LMS/RFS/S07730

Rocky Flats Site, Colorado

Quarterly Report of Site Surveillance and Maintenance Activities First Quarter Calendar Year 2011

July 2011

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U.S. Department of Energy
Office of Legacy Management

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Abbreviations

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
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ETPTS	East Trenches Plume Treatment System
IC	institutional control
LM	Office of Legacy Management
µg/L	microgram per liter
M&M	monitoring and maintenance
MSPTS	Mound Site Plume Treatment System
OLF	Original Landfill
pCi/L	picocuries per liter
PLF	Present Landfill
PLFTS	Present Landfill Treatment System
POC	point-of-compliance
POE	point-of-evaluation
RCRA	Resource Conservation and Recovery Act
RFLMA	*Rocky Flats Legacy Management Agreement*
RFSOG	*Rocky Flats Site Operations Guide*
SID	South Interceptor Ditch
Site	Rocky Flats Site
SPPTS	Solar Ponds Plume Treatment System

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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* (DOE 2006) issued on September 29, 2006, for the Rocky Flats Site (the Site). 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 Corrective Action Decision/Record of Decision (CAD/ROD) as described in the *Rocky Flats Legacy Management Agreement* (RFLMA) (DOE 2007a). Attachment 2 of the RFLMA defines the Central Operable Unit 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 2011a) 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) 2011 (January 1 through March 31). This report describes the following:

- 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 15, 2011.

The following categories were inspected or monitored during the inspection:

- Evidence of significant erosion in the Central Operable Unit (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, EPA, 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 well heads 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 2011 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 at SW027 (DOE 2010a). See Contact Record 2010-06 and the 2010 Annual Report (DOE 2011b) for a discussion of the SW027 monitoring data and mitigation actions. 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. Except for a deep hole in the vicinity of the former Building 881 southwest corner, these appeared to be minor and very limited in area. Survey coordinates indicate that the location of the hole was the south stairwell leading from the building entrance hallway to the basement level. A photograph of the hole is included in Appendix A, along with a copy of the building footprint showing the location. Based on the final characterization surveys of former Building 881, the building met free release criteria, and it was demolished by explosive demolition, resulting in the upper two floors collapsing onto the bottom floor. The area was then filled and contoured. The hole appears to be due to settling of fill material at the bottom area of the staircase, causing the fill soil to settle into the staircase structure that did not fully collapse during demolition.

The general area surrounding the hole was fenced off with temporary fencing, and Stoller Engineering provided guidance on the method to fill the hole. The hole was filled on March 30, 2011, using 28 tons of imported structural fines and 20 tons of imported Rocky Flats Alluvium. The fill material was imported from a pit located to the west of Rocky Flats Site. Fill material was hauled to the site with a tandem dump truck and staged approximately 60 feet away from the hole. An excavator was then used to move the material from the staging area directly into the hole. Fill material was mechanically compacted by using the bucket of the excavator. Final grade of the compacted fill was left approximately 1 foot above the surrounding grades so that any minor settlement of the fill material would not create a depression. The area was re-seeded with Rocky Flats native seed varieties upon completion of the project.

Based on the depth of the Building 881 hole and the possibility that other holes could form in the future above buried subsurface structures, site operations personnel now inspect selected areas quarterly. The surface locations have been marked with fence posts for ease of conducting inspections, and access to these locations is managed using the Site work authorization and approval process.

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 18, 2011, 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 is no longer required. Based on the vegetation monitoring conducted in 2009 and reported in the 2009 Annual Report (DOE 2010b), these 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 now 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 2011 was performed on February 28, 2011. No significant problems were observed during these inspections. 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 22, 2010. 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 5-year review of the Site (DOE 2007b).

2.2.2.1 Inspection Results

Routine OLF inspections during the first quarter of CY 2011 were performed on January 28, February 28, and March 30, 2011. The landfill cover vegetation was evaluated on March 17, 2011. The completed inspection forms are presented in Appendix B.

2.2.2.2 Settlement Monuments

The OLF settlement monuments were surveyed on March 23, 2011. 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 (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 26 and February 22, 2011. Due to intermittent problems with recorded data first noticed in August 2010, the inclinometer probe unit was returned to the manufacturer, Slope Indicator Co., for cleaning, inspection, and calibration after the February readings were taken. The instrument was returned on March 30, 2011. Readings were scheduled for the next day, but high winds forced Site work to be halted.

The readings were completed on April 5, 2011, and the probe instrument appears to be working correctly and providing good data. The April readings showed that there was very little deflection for any inclinometer over this quarter. Since no large or prolonged precipitation events occurred during this period, these results are consistent with expected results.

2.2.2.4 Slumps

As discussed in the quarterly report for the first quarter of CY 2010 (DOE 2010c), 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.

Berm 1

No new cracking was observed in the Berm 1 area during the first quarter of CY 2011. The decrease of movement in the area can most likely be attributed to the decreased precipitation on the landfill cover during the winter months. Staff continued to perform routine and nonroutine inspections of the Berm 1 area to monitor this location for any changes.

2.2.2.5 Topographic Survey

A topographic survey was completed in March 2009; the survey serves as a baseline for continued observation of berms and helps to identify areas for additional maintenance. Subsequent topographic surveys are used to identify areas that require additional soil to maintain minimum heights and to identify areas of ponding or slopes indicating channel areas that may be conducive to ponding.

In accordance with Section 3.1 of the OLF M&M Plan, "Inspection Procedures," a topographic survey will be conducted approximately every 2 years as an aid in periodically evaluating the subsidence and consolidation, slope stability, and storm water management structure conditions at the OLF.

Topographic survey fieldwork was conducted March 15, 16, and 21, 2011. The survey results are being evaluated, and maintenance work that results from the evaluation will be reported in subsequent quarterly reports.

2.2.2.6 Seeps

Seeps at the OLF were evaluated during the monthly inspections as well as 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 continued at the MSPTS through the first quarter of CY 2011. The most significant of these activities was the replacement of the media within the two treatment cells and repairs to the subsurface effluent discharge gallery, which had become partially clogged. In addition, minor upgrades to the plumbing within each treatment cell were made to support potential future upgrades that would reduce long-term maintenance costs. Finally, an effluent polishing component was also installed as a part of this project. The project was conducted in February and March; prior to its start, routine maintenance activities that were conducted included checking and flushing filters and inspecting influent and effluent flow conditions. The parallel upflow configuration established in June 2010 was maintained and will remain the primary flow configuration at the MSPTS until further notice.

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

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The effluent polishing component is an innovative, solar-powered air stripper that is contained within the pre-existing effluent metering manhole. This unit will be tested for effectiveness and optimized for some time before it is considered complete. Some of the aspects to be tested and optimized include the number and configuration of spray nozzles, the pump rate, ventilation of the air stripper housing (the manhole), and the system flow rate. Because of the numerous variables and need to optimize the unit, the component that was installed is only designed for half-time operation (during the daytime). Testing will be performed to identify adjustments needed to achieve optimal effectiveness. The results of optimization efforts will dictate additional infrastructure needs (ranging from nozzles and pumps to additional solar power infrastructure). Once optimized, the unit will be equipped for uninterrupted operation. The 2011 annual report will provide a more comprehensive discussion of the unit and its associated optimization.

Refer to Section 3.1.10.1 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 2011. These activities included checking influent and effluent flow conditions and water levels in the cells. Refer to Section 3.1.10.2 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 2011. 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.

The Phase II and III upgrades that were completed in the second quarter of CY 2009 continued to be a focal point for optimization efforts. Most of these efforts were directed to operation of Phase III Cell A (the cell filled with inert media, which is dosed with liquid carbon to support denitrifying bacteria), and included adjustments to recirculation, flow rates, and dosing. In addition, due to accumulation of biomass in the cell, maintenance actions were initiated that involved using a rod or similar tool to puncture and break apart the biomass.

Section 3.1.10.3 summarizes the non-RFLMA sampling conducted at the SPPTS in the first quarter of CY 2011.

2.3.4 PLF Treatment System

Routine maintenance activities continued at the PLFTS through the first quarter of CY 2011. These activities generally consisted of inspecting the system for potential problems.

2.4 Erosion Control and Revegetation

Maintenance of the site erosion control features required continued effort throughout the third quarter of CY 2010, 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 third quarter

of CY 2010. 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 monitoring objectives
- A summary of Area of Concern (AOC) well, Boundary 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 all 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 2011. More detailed interpretation and discussion will be provided in the annual report for CY 2011.

3.1.1 Water Monitoring Highlights

During the first quarter of CY 2011, the water monitoring network successfully met the targeted monitoring objectives as required by the RFLMA and in conformance with RFSOG implementation guidance. The RFLMA network consisted of 11 automated gaging stations, 10 surface water grab-sampling locations, 8 treatment system locations, 99 wells, and 8 precipitation gages. During the quarter, 25 flow-paced composite samples, 10 surface water grab samples, 8 treatment system samples, and 10 groundwater samples were collected (in accordance with RFLMA protocols) and submitted for analysis.[1] An additional three flow-paced composites were in progress during the quarter, and analytical data were not available for this report.

All water quality data at the RFLMA POCs remained well below the applicable standards through the first quarter of CY 2011.

Elevated levels of plutonium-239,240 were measured at POE SW027 during the second quarter of 2010. These data are presented and discussed further in Section 3.1.3.2. Since SW027 has seen very little flow since April 2010, no additional composite samples have been collected. Thus, no new analytical data are available to include in the 12-month rolling average, and the 12-month rolling average for plutonium remains at reportable levels. All other analyte

[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 2011, the 25 flow-paced composites comprised 1,167 individual grabs.

concentrations at SW027 remained below reporting levels as of the end of the first quarter of CY 2011.

All POE analyte concentrations at GS10 and SW093 remained below reporting levels as of the end of the first quarter of CY 2011. Erosion and runoff controls, as well as extensive revegetation efforts, have been effective in measurably reducing both sediment transport and constituent concentrations. As of the end of the first quarter of CY 2011, these monitoring locations continued to show plutonium-239, plutonium-240, and americium-241 activities well below the RFLMA standards. With the removal of impervious areas (resulting in decreased runoff), the stabilization of soils within the drainages, and the progression of revegetation, water quality is expected to continue to be acceptable.

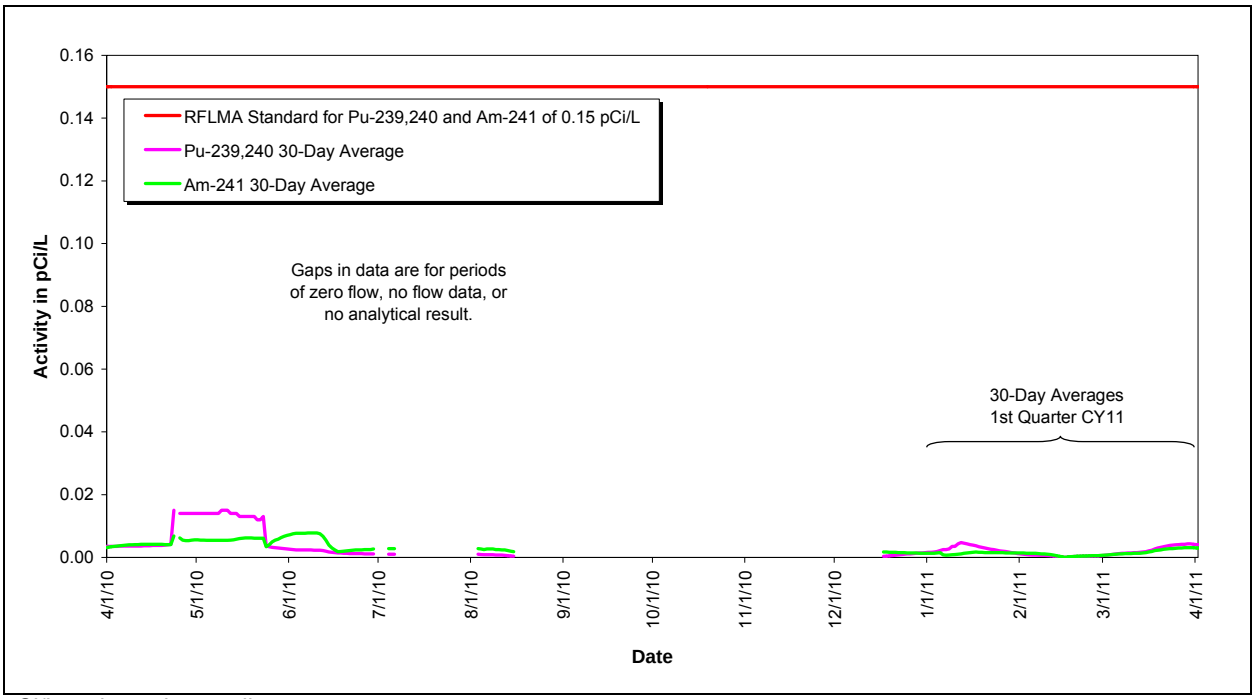
Groundwater monitoring results will be evaluated as part of the annual report for CY 2011.

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.

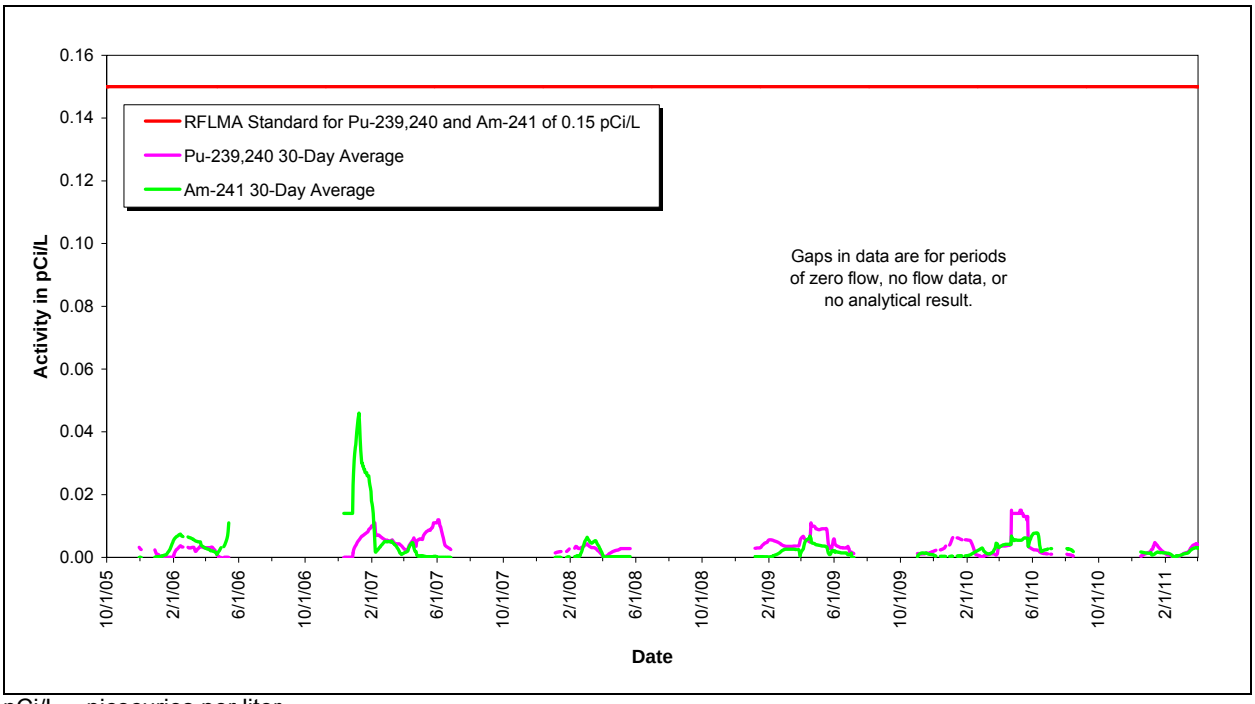
3.1.2.1 Monitoring Location GS01

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. Figure 3 and Figure 5 show sampling data from 2005 through first quarter CY 2011.



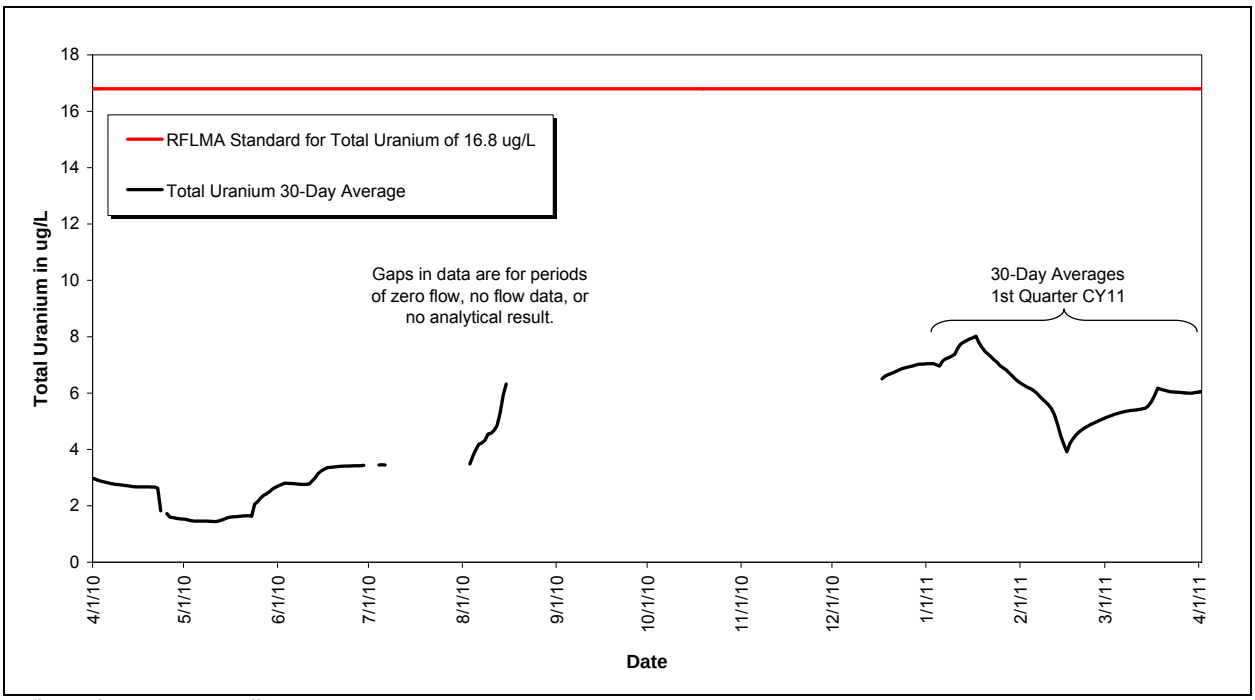
pCi/L = picocuries per liter

Figure 2. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS01: Calendar Year Ending First Quarter CY 2011



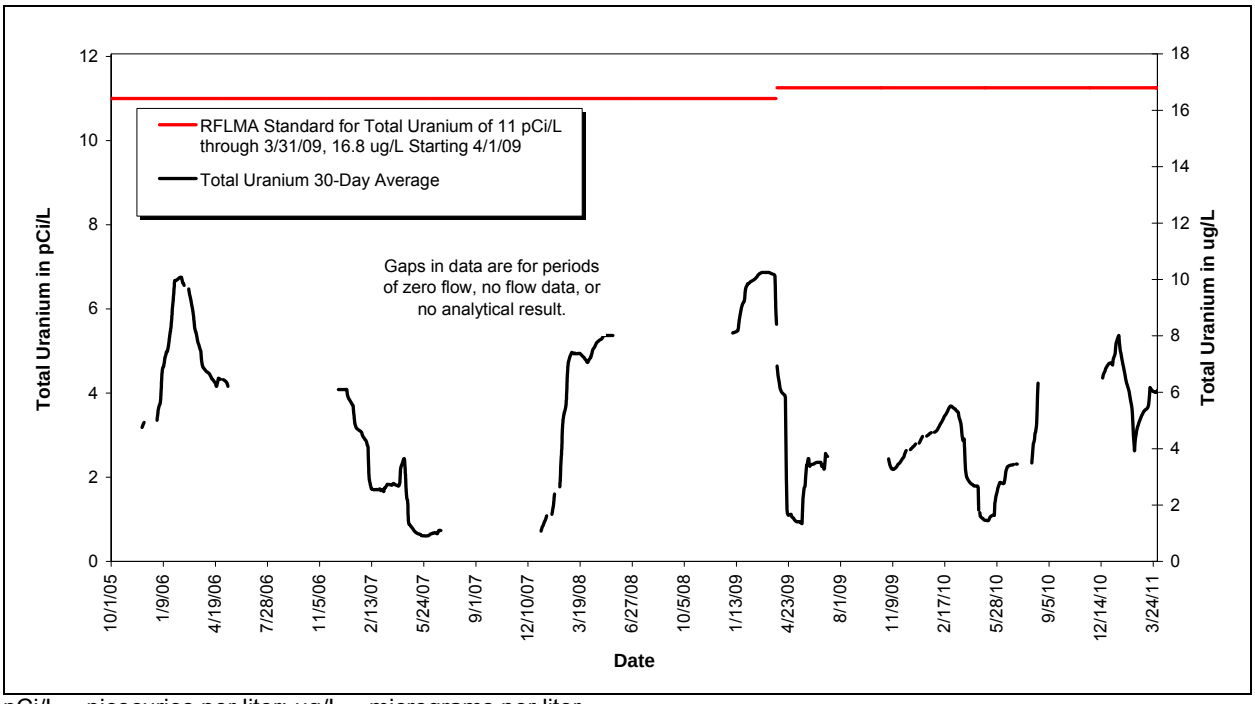
pCi/L = picocuries per liter

Figure 3. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS01: Post-Closure Period Ending First Quarter CY 2011



µg/L = micrograms per liter

Figure 4. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS01: Calendar Year Ending First Quarter CY 2011

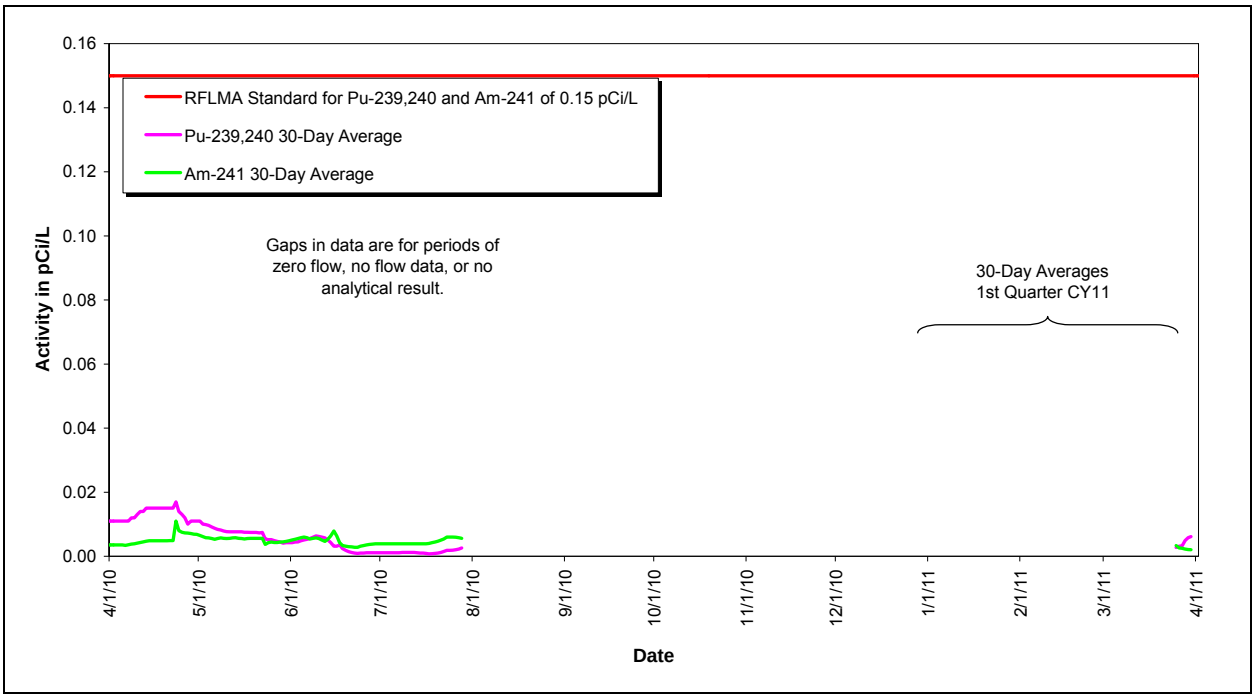


pCi/L = picocuries per liter; µg/L = micrograms per liter

Figure 5. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS01: Post-Closure Period Ending First Quarter CY 2011

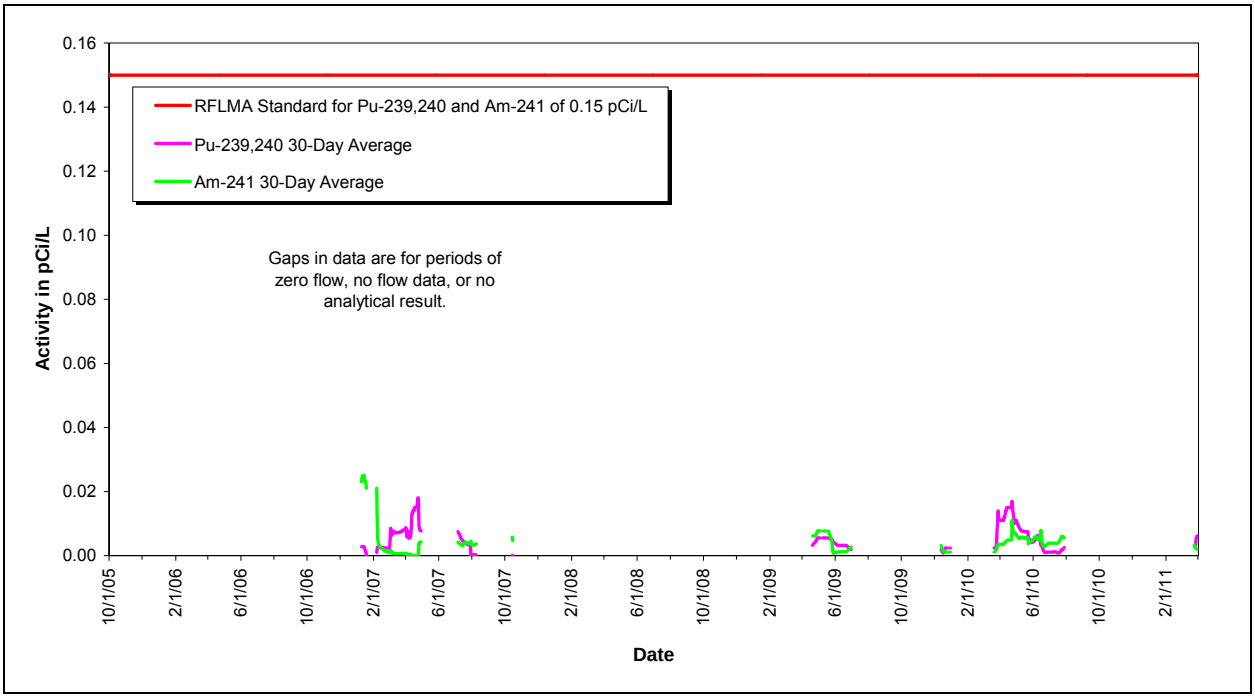
3.1.2.2 Monitoring Location GS03

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. Figure 7, Figure 9, and Figure 11 show sampling data from 2005 through first quarter CY 2011.



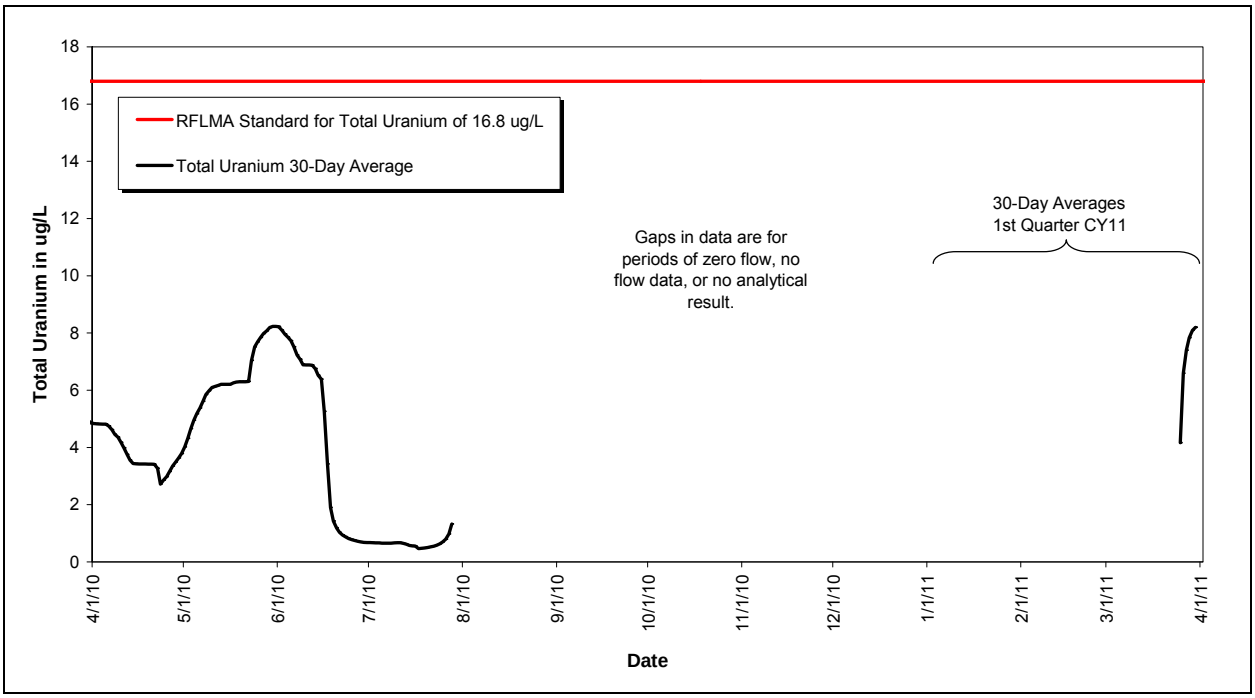
pCi/L = picocuries per liter; analytical results were not available for the composite sample covering the period 3/31-5/20/11

Figure 6. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS03: Calendar Year Ending First Quarter CY 2011



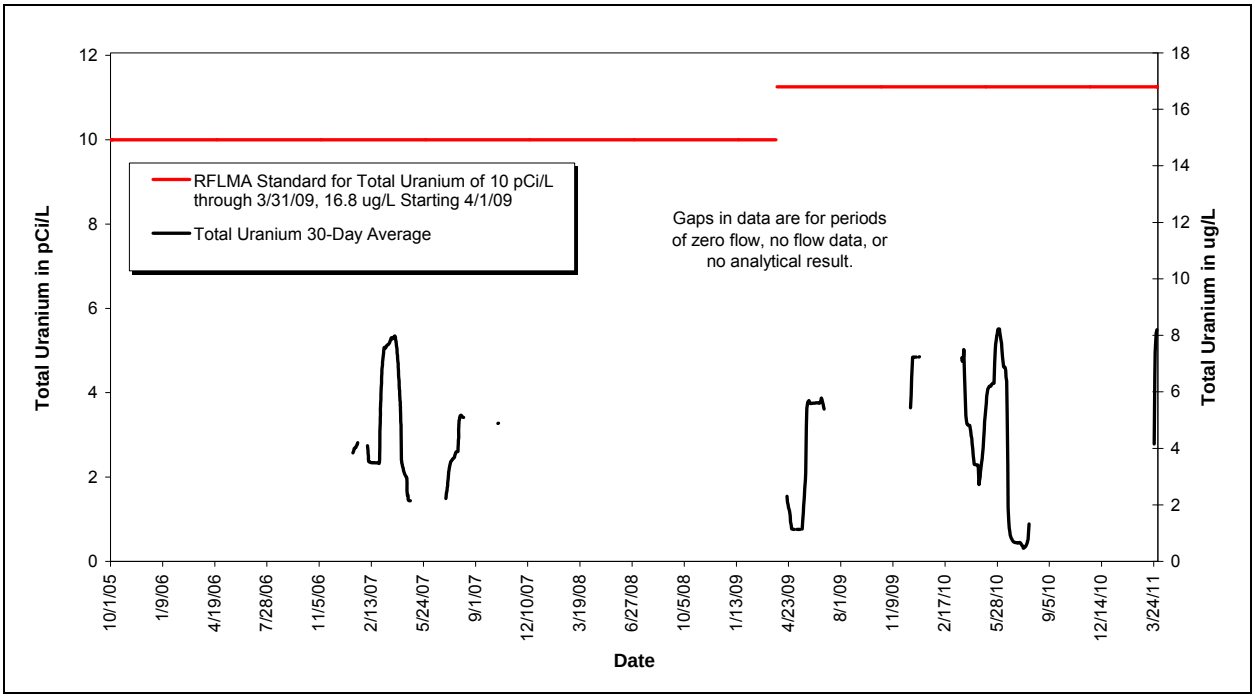
pCi/L = picocuries per liter; analytical results were not available for the composite sample covering the period 3/31–5/20/11

Figure 7. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS03: Post-Closure Period Ending First Quarter CY 2011



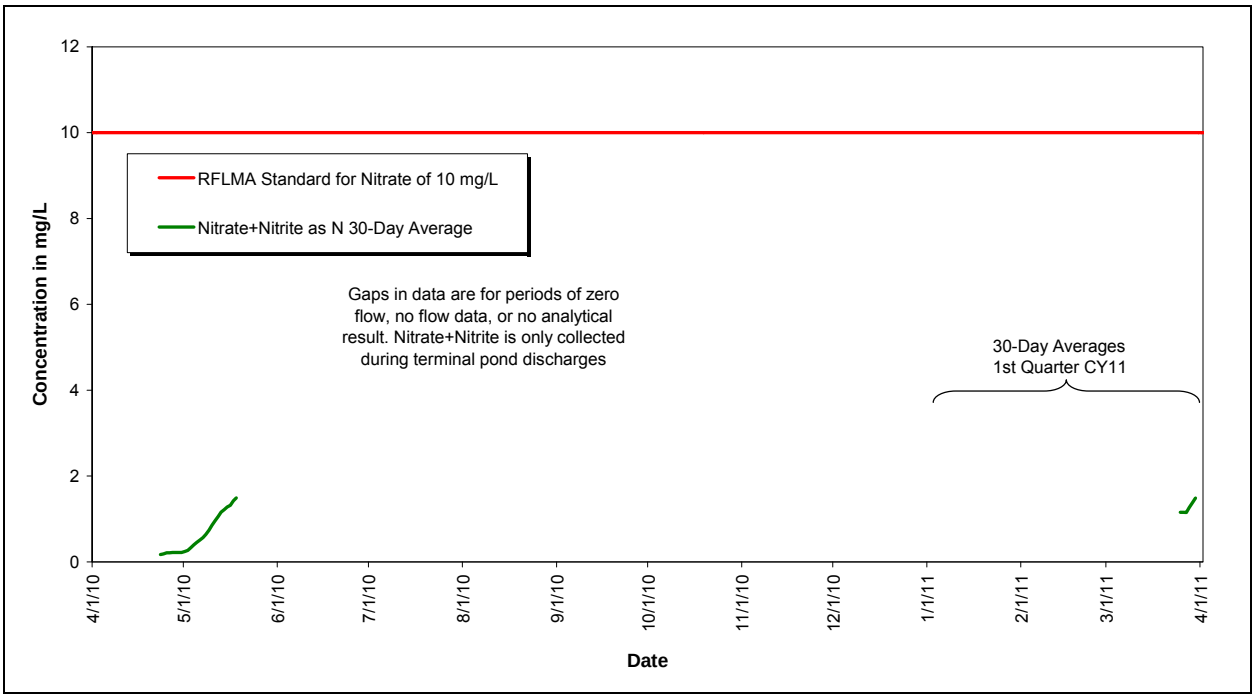
µg/L = micrograms per liter; analytical results were not available for the composite sample covering the period 3/31-5/20/11

Figure 8. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS03: Calendar Year Ending First Quarter CY 2011



µg/L = micrograms per liter; pCi/L = picocuries per liter; analytical results were not available for the composite sample covering the period 3/31–5/20/11

Figure 9. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS03: Post-Closure Period Ending First Quarter CY 2011



mg/L = milligrams per liter

Figure 10. Volume-Weighted 85th Percentile of 30-Day Average Nitrate+Nitrite Concentrations at GS03: Calendar Year Ending First Quarter CY 2011

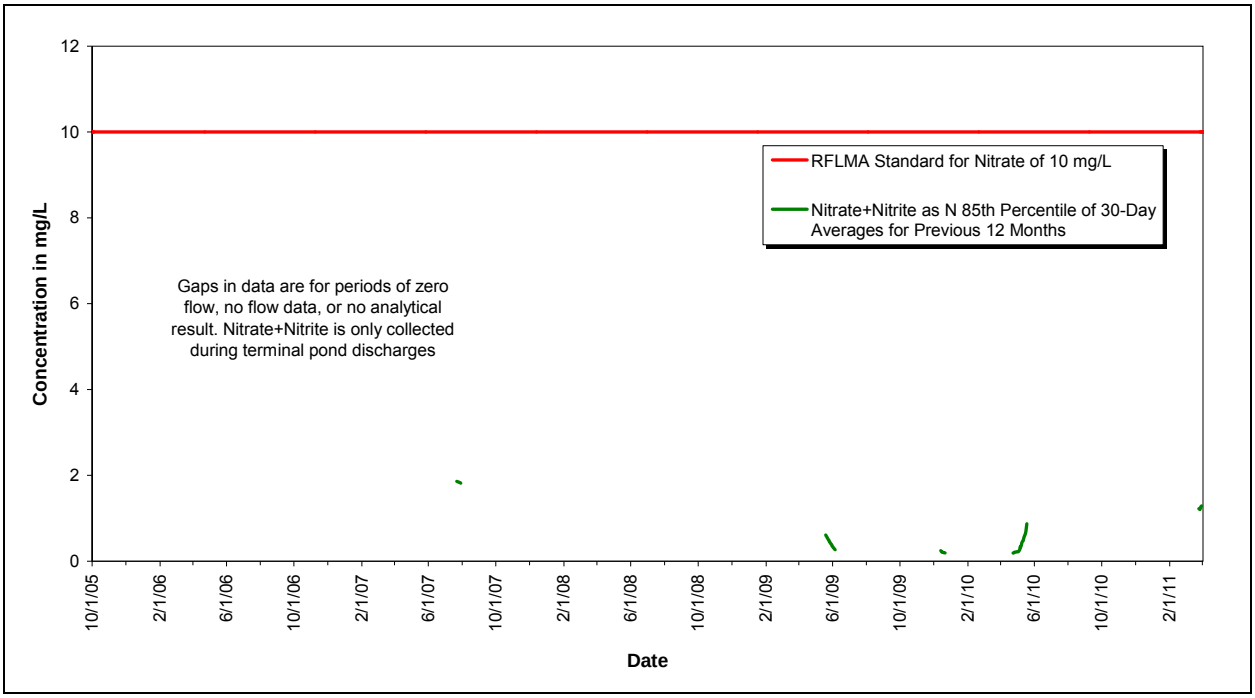
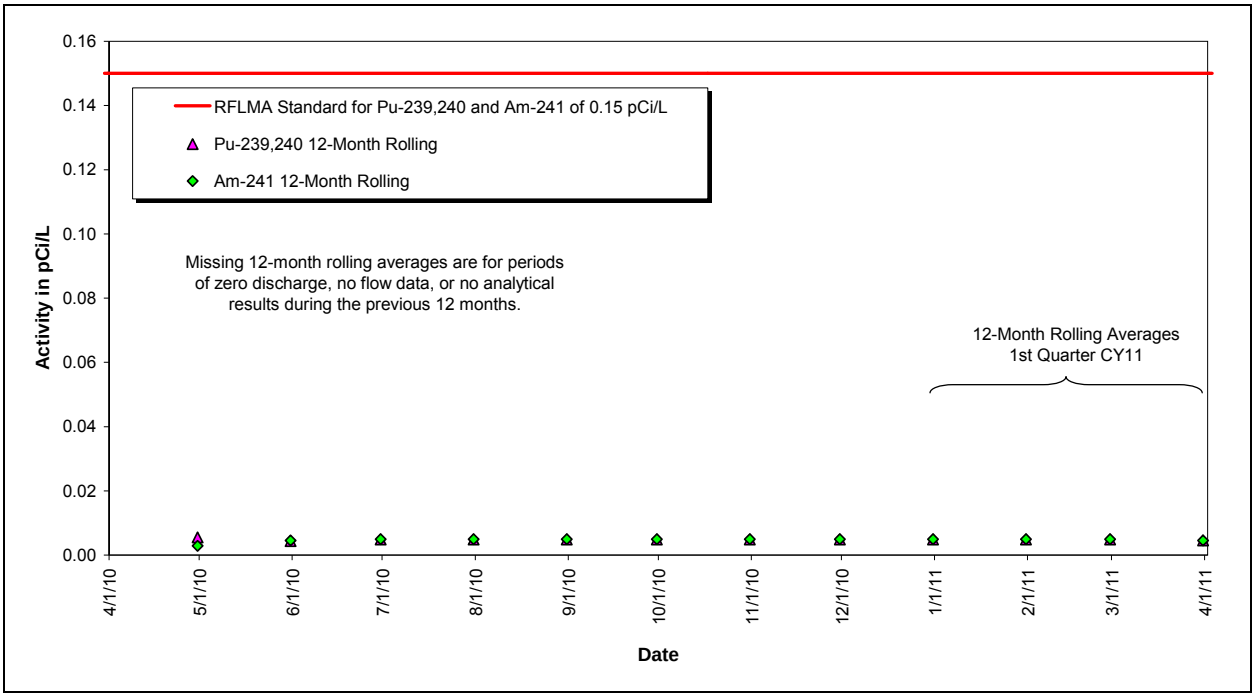


Figure 11. Volume-Weighted 85th Percentile of 30-Day Average Nitrate+Nitrite Concentrations at GS03: Post-Closure Period Ending First Quarter CY 2011

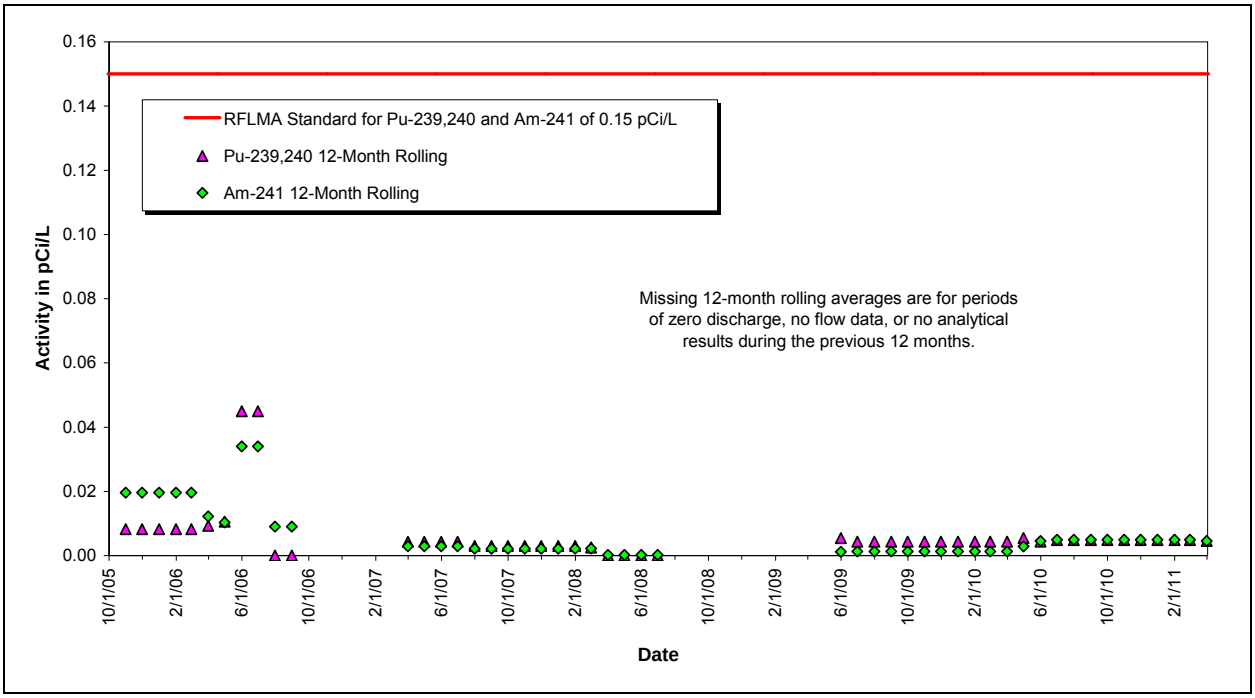
3.1.2.3 Monitoring Location GS08

Monitoring location GS08 is on South Walnut Creek at the outlet of Pond B-5. Figure 12, Figure 14, and Figure 16 show no occurrences of reportable 12-month rolling averages for the quarter. Figure 13, Figure 15, and Figure 17 show sampling data from 2005 through first quarter CY 2011.



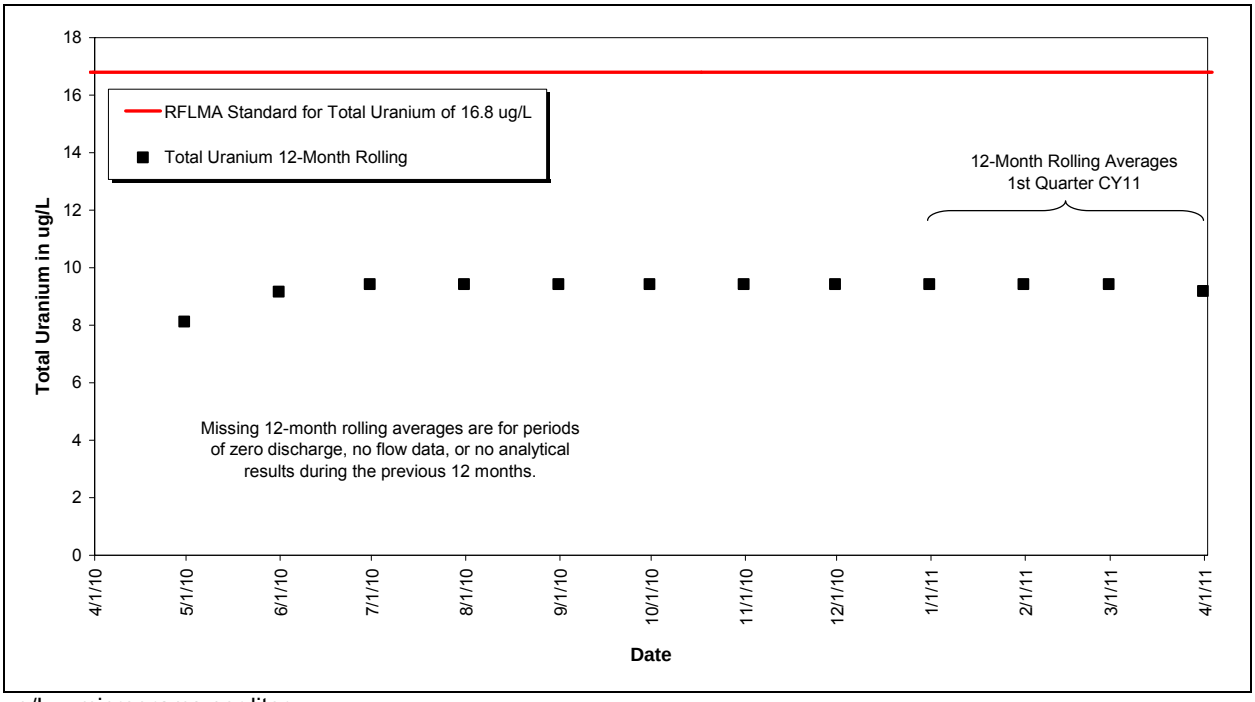
pCi/L = picocuries per liter

Figure 12. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS08: Calendar Year Ending First Quarter CY 2011



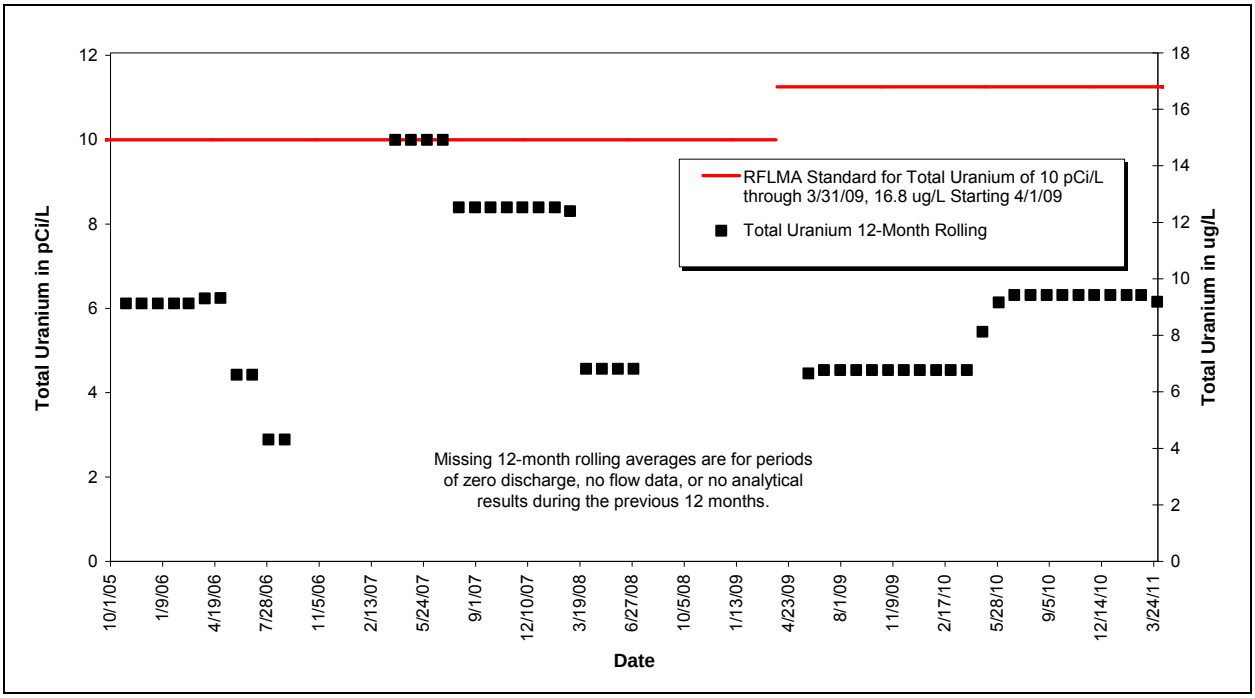
pCi/L = picocuries per liter

Figure 13. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS08: Post-Closure Period Ending First Quarter CY 2011



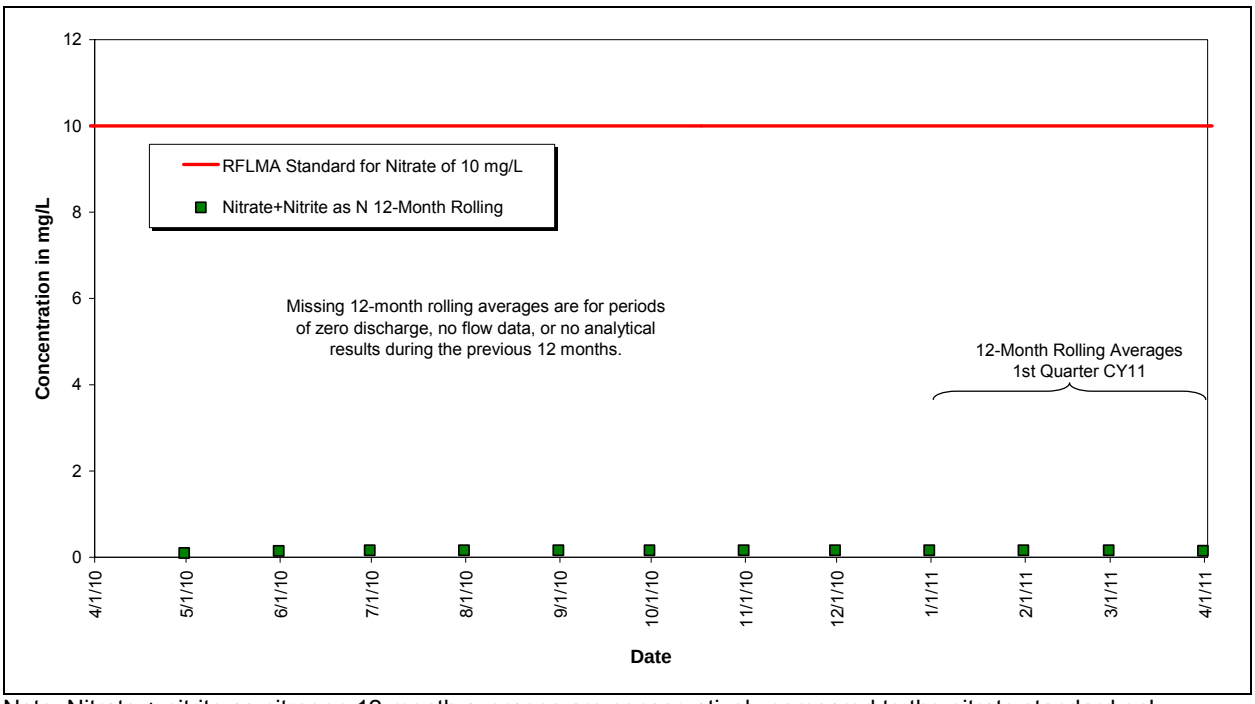
µg/L = micrograms per liter

Figure 14. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at GS08: Calendar Year Ending First Quarter CY 2011



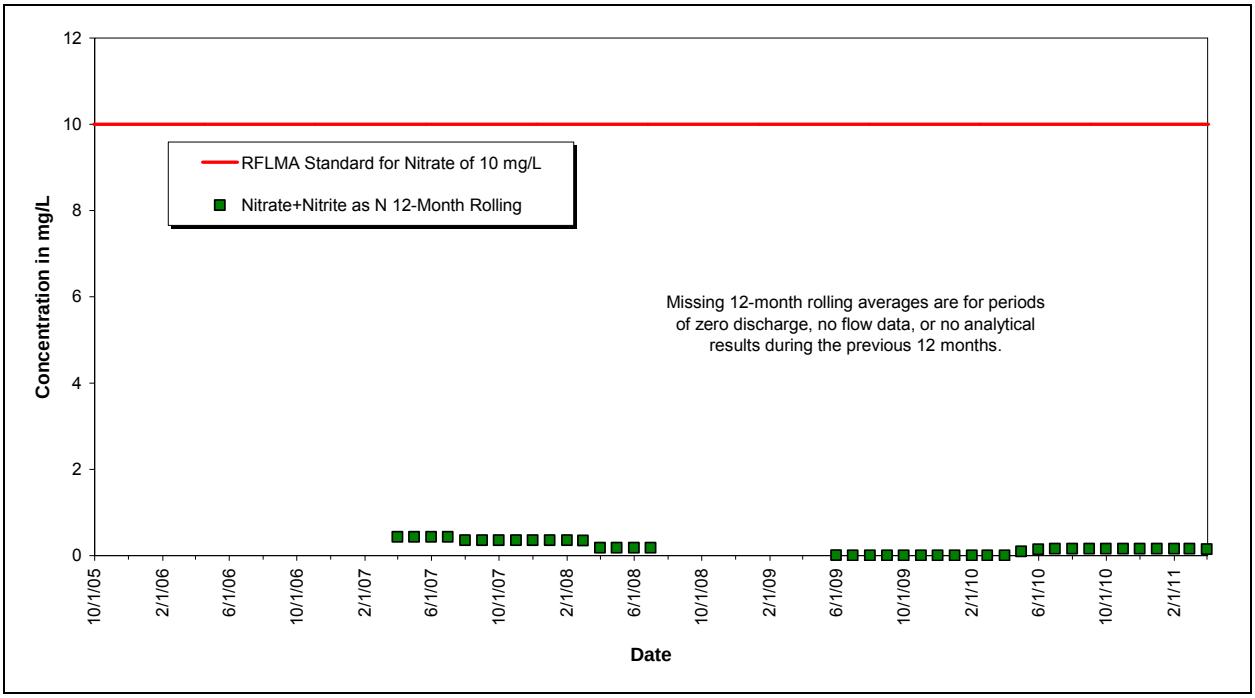
µg/L = micrograms per liter; pCi/L = picocuries per liter

Figure 15. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at GS08: Post-Closure Period Ending First Quarter CY 2011



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

Figure 16. Volume-Weighted 12-Month Rolling Average Nitrate + Nitrite as Nitrogen Concentrations at GS08: Calendar Year Ending First Quarter CY 2011

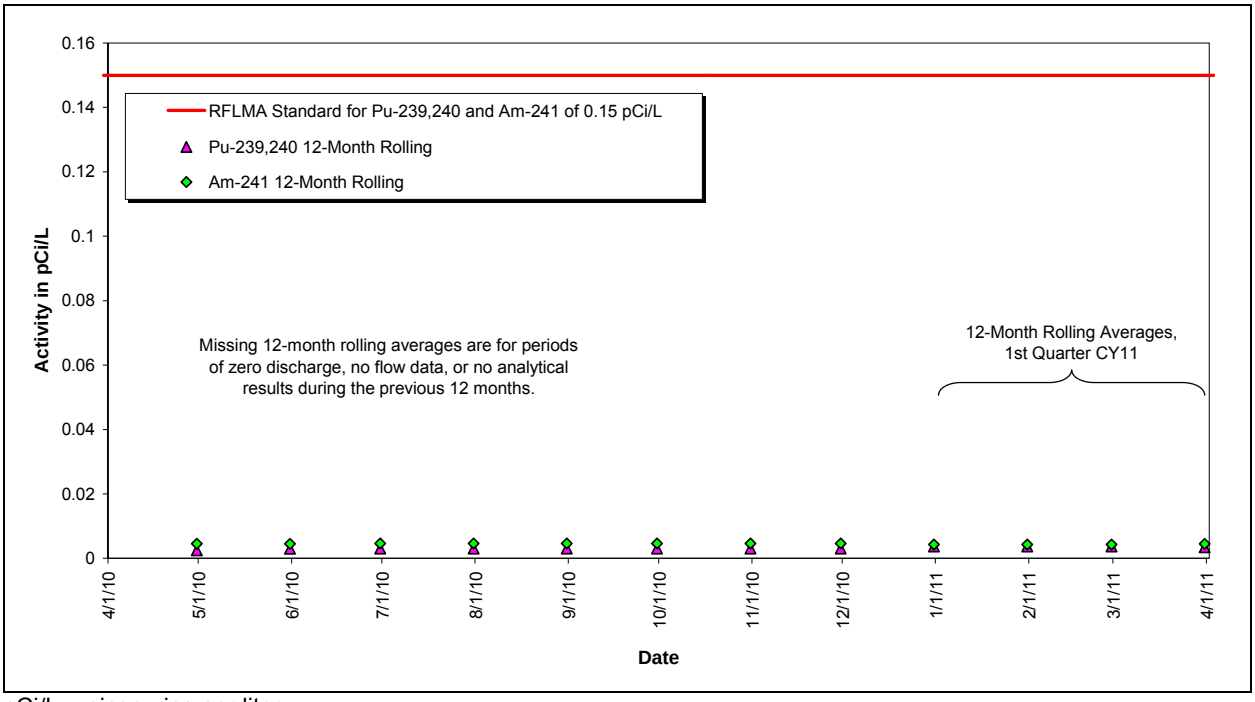


Note: Nitrate + nitrite as nitrogen 12-month averages are conservatively compared to the nitrate standard only.
mg/L = milligrams per liter

Figure 17. Volume-Weighted 12-Month Rolling Average Nitrate + Nitrite as Nitrogen Concentrations at GS08: Post-Closure Period Ending First Quarter CY 2011

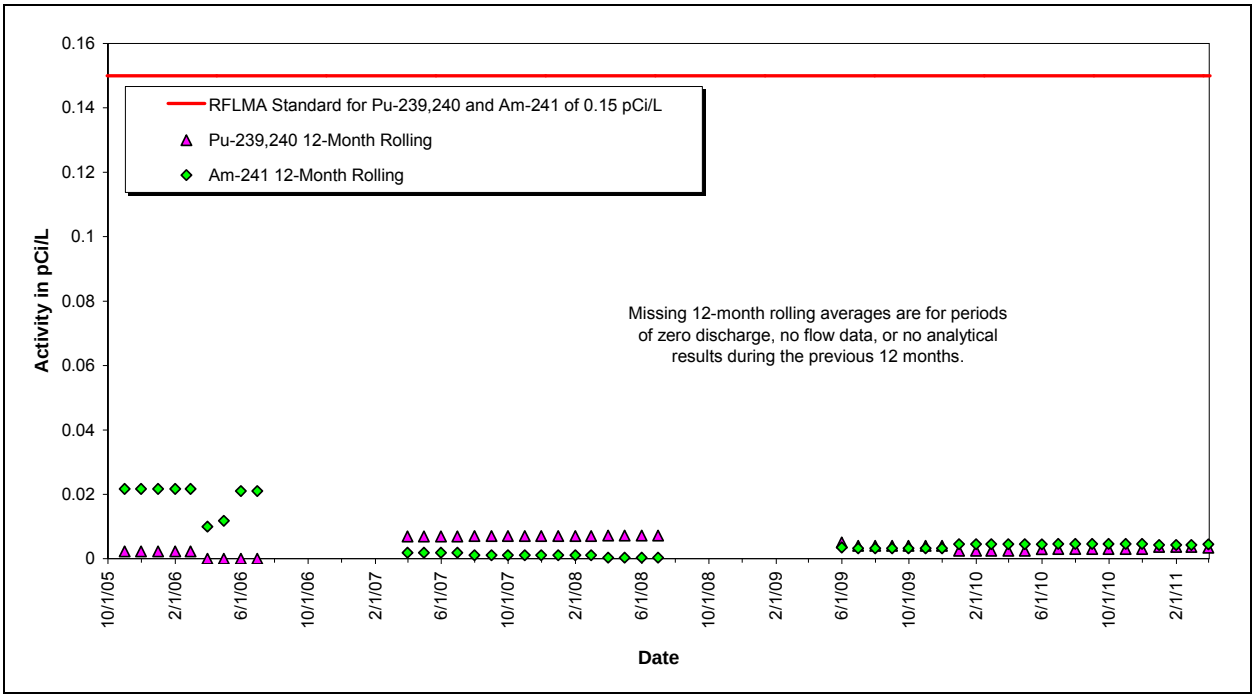
3.1.2.4 Monitoring Location GS11

Monitoring location GS11 is on North Walnut Creek at the outlet of Pond A-4. Figure 18, Figure 20, and Figure 22 show no occurrences of reportable 12-month rolling averages for the quarter. Figure 19, Figure 21, and Figure 23 show sampling data from 2005 through first quarter CY 2011.



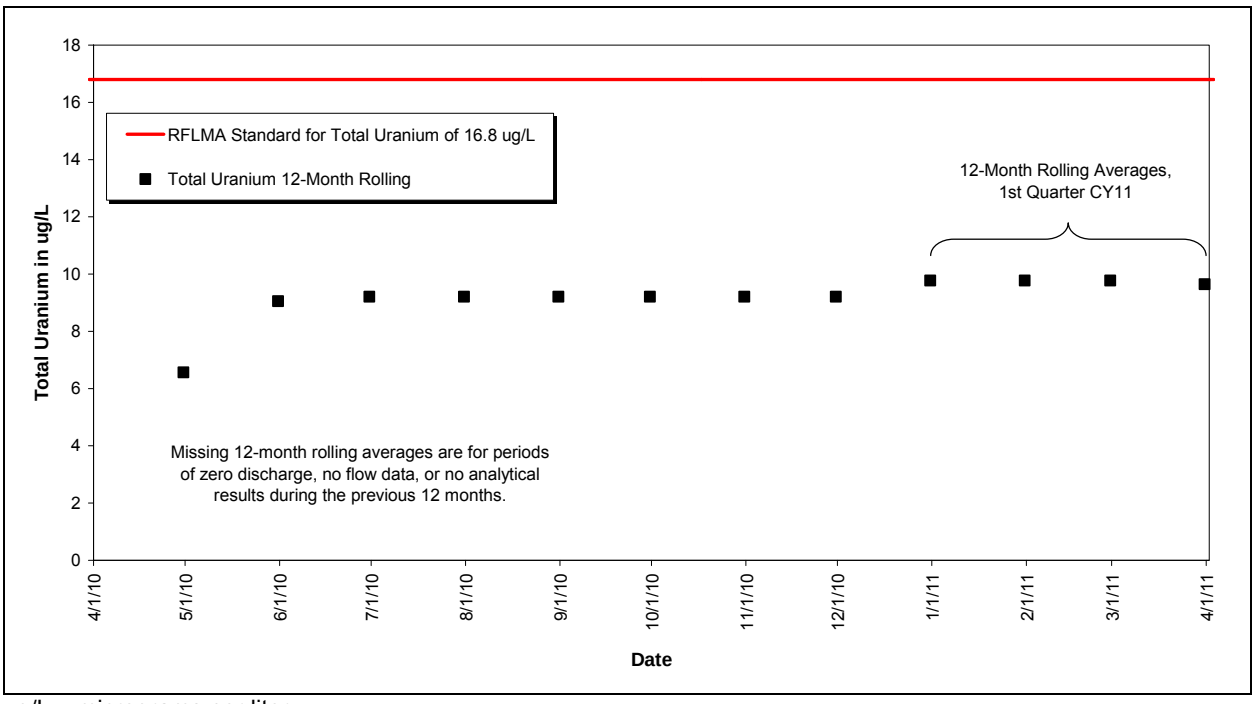
pCi/L = picocuries per liter

Figure 18. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS11: Calendar Year Ending First Quarter CY 2011



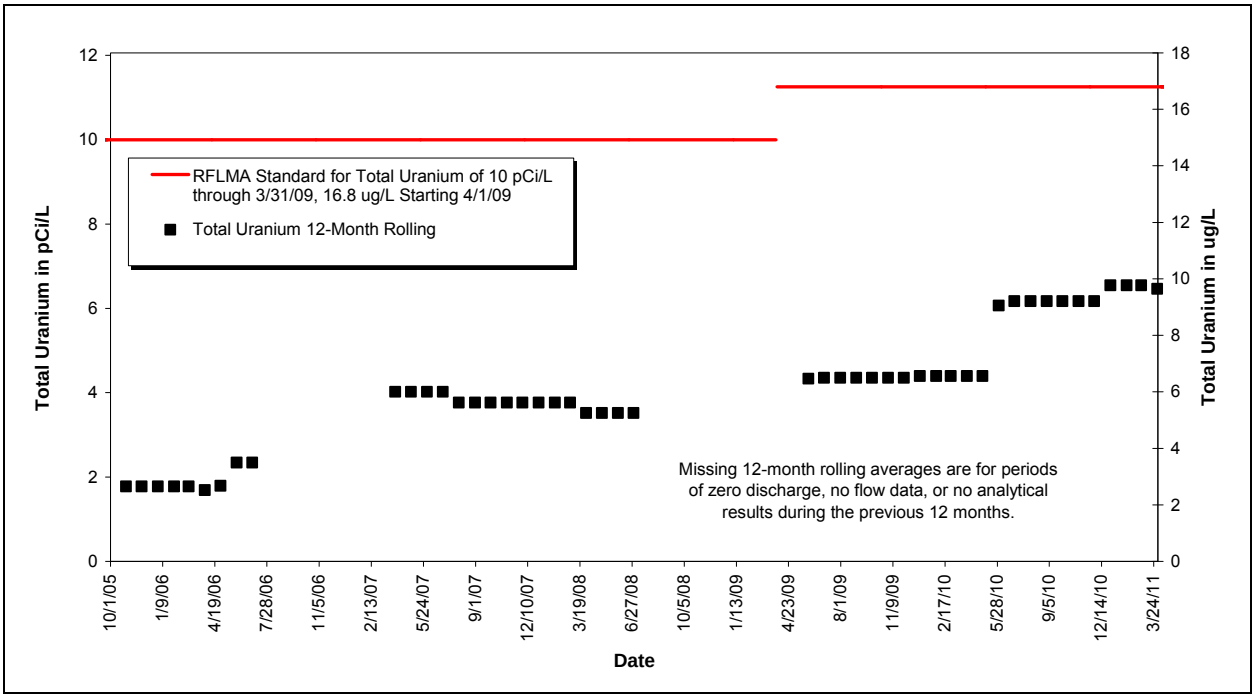
pCi/L = picocuries per liter

Figure 19. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS11: Post-Closure Period Ending First Quarter CY 2011



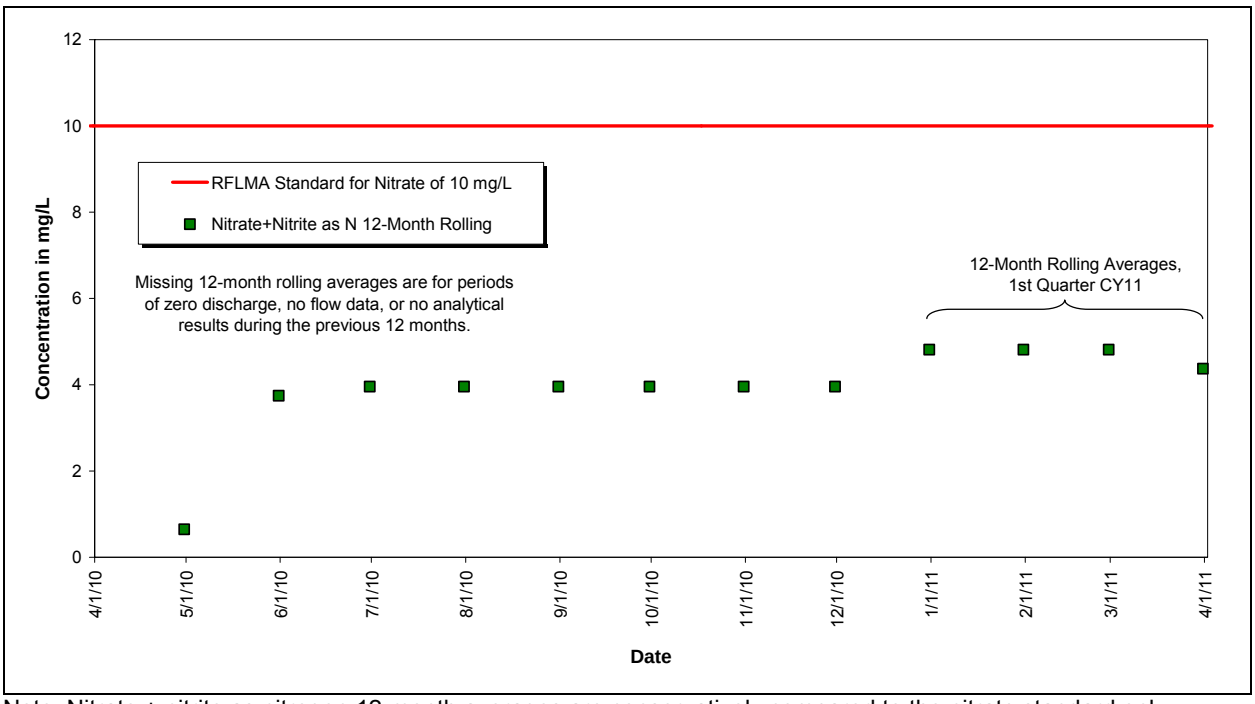
µg/L = micrograms per liter

Figure 20. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at GS11: Calendar Year Ending First Quarter CY 2011



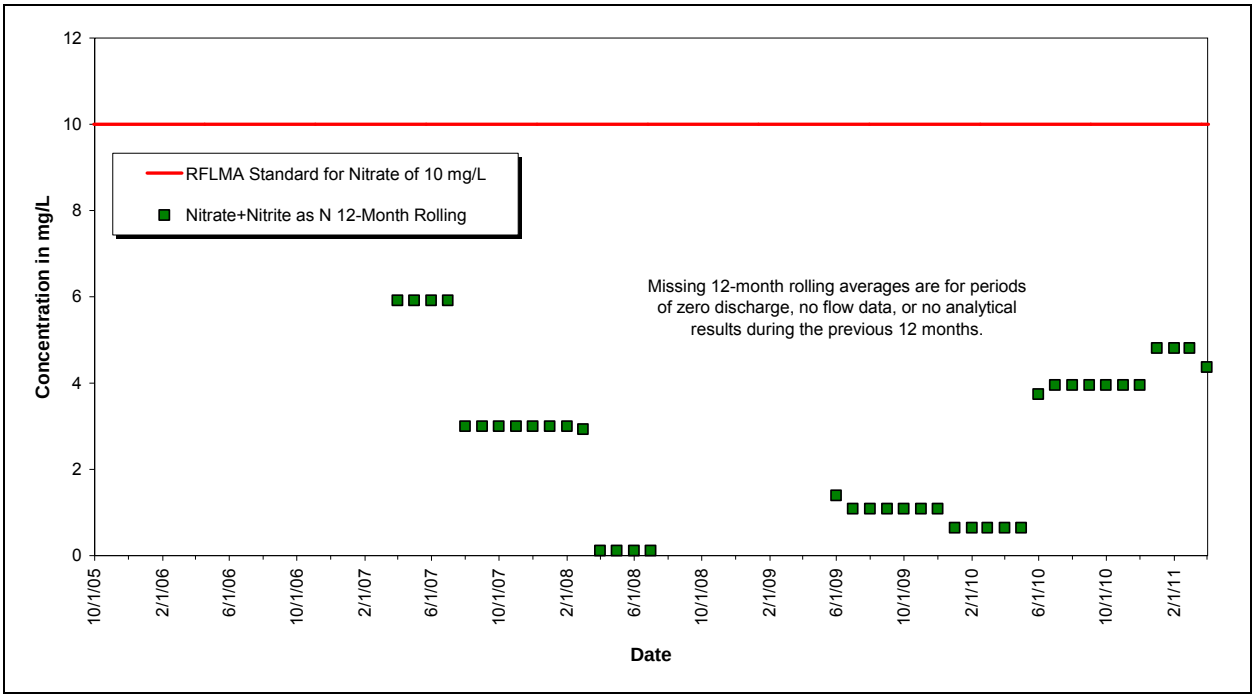
µg/L = micrograms per liter; pCi/L = picocuries per liter

Figure 21. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at GS11: Post-Closure Period Ending First Quarter CY 2011



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

Figure 22. Volume-Weighted 12-Month Rolling Average Nitrate + Nitrite as Nitrogen Concentrations at GS11: Calendar Year Ending First Quarter CY 2011

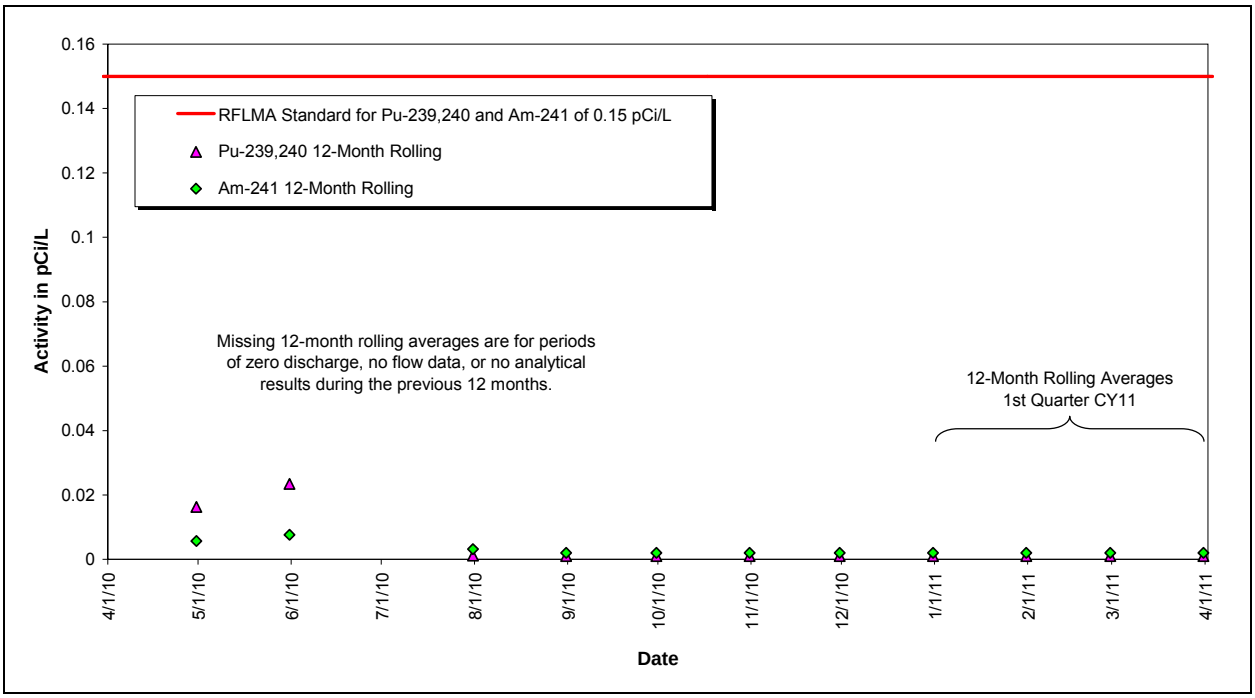


Note: Nitrate + nitrite as nitrogen 12-month averages are conservatively compared to the nitrate standard only.
mg/L = milligrams per liter

Figure 23. Volume-Weighted 12-Month Rolling Average Nitrate + Nitrite as Nitrogen Concentrations at GS11: Post-Closure Period Ending First Quarter CY 2011

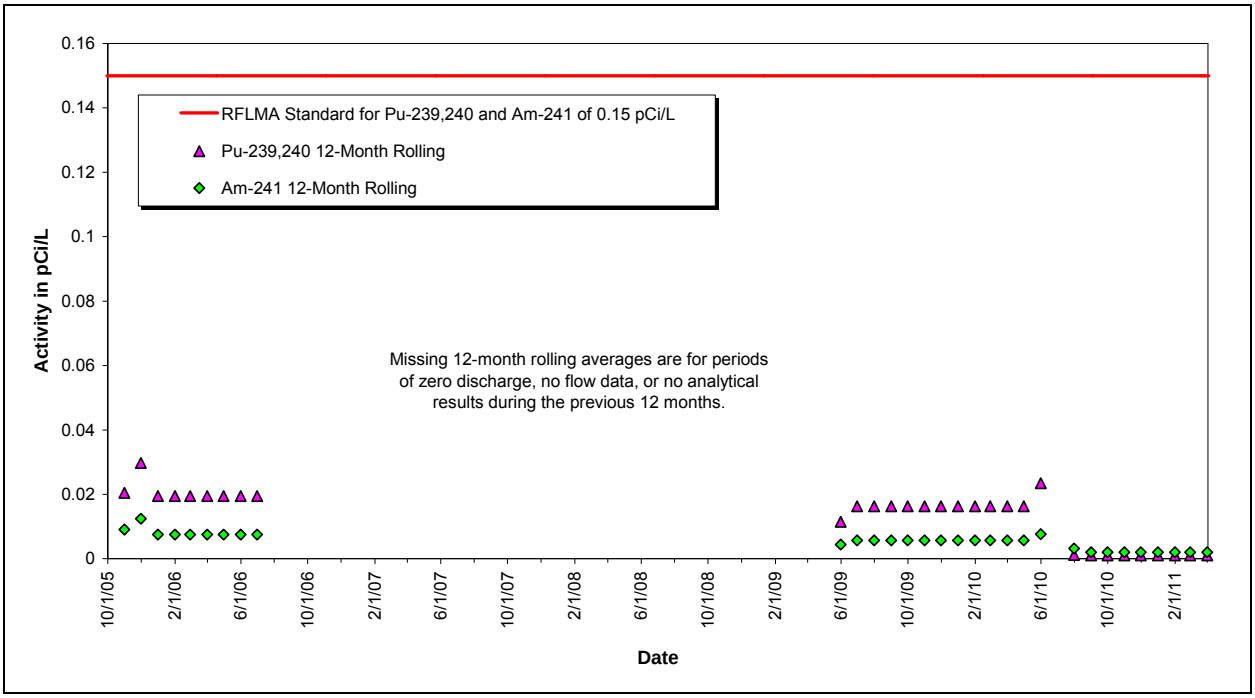
3.1.2.5 Monitoring Location GS31

Monitoring location GS31 is on Woman Creek at the outlet of Pond C-2. Figure 24 and Figure 26 show no occurrences of reportable 12-month rolling averages for the quarter. Figure 25 and Figure 27 show sampling data from 2005 through first quarter CY 2011.



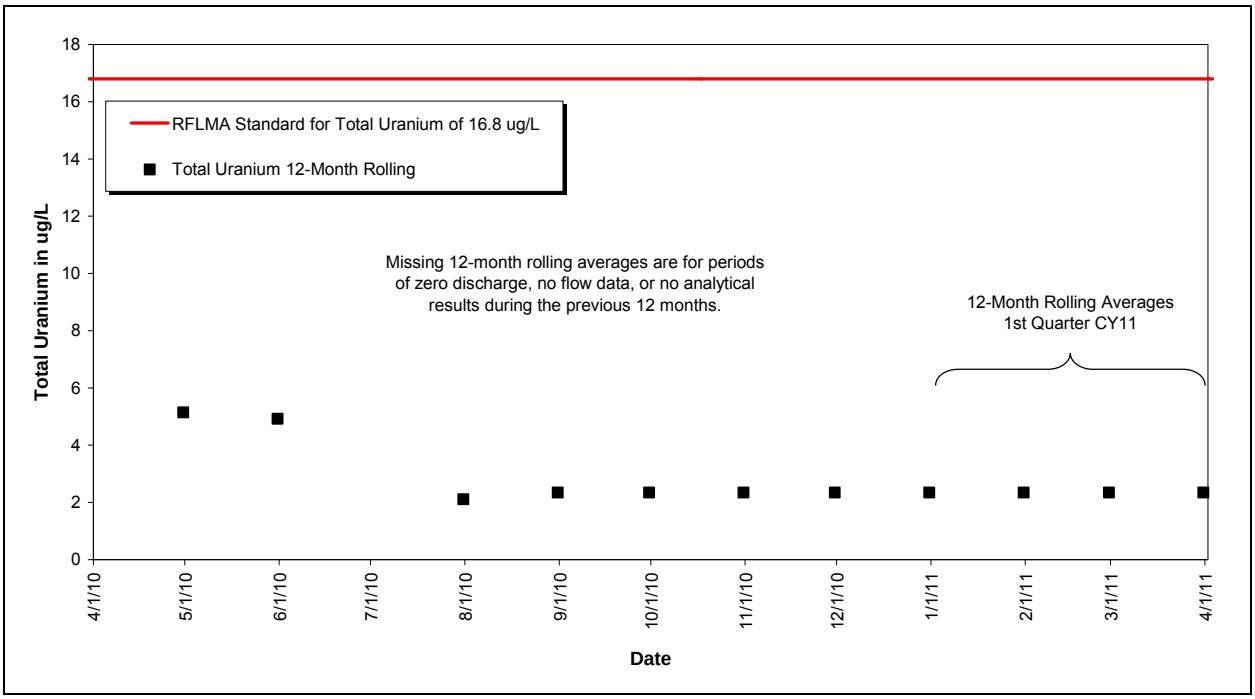
pCi/L = picocuries per liter

Figure 24. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS31: Calendar Year Ending First Quarter CY 2011



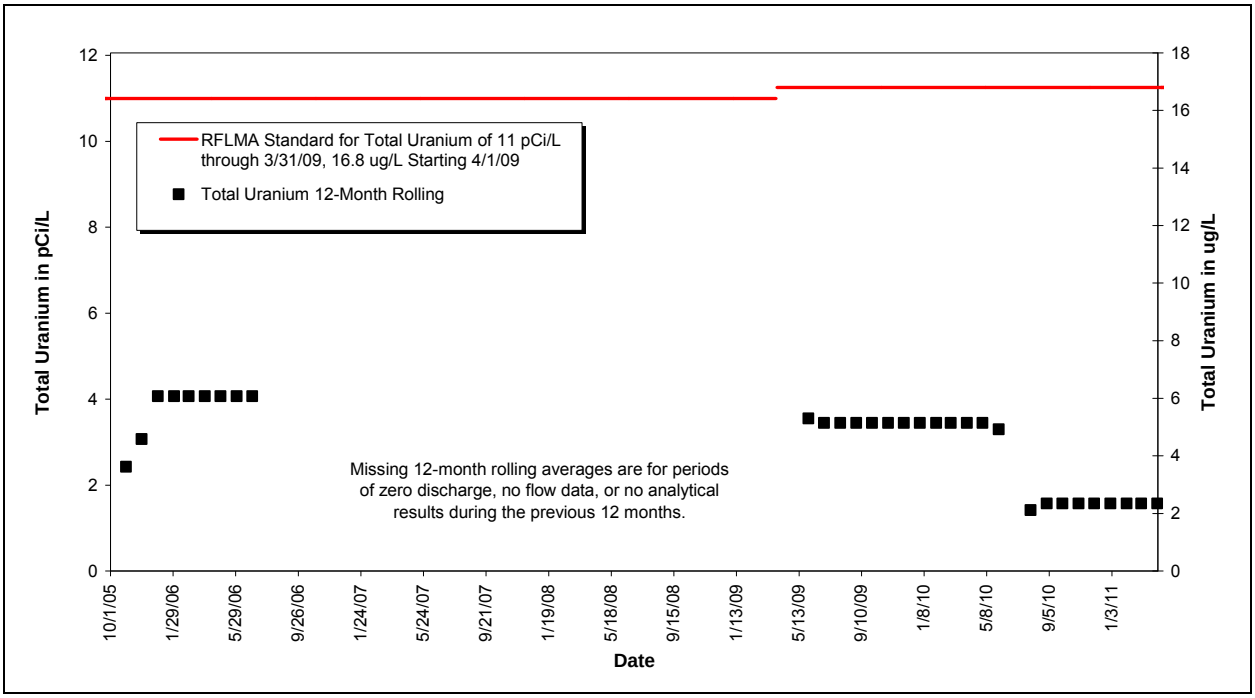
pCi/L = picocuries per liter

Figure 25. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS31: Post-Closure Period Ending First Quarter CY 2011



µg/L = micrograms per liter

Figure 26. Volume-Weighted 12-Month Rolling Average Total Uranium Activities at GS31: Calendar Year Ending First Quarter CY 2011



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

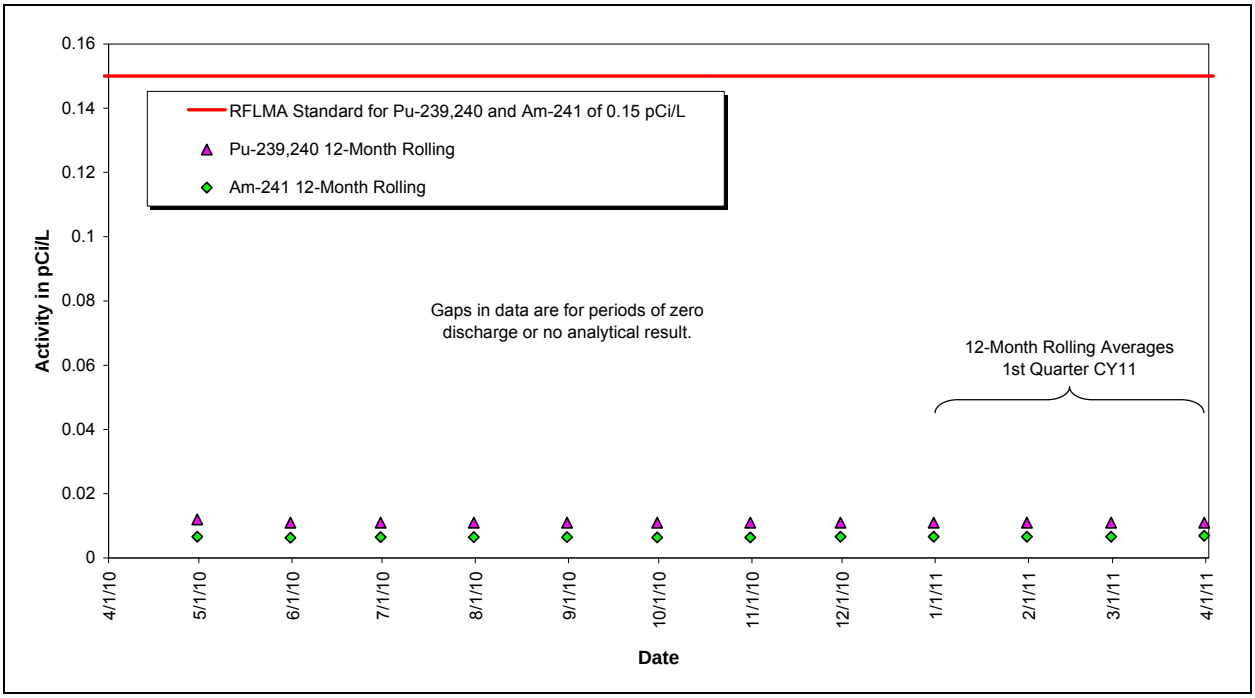
Figure 27. Volume-Weighted 12-Month Rolling Average Total Uranium Activities at GS31: Post-Closure Period Ending First Quarter CY 2011

3.1.3 POE Monitoring

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

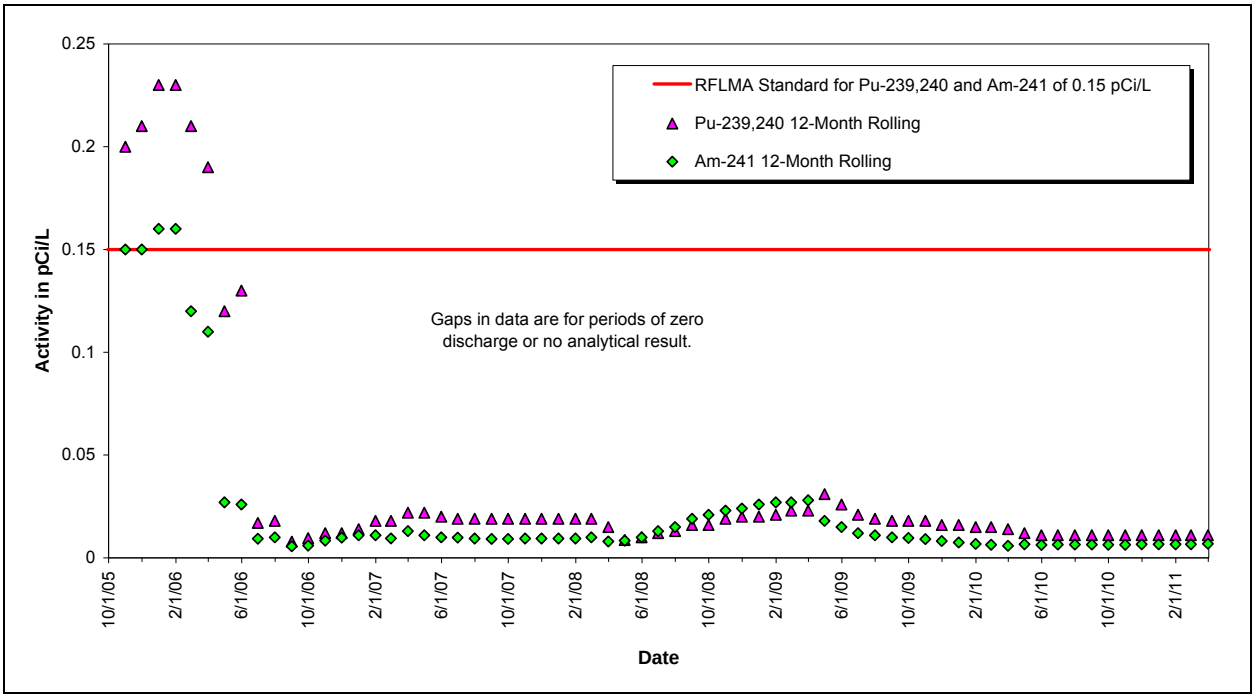
3.1.3.1 Monitoring Location GS10

Monitoring location GS10 is on South Walnut Creek just upstream of the B-Series ponds. Figure 28 and Figure 30 show no reportable plutonium, americium, or total uranium values during the quarter. Figure 29 and Figure 31 show sampling data from 2005 through first quarter CY 2011. In addition, none of the 85th-percentile 30-day average metals concentrations were reportable for the quarter.



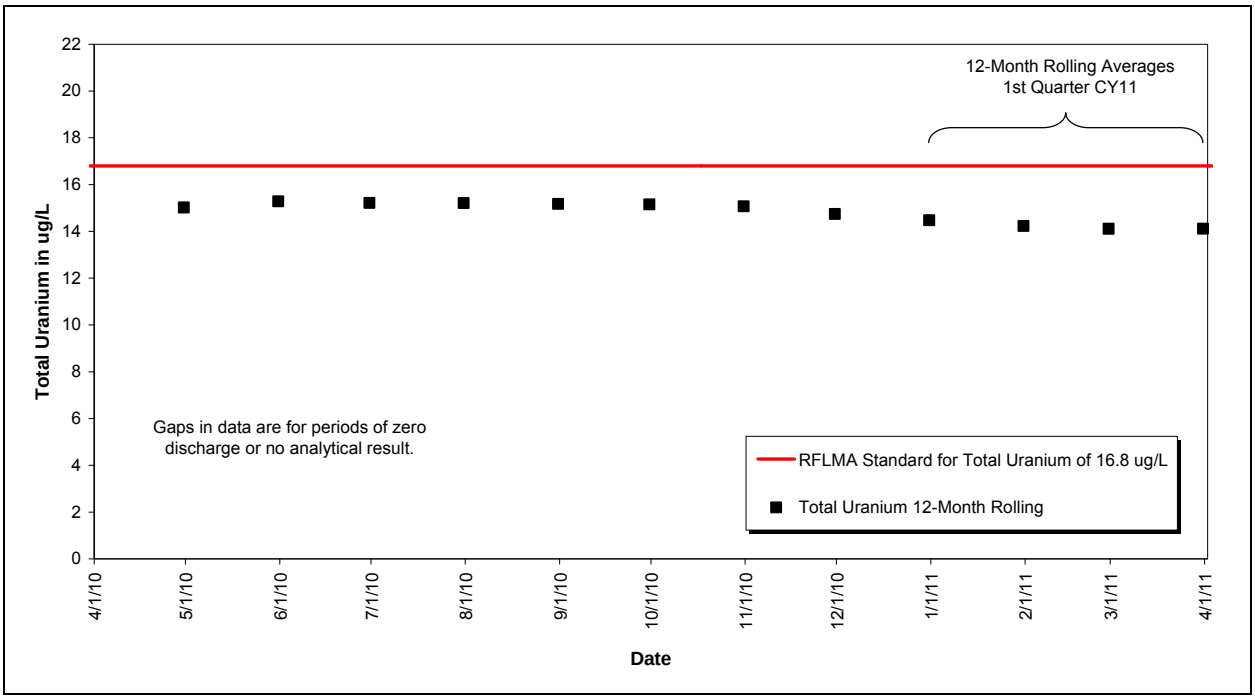
pCi/L = picocuries per liter

Figure 28. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS10: Calendar Year Ending First Quarter CY 2011



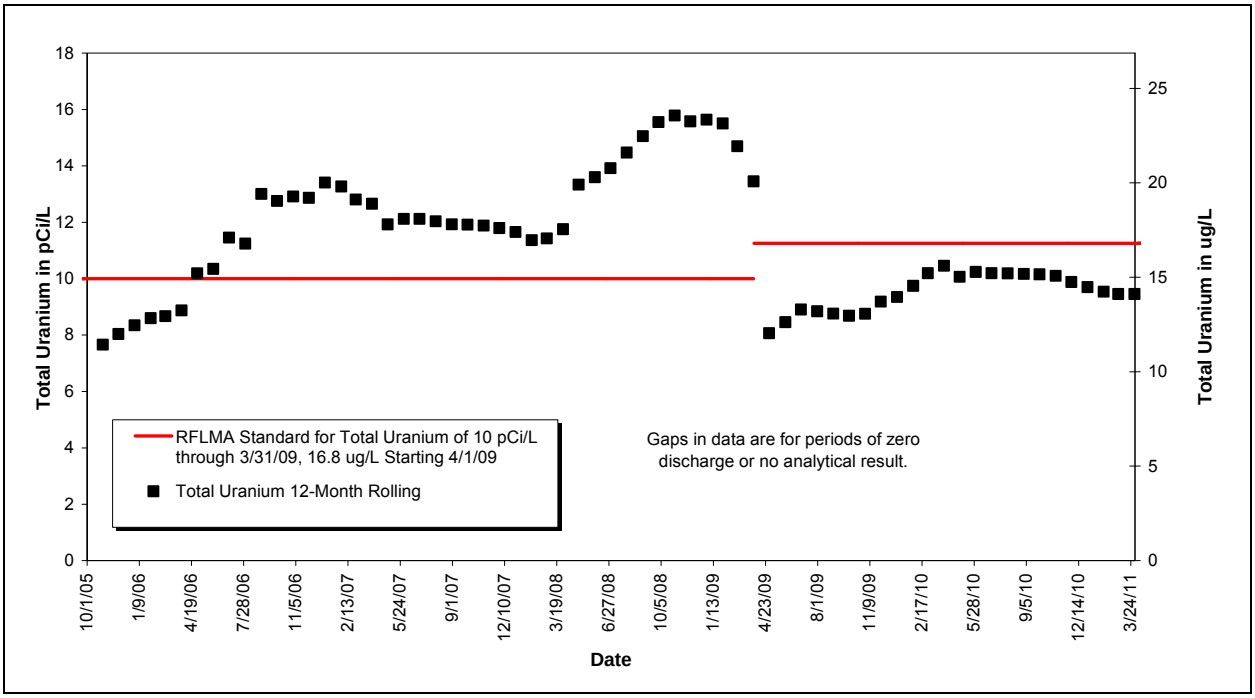
pCi/L = picocuries per liter

Figure 29. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS10: Post-Closure Period Ending First Quarter CY 2011



µg/L = micrograms per liter

Figure 30. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at GS10: Calendar Year Ending First Quarter CY 2011



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

Figure 31. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at GS10: Post-Closure Period Ending First Quarter CY 2011

3.1.3.2 Monitoring Location SW027

Monitoring location SW027 is at the end of the South Interceptor Ditch (SID) at the inlet to Pond C-2. Figure 32 and Figure 34 show the 12-month rolling averages for plutonium, americium, and total uranium during the quarter. Figure 33 and Figure 35 show sampling data from 2005 through first quarter CY 2011.

Figure 32 shows that the 12-month rolling average for plutonium exceeds the RFLMA standard of 0.15 picocurie per liter. The composite sampling results for plutonium at SW027 collected during CY 2010–2011 are given in Table 1. All other analytes were not reportable during the first quarter CY 2011.

While the 12-month rolling average values could not be formally calculated until complete analytical results were available for the April 27–October 4, 2010, sample, DOE initiated preemptive consultation with CDPHE on June 2, 2010. RFLMA Contact Record 2010-06, "Monitoring Results at Surface Water Point of Evaluation (POE) SW027," provides a discussion of the monitoring results and recaps the outcome of the RFLMA Parties' consultation regarding steps to be taken to evaluate the SW027 drainage area. Contact Record 2010-06 is available on the Rocky Flats website, http://www.lm.doe.gov/Rocky_Flats/ContactRecords.aspx.

Subsequent to Contact Record 2010-06, the *Report of Steps Taken Regarding Monitoring Results at Surface Water Point of Evaluation (POE) SW027* (DOE 2010a) was completed on August 31, 2010. This report provides data evaluation and an update on the steps taken in accordance with Contact Record 2010-06. Recommendations beyond the actions already taken

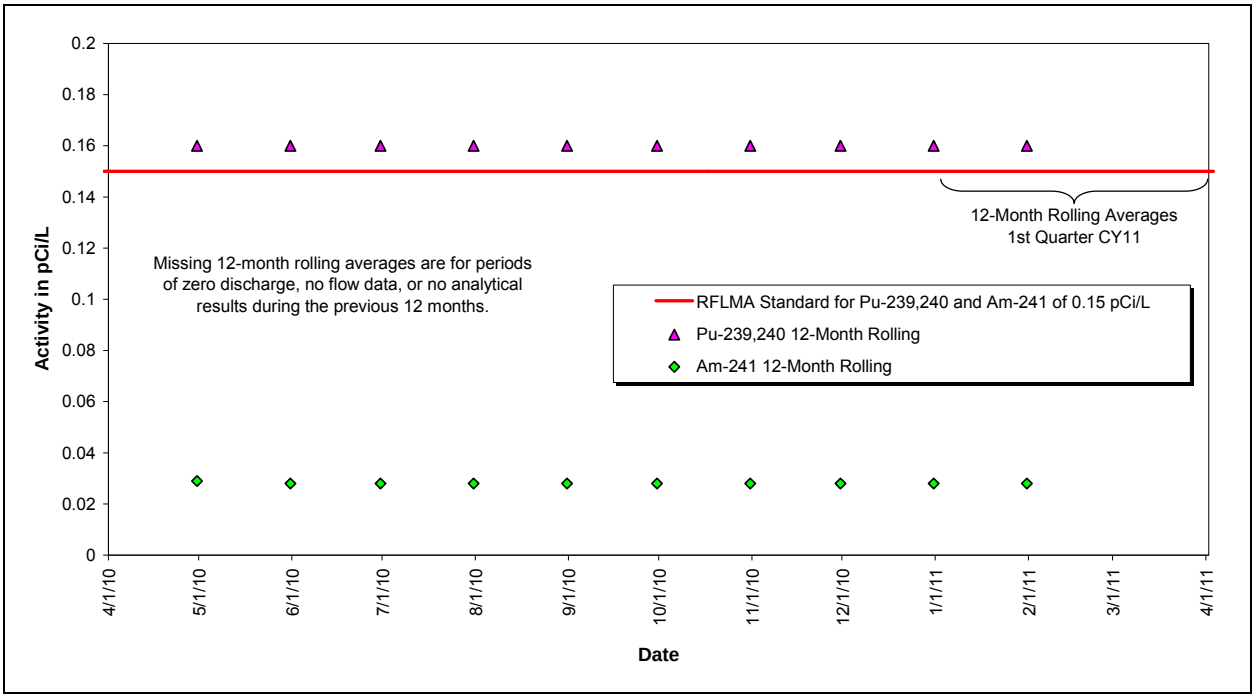
and discussed in the Contact Record are also provided. The August 31, 2010, report on the status of actions related to evaluation of the conditions is included in Appendix D with CR 2010-02. This report is also available on the Rocky Flats website, http://www.lm.doe.gov/Rocky_Flats/ContactRecords.aspx.

The recommendations in the evaluation included installing additional erosion control wattles in locations along the hillside north of the SID, installing permanent erosion blankets, and reseeding three areas in the SID. This work was successfully completed on December 20, 2010. Approximately 2,560 linear feet of Filtrexx wattles and 8,452 square feet of permanent erosion matting were installed.

Since SW027 has seen very little flow since April 2010, no additional composite samples have been collected. Thus, no new analytical data are available to include in the 12-month rolling average.

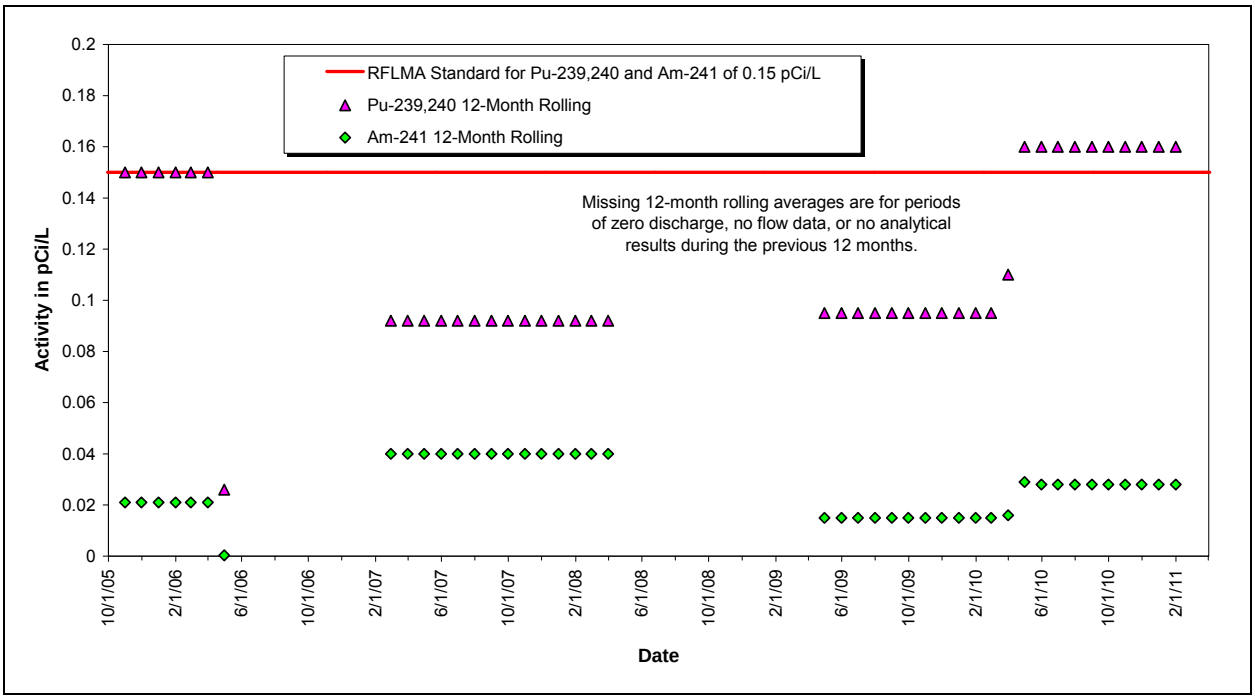
Table 1. CY 2010–2011 Composite Sampling Results for Plutonium for SW027

Date—Time Start	Date—Time End	Plutonium Result (pCi/L)
1/13/10—11:11	3/29/10—11:55	0.122
3/29/10—11:55	4/23/10—11:11	0.300
4/23/10—11:11	4/23/10—19:12	0.294
4/23/10—19:12	4/27/10—12:07	0.029
4/27/10—12:07	10/4/10—12:39	0.040
10/4/10—12:39	2/17/11—9:23	NA; No Flow
2/17/11—9:23	Sample in Progress	NA



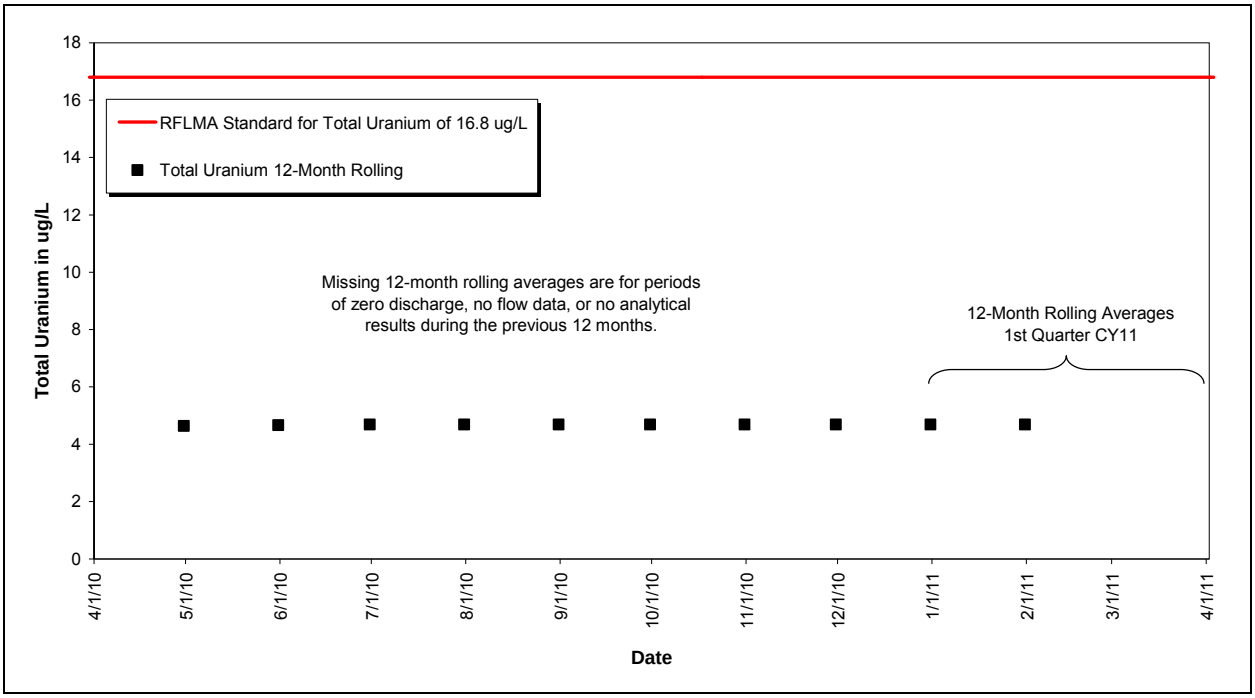
pCi/L = picocuries per liter; the composite sample started on 2/17/11 is still in progress

Figure 32. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW027: Calendar Year Ending First Quarter CY 2011



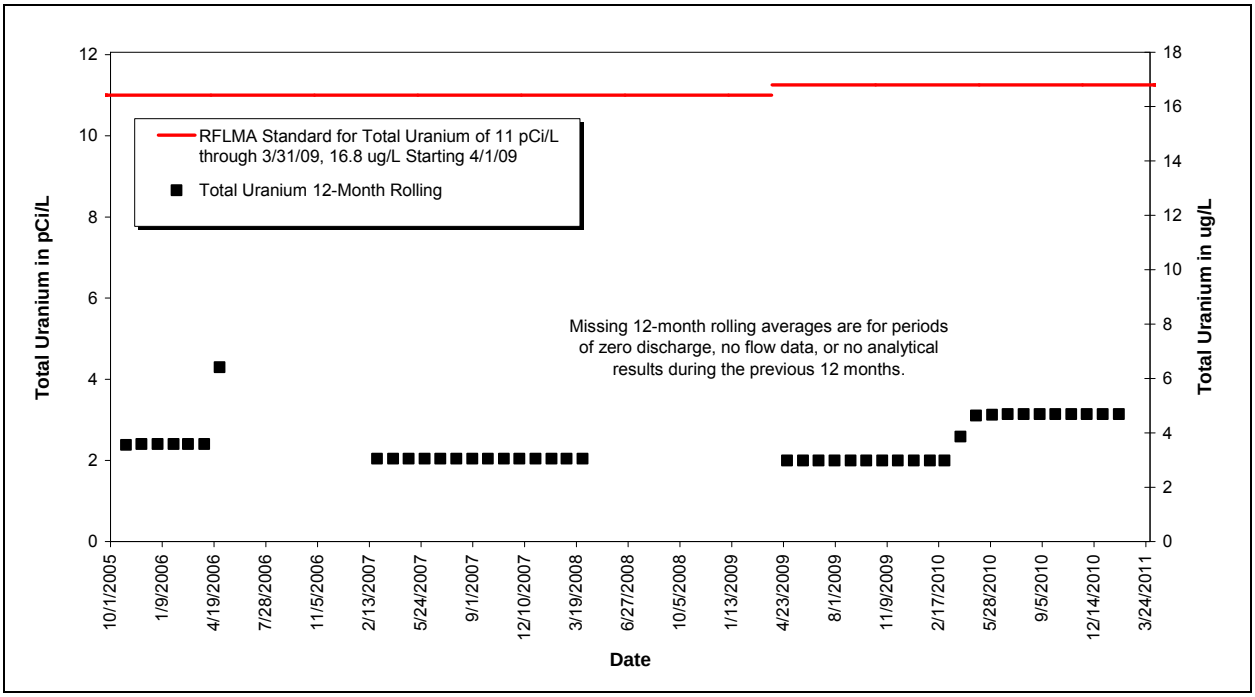
pCi/L = picocuries per liter; the composite sample started on 2/17/11 is still in progress

Figure 33. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW027: Post-Closure Period Ending First Quarter CY 2011



µg/L = micrograms per liter; the composite sample started on 2/17/11 is still in progress

Figure 34. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW027: Calendar Year Ending First Quarter CY 2011

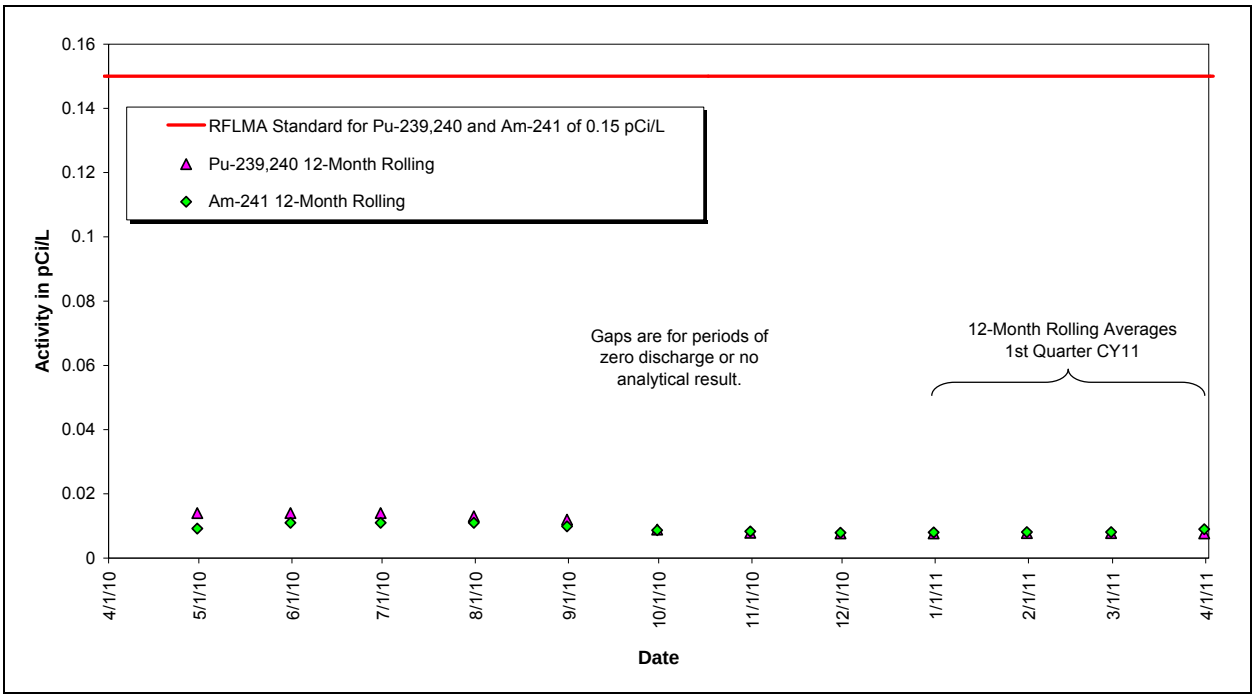


µg/L = micrograms per liter; pCi/L = picocuries per liter; the composite sample started on 2/17/11 is still in progress

Figure 35. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW027: Post-Closure Period Ending First Quarter CY 2011

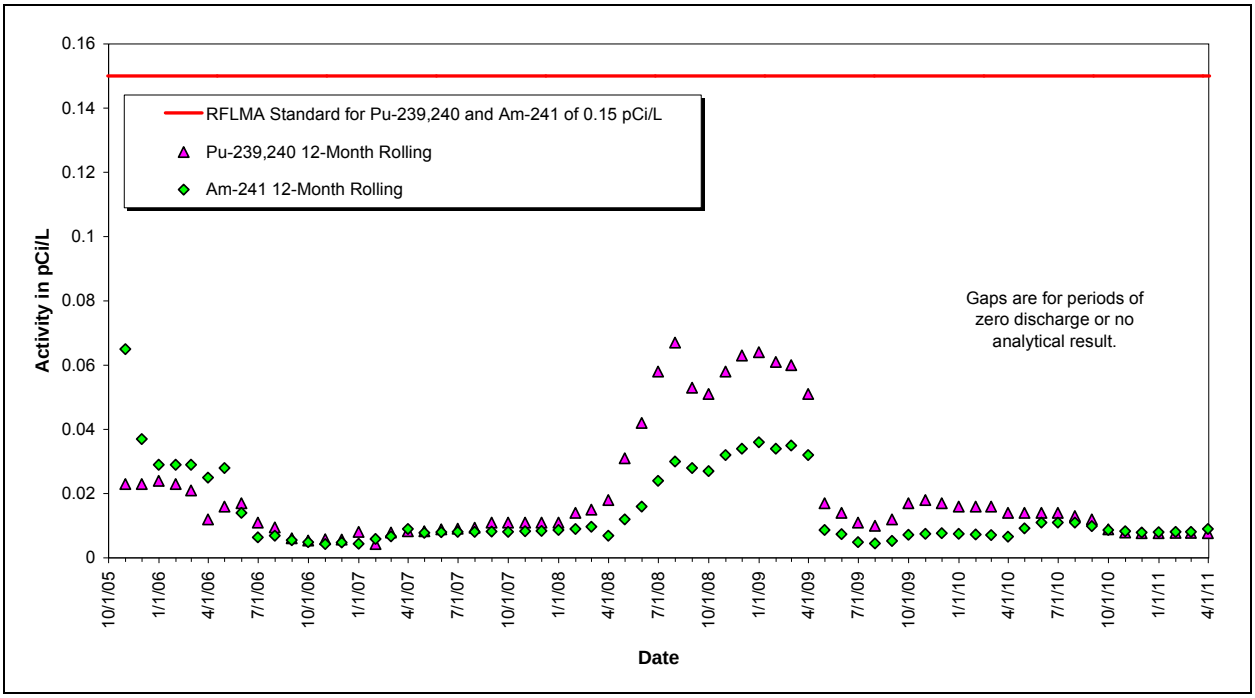
3.1.3.3 Monitoring Location SW093

Monitoring location SW093 is on North Walnut Creek 1,300 feet upstream of the A-Series ponds. Figure 36 and Figure 38 show no reportable plutonium, americium, or total uranium values during the quarter. Figure 37 and Figure 39 show sampling data from 2005 through first quarter CY 2011. None of the 85th-percentile 30-day average metals concentrations were reportable for the quarter.



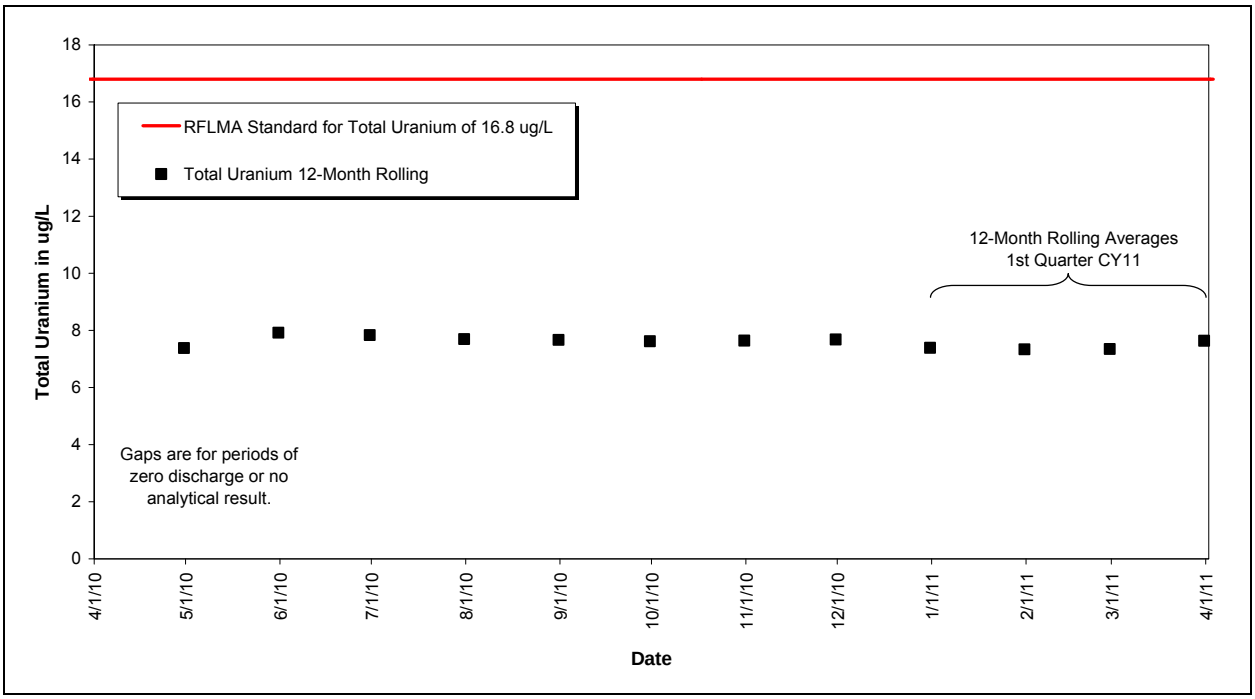
pCi/L = picocuries per liter

Figure 36. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW093: Calendar Year Ending First Quarter CY 2011



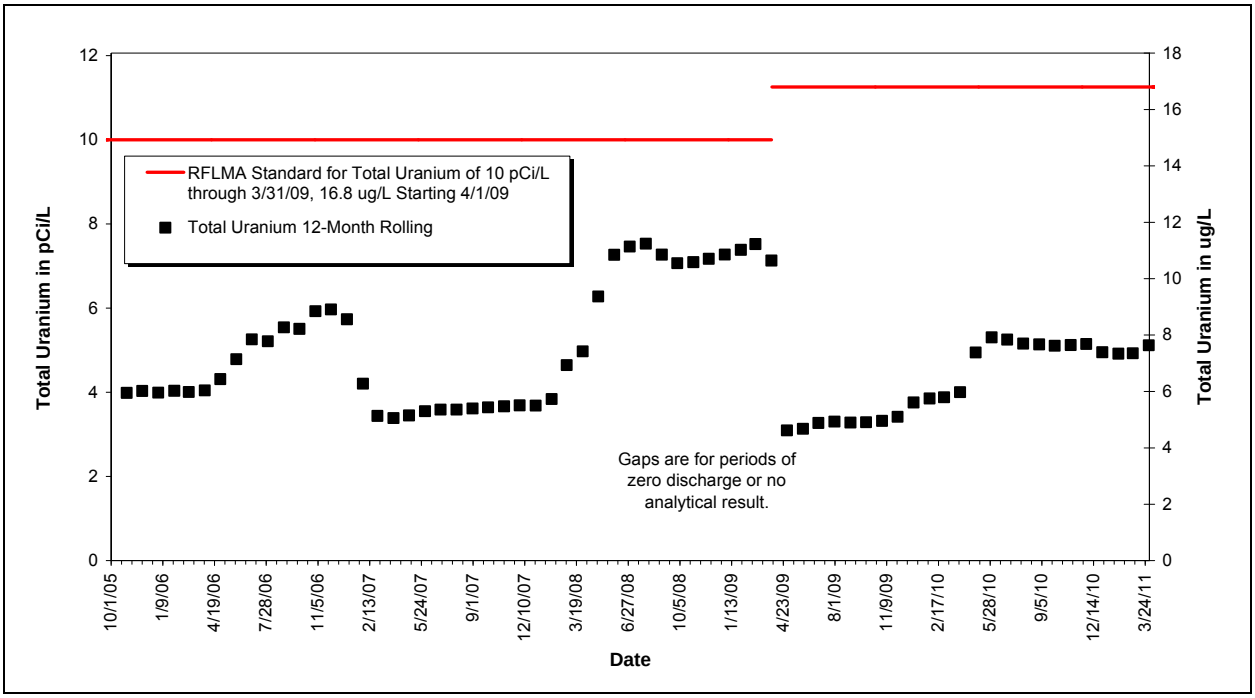
pCi/L = picocuries per liter

Figure 37. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW093: Post-Closure Period Ending First Quarter CY 2011



µg/L = micrograms per liter

Figure 38. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW093: Calendar Year Ending First Quarter CY 2011



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

Figure 39. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW093: Post-Closure Period Ending First Quarter CY 2011

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 2011.

3.1.5 Boundary Wells

Boundary wells were not scheduled for RFLMA monitoring in the first quarter of CY 2011.

3.1.6 Sentinel Wells

None of the Sentinel wells were scheduled for RFLMA monitoring in the first quarter of CY 2011.

3.1.7 Evaluation Wells

None of the Evaluation wells were scheduled for RFLMA monitoring in the first quarter of CY 2011.

3.1.8 PLF Monitoring

All RCRA groundwater monitoring wells at the PLF were sampled during the first quarter of CY 2011. 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 2011. Section 3.1.10.4 discusses surface water monitoring at the PLF.

3.1.9 OLF Monitoring

All RCRA groundwater monitoring wells at the OLF were sampled during the first quarter of CY 2011. 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 2011.

During the first quarter of CY 2011, when routine surface water sampling was performed in Woman Creek downstream of the OLF (GS59), all available analytical results were less than the applicable surface water standards.

3.1.10 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 surface water. The PLFTS treats water from the northern and southern components of the Groundwater Intercept System and flow from the PLF seep.

3.1.10.1 Mound Site Plume Treatment System

MSPTS monitoring locations were not scheduled for RFLMA sampling in the first quarter of CY 2011. However, samples were collected from the effluent manhole to test an air stripper approach to polishing the effluent. This was conducted before the media was replaced. Samples were also collected of the media for waste disposal determination. Refer to Section 2.3.1 for additional information; the annual report for 2011 will include a more comprehensive discussion of the associated work.

3.1.10.2 East Trenches Plume Treatment System

ETPTS monitoring locations were not scheduled for RFLMA sampling in the first quarter of CY 2011.

3.1.10.3 Solar Ponds Plume Treatment System

SPPTS monitoring locations were not scheduled for RFLMA sampling in the first quarter of CY 2011. However, non-RFLMA samples were collected on multiple occasions at several monitoring locations to support continuing evaluation and optimization of the Phase II and Phase III upgrades (see also Section 2.3.3). Most of these screening/optimization samples were analyzed by the in-house Environmental Sciences Laboratory in Grand Junction, Colorado, rather than by an EPA-certified contract laboratory, and cannot be validated. Several samples were also submitted to contract laboratories for confirmatory analysis.

3.1.10.4 PLF Treatment System

During collection of the January 19, 2011, sample at the system influent (monitoring location PLFSEEPINF), the flow rate was 1.17 gallons per minute As of March 31, 2011, the Landfill Pond outlet remained in an open configuration.

During the first quarter of CY 2011, routine sampling of the treated effluent exiting the system (monitoring location PLFSYSEFF) showed that no analyte concentrations were greater than the applicable surface water standards.

3.1.11 Pre-Discharge Monitoring

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

Pre-discharge samples were collected at Ponds A-4 and B-5 during the first quarter of CY 2011. Data indicated that release of the retained water would result in acceptable water quality at the downstream POCs. Confirmatory data from downstream POCs GS03, GS08, and GS11 are presented in Section 3.1.2.

3.1.12 Non-RFLMA Monitoring

In addition to the RFLMA-required monitoring discussed in the previous sections, nonregulatory 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.

3.1.12.1 Grab Sampling for Uranium and Nitrate+Nitrite in North and South Walnut Creeks

This monitoring objective is primarily intended to evaluate spatial variability of nitrate+nitrite and uranium at selected locations along North and South Walnut Creeks (Figure 40). Samples are currently collected as grabs on a biweekly frequency. Sampling for this monitoring objective began on January 27, 2010. Summary statistics for the sampling to date are given in Table 2.

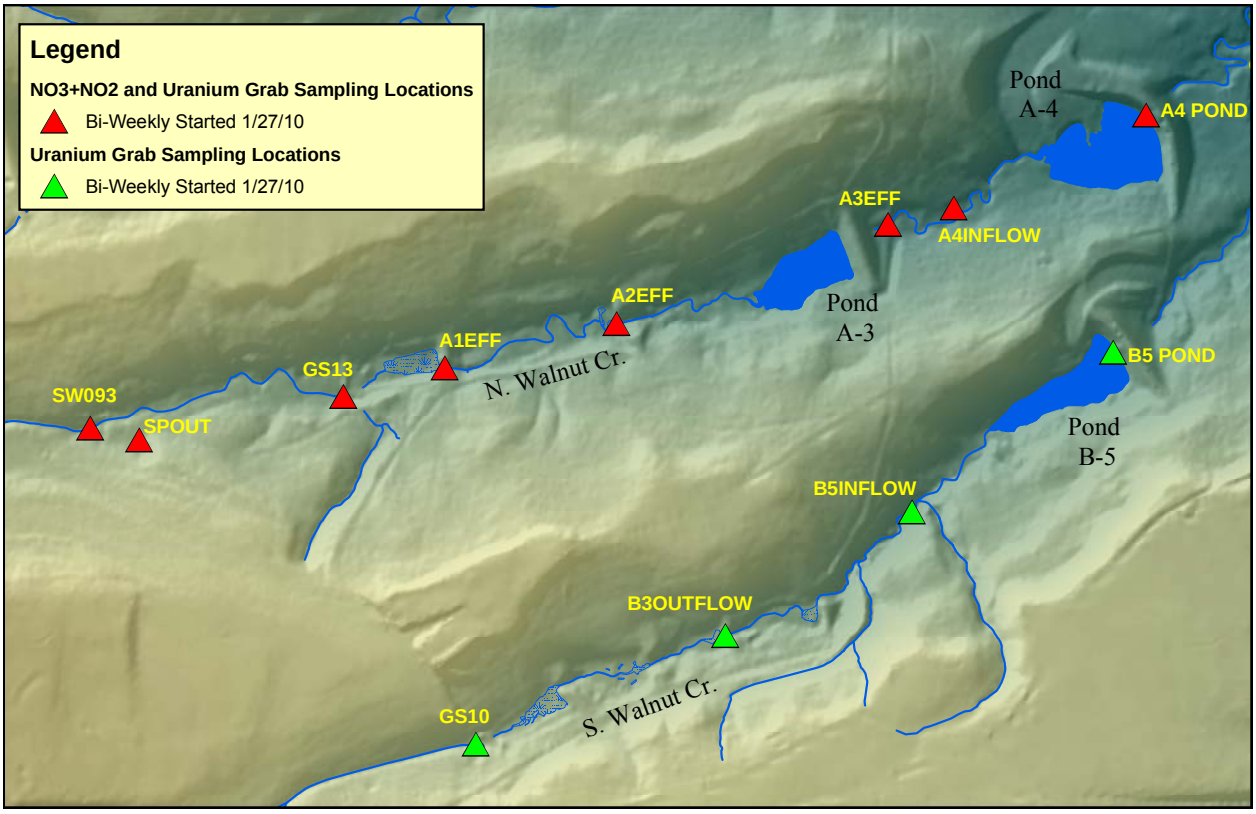


Figure 40. Grab-Sampling Locations in North and South Walnut Creeks

Table 2. Summary Statistics for Nitrate+Nitrite and Uranium Grab Sampling

North Walnut Creek			NO3+NO2 as N (mg/L)		Uranium (ug/L)	
	Location Code	Location Description	Average	Sample Count	Average	Sample Count
Upstream	SW093	POE at downstream end of Functional Channel 3	7.2	34	9.8	35
⬇	SPOUT*	Effluent from SPPTS	113.4	36	26.0	36
⬇	GS13	SPPTS Performance Monitoring Loc; influent to Pond A-1	23.9	29	31.4	29
⬇	A1EFF	Effluent from Pond A-1	15.5	30	31.5	31
⬇	A2EFF	Effluent from Pond A-2	12.2	22	39.0	24
⬇	A3EFF	Effluent from Pond A-3	6.3	16	24.5	17
Downstream	A4 POND	Pond A-4 at center of dam face	0.98	36	9.5	36

South Walnut Creek			Uranium (ug/L)	
	Location Code	Location Description	Average	Sample Count
Upstream	GS10	POE at downstream end of Functional Channel 4	18.2	36
⬇	B3OUTFLOW	Effluent from Pond B-3	17.6	33
⬇	B5INFLOW	Influent to Pond B-5	12.3	33
Downstream	B5 POND	Pond B-5 at center of dam face	8.79	36

Notes: *SPOUT (SPPTS effluent) is not located in North Walnut Creek but flows into to North Walnut between monitoring locations SW093 and GS13.
Sample counts vary because some locations are periodically dry.
Summary includes all data available as of June 16, 2011; some recent results are not validated (preliminary and subject to revision).

3.1.12.2 Continuous Flow-Paced Composite Sampling for Uranium in North and South Walnut Creeks

This monitoring objective is primarily intended to evaluate long-term spatial variability of uranium at selected locations along North and South Walnut Creeks (Figure 41). Samples are

collected as continuous flow-paced composites during all flow conditions. Sampling for this monitoring objective began on March 10, 2010, in North Walnut Creek and on June 16, 2010, in South Walnut Creek. Summary statistics for the sampling to date are given in Table 3.

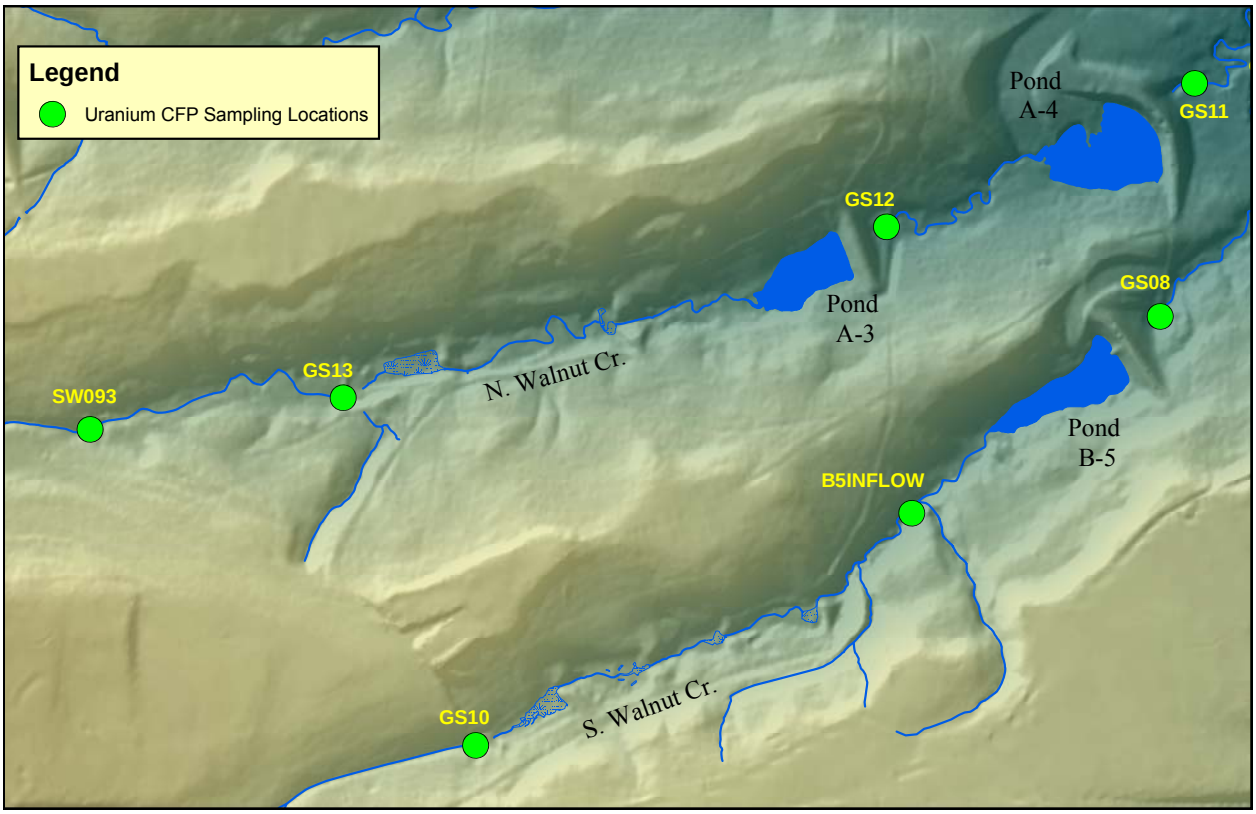


Figure 41. Continuous Flow-Paced Composite Sampling Locations in North and South Walnut Creeks

Table 3. Summary Statistics for Uranium Continuous Flow-Paced Composite Sampling

North Walnut Creek			Uranium (ug/L)	
	Location Code	Location Description	Volume-Weighted Average	Sample Count
Upstream	SW093*	POE at downstream end of Functional Channel 3	7.2	18
⬇	GS13*	SPPTS Performance Monitoring Loc; influent to Pond A-1	11.1	19
⬇	GS12	Effluent from Pond A-3	12.0	17
Downstream	GS11*	Effluent from Pond A-4	9.6	12

Data start on 3/10/10

South Walnut Creek			Uranium (ug/L)	
	Location Code	Location Description	Volume-Weighted Average	Sample Count
Upstream	GS10*	POE at downstream end of Functional Channel 4	20.0	8
⬇	B5INFLOW	Influent to Pond B-5	9.2	6
Downstream	GS08*	Effluent from Pond B-5	7.7	3

Data start on 6/16/10

Notes: *Data for SW093, GS13, GS11, GS10, and GS08 are acquired through the routine RFLMA-required monitoring at these locations.
Sample counts vary because composite sampling periods vary with water availability.
Summary includes all data available as of June 16, 2011; some recent results are not validated (preliminary and subject to revision).

3.1.12.3 Synoptic Storm-Event Sampling in North and South Walnut Creeks

This monitoring objective is primarily intended to evaluate spatial variability of plutonium, americium, uranium, and total suspended solids at selected locations along North and South Walnut Creeks (Figure 42). This sampling is specifically targeted at previously breached Dams A-1, A-2, B-1, B-2, and B-3. Samples are collected as time-paced composites using automated samplers that trigger during the rising limb of a runoff hydrograph as the event moves down a drainage. This type of sampling is opportunistic; a group of samples is only analyzed when the runoff event results in a significant increase in flow rate, and samples are collected at each location on the same portion of the hydrograph (rising limb). Thus, samples are periodically discarded when these criteria are not met. Sampling for this monitoring objective began in April 2010. Summary statistics for the sampling to date are given in Table 4.

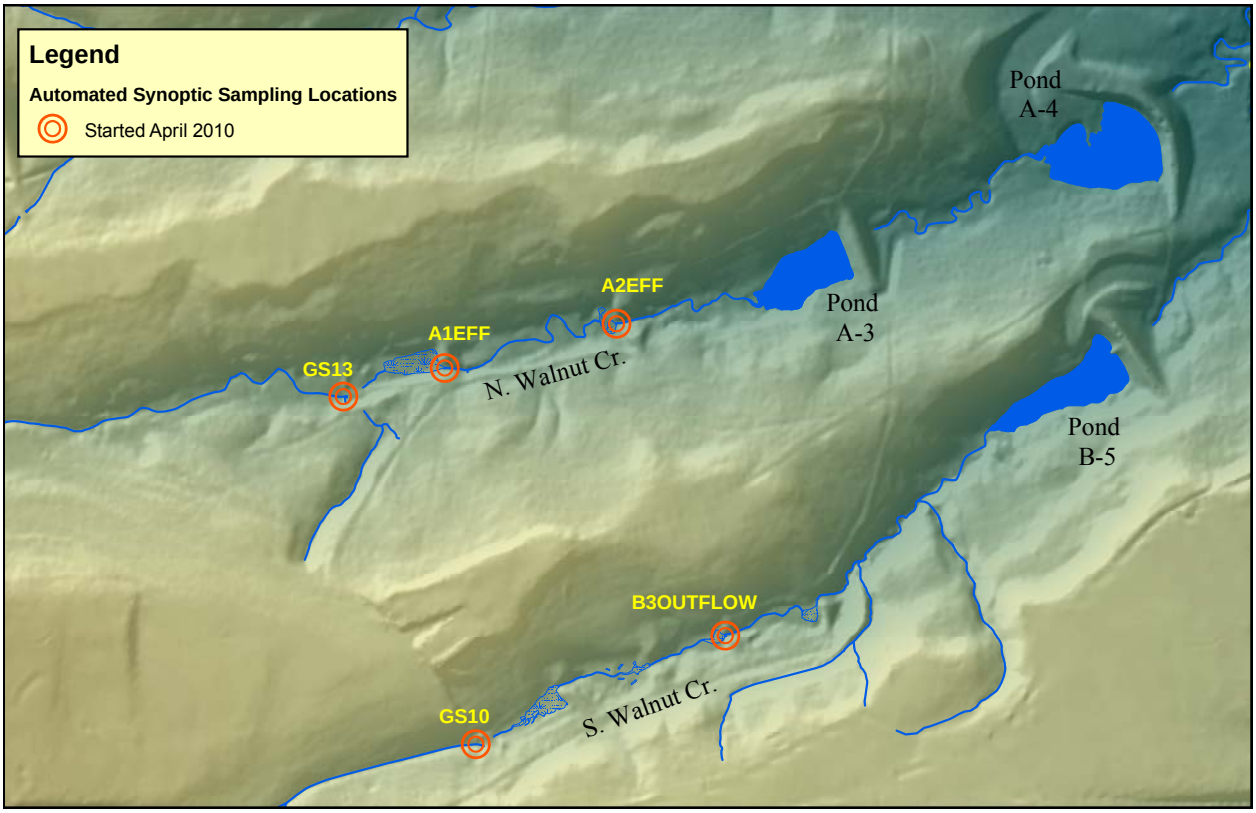


Figure 42. Synoptic Storm-Event Sampling Locations in North and South Walnut Creeks

Table 4. Summary of CY 2010-2011 Synoptic Storm-Event Sampling

North Walnut Creek

April 22, 2010 Event	Location Code	Location Description	Pu-239,240 (pCi/L)	Am-241 (pCi/L)	Uranium (ug/L)	TSS (mg/L)
Upstream	GS13	Influent to Pond A-1	0.006 ± 0.007	0.01 ± 0.007	10.50	62.0
⬇	A1EFF	Effluent from Pond A-1 / Influent to Pond A-2	0.004 ± 0.006	0 ± 0.004	13.30	undetect
Downstream	A2EFF	Effluent from Pond A-2	0.007 ± 0.006	0 ± 0.012	14.10	undetect

July 4, 2010 Event	Location Code	Location Description	Pu-239,240 (pCi/L)	Am-241 (pCi/L)	Uranium (ug/L)	TSS (mg/L)
Upstream	GS13	Influent to Pond A-1	0.011 ± 0.01	0.006 ± 0.005	9.17	2.4
⬇	A1EFF	Effluent from Pond A-1 / Influent to Pond A-2	0.007 ± 0.008	0.003 ± 0.005	6.24	2.5
Downstream	A2EFF	Effluent from Pond A-2	0.004 ± 0.006	0.002 ± 0.003	8.62	7.2

May 18, 2011 Event	Location Code	Location Description	Pu-239,240 (pCi/L)	Am-241 (pCi/L)	Uranium (ug/L)	TSS (mg/L)
Upstream	GS13	Influent to Pond A-1	pending	pending	pending	11.0
Downstream	A1EFF	Effluent from Pond A-2	pending	pending	pending	undetect

South Walnut Creek

April 22, 2010 Event	Location Code	Location Description	Pu-239,240 (pCi/L)	Am-241 (pCi/L)	Uranium (ug/L)	TSS (mg/L)
Upstream	GS10	Influent to Pond B-1	0.015 ± 0.008	0.01 ± 0.006	17.30	33.0
Downstream	B3OUTFLOW	Effluent from Pond B-3	0 ± 0.005	0.01 ± 0.013	18.20	undetect

May 18, 2011 Event	Location Code	Location Description	Pu-239,240 (pCi/L)	Am-241 (pCi/L)	Uranium (ug/L)	TSS (mg/L)
Upstream	GS10	Influent to Pond B-1	pending	pending	pending	3.0
Downstream	B3OUTFLOW	Effluent from Pond B-3	pending	pending	pending	undetect

Samples were recently collected successfully at GS10, B3OUTFLOW, GS13, and A1EFF on the night of May 18, 2011. Results of radionuclide analyses for these samples are pending.

3.1.12.4 Pre-Abandonment Sampling of Off-Site Monitoring Wells

Four off-site wells were scheduled for abandonment (one at the Standley Lake dam, one at the Great Western Reservoir dam, and two immediately upstream of Great Western Reservoir) as the third quarter ended. During the quarter, the three wells associated with Great Western Reservoir were scheduled for sampling to collect splits of samples collected by representatives of the City of Broomfield. The requested analytes were volatile organic compounds and nitrate. One well provided insufficient water for sampling, and the other two were successfully sampled. Analytical results from the DOE splits are presented in Appendix C (wells 11894 and 49192) and include nondetects for volatile organics and very low detections of nitrate.

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 2011.

5.0 References

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