-closure and post-closure samples previously analyzed by LANL. The locations described below are shown on Figure 30:

- Flow-paced surface-water sample from GS10 for the period June 3 to June 13, 2011. (Historically, GS10 has shown approximately 70 percent natural uranium.)
- Groundwater sample from upgradient well 99405. (Historically, 99405 has shown uranium concentrations that typically exceed 100 µg/L and have been 99.9 to 100 percent natural uranium.)

The results of the LANL analysis have been reported by LANL to Stoller staff. The following highlights are noted:

- The signature results for GS10 do not match the historical natural uranium percentage of approximately 70 percent. Natural uranium was reported as 50.6 percent. The uranium concentration was 21.6 µg/L. The previous LANL sample, taken on March 17, 2010, was 24.1 µg/L and 72.3 percent natural uranium.
- The results for well 99405 were 411.1 µg/L uranium, with a 100 percent natural uranium signature. These results are consistent with historical data.

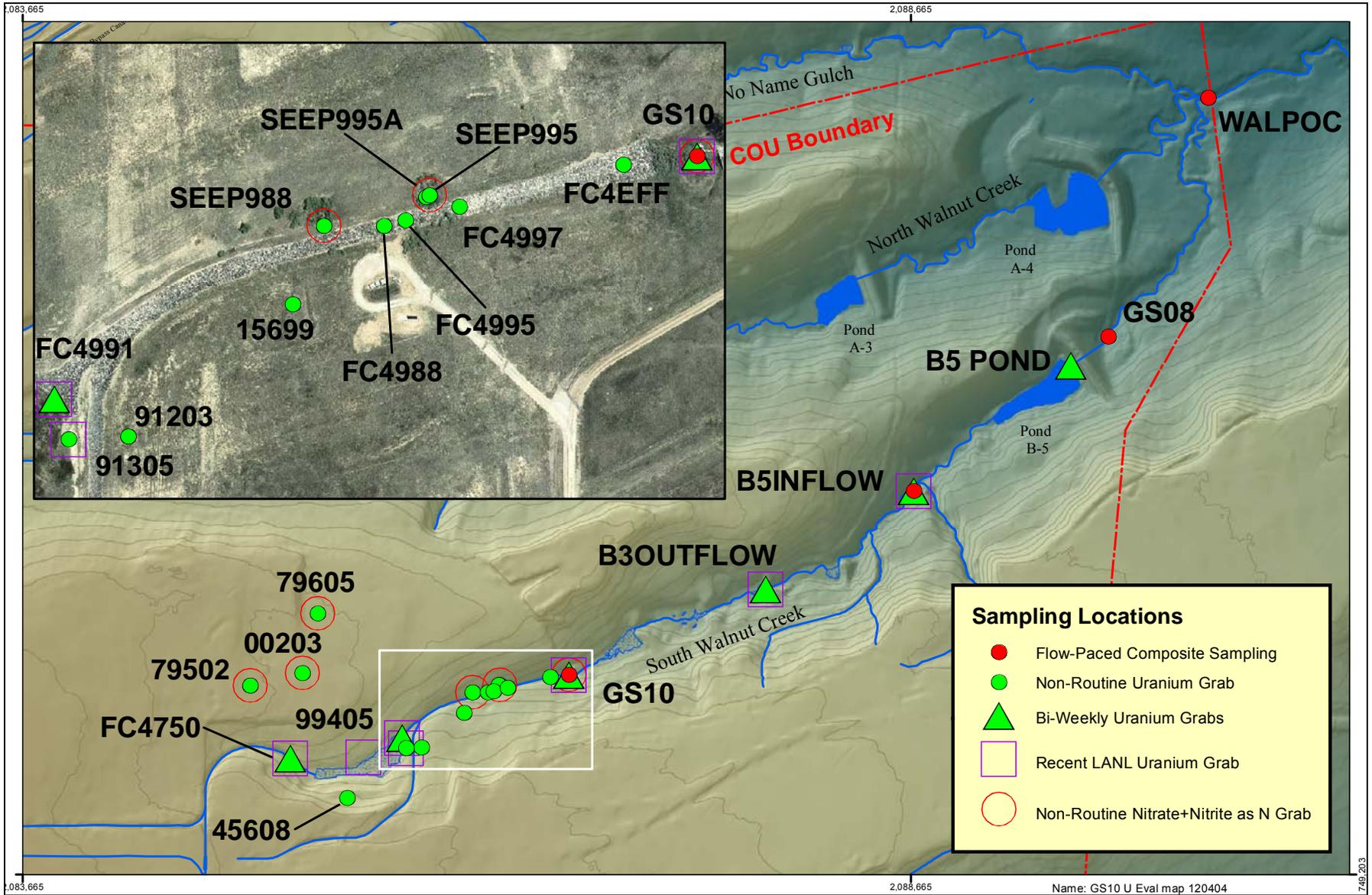


Figure 30. Uranium Evaluation Sampling Location Map for GS10 Drainage Area

Table 8. Recent Uranium Flow-Paced Composite Sample Results

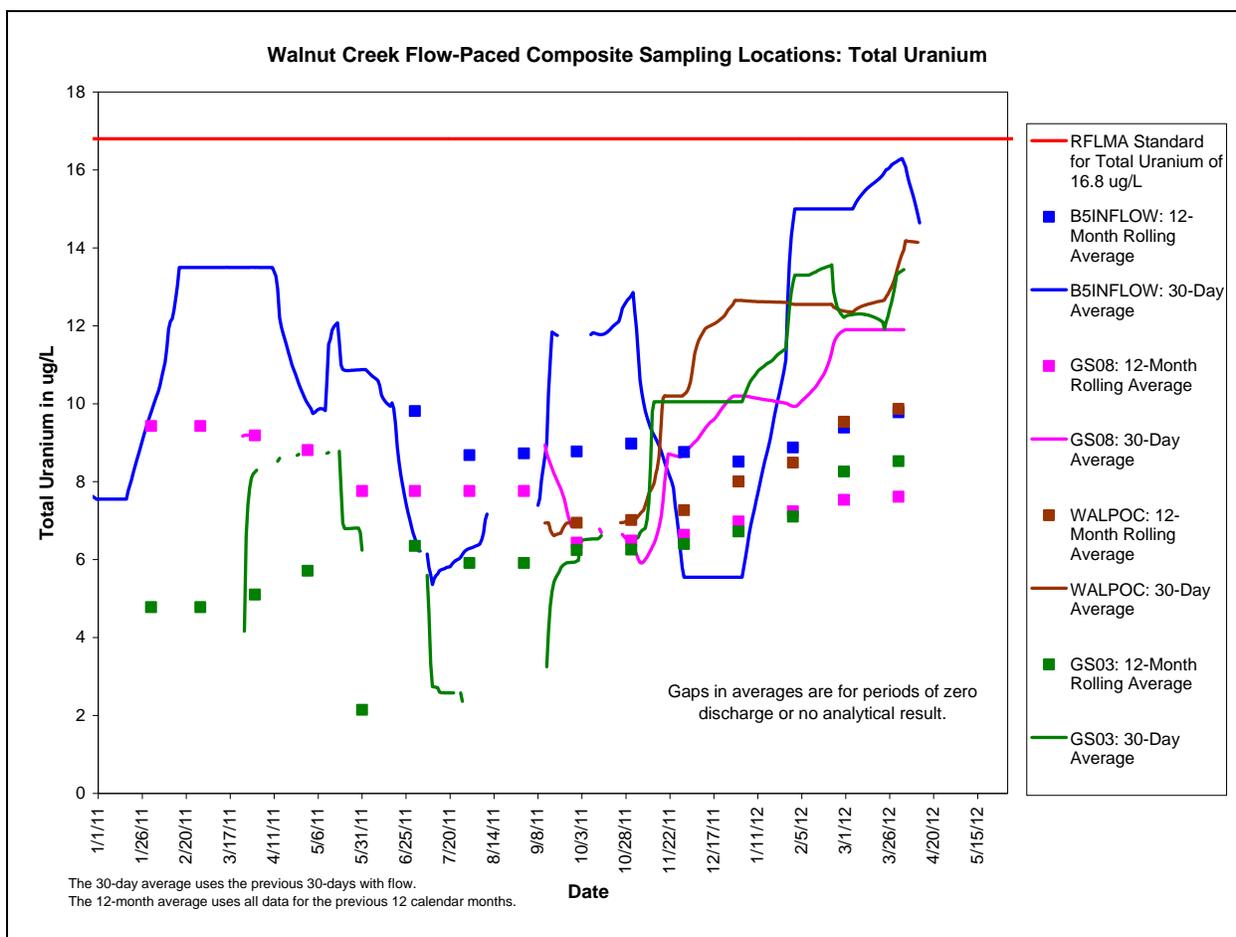
B5INFLOW		GS08		WALPOC		GS03	
Sample Period	Result (µg/L)	Sample Period	Result (µg/L)	Sample Period	Result (µg/L)	Sample Period	Result (µg/L)
1/18–4/11/11	13.5	3/24–3/26/11	7.9			3/24–3/26/11	8.0
4/11–5/4/11	9.1	3/26–3/28/11	7.5			3/26–3/28/11	9.1
5/4–5/13/11	14.6	3/28–3/30/11	7.9			3/28–3/31/11	9.2
5/13–5/18/11	11.9					3/31–5/20/11	3.3
5/18–5/19/11	8.0					5/20–9/12/11	2.4
5/19–5/20/11	10.3						
5/20–6/3/11	10.5						
6/3–7/1/11	6.2						
7/1–7/10/11	5.3						
7/10–7/11/11	4.7						
7/11–7/21/11	6.2						
7/21–8/24/11	12.2	9/12–9/15/11	5.6	9/12–9/15/11	6.9	9/12–9/15/11	6.1
8/24–9/29/11	11.2	9/15–9/18/11	5.4	9/15–9/18/11	6.3	9/15–9/18/11	6.9
		9/18–9/21/11	5.7	9/18–9/22/11	6.8	9/18–9/22/11	6.7
9/29–11/1/11	13.3	9/21–9/27/11	6.0	9/22–9/27/11	7.6	9/22–9/27/11	6.2
11/1/11–1/3/12	5.6	9/27–11/9/11	8.8	9/27–11/30/11	10.2	9/27/11–1/3/12	10.1
		11/9–11/29/11	8.5				
		11/29/11–1/5/12	10.2	11/30/11–1/3/12	12.7		
1/3–3/6/12	15.0	1/5–2/1/12	9.9	1/3–2/23/12	12.6	1/3–2/10/12	13.3
		2/1–4/4/12–	11.9			2/10–2/23/12	13.7
				2/23–3/6/12	12.2	2/23–2/27/12	11.2
						2/27–3/1/12	11.4
3/6–3/23/12	17.4			3/6–3/21/12	14.2	3/1–3/15/12	13.1
3/23–4/13/12	13.2			3/21–4/13/12	14.1	3/15–4/4/12	14.2
4/13–5/21/12	^a	4/4/12–	^b	4/13/12–	^a	4/4–6/6/12	^a
5/21/12–	^b					6/6/12–	^b

Notes:

Some results are preliminary and subject to revision.

^a Analysis pending

^b Sample in progress



Note: Plot includes unvalidated analytical data that are preliminary and subject to revision.

Figure 31. Average Uranium Concentrations at Locations Downstream of GS10

Table 9. Summary of Bi-Weekly Uranium Grab Sampling in South Walnut Creek

South Walnut Creek		Uranium (ug/L)			
		Location Code	Average	Sample Count	85th Percentile
Upstream ↓ ↓ ↓ ↓	FC4750	21.6	19	25.3	19.0
	FC4991	13.7	23	22.7	11.0
	GS10	16.1	61	22.0	15.0
	B3OUTFLOW	15.7	57	23.0	17.0
	B5INFLOW	12.4	53	18.0	11.0
Downstream	B5 POND	8.66	63	11.0	7.50

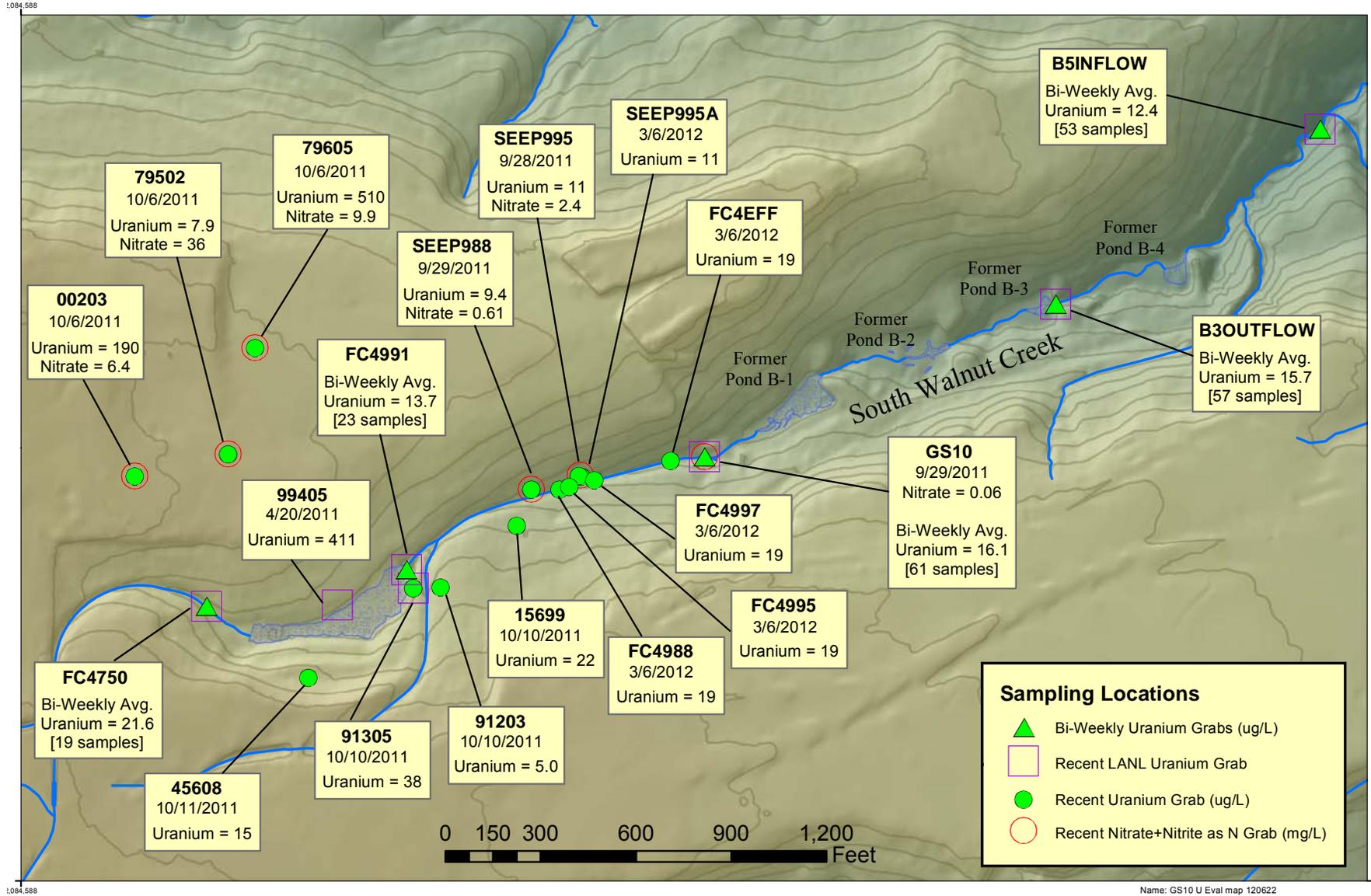


Figure 32. Uranium and Nitrate+Nitrite as N Results for Grab Samples Collected in South Walnut Creek

- Based on the above LANL results for GS10, the following additional samples were collected in the fall of 2011 and sent to LANL for isotopic analysis. The locations are shown on Figure 30.
 - Water from the routine flow-paced composite sample collected at GS10 during the period August 24–September 29, 2011, to help confirm the previous sample results.
 - Grab samples at FC4750 and FC4991 collected on September 28, 2011.
 - Water from the routine flow-paced composite sample collected at B5INFLOW during the period August 24–September 29, 2011. This location does not have previous LANL results.
 - A grab sample at B3OUTFLOW collected on September 27, 2011. One post-closure LANL sample has been collected at B3OUTFLOW. The result was a 74.7 percent natural uranium signature.
 - A grab sample at well 91305, which is upgradient of GS10, collected on October 10, 2011.

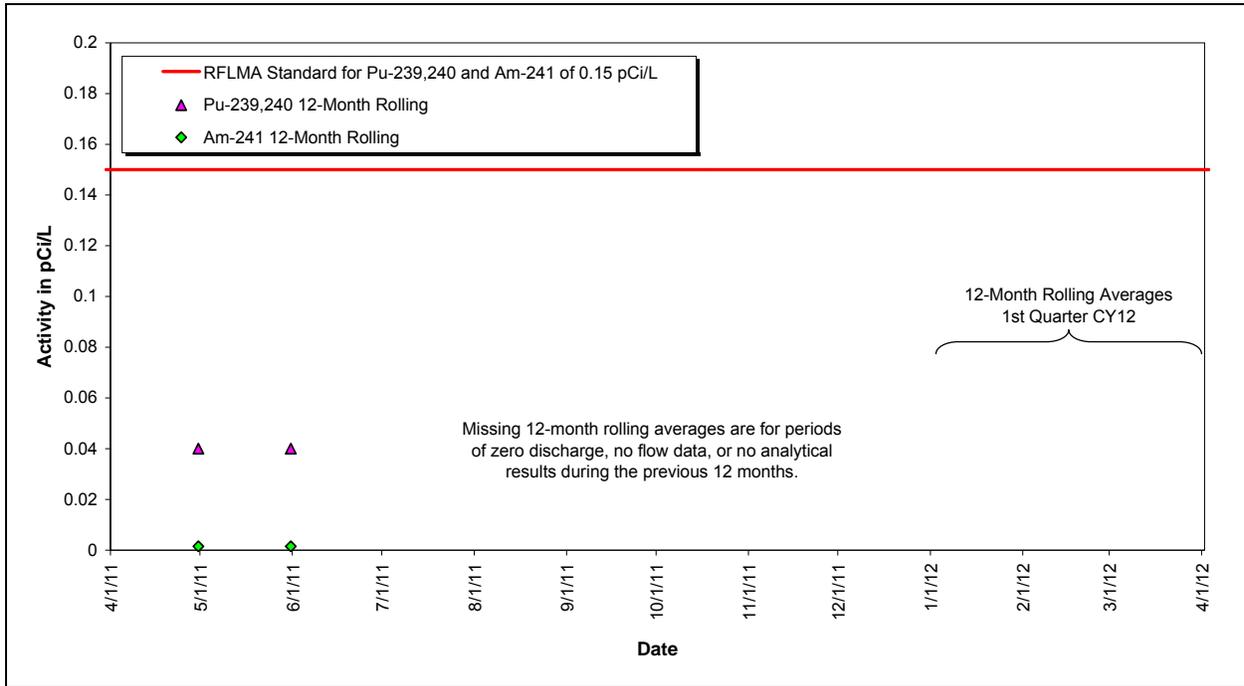
The results of the LANL analysis have been reported by LANL to Stoller staff. The following highlights are noted:

- The signature results for GS10 have returned to the historical natural uranium percentage of approximately 70 percent. Natural uranium was reported as 70.2 percent. The uranium concentration was 8.9 µg/L.
- The results for all of the other locations show natural uranium signatures between 70.9 and 90.8 percent. These results are consistent with historical data (where data exist).
- Additional nonroutine grab samples have been collected to assist in the possible identification of a source that may have contributed to elevated uranium levels at GS10. The results are shown on Figure 32.
 - Wells 15699, 45608, 91305, and 91203 were grab-sampled for uranium on October 10–October 11, 2011.
 - Wells 00203, 79502, and 79605 were grab-sampled for uranium and nitrate+nitrite as N on October 6, 2011.
 - GS10 and hillside seep locations SEEP988 and SEEP995 were also grab sampled for uranium and nitrate+nitrite as N on September 28–September 29, 2011.

Updates to the ongoing evaluation for GS10 will periodically be communicated through public meetings, routine reports, and contact records. For additional information, see http://www.lm.doe.gov/Rocky_Flats/ContactRecords.aspx.

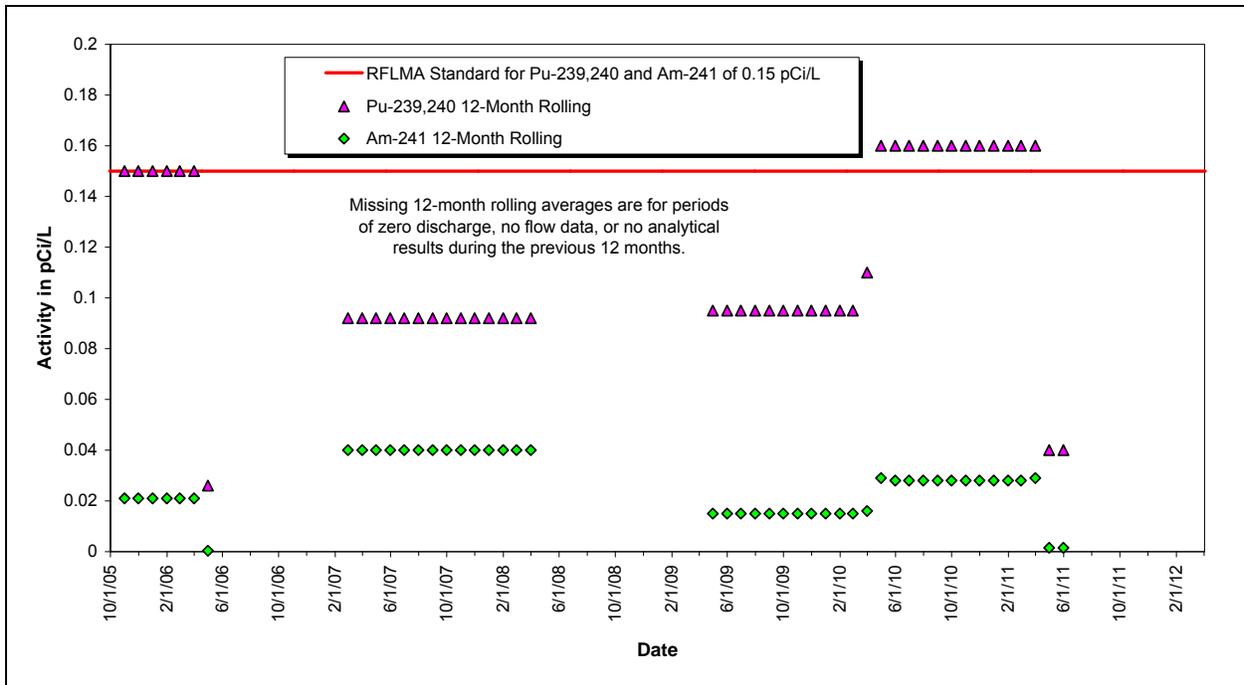
3.1.3.2 Monitoring Location SW027

Monitoring location SW027 is at the end of the South Interceptor Ditch at the inlet to Pond C-2. Figure 33 and Figure 35 show no reportable plutonium, americium, or total uranium values during the quarter. Figure 34 and Figure 36 show sampling data from 2005 through the first quarter of CY 2012. All other analytes were also not reportable for the quarter.



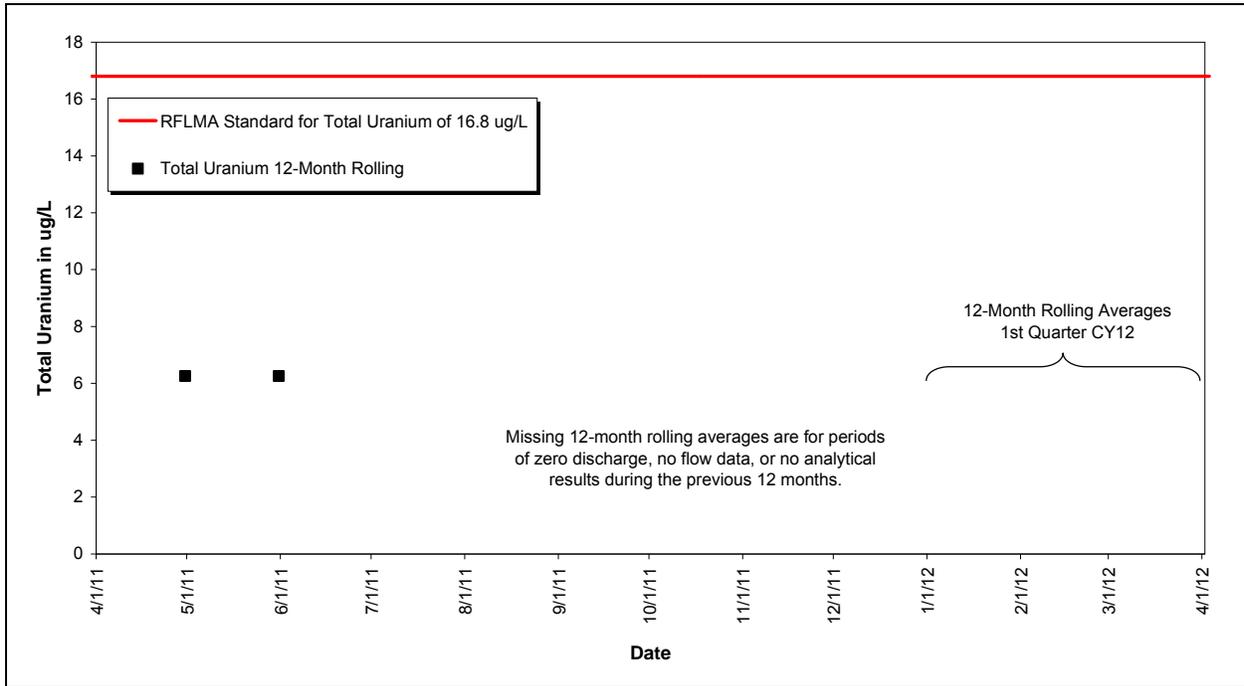
Note: No samples have been successfully collected since 2010; only 4,033 gallons of flow have been recorded in the last two years.

Figure 33. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW027: Calendar Year Ending First Quarter CY 2012



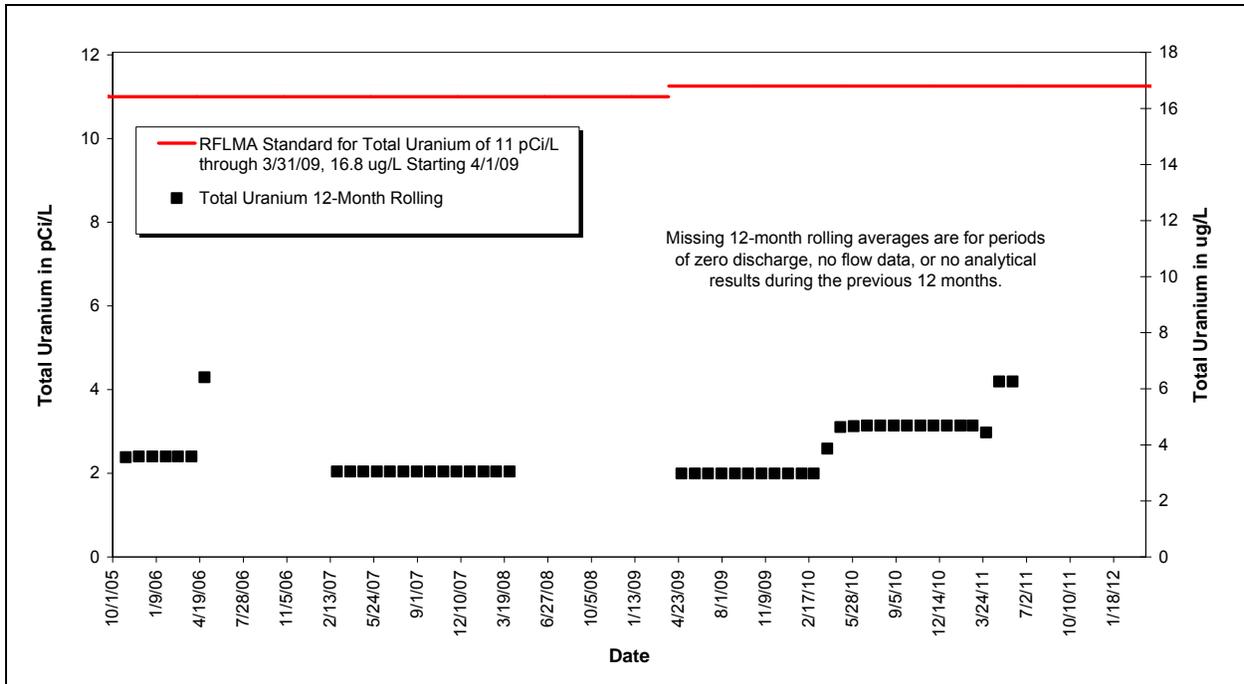
Note: No samples have been successfully collected since 2010; only 4,033 gallons of flow have been recorded in the last two years

Figure 34. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW027: Post-Closure Period Ending First Quarter CY 2012



Note: No samples have been successfully collected since 2010; only 4,033 gallons of flow have been recorded in the last 2 years. $\mu\text{g/L}$ = micrograms per liter

Figure 35. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW027: Calendar Year Ending First Quarter CY 2012



Note: No samples have been successfully collected since 2010; only 4,033 gallons of flow have been recorded in the last 2 years. $\mu\text{g/L}$ = micrograms per liter

Figure 36. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW027: Post-Closure Period Ending First Quarter CY 2012

3.1.3.3 Monitoring Location SW093

Monitoring location SW093 is on North Walnut Creek 1,300 feet upstream of the A-Series ponds. Figure 37 and Figure 39 show no reportable plutonium, americium, or total uranium values during the quarter. Figure 38 and Figure 40 show sampling data from 2005 through the first quarter of CY 2012. All other analytes were also not reportable for the quarter.

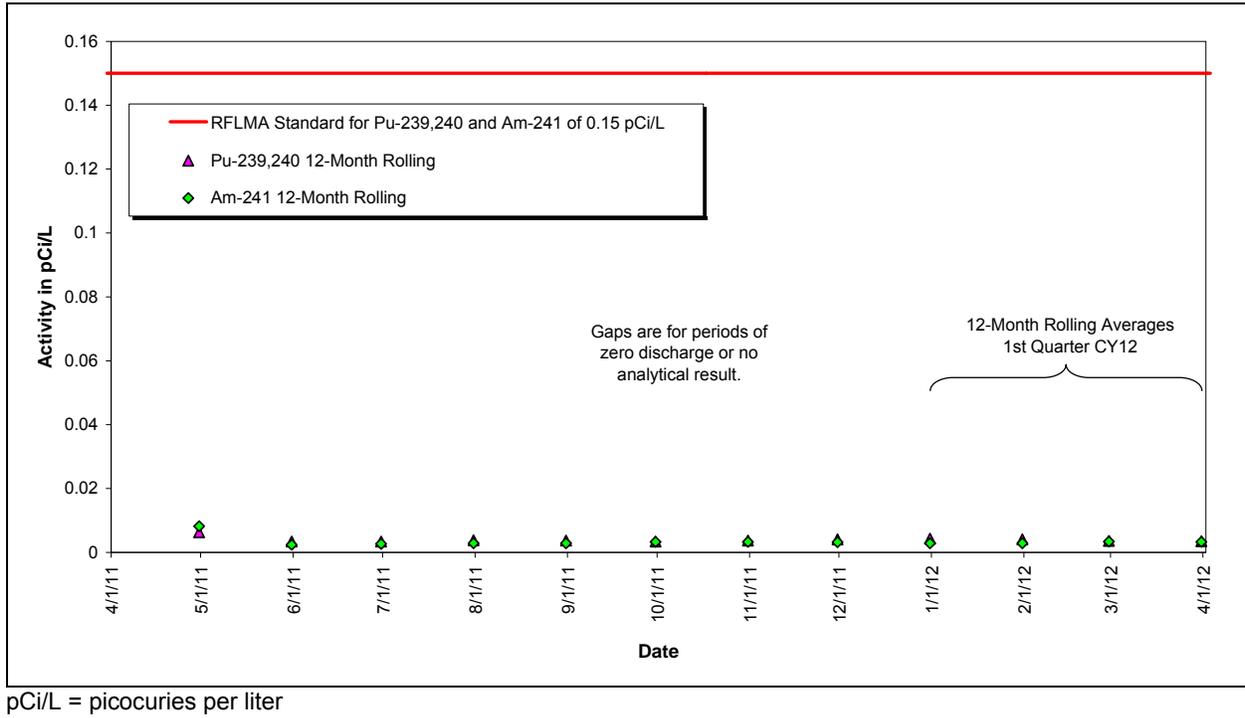
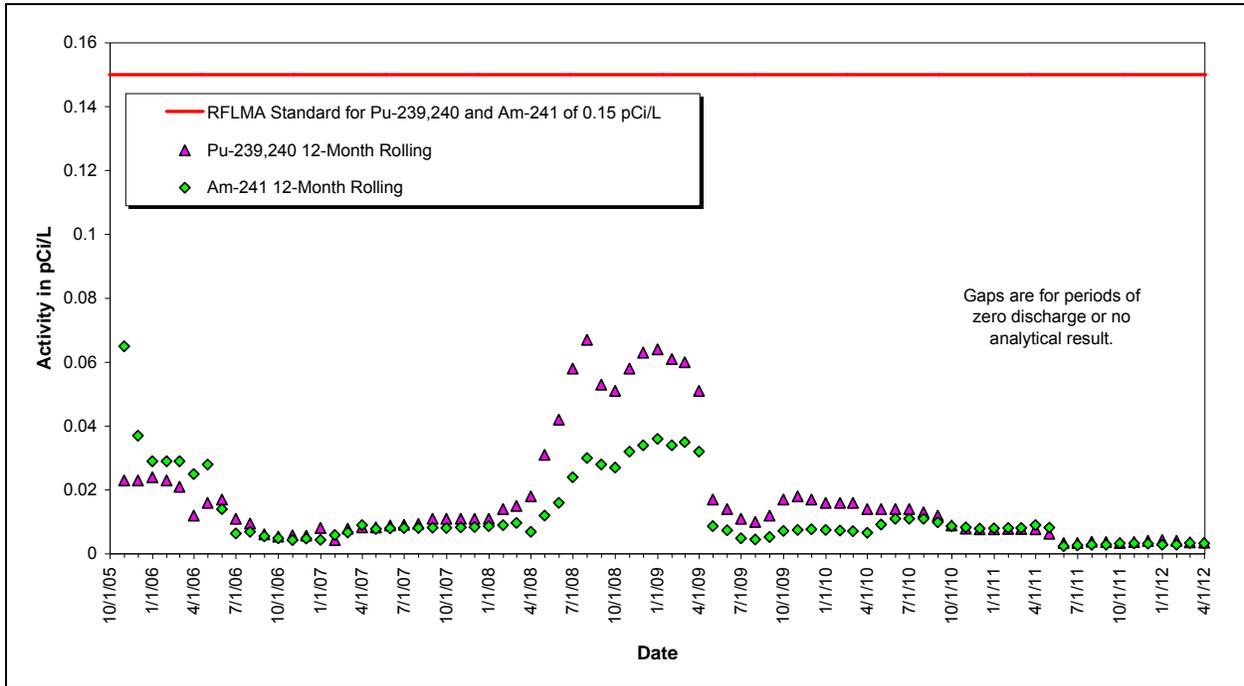
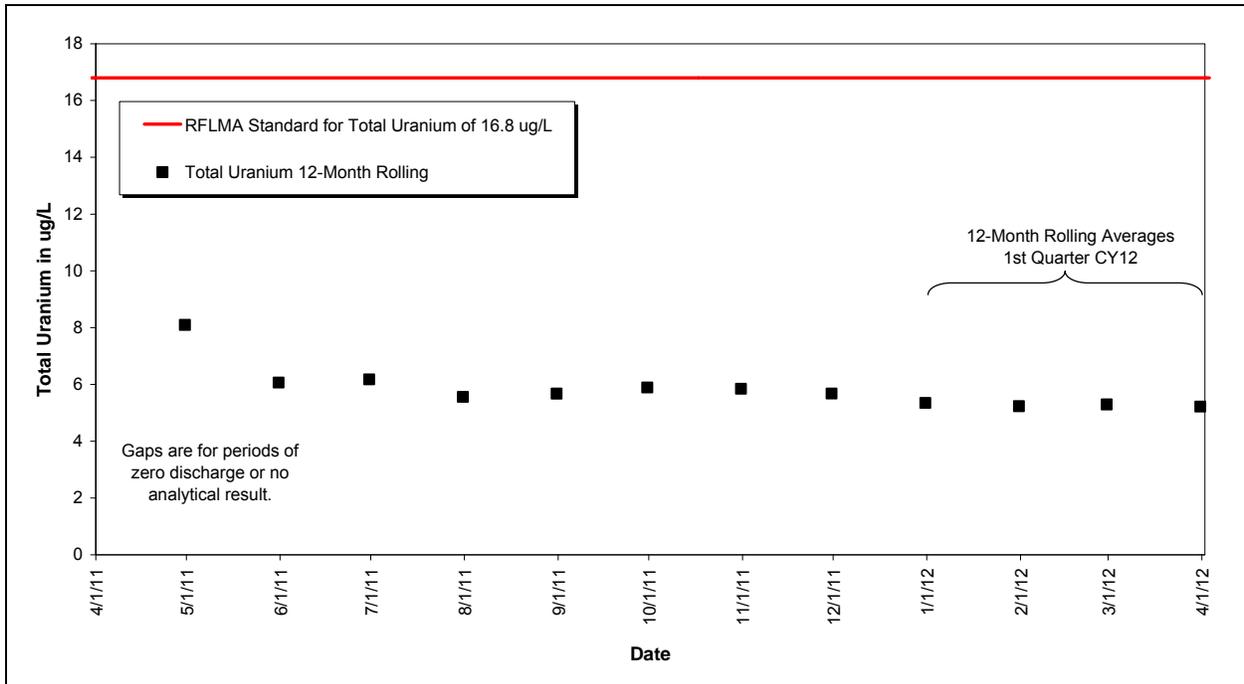


Figure 37. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW093: Calendar Year Ending First Quarter CY 2012



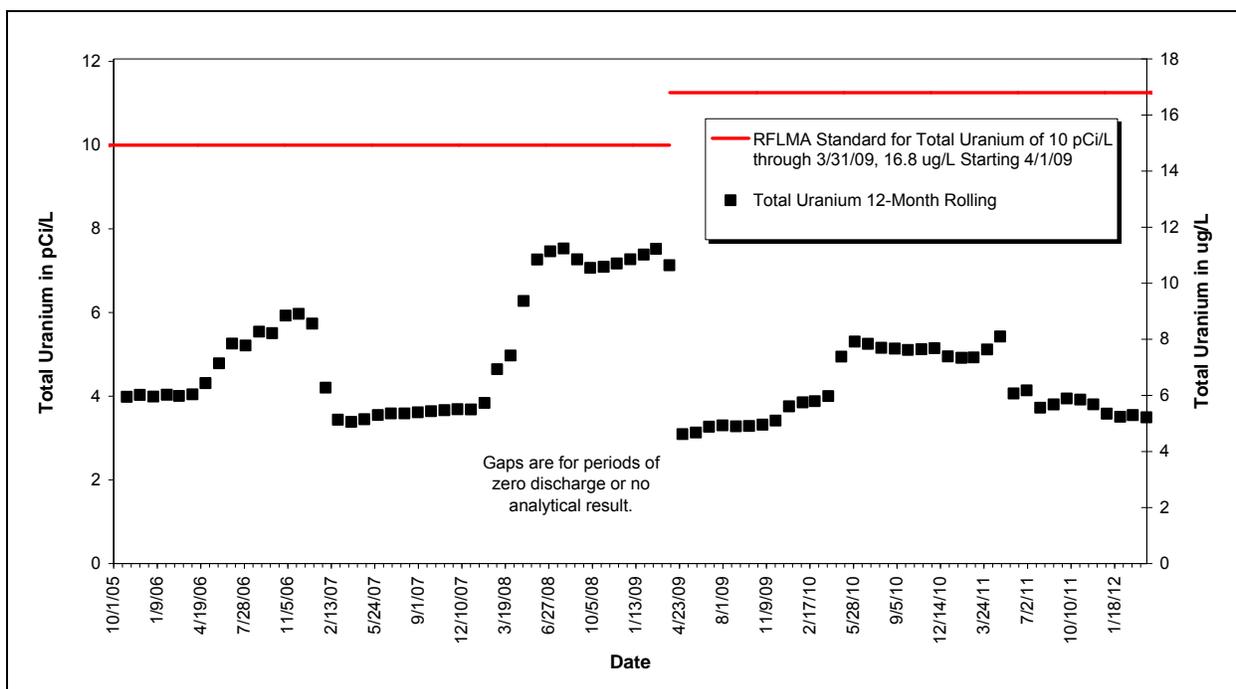
pCi/L = picocuries per liter

Figure 38. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW093: Post-Closure Period Ending First Quarter CY 2012



µg/L = micrograms per liter

Figure 39. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW093: Calendar Year Ending First Quarter CY 2012



µg/L = micrograms per liter; pCi/L = picocuries per liter

Figure 40. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW093: Post-Closure Period Ending First Quarter CY 2012

3.1.4 AOC Wells and Surface Water Location SW018

Neither the AOC wells nor SW018 were scheduled for RFLMA monitoring in the first quarter of CY 2012.

3.1.5 Sentinel Wells

None of the Sentinel wells were scheduled for RFLMA monitoring in the first quarter of CY 2012.

3.1.6 Evaluation Wells

None of the Evaluation wells were scheduled for RFLMA monitoring in the first quarter of CY 2012.

3.1.7 PLF Monitoring

All RCRA groundwater monitoring wells at the PLF were sampled during the first quarter of CY 2012. Analytical results (Appendix C) were generally consistent with past samples and will be discussed and statistically evaluated as part of the annual report for CY 2012. Section 3.1.9.4 discusses monitoring the PLFTS.

3.1.8 OLF Monitoring

All RCRA groundwater monitoring wells at the OLF were sampled during the first quarter of CY 2012. Analytical results (Appendix C) were generally consistent with past samples and will be discussed and statistically evaluated as part of the annual report for CY 2012.

During the first quarter of CY 2012, when routine surface water sampling was performed in Woman Creek downstream of the OLF (GS59), all analytical results were less than the applicable surface water standards.

3.1.9 Groundwater Treatment System Monitoring

As described in Section 2.3, contaminated groundwater is intercepted and treated in four areas of the Site. The MSPTS, ETPTS, and SPPTS include a groundwater intercept trench. Groundwater entering the trenches is routed through a drain pipe into one or more treatment cells, where it is treated and then discharged to the subsurface. The PLFTS treats water from the northern and southern components of the Groundwater Intercept System and flow from the PLF seep.

3.1.9.1 Mound Site Plume Treatment System

MSPTS monitoring locations were not scheduled for RFLMA sampling in the first quarter of CY 2012. Non-RFLMA samples were collected at the MSPTS to support optimization of the air stripper. The associated results and discussion will be provided in the 2012 Annual Report.

3.1.9.2 East Trenches Plume Treatment System

ETPTS monitoring locations were not scheduled for RFLMA sampling in the first quarter of CY 2012. However, confirmatory samples were collected to follow up on results from the fourth-quarter CY 2011 samples that showed elevated levels of trichloroethene in system effluent. In response to those results, flow through the ETPTS was reconfigured in December 2011 (see the 2011 Annual Report). The samples collected in the first quarter of CY 2012 confirmed this maintenance activity improved treatment effectiveness.

3.1.9.3 Solar Ponds Plume Treatment System

SPPTS monitoring locations were not scheduled for RFLMA sampling in the first quarter of CY 2012, although samples of system effluent were collected to support the Adaptive Management Plan. In addition, testing of a small-scale uranium treatment component (referred to as a microcell) began, and incorporated periodic sampling. The intent of these tests is to assess whether a small-scale component, with a correspondingly short residence time, would perform better than the large-scale Phase II treatment cell. The successes of lab-scale uranium treatment suggest that this may be the case. (The test microcells are pipe segments on the order of 2 feet long by 4 inches in diameter and filled with media, while the Phase II cell is 8 feet in diameter and contains a 4-foot-thick layer of media.) These laboratory tests used SPPTS influent and operated successfully under conditions of residence times of a few minutes; uranium was effectively removed for well over a thousand cell pore volumes. In contrast, the Phase II cell operated with a residence time of approximately 8 hours and its effectiveness decreased after only some 200 pore volumes.

The microcell tests will continue for some time. Additional information and discussion on the microcell approach and results will be provided in the 2012 Annual Report.

3.1.9.4 PLF Treatment System

During collection of the January 24, 2012, sample at the system influent (monitoring location PLFSEEPINF), the flow rate was 1.3 gallons per minute. As of March 31, 2012, the PLF Dam was in the process of being breached; treatment system effluent was being periodically pump-transferred around the construction area. This flow configuration is essentially equivalent to the normal open-valve configuration.

During the first quarter of CY 2012, routine sampling of the treated effluent exiting the system (monitoring location PLFSYSEFF) showed arsenic above the RFLMA standard. In accordance with the RFLMA data evaluation protocols, sampling frequency was increased to monthly.

In the first monthly sample collected on March 9, 2012, the arsenic concentration was below the standard. Therefore, sampling frequency returned to quarterly.

No other analyte concentrations were greater than the applicable surface water standards during the routine quarterly sample.

3.1.10 Pre-Discharge Monitoring

Pre-discharge samples are collected prior to opening the valves to initiate a discharge period at Ponds A-4, B-5, and C-2 on North Walnut Creek, South Walnut Creek, and Woman Creek, respectively.

No pre-discharge samples were collected at Ponds A-4, B-5, or C-2 during the first quarter of CY 2012. All three ponds were operated in a flow-through configuration during the entire quarter.

3.1.11 Additional Monitoring

In addition to the RFLMA-required monitoring discussed in the previous sections, non-regulatory monitoring is performed at the Site to further describe the fate and transport of selected constituents at the Site. Data in this section are not limited to the current quarter but include all available data.

3.1.11.1 High-Resolution Inductively Coupled Plasma/Mass Spectrometry and Thermal Ionization Mass Spectrometry Analyses

Prior to and after Site closure, groundwater and surface water samples from select locations were sent to LANL for high-resolution inductively coupled plasma/mass spectrometry and/or thermal ionization mass spectrometry analyses. These analytical methods measure mass ratios of four uranium isotopes (masses 234, 235, 236, and 238). Isotopic ratios provide a signature that indicates whether and to what extent the uranium content is natural or anthropogenic (manmade).

No samples were collected in the first quarter of CY 2012 for analysis by LANL; the most recent samples were collected in the third quarter of CY 2011. The 2011 Annual Report presents information on the results of the LANL analysis (DOE 2012a).

4.0 Adverse Biological Conditions

No evidence of adverse biological conditions (e.g., unexpected mortality or morbidity) was observed during monitoring and maintenance activities in the first quarter of CY 2012.

5.0 Ecology Monitoring

During the first quarter of CY 2012, Preble's meadow jumping mouse (PMJM) mitigation monitoring and wetland mitigation monitoring were conducted. The PMJM monitoring data will be summarized and delivered to the U.S. Fish and Wildlife Service (USFWS) in the 2011 Preble's Meadow Jumping Mouse Mitigation Monitoring Report for Biological Opinions at the Rocky Flats Site. These reports were due to USFWS on December 1, 2011. The wetland monitoring data will be summarized and delivered to EPA in the 2011 Rocky Flats Site Annual Wetland Mitigation Monitoring Report due on March 1, 2012. A brief summary of the information from both reports will be included in the annual report for CY 2011. In late August through early September 2011, EPA conducted vegetation monitoring as part of its own evaluation of revegetation success. The conclusion of the EPA evaluation is that the revegetation areas at Rocky Flats have achieved above-average results with respect to established success criteria, the vegetation is expected to continue to provide effective soil stability, and the DOE success criteria are more stringent than the EPA criteria. The EPA monitoring report summary will be included as an appendix in the annual report for CY 2011. Other ecological monitoring conducted during the first quarter of CY 2012 included revegetation monitoring, weed mapping, PLF/OLF quarterly vegetation surveys, nest box surveys, and photopoint monitoring.

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