ROCKY FLATS STEWARDSHIP COUNCIL

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Jefferson County -- Boulder County -- City and County of Broomfield -- City of Arvada -- City of Boulder
City of Golden -- City of Northglenn -- City of Thornton -- City of Westminster -- Town of Superior
League of Women Voters -- Rocky Flats Cold War Museum -- Rocky Flats Homesteaders
Nancy Newell

Board of Directors Meeting – Agenda

Monday, February 3, 2014, 8:30 AM – 11:30 AM

Rocky Mountain Metropolitan Airport, Terminal Building, Mount Evans Room
11755 Airport Way, Broomfield, Colorado

8:30 AM Convene/Introductions/Agenda Review

8:35 AM Chairman's Review of December 16th Executive Committee meeting

8:40 AM Business Items (briefing memo attached)

1. Election of Stewardship Council Officers for 2014

   Action Item: Elect Officers

2. Consent Agenda
   - Approval of meeting minutes and checks

3. Approve 2014 Meeting Dates and Notice Provisions Resolution

   Action item: Adopt resolution and meeting notice provisions

4. Executive Director's Report

9:00 AM Public Comment

9:10 AM Host DOE Quarterly Meeting (briefing memo attached)
- DOE will brief the Stewardship Council on site activities for the third quarter of 2013 (July – September).
- The briefing will include water quality monitoring for the September flood, and related site issues.
- Activities include surface water monitoring, groundwater monitoring, ecological monitoring, and site operations (inspections, maintenance, etc.).

10:20 AM Briefing/Discussion on Groundwater at Rocky Flats (briefing memo attached)

- Throughout 2014, the Stewardship Council will study groundwater issues at Rocky Flats.
- This briefing will be the first in a series of briefings and discussions.
- This briefing will focus primarily on groundwater hydrology at Rocky Flats.

11:10 AM Public comment

11:20 PM Updates/Big Picture Review

1. Executive Director
2. Member Updates
3. Review Big Picture

Adjourn

Upcoming Meetings: All dates are proposed and will be set at this meeting

April 7
June 2
September 8
November 3

Acronym or Term	Means	Definition
Alpha Radiation		A type of radiation that is not very penetrating and can be blocked by materials such as human skin or paper. Alpha radiation presents its greatest risk when it gets inside the human body, such as when a particle of alpha emitting material is inhaled into the lungs. Plutonium, the radioactive material of greatest concern at Rocky Flats, produces this type of radiation.
Am	americium	A man-made radioactive element which is often associated with plutonium. In a mass of Pu, Am increases in concentration over time which can pose personnel handling issues since Am is a gamma radiation-emitter which penetrates many types of protective shielding. During the production era at Rocky Flats, Am was chemically separated from Pu to reduce personnel exposures.
AME	Actinide Migration Evaluation	An exhaustive years-long study by independent researchers who studied how actinides such as Pu, Am, and U move through the soil and water at Rocky Flats
AMP	Adaptive Management Plan	Additional analyses that DOE is performing beyond the normal environmental assessment for breaching the remaining site dams.
AOC well	Area of Concern well	A particular type of groundwater well
B	boron	Boron has been found in some surface water and groundwater samples at the site
Be	beryllium	A very strong and lightweight metal that was used at Rocky Flats in the manufacture of nuclear weapons. Exposure to beryllium is now known to cause respiratory disease in those persons sensitive to it
Beta Radiation		A type of radiation more penetrating than alpha and hence requires more shielding. Some forms of uranium emit beta radiation.
BMP	best management practice	A term used to describe actions taken by DOE that are not required by regulation but warrant action.
BZ	Buffer Zone	The majority of the Rocky Flats site was open land that was added to provide a "buffer" between the neighboring communities and the industrial portion of the site. The buffer zone was approximately 6,000 acres. Most of the buffer zone lands now make up the Rocky Flats National Wildlife Refuge.
CAD/ROD	corrective action decision/record of decision	The complete final plan for cleanup and closure for Rocky Flats. The Federal/State laws that governed the cleanup at Rocky Flats required a document of this sort.
CCP	Comprehensive Conservation Plan	The refuge plan adopted by the U.S. Fish and Wildlife Service in 2007.
CDPHE	Colorado Department of Public Health and Environment	State agency that regulates the site.
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act	Federal legislation that governs site cleanup. Also known as the Superfund Act
cfs	cubic feet per second	A volumetric measure of water flow.
COC	Contaminant of Concern	A hazardous or radioactive substance that is present at the site.

COU	Central Operable Unit	A CERCLA term used to describe the DOE-retained lands, about 1,500 acres comprised mainly of the former Industrial Area where remediation occurred
CR	Contact Record	A regulatory procedure where CDPHE reviews a proposed action by DOE and either approves the proposal as is or requires changes to the proposal before approval. CRs apply to a wide range of activities performed by DOE. After approval the CR is posted on the DOE-LM website and the public is notified via email.
Cr	chromium	Potentially toxic metal used at the site.
CRA	comprehensive risk assessment	A complicated series of analyses detailing human health risks and risks to the environment (flora and fauna).
D&D	decontamination and decommissioning	The process of cleaning up and tearing down buildings and other structures.
DG	discharge gallery	This is where the treated effluent of the SPPTS empties into North Walnut Creek.
DOE	U.S. Department of Energy	The federal agency that manages portions of Rocky Flats. The site office is the Office of Legacy Management (LM).
EA	environmental assessment	Required by NEPA (see below) when a federal agency proposes an action that could impact the environment. The agency is responsible for conducting the analysis to determine what, if any, impacts to the environment might occur due to a proposed action.
EIS	environmental impact statement	A complex evaluation that is undertaken by a government agency when it is determined that a proposed action by the agency may have significant impacts to the environment.
EPA	U.S. Environmental Protection Agency	The federal regulatory agency for the site.
ETPTS	east trenches plume treatment system	The treatment system near the location of the east waste disposal trenches which treats groundwater contaminated with organic solvents emanating from the trenches. Treated effluent flows into South Walnut Creek.
FC	functional channel	Man-made stream channels constructed during cleanup to help direct water flow.
FACA	Federal Advisory Committee Act	This federal law regulated federal advisory boards. The law requires balanced membership and open meetings with published Federal Register meeting dates.
Gamma Radiation		This type of radiation is very penetrating and requires heavy shielding to keep it from exposing people. Am is a strong gamma emitter.
GAO	Government Accountability Office	Congressional office which reports to Congress. The GAO did 2 investigations of Rocky Flats relating to the ability to close the site for a certain dollar amount and on a certain time schedule. The first study was not optimistic while the second was very positive.
g	gram	metric unit of weight
gpm	gallons per minute	A volumetric measure of water flow in the site's groundwater treatment systems and other locations.
GWIS	groundwater intercept system	Refers to a below ground system that directs contaminated groundwater toward the Solar Ponds and East Trenches treatment systems.
IA	Industrial Area	Refers to the central core of Rocky Flats where all production activities took place. The IA was roughly 350 of the total 6,500

		acres at the site.
IC	Institutional Control	ICs are physical and legal controls geared towards ensuring the cleanup remedies remain in place and remain effective.
IHSS	Individual Hazardous Substance Site	A name given during cleanup to a discrete area of known or suspected contamination. There were over two hundred such sites at Rocky Flats.
ITPH	interceptor trench pump house	The location where contaminated groundwater collected by the interceptor trench is pumped to either the Solar Ponds and East Trenches treatment systems
L	liter	Metric measure of volume, a liter is slightly larger than a quart.
LANL	Los Alamos National Laboratory	One of the US government's premier research institutions located near Santa Fe, NM. LANL is continuing to conduct highly specialized water analysis for Rocky Flats. Using sophisticated techniques LANL is able to determine the percentages of both naturally-occurring and man-made uranium which helps to inform water quality decisions.
LM	Legacy Management	DOE office responsible for overseeing activities at closed sites.
LMPIP	Legacy Management Public Involvement Plan	This plan follows DOE and EPA guidance on public participation and outlines the methods of public involvement and communication used to inform the public of site conditions and activities. It was previously known as the Post-Closure Public Involvement Plan (PCPIP).
M&M	monitoring and maintenance	Refers to ongoing activities at Rocky Flats.
MOU	Memorandum of Understanding	MOU refers to the formal agreement between EPA and CDPHE which provides that CDPHE is the lead post-closure regulator with EPA providing assistance when needed.
MSPTS	Mound site plume treatment system	The treatment system for treating groundwater contaminated with organic solvents which emanates from the Mound site where waste barrels were buried. Treated effluent flows into South Walnut Creek.
NEPA	National Environmental Policy Act	Federal legislation that requires the federal government to perform analyses of environmental consequences of major projects or activities.
nitrates		Contaminant of concern found in the North Walnut Creek drainage derived from Solar Ponds wastes. Nitrates are very soluble in water and move readily through the aquatic environment
Np	neptunium	A man-made radioactive isotope that is found as a by-product of nuclear reactors and plutonium production.
NPL	National Priorities List	A listing of Superfund sites. The refuge lands were de-listed from the NPL while the DOE-retained lands are still on the NPL due to ongoing groundwater contamination and associated remediation activities.
OLF	Original Landfill	Hillside dumping area of about 20 acres which was used from 1951 to 1968. It underwent extensive remediation with the addition of a soil cap and groundwater monitoring locations.
OU	Operable Unit	A term given to large areas of the site where remediation was focused.
PCE	perchloroethylene	A volatile organic solvent used in past operations at the site. PCE is also found in environmental media as a breakdown product of other solvents.

pCi/g	picocuries per gram of soil	A unit of radioactivity measure. The soil cleanup standard at the site was 50 pCi/g of soil.
pCi/L	picocuries per liter of water	A water concentration measurement. The State of Colorado has a regulatory limit for Pu and Am which is 0.15 pCi/L of water. This standard is 100 times stricter than the EPA's national standard.
PLF	Present Landfill	Landfill constructed in 1968 to replace the OLF. During cleanup the PLF was closed under RCRA regulations with an extensive cap and monitoring system.
PMJM	Preble's Meadow Jumping Mouse	A species of mouse found along the Front Range that is on the endangered species list. There are several areas in the Refuge and COU that provide an adequate habitat for the mouse, usually found in drainages. Any operations that are planned in potential mouse habitat are strictly controlled.
POC	Point of Compliance (surface water)	A surface water site that is monitored and must be found to be in compliance with federal and state standards for hazardous constituents. Violations of water quality standards at the points of compliance could result in DOE receiving financial penalties.
POE	Point of Evaluation (surface water)	These are locations at Rocky Flats at which surface water is monitored for water quality. There are no financial penalties associated with water quality exceedances at these locations, but the site may be required to develop a plan of action to improve the water quality.
POU	Peripheral Operable Unit	A CERCLA term used to describe the Wildlife Refuge lands of about 4,000 acres.
Pu	plutonium	Plutonium is a metallic substance that was fabricated to form the core or "trigger" of a nuclear weapon. Formation of these triggers was the primary production mission of the Rocky Flats site. Pu-239 is the primary radioactive element of concern at the site. There are different forms of plutonium, called isotopes. Each isotope is known by a different number. Hence, there are plutonium 239, 238, 241 and others.
RCRA	Resource Conservation and Recovery Act	Federal law regulating hazardous waste. In Colorado, the EPA delegates CDPHE the authority to regulate hazardous wastes.
RFCA	Rocky Flats Cleanup Agreement	The regulatory agreement which governed cleanup activities. DOE, EPA, and CDPHE were signors.
RFCAB	Rocky Flats Citizen Advisory Board	This group was formed as part of DOE's site-specific advisory board network. They provided community feedback to DOE on a wide variety of Rocky Flats issues from 1993-2006.
RFCLOG	Rocky Flats Coalition of Local Governments	The predecessor organization of the Rocky Flats Stewardship Council
RFETS	Rocky Flats Environmental Technology Site	The moniker for the site during cleanup years.
RFLMA	Rocky Flats Legacy Management Agreement	The post-cleanup regulatory agreement between DOE, CDPHE, and EPA which governs site activities. The CDPHE takes lead regulator role, with support from EPA as required.
RFNWR	Rocky Flats National Wildlife Refuge	The approximate 4,000 acres which compose the wildlife refuge.
RFSOG	Rocky Flats Site	The nuts-and-bolt guide for post-closure site activities performed by

	Operations Guide	DOE and its contractors.
SPPTS	solar ponds plume treatment system	System used to treat groundwater contaminated with uranium and nitrates. The nitrates originate from the former solar evaporation ponds which had high levels of nitric acid. The uranium is primarily naturally-occurring with only a slight portion man-made. Effluent flows into North Walnut Creek
SVOCs	semi-volatile organic compounds	These compounds are not as volatile as the solvent VOCs. They tend to be similar to oils and tars. They are found in many environmental media at the site. One of the most common items to contain SVOCs is asphalt.
TCE	trichloroethlyene	A volatile organic solvent used in past operations at the site. TCE is also found in environmental media as a breakdown product of other solvents.
U	uranium	Naturally occurring radioactive element. There were two primary isotopes of U used during production activities. The first was enriched U which contained a very high percentage (>90%) of U-235 which was used in nuclear weapons. The second isotope was U-238, also known as depleted uranium. This had various uses at the site and only had low levels of radioactivity..
USFWS	United States Fish & Wildlife Service	An agency within the US Department of the Interior that is responsible for maintaining the nation-wide system of wildlife refuges, among other duties. The regional office is responsible for the RFNWR.
VOC	volatile organic compound	These compounds include cleaning solvents that were used in the manufacturing operations at Rocky Flats. The VOCs used at Rocky Flats include carbon tetrachloride (often called carbon tet), trichloroethene (also called TCE), perchloroethylene (also called PCE), and methylene chloride.
WCRA	Woman Creek Reservoir Authority	This group is composed of the three local communities, the Cities of Westminster, Northglenn, and Thornton, who use Stanley Lake as part of their drinking water supply network. Water from the site used to flow through Woman Creek to Stanley Lake but the reservoir severed that connection. The Authority has an operations agreement with DOE to manage the Woman Creek Reservoir.
WQCC	Water Quality Control Commission	State board within CDPHE tasked with overseeing water quality issues throughout the state. DOE has petitioned the WQCC several times in the last few years regarding water quality issues.
ZVI	zero valent iron	A type of fine iron particles used to treat VOC's in the ETPTS and MSPTS.

Business Items

- Cover memo
- October 28, 2013, draft board meeting minutes
- List of Stewardship Council checks
- 2014 meeting dates resolution

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MEMORANDUM

TO: Board
FROM: David Abelson
SUBJECT: Business Items
DATE: January 21, 2014

In addition to approving the consent agenda (minutes and checks), the Board will need to

1. Appoint officers for 2014
2. Adopt a resolution regarding 2014 meeting dates

Election of officers

In accordance with the Stewardship Council bylaws, "the Chair, Vice Chair, and Secretary/Treasurer shall be elected annually by the Board of Directors. The terms shall commence at the first meeting of the Board held on or after February 1 of each year." There are no limitations as to the number of terms one can serve.

If you are interested in serving as an officer and have not yet let me know of your interest, please email or call me ASAP. That way I can notify your fellow board members of your interest. As of the drafting of this memo, the following people expressed interest in serving on the executive committee:

Joyce Downing (Northglenn) – Chairman
Deb Gardner (Boulder County) – Secretary/Treasurer
Lisa Morzel (Boulder) – any position

Action Item: Elect officers

Resolution Re: 2014 Meeting Dates and Notice Provisions

Each year, the Board is required to adopt a resolution establishing the meeting dates for the year. Most years, the Board meets the first Monday of February, April, June, and November and the second Monday of September. If we follow that plan, the Board would meet:

February 3
April 7

June 2
September 8 (second Monday of the month)
November 3

Please note, the November meeting would be the day prior to Election Day. Some years the Board has moved the November meeting date to either a week earlier or a week later.

The attached notice provisions track the Stewardship Council's bylaws.

Action item: Adopt resolution and meeting notice provisions

ROCKY FLATS STEWARDSHIP COUNCIL
Monday, October 28, 2013, 8:30 AM – 11:30 AM
Rocky Mountain Metropolitan Airport, Terminal Building, Mount Evans Room
11755 Airport Way, Broomfield, Colorado

Board members in attendance: Mark McGoff (Alternate, Arvada), Jim McCarthy (Alternate, Arvada), Lisa Morzel (Director, City of Boulder), Tim Plass (Alternate, City of Boulder), Deb Gardner (Boulder County), Mike Shelton (Alternate, Broomfield), David Allen (Alternate, Broomfield), Bill Fisher (Director, Golden), Joyce Downing (Director, Northglenn), Emily Hunt (Alternate, Thornton), Chris Hansen (Alternate, Superior), Bob Briggs (Director, Westminster), Mary Fabisiak (Alternate, Westminster), Jeannette Hillery (Director, League of Women Voters), Sue Vaughan (Alternate, League of Women Voters), Ann Lockhart (Director, Rocky Flats Cold War Museum), Roman Kohler (Director, Rocky Flats Homesteaders), Arthur Widdowfield (citizen).

Stewardship Council staff members and consultants in attendance: David Abelson (Executive Director), Rik Getty (Technical Program Manager), Barb Vander Wall (Seter & Vander Wall, P.C), Erin Rogers (consultant).

Attendees: Vera Moritz (EPA), John Dalton (EPA), Carl Spreng (CDPHE), Charles Adams (CDPHE), Bob Darr (DOE), Linda Kaiser (DOE), Scott Surovchak (DOE), Jeremiah McLaughlin (Stoller), John Boylan (Stoller), Jody Nelson (Stoller), George Squibb (Stoller), Rick DiSalvo (Stoller), Patrick O'Connell (Jefferson County), Mickey Harlow (citizen), Anne Fenerty (citizen), Nancy Newell (citizen), Keith Fournier (citizen), Michelle Gabrieloff-Parish (citizen), Ramon Parish (citizen), Pieter Van Winkle (citizen), Sky Osawa (citizen).

Convene/Agenda Review

Chairman Bob Briggs convened the meeting at 8:38 a.m.

Chairman's Review of October 7, 2013 Executive Committee meeting

Bob Briggs noted that an Executive Committee meeting was held on October 7th, 2013 at the Front Range Community College library. The purpose was to develop the agenda for this meeting.

Consent Agenda

David Allen noted one change to the September 9, 2013 minutes.

Joyce Downing moved to approve the September 9, 2013 Board meeting minutes as revised and the checks. The motion was seconded by Murph Widdowfield. The motion to accept the minutes and checks passed 13-0.

Executive Director's Report

David Abelson began by noting that he had emailed the quarterly financial report to Board members.

David said there had been some concern about accounting at the National Nuclear Security Administration, so Senator David Vitter (R-LA) put a hold on approving Beth Robinson as DOE's Under Secretary for Management and Performance. David said he did not think this would be a significant issue for Rocky Flats.

David reported that a federal advisory panel had made a tremendously important decision in recent weeks related to worker benefits. For years, the Stewardship Council has strongly supported the Energy Employees Occupational Illness Compensation Program Act of 2000 (EEOICPA). However, this program was poorly implemented, and there were many attempts to undermine it based on budgetary concerns. The proposed Charlie Wolf Act was also plagued by associated high costs. The EEOICPA defines a 'Special Cohort Status', which is a class of workers for which exposure is assumed to have occurred. For this reason, workers in this class have many fewer hoops to jump through in terms of securing benefits. Without this status, workers encounter numerous challenges due to access to files, missing files, and proving their exposure. The recent decision applies Special Cohort status to additional workers – extending the coverage from workers who had been employed through 1961 to those who had worked through 1983.

Since the Board's September meeting, David highlighted two major events that had occurred – the government shutdown and local flooding. In terms of the shutdown, David said it was unclear what effects it might have pertaining to DOE. However, he noted that the relatively small budget of $180 million for DOE-LM was unlikely to be affected.

David noted that DOE would brief on the September flooding. He reported that he and Rik Getty had attended a meeting earlier in the week, and also participated in a three hour tour of the site after the flooding. David said that the site held up remarkably well. There was some noticeable high water, and areas where roads had been washed out, which was easily fixed with some gravel. He said there was not any gullying, and no real visual impact. The only areas where they saw visual impacts of the flooding were in the northwest portion of the National Wildlife Refuge lands, adjacent to the NREL site.

Public Comment

Anne Fenerty spoke first, and noted that she had been a member of the Rocky Flats Citizens Advisory Board for two years. She said she was glad the site was in good condition after the flooding. She noted that when she served on the RFCAB, there had been independent scientific reviews of the Original Landfill (OLF) and a recommendation was made in 2005 that the landfill be covered by a RCRA cap. She referred to a quote from Scott Surovchak in a newspaper stating that the landfill pre-dated RCRA. Anne referred to a Sierra Club lawsuit, and a judgment that RCRA applied to Rocky Flats. She said DOE called the landfill a 'household waste' site, and only used a two foot cover. Anne also brought up plutonium migration, and that DOE's own

studies show that plutonium migrates attached to small particles. She said she would like to make sure that is understood that we are exposed to colloidal particles, which is very dangerous and will affect areas to the southeast of the site, where construction is taking place.

Mickey Harlow, citizen of Arvada, spoke next. She said she was concerned that there were not any news releases by DOE during the flooding. She stated her belief that DOE has a responsibility to share this information with the public. She said that there were rumors about radioactive materials flowing into Standley Lake, and she had to explain to people about how they were protected from this happening.

New Member Interviews and Selection

Applicant Michelle Gabrieloff-Parish had requested an early interview because of work commitments, and was therefore given an opportunity to speak with the Board at this point.

Bob Briggs began by asking her why she wanted to serve on the Stewardship Council. She said she had three children and had been a resident of Rock Creek for the past six years, having moved from Summit County. She said that initially when she would drive past Rocky Flats, she was not sure what it was. Therefore, she did some research, and specifically looked at water issues and determined that her new home was far enough away to be safe. She said that she thinks the issue is less about water, and more about respirable plutonium – and that she was curious about the potential for risk over the long-term. She said she was interested in how to protect the site over this scale of time.

Deb Gardner asked Michelle about a nonprofit that she had founded. She said that several years ago in Summit County, the Town of Frisco was going to donate an expensive piece of land for affordable housing. She and others had encouraged the Town Council to make this sustainable housing, and ended up creating their own group to bid on the project. She said that they did not win, but did have an effect on the RFP. After this project, the nonprofit did some community education on sustainability as well. Bill Fisher asked Michelle if she had any specific thoughts about how to approach the long-term needs for Rocky Flats. She said that there should be community input on ways to memorialize the site, which could be something such as permanent works of art. She said it should be beautiful art (nothing intended to scare the public) that would last (e.g., stone).

Michelle asked the other non-governmental members their reasons for serving on the Board. Murph Widdowfield said that he wanted to be able to learn and understand the truth at the site, given so much misinformation. David Abelson continued on the theme of identifying lasting institutions, and pointed to government. He said that having local government representatives on the Board helps to ensure some continuity of knowledge. He added that there was no singular answer, and that there will be a combination of things that build up layers of protection. Lisa Morzel noted that the Council has really struggled with the long-term timeframe, and had decided on focusing on about 200 years, or the age of this country. She referred to archives and stone memorials, which were not perfect, but would probably last as long as possible. This concluded Michelle's interview.

Joyce Downing asked if the Board could keep going with interviews; however the remaining applicants were not present yet.

Host DOE Quarterly Meeting

DOE briefed on site activities for the 2nd Quarter of 2013. DOE posted the report on its website. Activities included surface water monitoring, groundwater monitoring, ecological monitoring, and site operations (inspections, maintenance, etc.).

Surface Water – George Squibb
George began by reviewing the requirements for quarterly monitoring and reporting at Rocky Flats, which is detailed in the Rocky Flats Legacy Management Agreement (RFLMA). The primary goal of the cleanup is protection of surface water. Response actions under the final remedy for Rocky Flats include the following requirements:

- Maintain two landfill covers
- Maintain four groundwater treatment systems
- Surface water and groundwater monitoring
- Physical controls
    - Signage
    - Restricted access
- Institutional controls
    - No building construction or occupation
    - Restrictions on excavation and soil disturbance
    - No consumption or agricultural use of surface water
    - No groundwater wells except for monitoring
- Protection of landfill covers and engineered remedy components

George's began by showing the monitoring locations onsite. He then summarized quarterly performance monitoring at the Original Landfill (OLF) and Present Landfill (PLF). At the OLF, all sampling results met water quality standards during the quarter. At the PLF, a routine sample collected from the system effluent on April 24 measured selenium (Se) at 8.6 ug/L (the standard is 4.6 ug/L). The result prompted Se sampling to be done on a more frequent, monthly basis. Selenium was not detected in the first monthly sample, and sampling frequency was returned to quarterly.

Reportable 12-month rolling average values for americium, plutonium, and uranium at GS10 were observed during the quarter. Additional sampling is being conducted both upstream of and downstream of GS10. So far, all downstream results are below standards. Overall, they are not seeing anything new, or anything that would explain what is causing the exceedances at GS10. George noted that initial results through the end of September seem to suggest that uranium will be below reportable levels; however, he was not sure about plutonium and americium.

David Allen referred to Figure 23 in the quarterly report and the history of plutonium and americium at GS10. He asked how the current values compared to earlier results. George said that it was about the same, but flow rates are much lower now. He added that the annual report

contains graphs that show results further back in time. Shelly Stanley asked if there was any significance to the fact that plutonium/americium ratios were flipped in the results. George said it was nothing new. He added that it may have always been like this, but masked by much higher water levels. He said there also may be two low-level sources contributing to the exceedances.

Groundwater – John Boylan
John noted that since it was the second quarter of an odd-numbered year, it was a heavier quarter for monitoring. They sampled all but the evaluation wells, which included sentinel wells, Area of Concern (AOC) wells, RCRA wells at the PLF and OLF, and the treatment system locations.

At the AOC wells, all standards were met, which was consistent with previous results. Monitoring results at the treatment systems included:

- Mound Site Plume Treatment System (MSPTS) effluent: vinyl chloride slightly higher than MCL
- East trenches Plume Treatment System (ETPTS) effluent: improvements show effect of air stripper. ETPTS air stripper is generating scale (due to hard water being processed) and clogging repeatedly
- Solar Ponds Plume Treatment System (SPPTS) microcell, lagoon treatment evaluations are showing very good results

John noted that the scale being generated at the ETPTS meant more maintenance was required. At the MSPTS, groundwater was being treated with zero valent iron (ZVI) to remove hardness of water before the air stripper, and this system does not have the scaling problem. At the SPPTS, they have also tried steel wool as a treatment media, which was also working well. Jeannette Hillery asked how often they have to change out the ZVI media and then what they did with it. John said that it was changed out about every week. It was being stored onsite and will be shipped to Utah.

Non-RFLMA monitoring for the quarter included selected evaluation wells and treatment systems. Certain evaluation wells were normally scheduled for sampling on even-numbered years. However, previous samples (second quarter of 2012) were taken during relatively dry conditions and since conditions in 2013 have been wetter, they were sampled again. These monitoring results will be included in the 2013 annual report.

As part of testing and optimization of the air strippers, little adjustment was required at the MSPTS. At the ETPTS, scale was causing nozzles, pump, and lines to clog. They adjusted the influent plumbing to increase exposure to the air stripper, including testing different configurations of the "medusa" nozzle assembly. Air stripper optimization will continue.

There also was continued testing at the SPPTS where ZVI-containing microcells are used to treat uranium. Each microcell is a variation of a theme (small volume of ZVI and short residence time). George said that they are working to optimize the grain size and volume of ZVI required to treat ~1-1.5 gpm flow with ~75 ug/L uranium.

Also at the SPPTS, pilot-scale lagoons are being evaluated to treat nitrate. In the 2nd quarter, the site evaluated doubling the flow rate (half the residence time) that a full-scale lagoon occupying the entire "big box" would receive.

David Allen asked whether the 'even-year' sampling would still be completed in 2014, since they conducted some of this sampling in 2013. John said it would. Michelle (audience) asked if they were testing for other elements such as beryllium. John explained that that would depend on what was developed as the suite of 'analytes of interest' for particular areas.

John said that additional details would be presented and data would be evaluated in the 2013 annual report.

Site Operations – Jeremiah McLaughlin
Jeremiah began by summarizing quarterly sign inspections, as signs are a RFLMA-mandated physical control. He said that all signs were in good condition

At the OLF, three monthly inspections were performed. Eight settlement monuments and seven inclinometers were monitored. He said that everything was in good condition, and that very little movement was observed.

At the PLF, one quarterly inspection was performed. Annual surveys of nine settlement monuments and six side-slope monitors were scheduled for the fourth quarter. Shelly Stanley asked if there were inclinometers on the PLF, and Jeremiah said there were not.

Ecological Monitoring – Jody Nelson
Jody reported that the following ecological monitoring activities were performed during the quarter:

- Weed mapping
- Nest box surveys
- Prairie dog surveys
- Wetland water level
- Wetland weed surveys
- Preparations for revegetation monitoring, PMJM monitoring, and wetland monitoring
- Planted approximately 270 coyote willow stakes at wetland mitigation locations

Jody also mentioned a wildlife habitat enhancement project in which 144 shrubs (buffalo berry and fourwing saltbush) were planted in the COU. He noted that new shrubs are only irrigated for one year and they will see how they do on their own after that. There was also some revegetation work done during the quarter in which soil amendments (compost) were added to two small areas to increase vegetation cover. A subsidence area where soil had been added to restore the original grade was also revegetated.

Mickey Harlow asked if the site was required to notify CDPHE if they are planning on any tilling of the soil. Jody said this is required if they are going below certain depth. Michelle Gabrieloff-Parish asked if there were any problems involved with planting buffalo berry, since it

is an edible plant. Jody said there were not, especially considering that these areas were not open to the public.

Original Landfill – Rick DiSalvo
Rick briefed on localized instability at the OLF after the September flooding. As background information, Rick explained that the OLF was a 20 acre site, situated on a hillside which was used as a dump. As part of closure, there was full investigation to determine an appropriate closure process. The Atomic Energy Commission stopped using this landfill in 1969, placed some soil over the surface, and left it alone. There has always been groundwater and surface water monitoring in this area. There was one instance of a piece of depleted uranium being placed on the landfill to burn out, after which as much of the material was removed as possible. The primary contaminants of concern at the OLF are polycyclic aromatic hydrocarbons, which are associated with things like coal tars, oil and asphalt. The main source was incomplete combustion products of fossil fuels, as asphalt and debris from parking lot sweeping was dumped into this landfill. There were several rounds of characterization of the OLF in different time periods. The results showed no migration of contaminants and low concentration levels, well within risk levels for RCRA/CERCLA. As part of closure, the hillside was graded, and berms were constructed to direct runoff to perimeter channels.

DOE is required to conduct certain inspections based on the level of rainfall, so the OLF was inspected many times during the September floods. This area held up very well during the heavy rains, with only some small areas needing repairs. Cracks had propagated through Berm 4. Initial repairs were completed within a week, which involved smoothing out the area using hand tamping and raking, and adding erosion matting. Also, as a temporary fix, they added a drain pipe to the Berm 4 channel. CDPHE, EPA and a geotechnical engineer were all involved. The OLF is being inspected weekly, and there has been no more cracking. Contact Record 2013-02 details these repairs, and is posted on the website. DOE is in the process of designing longer term repairs, which should be ready for regulator review by the end of November or early December.

Mary Fabisiak asked if there was a lot of sheet flow on the landfill. Rick said there was. He said that most of the precipitation happened at night, so was not observed directly, but from what they can tell, the water did not reach tops of berms. Lisa Morzel noted that some areas had a 1,000 year precipitation event, and this landfill is located on top of a larger landslide area. She asked if the site was monitoring to see if the landslides were reactivating. Rick said they had not, and Lisa replied that she thought they should.

Anne Fenerty said she disagreed with Rick's characterization of the landfill contamination. She said that there had to be radionuclides and metals since this was the only landfill onsite during that timeframe. She also said it was not properly closed per RCRA. Rick clarified that the site did not call it a 'household' waste landfill, and that it was used for construction debris. He said there was a RCRA monitoring scheme in place and that its closure was consistent with the presumptive closure for this type of landfill, which is waste containment. He said that they had detected metals and VOC's, but all are at very low levels. In response to the question of why this was not closed as a RCRA landfill, Rick said that the topography was not suitable for the requirements, and that it was not cost effective. Mickey Harlow said that classified shapes had come to the surface in this area, and that based on that fact, there must be more contaminants that

the records do not account for. She said it was not fair to characterize the contents as construction debris, and pointed out that they could not sample every inch of the landfill. Rick said that there is great deal of information available about the OLF online. The thickness of the waste ranges from 1-10 feet. Soil was added intermittently, so there are various thicknesses throughout. Rick noted that even before closure DOE did not see any migration of contaminants in any of the 70-80 surrounding groundwater wells.

September Flooding – George Squibb
George noted that he was presenting the same information that was shared at a recent meeting with city technical staff and Stewardship Council staff. He showed about 30 photos taken around time of storms. Rain gauges showed 6-9 inches of rain onsite. Much of the water flowing across the site during the storm came from offsite rather than direct rainfall. For example, much of the water in South Walnut Creek came from Coal Creek, which washed out railroad tracks on the west side of the site.

During the storm, there was water in some drainages onsite, but not others. None of the dams suffered damage. The samplers filled up quickly, so there are some data gaps. George said that they replaced the most important samplers first, such as at the POC's and POE's. He said the worst impact was on the GS01 sampler. It was fixed within couple days, but does not have telemetry operating yet. George requested data from the Woman Creek Reservoir Authority to help him calculate data, such as flow rates and volume for Woman Creek. Samples were being sent out and the results should be back in a couple weeks. While most of the results had not been validated yet, George said that preliminary data shows that GS51 was the only exceedance for plutonium or americium. He noted that the values were less than they saw during smaller event in 2010. George also reported that barbed wire fences across streams did not get washed out. He said that those drainages do not have many trees, which helped keep debris down.

George said that they did not see a lot of erosion during the event. Since the site was contoured with drainage in mind, what they saw was more bank erosion. Preliminary results for suspended solids were not very high (less than 100mg/l). Tim Plass asked how much plutonium migrated offsite. George said that concentrations were below standards, but the load would be hard to determine, based on the data they have. He said that they did see increases almost everywhere, but they were very low. Uranium levels went down. George concluded that, overall, the aftermath of the storm looked good. The concentrations were not alarming, they did not lose many structures, and they were able to gather a lot of data.

Board Approval of 2014 Work Plan

The Board reviewed the draft work plan at the September meeting. No changes were offered at that meeting. Deb Gardner moved to approve the 2014 Stewardship Council Work Plan. The motion was seconded Lisa Morzel. The motion passed 13-0.

Board Approval of 2014 Budget

The Board reviewed the draft budget at the September meeting. No changes were offered. The Board's attorney Barb Vander Wall explained the required budget review process. Prior to

finalizing the budget, the Board must hold a budget hearing and allow time for public comment. Following the public hearing, the Board must approve the budget resolution. This must occur before the end of each year. She also noted that after the budget is approved, it is filed with the State by the end of the year. She reported that a notice for this meeting was published in the *Denver Post* as required.

Chair Bob Briggs officially opened the budget hearing. There were no comments from the audience. Bob then closed the budget hearing. David Abelson noted that there were no changes since the last meeting. There were no comments from Board members.

Deb Gardner moved to approve the Fiscal Year 2014 budget. The motion was seconded by Tim Plass. The motion passed 13-0.

New Member Interviews and Selection

David Abelson began the discussion by noting that seven non-governmental groups/individuals applied for membership to the Rocky Flats Stewardship Council. The next step was for the government members to complete the interviews and then vote to approve four individuals/organizations as Board members for 2014-2015.

All of the current non-governmental representatives had expressed their desire to continue as members. This included Murph Widdowfield, The Rocky Flats Homesteaders, The Rocky Flats Cold War Museum, and the League of Women Voters. Since they were already on the Board, these entities were not interviewed.

The first applicant was Nancy Newell, a citizen of Louisville. Nancy explained that she had been born and raised in Colorado. She retired from the hazardous waste/RCRA division at the Colorado Department of Public Health and Environment (CDPHE) in order to stay home with her family. Due to this job history, she said that she had fairly good knowledge about Rocky Flats. She said that she loved her job at CDPHE, where she inspected large and small waste generators, and did lots of compliance work. She said she did work at Rocky Flats from 1997 through closure. She explained that volunteering with the Stewardship Council would be a good fit for her to get out in the community and stay involved in issues with which she was familiar. Deb Gardner was she was impressed with Nancy's background and thought she would be good addition to the Board. Deb asked Nancy if she had any specific concerns about Rocky Flats. Nancy said that she had no political agenda, and just wanted to use her knowledge to help discern facts and analyze data. She said her neighbors ask questions about Rocky Flats and that she would like to know more about it.

Keith Fournier, a former Rocky Flats employee, was the next interviewee. Keith said that he started at Rocky Flats in 1980 as security inspector/guard. After two years, he moved into chemical operations in Building 774, which involved working with gloveboxes, solution lines and tanks. As part of these liquid waste operations, he helped process effluents from Building 771. In 1990, he became a supervisor in Buildings 771 and 774. When Kaiser-Hill took over site activities in 1995, decontamination and decommissioning became a high priority. Keith was then involved emptying tanks and process lines, which he described as very risky and interesting

work. In 2000, he moved to Building 707 as a supervisor, and did a lot of 'bag-outs' of gloveboxes. Keith said that working on decommissioning the XY retriever was probably most difficult part of the cleanup. In 2004, he transferred to the Idaho National Energy Laboratory (INEL), and was involved in digging up Pit 9, which contained waste from Rocky Flats. In 2009, he worked at Hanford on the uranium canyon project, and then retired in 2011. Keith said that his interest in Rocky Flats was piqued recently when he heard about the possibility of a new highway being constructed adjacent to Rocky Flats. Keith noted that several of his co-workers have passed away, which could likely be work-related. He said Rocky Flats was good place to work until 1996. Keith lives in Jefferson County, has two daughters, and his wife is a firefighter. He said that there is not a lot of interest in the community about what went on at Rocky Flats, and that he would like to change that. Emily Hunt asked Keith what sort of involvement he had with the former worker community. He said he did not have any, since many of the colleagues he worked with did not stay in the area. David Allen asked Keith if he had been in contact with the Rocky Flats Cold War Museum. Keith said that he had not, but would be getting in touch with them.

The Board moved on to the voting process. According to the Stewardship Council bylaws, each government had four votes to distribute. The seven applicants were as follows:

- League of Women Voters (LWV)
- Rocky Flats Cold War Museum (RFCWM)
- Rocky Flats Homesteaders
- Murph Widdowfield
- Michelle Gabrieloff-Parish
- Nancy Newell
- Keith Fournier

The government votes were recorded as follows:

Superior – LVW, RFCWM, Homesteaders, Murph Widdowfield
Broomfield – LWV, RFCWM, Homesteaders, Nancy Newell
Boulder County – LWV, RFCWM, Homesteaders, Nancy Newell
Northglenn – LWV, Homesteaders, Nancy Newell, Keith Fournier
Thornton – LWV, RFCWM, Homesteaders, Nancy Newell
Golden – LVW, RFCWM, Homesteaders, Nancy Newell
Arvada – LVW, RFCWM, Homesteaders, Murph Widdowfield
Boulder – LWV, Homesteaders, Nancy Newell, Keith Fournier
Westminster – LVW, RFCWM, Homesteaders, Murph Widdowfield

Final vote tallies for each applicant:

*LWV – 9
*Museum – 7
*Homesteaders -9
Murph – 3
Keith – 2

*Nancy – 6
Michelle – 0

The four people/entities with the highest number of votes were elected to the Board. These were the League of Women Voters, the Rocky Flats Cold War Museum, the Rocky Flats Homesteaders, and Nancy Newell.

Updates/Big Picture Review

February 3, 2014

Potential Business Items

- Elect 2014 officers
- Adopt resolution re: 2014 meeting dates

Potential Briefing Items

- Host LM Quarterly public meeting
- DOE-initial briefing on groundwater
- DOE and CDPHE flood update (validated data)

April 7, 2014

Potential Briefing Items

- DOE – briefing on groundwater sampling and treatment
- AMP sampling update
- Updates on NRD projects

Issues to watch:
Americium, Plutonium and Uranium levels upstream of pond B-3

EXECUTIVE SESSION

At 11:32 a.m. Jeannette Hillery made a motion to move into Executive Session for the purpose of discussing personnel issues, and to receive legal advice on such issues, as authorized under Sections 24-6-402(4)(b) and (f), C.R.S. Tim Plass seconded the motion. The motion passed 13-0.

The Board reconvened from Executive Session at 11:40 a.m. and affirmed that no actions had been taken during Executive Session.

The meeting was adjourned at 11:40 a.m.

Respectfully submitted by Erin Rogers.

Rocky Flats Stewardship Council
Check Detail-20134
October 9, 2013 through January 12, 2014

Type	Num	Date	Name	Account	Paid Amount	Original Amount
Check		**10/28/2013**		**CASH-Wells Fargo-Operating**		**-3.50**
				Admin Services-Misc Services	-3.50	3.50
TOTAL					-3.50	3.50
Check	**1644**	**11/9/2013**	**Century Link**	**CASH-Wells Fargo-Operating**		**-27.11**
				Telecommunications	-27.11	27.11
TOTAL					-27.11	27.11
Bill P...	**1645**	**11/9/2013**	**Blue Sky Bistro**	**CASH-Wells Fargo-Operating**		**-260.00**
Bill	1648	10/28/2013		Misc Expense-Local Government	-260.00	260.00
TOTAL					-260.00	260.00
Bill P...	**1646**	**11/9/2013**	**Crescent Strategies...**	**CASH-Wells Fargo-Operating**		**-7,389.69**
Bill	10/3...	10/31/2013		Personnel - Contract	-6,850.00	6,850.00
				Telecommunications	-135.88	135.88
				TRAVEL-Local	-121.48	121.48
				Postage	-15.99	15.99
				Printing	-266.34	266.34
TOTAL					-7,389.69	7,389.69
Bill P...	**1647**	**11/9/2013**	**Jennifer A. Bohn**	**CASH-Wells Fargo-Operating**		**-374.00**
Bill	13-77	10/31/2013		Accounting Fees	-374.00	374.00
TOTAL					-374.00	374.00
Bill P...	**1648**	**11/9/2013**	**Seter & Vander Wal...**	**CASH-Wells Fargo-Operating**		**-2,475.45**
Bill	67363	10/31/2013		Attorney Fees	-2,475.45	2,475.45
TOTAL					-2,475.45	2,475.45
Check	**1649**	**12/5/2013**	**Century Link**	**CASH-Wells Fargo-Operating**		**-26.71**
				Telecommunications	-26.71	26.71
TOTAL					-26.71	26.71
Bill P...	**1650**	**12/5/2013**	**Crescent Strategies...**	**CASH-Wells Fargo-Operating**		**-7,044.67**
Bill	11/3...	11/30/2013		Personnel - Contract	-6,850.00	6,850.00
				Telecommunications	-134.38	134.38
				TRAVEL-Local	-18.08	18.08
				Postage	-15.99	15.99
				Misc Expense-Local Government	-26.22	26.22
TOTAL					-7,044.67	7,044.67
Bill P...	**1651**	**12/5/2013**	**Jennifer A. Bohn**	**CASH-Wells Fargo-Operating**		**-161.50**
Bill	13-85	11/30/2013		Accounting Fees	-161.50	161.50
TOTAL					-161.50	161.50
Check	**1652**	**1/12/2014**	**Century Link**	**CASH-Wells Fargo-Operating**		**-27.61**
				Telecommunications	-27.61	27.61

Rocky Flats Stewardship Council
Check Detail-20134
October 9, 2013 through January 12, 2014

Type	Num	Date	Name	Account	Paid Amount	Original Amount
TOTAL					-27.61	27.61
Bill P...	**1653**	**1/12/2014**	**Crescent Strategies...**	**CASH-Wells Fargo-Operating**		**-7,945.07**
Bill	12/3...	12/31/2013		Personnel - Contract	-6,850.00	6,850.00
				Telecommunications	-134.38	134.38
				TRAVEL-Local	-33.90	33.90
				Postage	-283.99	283.99
				TRAVEL-Out of State	-642.80	642.80
TOTAL					-7,945.07	7,945.07
Bill P...	**1654**	**1/12/2014**	**Jennifer A. Bohn**	**CASH-Wells Fargo-Operating**		**-272.00**
Bill	13-88	12/31/2013		Accounting Fees	-272.00	272.00
TOTAL					-272.00	272.00
Bill P...	**1655**	**1/12/2014**	**Seter & Vander Wal...**	**CASH-Wells Fargo-Operating**		**-639.55**
Bill	67622	12/31/2013		Attorney Fees	-639.55	639.55
TOTAL					-639.55	639.55

RESOLUTION
OF THE
BOARD OF DIRECTORS
OF
ROCKY FLATS STEWARDSHIP COUNCIL

regarding

2014 MEETING SCHEDULE AND NOTICE PROVISIONS

WHEREAS, pursuant to an Intergovernmental Agreement dated as of February 13, 2006, and as amended thereafter, (the "IGA"), the Rocky Flats Stewardship Council ("Stewardship Council") was established; and

WHEREAS, the Stewardship Council was created to allow local governments to work together on the continuing local oversight of the activities occurring on the Rocky Flats site to ensure that government and community interests are met with regards to long term stewardship of residual contamination and refuge management; and

WHEREAS, the Board of Directors of the Stewardship Council has a duty to perform certain obligations in order to assure the efficient operation of the Stewardship Council; and

WHEREAS, on March 6, 2006, the Board of Directors of the Stewardship Council adopted Bylaws regarding the operations of the Stewardship Council, governing, *inter alia*, meeting and notice requirements; and

WHEREAS, § 24-6-402, C.R.S., of the Colorado Sunshine Law, specifies the duty of the Board of Directors at its first regular meeting of the calendar year to designate a public posting place within the boundaries of the Stewardship Council for notices of meetings, in addition to any other means of notice; and

WHEREAS, pursuant to its Bylaws and Colorado laws, the Stewardship Council desires to establish its regular meeting schedule and location, and to designate its public posting place(s) for 2014.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE ROCKY FLATS STEWARDSHIP COUNCIL THAT:

1. Meeting Schedule/Location. The Board of Directors determines to hold regular meetings the **first Monday of February, April, June, and November, the second Monday of September at 8:30 AM** at the Rocky Mountain Metropolitan Airport Terminal Building, 11755 Airport Way, Broomfield, Colorado; and to hold special meetings as may be necessary, in accordance with the Bylaws of the Stewardship Council.

2. Regular Meeting Notice. The Board of Directors determines to annually post its regular meeting schedule at the Clerk and Recorder's office of the following counties: Jefferson, Boulder, Broomfield, Adams and Weld; and at the City or Town Clerk's Office of the following cities and/or towns: Arvada, Boulder, Broomfield, Westminster, Golden, Superior, Thornton, and Northglenn, for posting in a public place. In addition, the Board shall post its regular meeting schedule on the website established for the Stewardship Council. These notices shall remain posted throughout the year. At least seven (7) days advance notice of the regular meeting time, place and date shall be provided to the

directors and alternate directors, and to those members of the public who so request. The general nature of the business proposed to be transacted or the purpose of any meeting of the Board of Directors shall be specified in the notices of such meeting where possible.

3. Special Meeting Notice. In the event of a special meeting, a notice of such special meeting shall be posted at least seventy-two (72) hours in advance at the clerks' offices of the counties, cities and towns indicated above, for posting in a public place. At least seventy-two (72) hours advance notice of the special meeting time, place and date shall be provided to the directors and alternate directors, and to those members of the public who so request. The general nature of the business proposed to be transacted at or the purpose of any meeting of the Board of Directors shall be specified in the notices of such meeting where possible. The Board of Directors' ability to act on matters brought before it at a special meeting is restricted to those items specified in the notice.

4. Emergency Meeting Notice. Should the Board of Directors determine an emergency special meeting is necessary, a notice of such emergency meeting shall be posted at least twenty-four (24) hours in advance at the clerks' offices of the counties, cities and towns indicated above in accordance with the Colorado Open Meetings Act. The general nature of the business proposed to be transacted at, or the purpose of, any meeting of the Board of Directors shall be specified in the notices of such meeting where possible. The Board of Directors' ability to act on matters brought before it at a special meeting is restricted to those items specified in the notice.

5. Written Notice Requirements. Written notice of each meeting of the Board of Directors shall be given by telefax or electronic mail; provided, however, that in the instance of any Director who in writing requests that such notice not be given by telefax or electronic mail, the notice shall be by hand delivery to an address within the boundaries of the Parties designated in writing.

6. Additional Notification. The Stewardship Council shall maintain a list of persons who, within the previous two years, have requested notification of all meetings, or of meetings with discussions of certain specified policies, and shall provide reasonable advance notification of such meetings to the individuals.

APPROVED AND ADOPTED THIS _____ DAY OF _____, 2014.

(SEAL)

ROCKY FLATS STEWARDSHIP COUNCIL

By: _____
Chair

ATTEST:

By: _____

DOE Quarterly Report Briefing

- Cover memo
- Section of quarterly report

ROCKY FLATS STEWARDSHIP COUNCIL

P.O. Box 17670
Boulder, CO 80308-0670
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(303) 412-1200
(303) 600-7773 (f)

MEMORANDUM

TO: Stewardship Council Board
FROM: Rik Getty
SUBJECT: DOE Quarterly Report Briefing
DATE: January 22, 2014

We have scheduled seventy minutes for DOE to present its quarterly update for the third quarter of 2013 (July-September). The report (158 pages) can be found at: http://www.lm.doe.gov/Rocky_Flats/Documents.aspx Fifty-six pages of the report are attached. (The electronic version includes a few additional maps that are not included in the hard copy.)

In reviewing this material, it is important to bear in mind that this quarter included the September flooding. Many of the impacts to Rocky Flats' infrastructure from the flooding are mentioned in the report. Those impacts to site infrastructure from the flooding are noted below.

DOE will brief on the following topics in a format similar to past quarterly and annual report updates:

- surface water monitoring;
- groundwater monitoring;
- ecological monitoring; and,
- site operations (inspections, pond operations, security, general maintenance, etc.).

THIRD QUARTER 2013 QUARTERLY REPORT

Highlights of the surveillance and maintenance activities are as follows (largely quoting from the document).

Water Monitoring Highlights

During the quarter, water monitoring successfully met the targeted monitoring objectives as required by the RFLMA, and was in conformance with RFSOG implementation guidance. The routine RFLMA network consists of 10 automated gaging stations, 12 surface water grab-sampling locations, eight treatment system locations, and 97 wells. Ten precipitation gages are also installed. Additional locations are occasionally sampled in support of investigations in response to reportable conditions. During the quarter, 33 flow-paced composite samples, 53

surface water grab samples, 16 treatment system samples, and 10 groundwater samples were collected (in accordance with RFLMA protocols) and submitted for analysis.

Water quality data at the RFLMA POCs remained below the applicable standards through the quarter.

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) and plutonium (Pu) activities were also observed starting on August 31, 2011, and May 31, 2012, respectively. As of the end of the quarter, Pu and Am were still reportable. The 12-month rolling average uranium concentration was below the RFLMA Attachment 2 water quality standard, and was no longer reportable at GS10 as of September 30, 2013. GS10 data are evaluated in Section 3.1.3.1 of this report.

Except for GS10 as discussed above, all other analyte concentrations at POEs were less than the applicable RFLMA Attachment 2 water quality standards as of the end of the quarter.

Groundwater monitoring results will be evaluated as part of the 2013 annual report.

Summary of flood impacts

As with many locations on the Front Range, Rocky Flats experienced very high flows during the second week of September 2013. In some cases the high flows and debris damaged the automated surface water sampling equipment, resulting in temporary interruptions in composite sampling. At almost all locations, the runoff volumes caused flow-paced composite bottles to fill before personnel could safely replace them with empty bottles. Access to various areas of Rocky Flats was unsafe and restricted by local authorities during certain periods of the flood. Due to the interruptions in automated sampling at POCs and POEs, tables have been added to this report (see individual sections for each location below) detailing automated composite sample collection during September 2013. During September 2013, composite samples collected at POCs and POEs were comprised of more than 2,000 individual grabs.

Landfills

Present Landfill (PLF)

The routine PLF inspection for the quarter was performed on August 22, and a special inspection was performed September 16, 2013, following the flood. No significant problems were observed during these inspections. Copies of the landfill inspection forms are presented in Appendix A.

Original Landfill (OLF)

The OLF is inspected monthly, in accordance with the requirements in the OLF Monitoring & Maintenance Plan and the RFLMA. It was anticipated that after the first year, the inspection frequency might be reduced to quarterly for an additional four years. However, because of observed localized slumping and seep areas, and investigation and repairs to the OLF cover completed in 2009, no change to the monthly inspection frequency was recommended in the third five-year review of Rocky Flats.

Routine OLF inspections during the quarter were performed on July 27, August 22, and September 16, 2013. Evaluations of the landfill cover vegetation have been discontinued, as the success criteria, according to the requirements outlined in RFLMA, have been met. The completed inspection forms are presented in Appendix A.

Summary of flood impacts

Localized surface cracking and differential settlement in the northeastern portion of the cover were noted during the September 16th inspection. (As described below, the affected area is near an area where cracks were observed in 2010 and 2011.) Cracks with vertical displacement of up to approximately two feet and cracks up to approximately ½ foot wide were observed during the inspection. The cracking and settling extended through portions of Diversion Berms 4 and 5, and a minor depression was formed in the Diversion Berm 4 channel between the cracks. In accordance with RFLMA Attachment 2, Section 6.0, "Action Determinations," DOE determined this was a reportable condition affecting the effectiveness of the OLF cover. Figure 1 shows the location of the observed cracking.

DOE informed CDPHE and EPA of the cracking on the northeast side of the OLF on September 17. DOE, CDPHE, and EPA personnel toured the area on September 18 to start the consultative process to develop a proposed course of action.

Initial mitigation steps were undertaken by DOE to minimize the potential for infiltration of precipitation. Initial steps included (1) minor regrading of the differential displacement cracks to seal the openings using Rocky Flats Alluvium from the adjacent area, and (2) filling minor cracks by smoothing and tamping the surrounding surface. Erosion mats were placed over the regarded area. This work was completed on September 20. This area will be inspected weekly and any continuation of the cracking will be filled by smoothing out and tamping the surface as needed.

A qualified geotechnical engineer and S.M. Stoller Corporation engineering staff visited the OLF on September 24th to view the affected area, provide recommendations for additional near-term repairs, and assist in developing a plan and schedule to address the conditions. RFLMA Contact Record 2013-02, "Reportable Condition at the Original Landfill," describes the outcome of consultation regarding the evaluation plan and schedule to address the observed localized instability. The geotechnical engineer's evaluation results and recommendations are included as an attachment to the Contact Record.

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], the East Trenches Plume Treatment System [ETPTS], and the 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 drainpipe into one or more treatment cells, where it is treated and then discharged. Solar-powered air strippers were added in early 2013 to the MSPTS (to polish effluent from the treatment cells) and ETPTS (to pretreat water before it enters the treatment cells). 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.

MSPTS

Routine maintenance activities continued at the MSPTS through the quarter. These activities included checking flows, piping, and water levels. The air stripper operated throughout the quarter. Air stripper maintenance mainly comprised monitoring of the water pressures and nozzle spray patterns, and cleaning the pump, lines, and nozzles as warranted. Sampling was conducted to support continuing evaluation and optimization efforts.

Extra inspections were conducted following the precipitation events in mid-September. The MSPTS was not adversely affected by these events. The 2013 annual report will provide a more detailed discussion of the MSPTS, including the air stripper.

ETPTS

Routine maintenance activities continued at the ETPTS through the quarter. These activities included checking flows, piping, and water levels. The air stripper was the focus of substantial operation and maintenance effort. This work primarily focused on installing and testing different nozzles and nozzle configurations to achieve improved treatment of volatile organic compounds and cleaning the mineral precipitates (i.e., hard water "scale") that clogged nozzles and other components. The air stripper was taken offline in early September, when the pump failed due to this repeated clogging, and remained off for the balance of the quarter while alternate pumps were researched.

Extra inspections were conducted following the precipitation events in mid-September. The ETPTS was not adversely affected by these events. The 2013 annual report will provide a more detailed discussion of the ETPTS, including the air stripper.

SPPTS

Routine maintenance activities continued at the SPPTS through the quarter. 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. Tests also continued through the quarter on treating uranium (U) with smaller-scale "microcell" treatment components incorporating zero-valent iron as a treatment media, and treating nitrate using pilot-scale lagoons.

Flood impacts

Extra inspections, adjustments, and maintenance were performed following the September flood. In particular, the area surrounding the SPPTS was saturated (as was the case across Rocky Flats, but this condition was amplified in the flat area adjacent to the SPPTS), leading to higher groundwater levels and flooding of the vaults, which triggered automatic system shutdown. (The system is designed to shut down in such an event in case the water is a result of pipe leakage.) The system also shut down when these higher water levels caused a short in the wiring.

The wiring was repaired and the vaults were repeatedly pumped out to help keep components dry. Fluid pumped from the vaults was routed to the original concrete treatment cells (the Cell 1/Cell 2 structure). Several electrical components were replaced due to water damage, including

one flow meter and both of the dosing pumps used to deliver liquid carbon nutrients (a proprietary substance called MicroCg) to the pilot-scale lagoons. During or shortly after the rain, the tubing used to deliver nutrients leaked, resulting in a mixture of water and the clear, colorless MicroCg entering this vault. This condition was not recognized until after the container of MicroCg had drained and several vault-pumping events had been conducted. Samples of residual liquid in the vault were then collected and analyzed to confirm there was no environmental concern. A new container of MicroCg was obtained and put online, the system was restored to full operation, and the vaults continued to be pumped dry as conditions warranted.

Both the microcell and lagoon tests are expected to continue for the next several months. The associated results will be discussed in greater detail in the 2013 annual report.

PLFTS

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

There were no impacts to the PLFTS from the flooding.

Sign Inspection

"U.S. Department of Energy - No Trespassing" signs are required to be posted at intervals around the perimeter of the COU to notify persons that they are at the boundary of the COU. Signs listing the use restrictions (ICs) and providing contact information are also required to be posted at access points to the COU. The signs are required as physical controls of the remedy, are inspected quarterly, and are maintained by repairing or replacing them as needed. Physical controls protect the engineered components of the remedy, including landfill covers, groundwater treatment systems, and monitoring equipment, which are also inspected routinely during monitoring and maintenance activities.

The signs were inspected on September 4, 2013, and they met the requirements.

Erosion Control and Revegetation

Maintenance of Rocky Flats erosion control features required continued effort throughout the quarter, 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 quarter.

Flood impacts

The flooding caused erosion damage to the dirt roads at Rocky Flats, requiring some repairs.

LMS/RFS/S11334

Rocky Flats, Colorado, Site

Quarterly Report of Site Surveillance and Maintenance Activities Third Quarter Calendar Year 2013

January 2014

U.S. DEPARTMENT OF ENERGY | Legacy Management

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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
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
EPC	East Perimeter Channel
ETPTS	East Trenches Plume Treatment System
IC	institutional control
LANL	Los Alamos National Laboratory
LBNL	Lawrence Berkeley National Laboratory
LM	Office of Legacy Management
µg/L	micrograms 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
PMJM	Preble's meadow jumping mouse
POC	Point of Compliance
POE	Point of Evaluation
Pu	plutonium
RCRA	Resource Conservation and Recovery Act
RFLMA	*Rocky Flats Legacy Management Agreement*
RFSOG	*Rocky Flats Site Operations Guide*
Site	Rocky Flats Site
SPPTS	Solar Ponds Plume Treatment System
Stoller	S.M. Stoller Corporation
U	uranium
USFWS	U.S. Fish and Wildlife Service

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, and amended on September 21, 2011 (DOE, EPA, and CDPHE 2011), 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 have chosen to implement the monitoring and maintenance requirements of the CAD/ROD as described in the *Rocky Flats Legacy Management Agreement* (RFLMA) (DOE 2007). 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 (ICs), 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, Colorado, Site Site Operations Guide* (RFSOG) (DOE 2013) 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 third quarter of calendar year (CY) 2013 (July 1 through September 30). This report describes the following activities:

- 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
- Inspection of signs posted at the perimeter of the COU as physical controls

2.0 Site Operations and Maintenance

2.1 Landfills

A rainfall event from September 9 through September 16, 2013, caused catastrophic flooding in northeastern Colorado. Because the heavy precipitation event produced more than 1 inch of rainfall within a 24-hour period, the covers and storm water management systems for the landfills were inspected after this storm event in accordance with RFLMA Attachment 2, Table 3, "Present and Original Landfill Inspection and Maintenance Requirements."

2.1.1 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 2007). Vegetation monitoring has been conducted on the PLF according to the requirements in RFLMA Attachment 2, Table 3.

2.1.1.1 Inspection Results

The routine PLF inspection for the third quarter of CY 2013 was performed on August 22, and a special inspection was performed September 16, 2013. No significant problems were observed during these inspections. Copies of the landfill inspection forms are presented in Appendix A.

2.1.1.2 Settlement Monuments

The 2013 survey of the PLF settlement monuments was performed on December 9, 2013. 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).

2.1.2 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 completed in 2009, no change to the monthly inspection frequency was recommended in the third five-year review of the Site (DOE 2012).

2.1.2.1 Inspection Results

Routine OLF inspections during the third quarter of CY 2013 were performed on July 27, August 22, and September 16, 2013. No issues were noted during an additional inspection performed on September 12, 2013, in response to the heavy precipitation. Evaluations of the landfill cover vegetation have been discontinued, as the success criteria, according to the requirements outlined in RFLMA, have been met. The completed inspection forms are presented in Appendix A.

Localized surface cracking and differential settlement in the northeastern portion of the cover were noted during the September 16 inspection. (As described below, the affected area is near an area where cracks were observed in 2010 and 2011.) Cracks with vertical displacement of up to approximately 2 feet and cracks up to approximately 0.5 foot wide were observed during the inspection. The cracking and settling extended through portions of Diversion Berms 4 and 5, and a minor depression was formed in the Diversion Berm 4 channel between the cracks. In accordance with RFLMA Attachment 2, Section 6.0, "Action Determinations," DOE determined this was a reportable condition affecting the effectiveness of the OLF cover. Figure 1 shows the location of the observed cracking.

DOE informed the Colorado Department of Public Health and Environment (CDPHE) and EPA of the cracking on the northeast side of the OLF on September 17. DOE, CDPHE, and EPA personnel toured the area on September 18 to start the consultative process to develop a proposed course of action.

Initial mitigation steps were undertaken by DOE to minimize the potential for infiltration of precipitation. Initial steps included (1) minor regrading of the differential displacement cracks to seal the openings using Rocky Flats Alluvium from the adjacent area and (2) filling minor cracks by smoothing and tamping the surrounding surface. Erosion mats were placed over the regraded area. This work was completed on September 20. This area will be inspected weekly and any continuation of the cracking will be filled by smoothing out and tamping the surface as needed.

A qualified geotechnical engineer and S.M. Stoller Corporation (Stoller) engineering staff visited the OLF on September 24 to view the affected area, to provide recommendations for additional near-term repairs, and to assist in developing a plan and schedule to address the conditions.

Minor surface cracking north of the beginning of the East Perimeter Channel (EPC) was noted in August 2010. A qualified geotechnical engineer evaluated the observed cracking in August 2010 and in September 2011. The evaluations concluded that, based on the proximity and shape of the cracks, they appeared to be related to the abrupt slope change at the beginning of the EPC. In 2010, the geotechnical engineer recommended that as part of routine maintenance the cracks be monitored for expansion and be filled and tamped to prevent infiltration of precipitation. This routine maintenance has been performed since that time. The condition of the observed cracking has also been noted on the OLF monthly inspection reports.

The geotechnical engineer's recommendation was reiterated after observation of the area in 2011, and no significant expansion of the cracking was observed until the September 16, 2013, inspection. The 2008 geotechnical investigation concluded for the northwest side OLF instability that a weak clay layer containing organic materials at or near the bedrock contact appeared to be a weak interface area. Modeling predicted small-scale instability due to percolating moisture that lubricates this weak interval. It is likely that the recent northeast side OLF instability is associated with the effects of moisture from the September 2013 heavy precipitation event.

RFLMA Contact Record 2013-02, "Reportable Condition at the Original Landfill," describes the outcome of consultation regarding the evaluation plan and schedule to address the observed localized instability. The geotechnical engineer's evaluation results and recommendations are included as an attachment to the Contact Record.

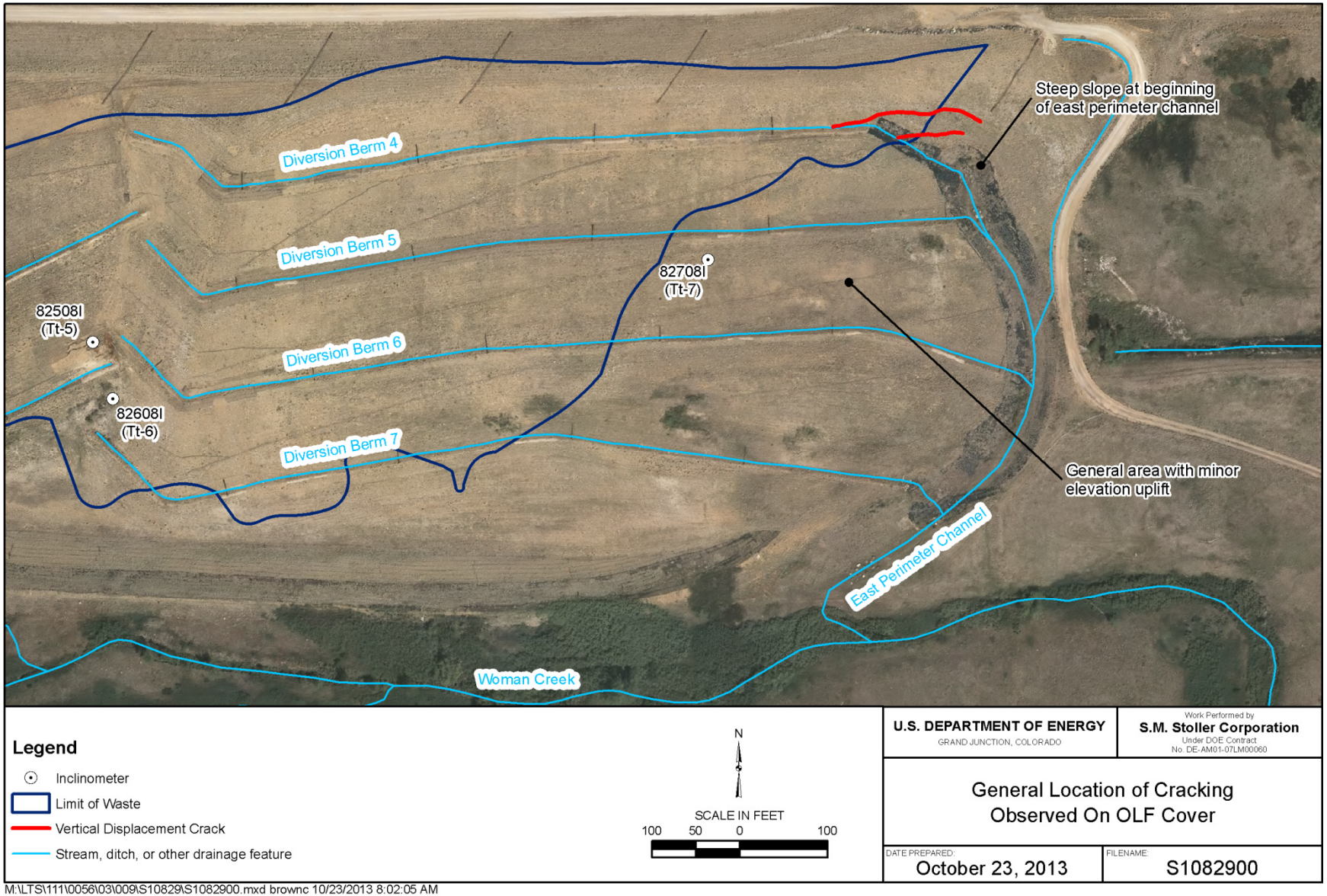


Figure 1. Location of Observed Cracking

The Contact Record is posted to the Rocky Flats public website. DOE will provide information of the progress of the evaluation and any repairs and maintenance required to address the reportable condition in subsequent contact records and quarterly and annual reports.

2.1.2.2 Settlement Monuments

The OLF settlement monuments were surveyed on September 25, 2013. 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 A.

2.1.2.3 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 2).

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, that 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). The geotechnical engineer also reviews the inclinometer data annually, and the geotechnical engineer's report is included in RFLMA annual reports.

Inclinometer measurements were taken on July 30, August 8, and September 26, 2013. For the September 26 readings, all of the inclinometers except for 82108I (Tt-1) showed noticeable deflection. Except for inclinometer 82708I (Tt-7), deflection of less than 1 inch was recorded. Deflection for Tt-7, which was installed to a depth of 29 feet below the OLF cover surface, prevented the monitoring instrument from accessing depths greater than 9 feet below the OLF cover surface.

Based on the geotechnical investigation, maintenance and repairs were made in 2009 to address localized instability on the northwest side of the OLF to minimize the effects of lubrication of a subsurface organic layer by groundwater and precipitation infiltration. The new cracking on the northeast side of the OLF appears similar to the cracking that was previously observed and repaired on the northwest side.

Routine maintenance to fill any surface cracking noted in inspections to minimize infiltration of precipitation appears to be an effective way to address conditions that may lead to localized instability.

2.1.2.4 Slumps

As discussed in the 2009 annual report (DOE 2010), areas where the landfill cover is pushed up or rolling are noticeable on the western end of the OLF between Berms 2 and 3. An additional smaller slumping area in the East Perimeter Channel was documented in 2011 and remains in stable condition. A new slump on the eastern end of the OLF between Berms 4 and 5 was observed during the inspection following the extremely heavy precipitation event discussed above in Section 2.1.2.1. The slump extended from above Berm 4 and through the berm pushing up between Berms 4 and 5. Cracking was present on the upper end of the slump extending through Berm 4. A project to close the cracks with heavy equipment and add erosion controls was completed on September 20. The slumping area was inspected by a qualified geotechnical engineer on September 24, and as of the end of the quarter, recommendations for any additional repairs were being evaluated.

2.1.2.5 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.

2.1.2.6 Topographic Survey

In accordance with Section 3.1, "Inspection Procedures," in the OLF M&M Plan, 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. The survey was completed in April 2013. The previous survey was completed in May 2011.

The survey results were mapped by engineering staff during this quarter and plans were developed for (1) adding minor amounts of soil to specific areas on the diversion berms to maintain minimum berm height and (2) making minor adjustments to the slope in some locations in berm channels. The results of the survey were forwarded to a qualified geotechnical engineer for review.

Prior to the September precipitation event, diversion berm height maintenance had been planned to begin on September 23. This planned work would involve adding soil to the tops of those portions of the diversion berms that, due to minor settling of the berms over time, do not meet the minimum height requirements. Generally, measurements show that most portions needing adjustment are low by an inch or two, but the planned maintenance approach was to add soil to the berm tops in 6-inch lifts, compact the lifts, seed the added soil, and cover with erosion matting.

The minimum diversion berm heights were calculated (based on modeling) to be sufficient to convey the runoff from a 100-year/24-hour storm event to the perimeter channels, with additional height (freeboard) based on a projected 1,000-year/24-hour storm event. Inspections of the OLF during and after the September 2013 precipitation event demonstrated that the diversion berms were more than adequate to convey the runoff without causing significant water level elevations in the berm channels. It appeared that runoff collected and conveyed by the diversion berms was approximately 6 to 10 inches deep in the berm channels. The fast-moving

Figure 2. Original Landfill Features

water did cause some erosion and gullying at the ends of several diversion berms where they joined the perimeter channels. However, there was no evidence of any significant erosion of the OLF cover or the perimeter channels, or loss of existing vegetation from run on and runoff.

Based on these observations, it appears that, except for the northeast side of the OLF, the storm water management systems performed very well and that these features are robust. The RFLMA parties agreed that the planned berm-height maintenance can be delayed until DOE can assess performance of the diversion berms in relation to this event and then evaluate a possible modification to the minimum berm-height criteria.

2.2 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], the East Trenches Plume Treatment System [ETPTS], and the 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 drainpipe into one or more treatment cells, where it is treated and then discharged. Solar-powered air strippers were added in early 2013 to the MSPTS (to polish effluent from the treatment cells) and ETPTS (to pretreat water before it enters the treatment cells). 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.

2.2.1 Mound Site Plume Treatment System

Routine maintenance activities continued at the MSPTS through the third quarter of CY 2013. These activities included checking flows, piping, and water levels.

The air stripper operated throughout the quarter. Air stripper maintenance mainly comprised monitoring of the water pressures and nozzle spray patterns, and cleaning the pump, lines, and nozzles as warranted. Sampling was conducted to support continuing evaluation and optimization efforts.

Extra inspections were conducted following the precipitation events in mid-September. The MSPTS was not adversely affected by these events.

The annual report for 2013 will provide a more detailed discussion of the MSPTS, including the air stripper.

Refer to Section 3.1.9.1 for information on water quality sampling.

2.2.2 East Trenches Plume Treatment System

Routine maintenance activities continued at the ETPTS through the third quarter of CY 2013. These activities included checking flows, piping, and water levels.

The air stripper was the focus of substantial operation and maintenance effort. This work primarily focused on installing and testing different nozzles and nozzle configurations to achieve improved treatment of volatile organic compounds and cleaning the mineral precipitates (i.e., hard water "scale") that clogged nozzles and other components. The air stripper was taken offline in early September, when the pump failed due to this repeated clogging, and remained off for the balance of the quarter while alternate pumps were researched.

Extra inspections were conducted following the precipitation events in mid-September. The ETPTS was not adversely affected by these events.

The annual report for 2013 will provide a more detailed discussion of the ETPTS, including the air stripper.

Refer to Section 3.1.9.2 for information on water quality sampling.

2.2.3 Solar Ponds Plume Treatment System

Routine maintenance activities continued at the SPPTS through the third quarter of CY 2013. 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.

Tests also continued through the quarter on treating uranium (U) with smaller-scale "microcell" treatment components incorporating zero-valent iron as a treatment media, and treating nitrate using pilot-scale lagoons.

Extra inspections, adjustments, and maintenance were performed following the precipitation events in mid-September. In particular, the area surrounding the SPPTS was saturated (as was the case across the Site, but this condition was amplified in the flat area adjacent to the SPPTS), leading to higher groundwater levels and flooding of the vaults, which triggered automatic system shutdown. (The system is designed to shut down in such an event in case the water is a result of pipe leakage.) The system also shut down when these higher water levels caused a short in the wiring. The wiring was repaired and the vaults were repeatedly pumped out to help keep components dry; fluid pumped from the vaults was routed to the original concrete treatment cells (the Cell 1/Cell 2 structure). Several electrical components were replaced due to water damage, including one flow meter and both of the dosing pumps used to deliver liquid carbon nutrients (a proprietary substance called MicroCg) to the pilot-scale lagoons. During or shortly after the precipitation events, the tubing used to deliver nutrients leaked, resulting in a mixture of water and the clear, colorless MicroCg entering this vault. This condition was not recognized until after the container of MicroCg had drained and several vault-pumping events had been conducted. Samples of residual liquid in the vault were then collected and analyzed to confirm there was no environmental concern. A new container of MicroCg was obtained and put online, the system was restored to full operation, and the vaults continued to be pumped dry as conditions warranted.

Both the microcell and lagoon tests are expected to continue for the next several months. The associated results will be discussed in greater detail in the annual report for 2013.

Refer to Section 3.1.9.3 for information on water quality sampling.

2.2.4 Present Landfill Treatment System

Routine maintenance activities continued at the PLFTS through the third quarter of CY 2013. These activities generally consisted of inspecting the system for potential problems.

Refer to Section 3.1.9.4 for information on water quality sampling.

2.3 Sign Inspection

"U.S. Department of Energy - No Trespassing" signs are required to be posted at intervals around the perimeter of the COU to notify persons that they are at the boundary of the COU. Signs listing the use restrictions (ICs) and providing contact information are also required to be posted at access points to the COU. The signs are required as physical controls of the remedy, are inspected quarterly, and are maintained by repairing or replacing them as needed. Physical controls protect the engineered components of the remedy, including landfill covers, groundwater treatment systems, and monitoring equipment, which are also inspected routinely during monitoring and maintenance activities.

The signs were inspected on September 4, 2013, and they met the requirements.

2.4 Erosion Control and Revegetation

Maintenance of the site erosion control features required continued effort throughout the third quarter of CY 2013, 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 2013.

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.
- Summaries of Area of Concern (AOC) well, Evaluation well, Sentinel well, and Resource Conservation and Recovery Act (RCRA) well groundwater monitoring; treatment system monitoring; and Surface Water Support monitoring at the Site.
- A summary of results of special high-resolution isotopic uranium analyses.

RFLMA Attachment 2 and the RFSOG offer details about the monitoring locations, sampling criteria, and evaluation protocols for the water monitoring objectives mentioned in the following

sections. Appendix B provides analytical water quality data for the third quarter of CY 2013. A more detailed interpretation and discussion will be provided in the annual report for CY 2013.

3.1.1 Water Monitoring Highlights

During the third quarter of CY 2013, water monitoring successfully met the targeted monitoring objectives as required by the RFLMA and was in conformance with RFSOG implementation guidance. The routine RFLMA network consists of 10 automated gaging stations, 12 surface water grab-sampling locations, 8 treatment system locations, and 97 wells. Ten precipitation gages are also installed. Additional locations are occasionally sampled in support of investigations in response to reportable conditions. During the quarter, 33 flow-paced composite samples, 53 surface water grab samples, 16 treatment system samples, and 10 groundwater samples were collected (in accordance with RFLMA protocols) and submitted for analysis.[1]

As with many locations on the Front Range, the Site experienced very high flows during the second week of September 2013. In some cases the high flows and debris caused damage to the automated sampling equipment, resulting in temporary interruptions in composite sampling. At almost all locations, the unanticipated runoff volumes caused flow-paced composite bottles to fill before personnel could safely replace them with empty bottles. Access to various areas of the Site was unsafe and restricted by local authorities during certain periods.

Due to the interruptions in automated sampling at RFLMA POCs and POEs, tables have been added to this report (see individual sections for each location below) detailing automated composite sample collection during September 2013. That said, the automated surface-water monitoring network performed as well as could be expected. During September 2013, composite samples collected at RFLMA POCs and POEs were comprised of more than 2,000 individual grabs.

Water quality data at the RFLMA POCs remained below the applicable standards through the third quarter of CY 2013.

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) and plutonium (Pu) activities were also observed starting on August 31, 2011, and May 31, 2012, respectively. As of the end of the third quarter of CY 2013, Pu and Am were still reportable. The 12-month rolling average uranium concentration was below the RFLMA Attachment 2 water quality standard and was no longer reportable at GS10 as of September 30, 2013. GS10 data are evaluated in Section 3.1.3.1 of this report.

Except for GS10 as discussed above, all other analyte concentrations at POEs were less than the applicable RFLMA Attachment 2 water quality standards as of the end of the third quarter of CY 2013.

Groundwater monitoring results will be evaluated as part of the annual report for CY 2013.

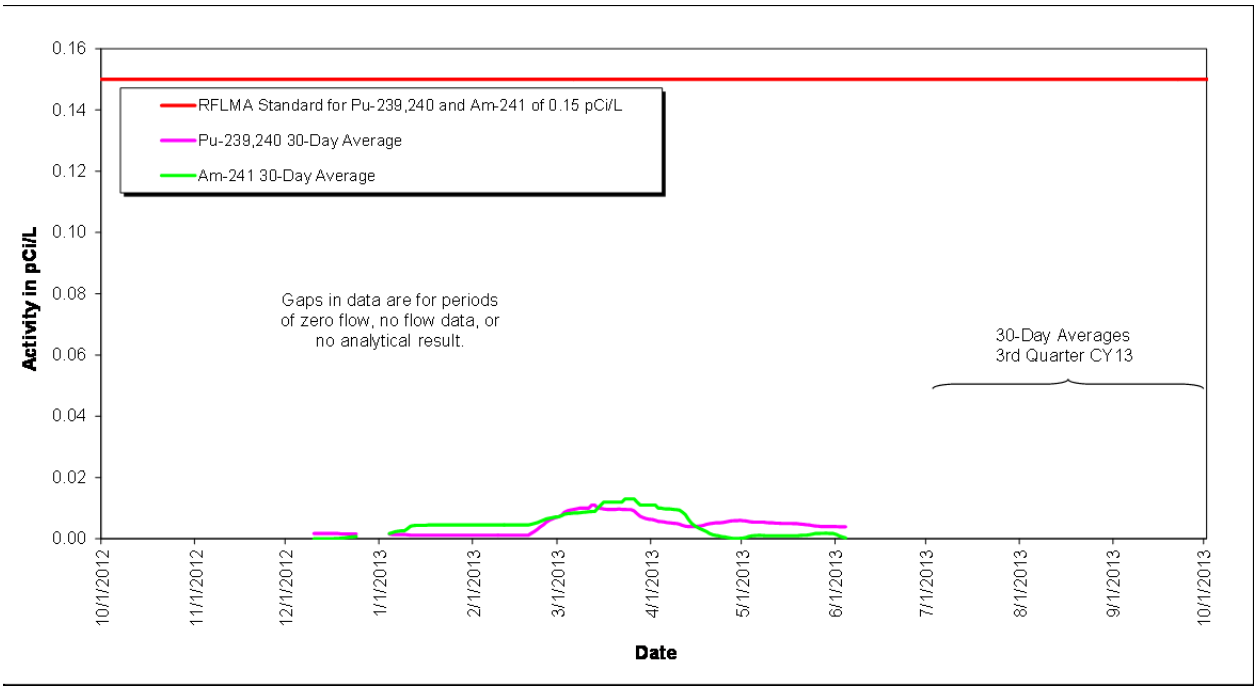
[1] Composite samples consist of multiple aliquots ("grabs") of identical volume. Each grab is delivered by the automatic sampler to the composite container at each predetermined flow volume or time interval. During the third quarter of CY 2013, the 33 flow-paced composites comprised 2,894 individual grabs.

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.

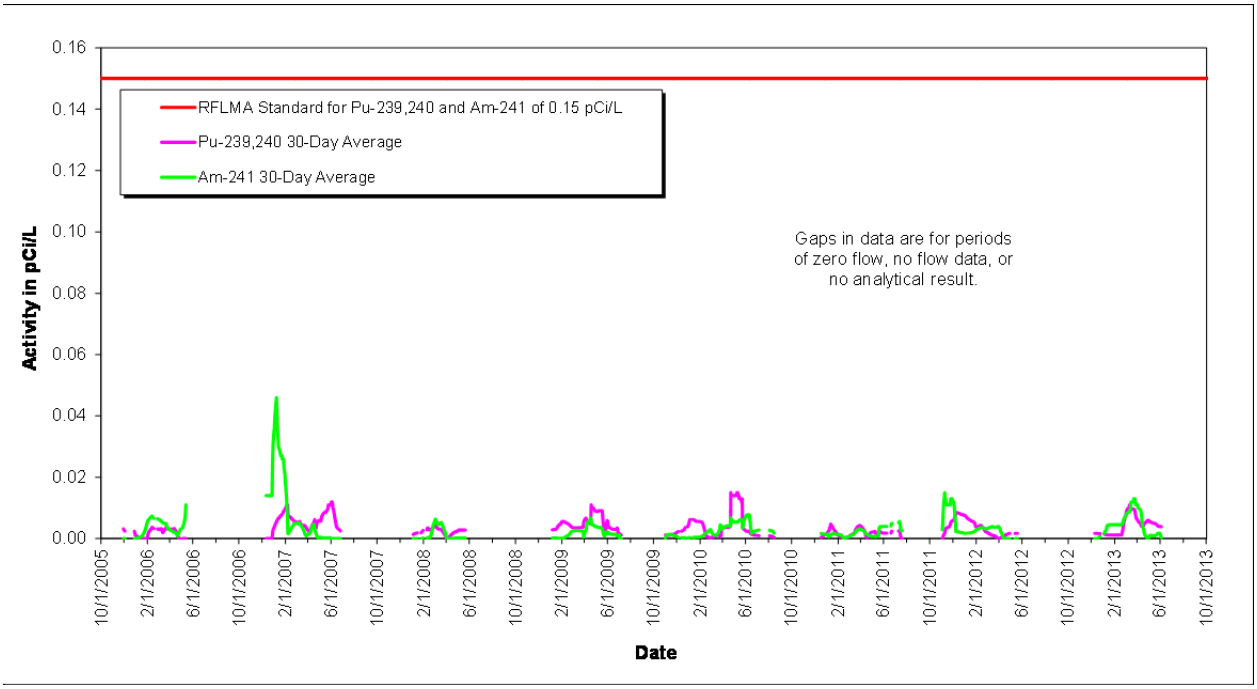
3.1.2.1 Monitoring Location GS01

Monitoring location GS01 is on Woman Creek at Indiana Street. Figure 3 and Figure 5 show no occurrences of reportable 30-day averages for the quarter. As of September 9, 2013, GS01 is no longer an RFLMA POC. There was no flow at GS01 for the period June 5, 2013, through September 9, 2013. Figure 4 and Figure 6 show sampling data from 2005 through September 9, 2013.



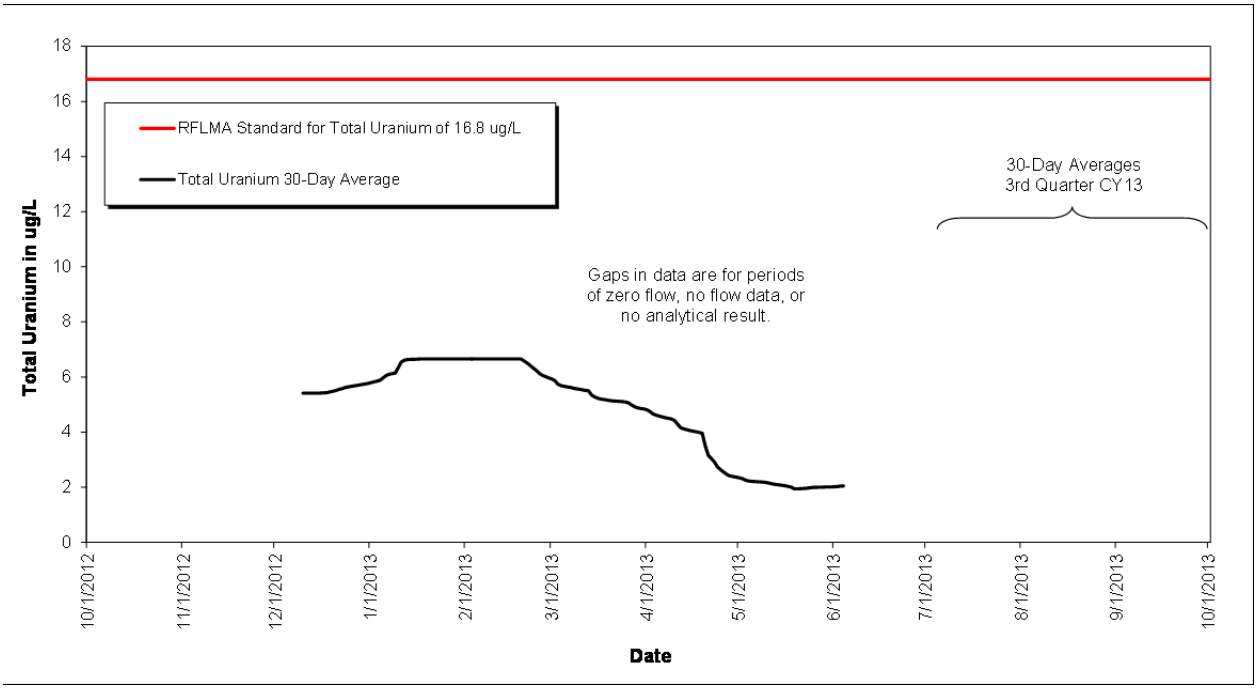
pCi/L = picocuries per liter

Figure 3. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS01: Period Ending September 9, 2013



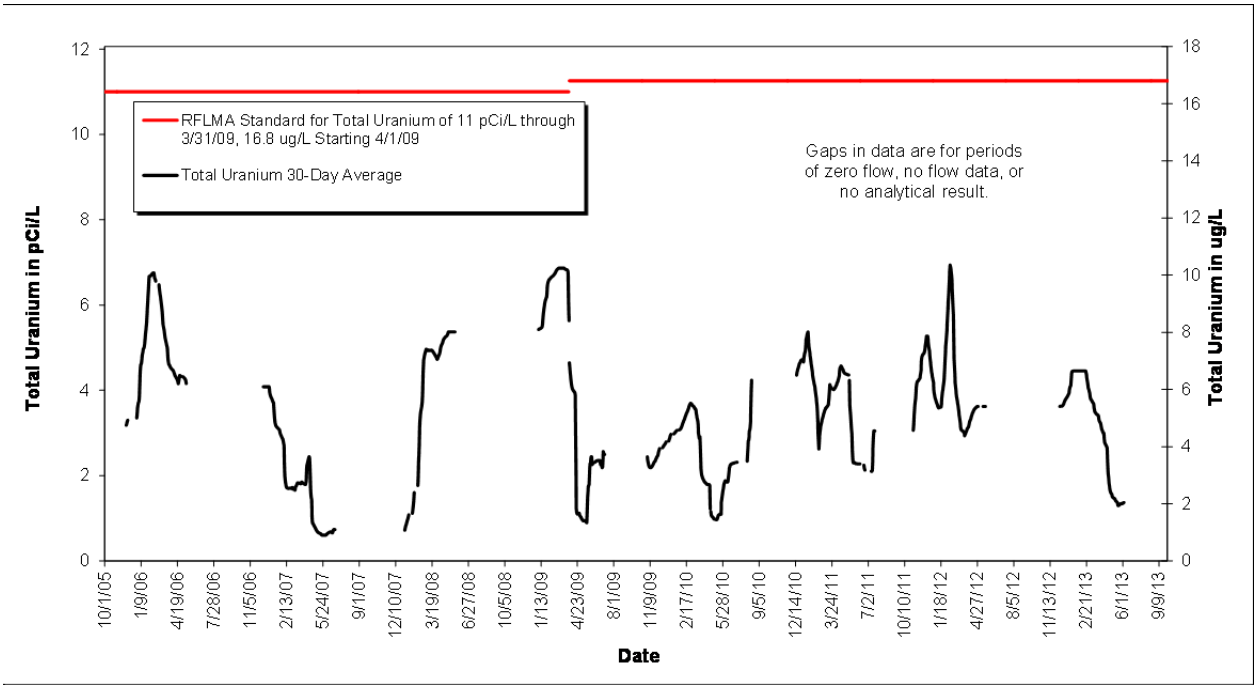
pCi/L = picocuries per liter

Figure 4. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS01: Postclosure Period Ending September 9, 2013



ug/L = µg/L = micrograms per liter

Figure 5. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS01: Period Ending September 9, 2013



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

Figure 6. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS01: Postclosure Period Ending September 9, 2013

3.1.2.2 Monitoring Location GS03

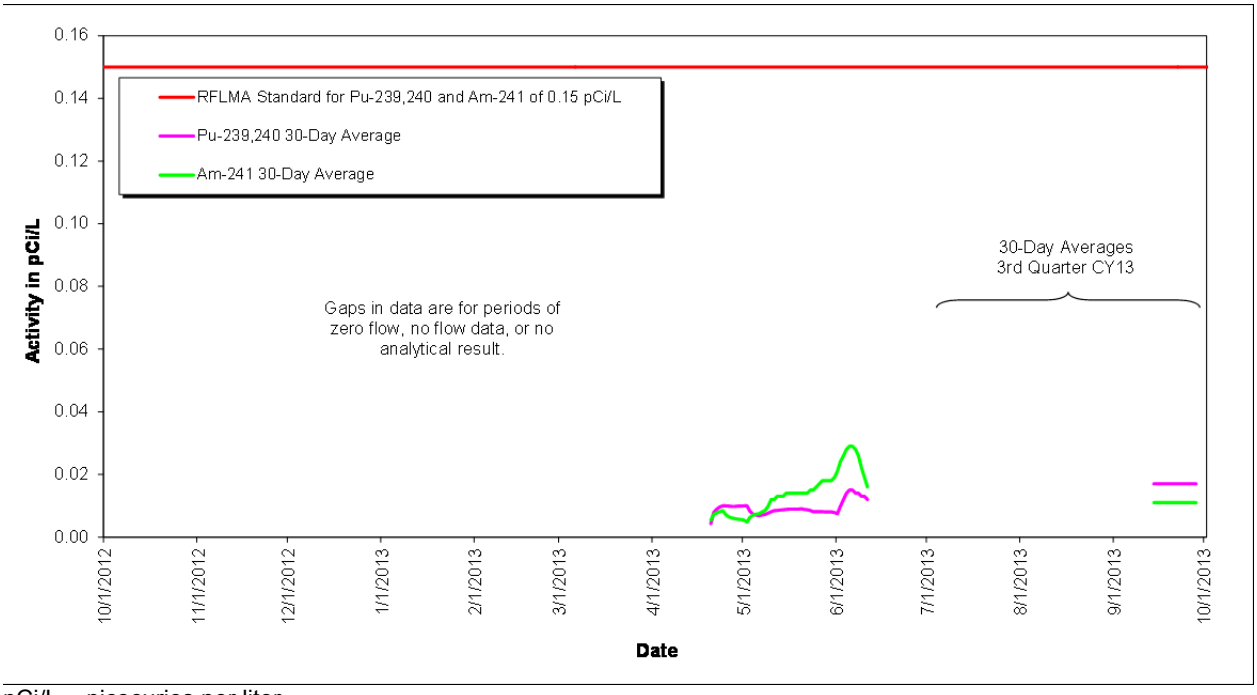
Monitoring location GS03 is on Walnut Creek at Indiana Street. Figure 7, Figure 9, and Figure 11 show no occurrences of reportable water quality for the quarter. As of September 28, 2013, GS03 is no longer an RFLMA POC. Figure 8, Figure 10, and Figure 12 show sampling data from 2005 through September 28, 2013.

Table 1 shows automated composite sampling information collected during September 2013. Flow rates could not be accurately estimated for the period 9/12/13 2:00 through 9/13/13 14:00. Therefore, no discharge volumes are available and in accordance with routine evaluation protocols, this period is not included in the calculation of 12-month rolling and 30-day averages.

Table 1. September 2013 Composite Sampling Detail for POC GS03

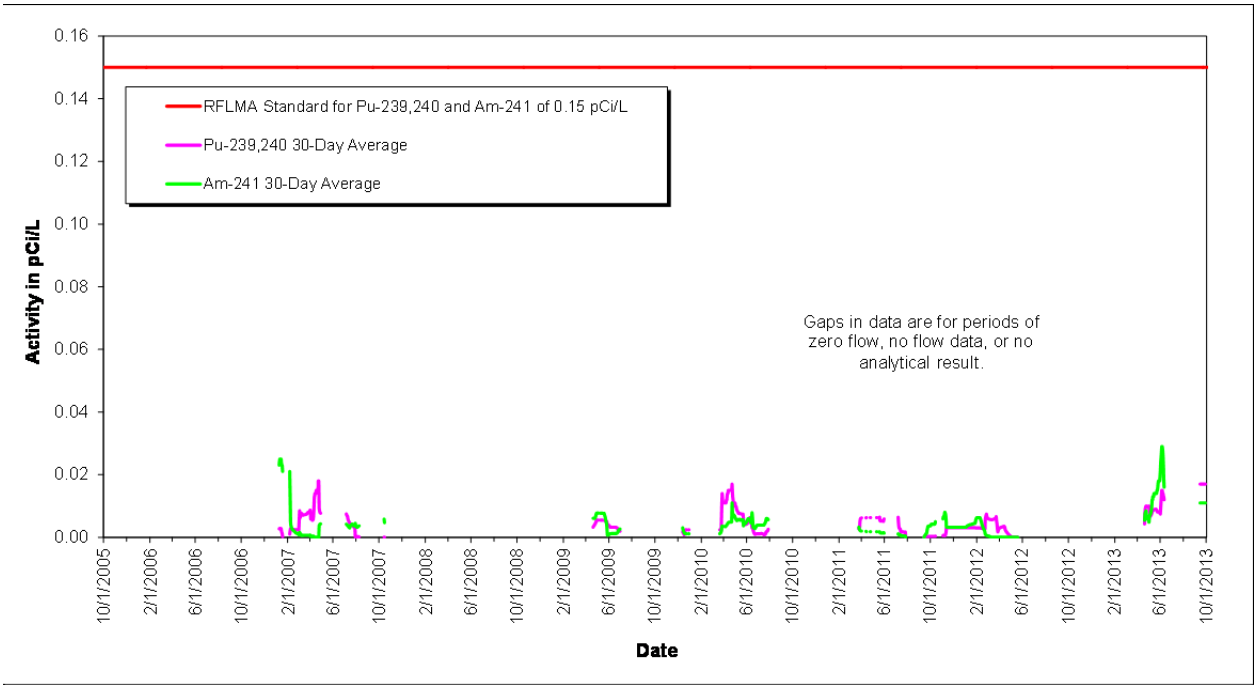
Sampling Period	Number of Grabs	Sample Results			Flow Volume (MG)	Flow Rates (CFS)	Comments
		Am-241 (pCi/L)	Pu-239, 240 (pCi/L)	Uranium (µg/L)			
6/25 12:07–9/12 14:36	249	0.016	0.036	8.90	NA	NA	Sampler was full on 9/12 from 7:28 to 14:36
9/12 14:36–9/14 9:50	251	0.032	0.042	2.15	NA	NA	Sampler was full for the period 9/14 6:43 to 9:50
9/14 9:50–10/2 14:37	52	0.011	0.017	2.91	50.2	0.2–68.4	

Notes:
CFS = cubic feet per second
µg/L = micrograms per liter
MG = million gallons
NA = not analyzed
pCi/L = picocuries per liter



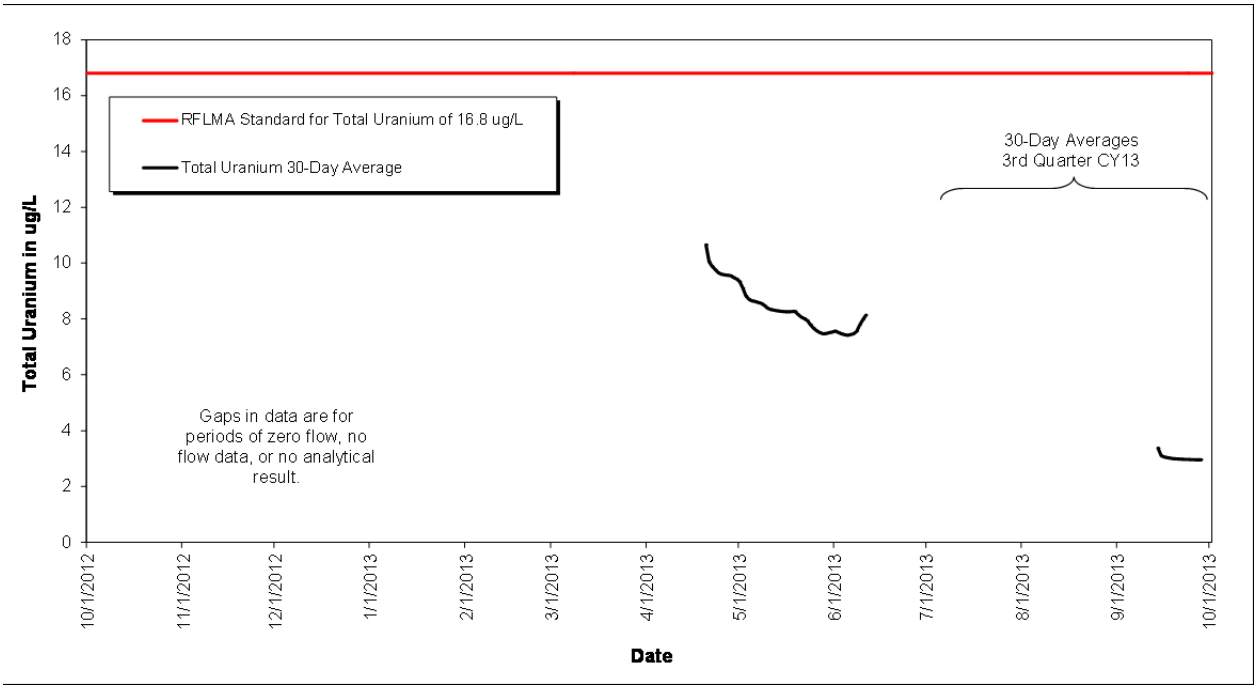
pCi/L = picocuries per liter

Figure 7. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS03: Year Ending Third Quarter CY 2013



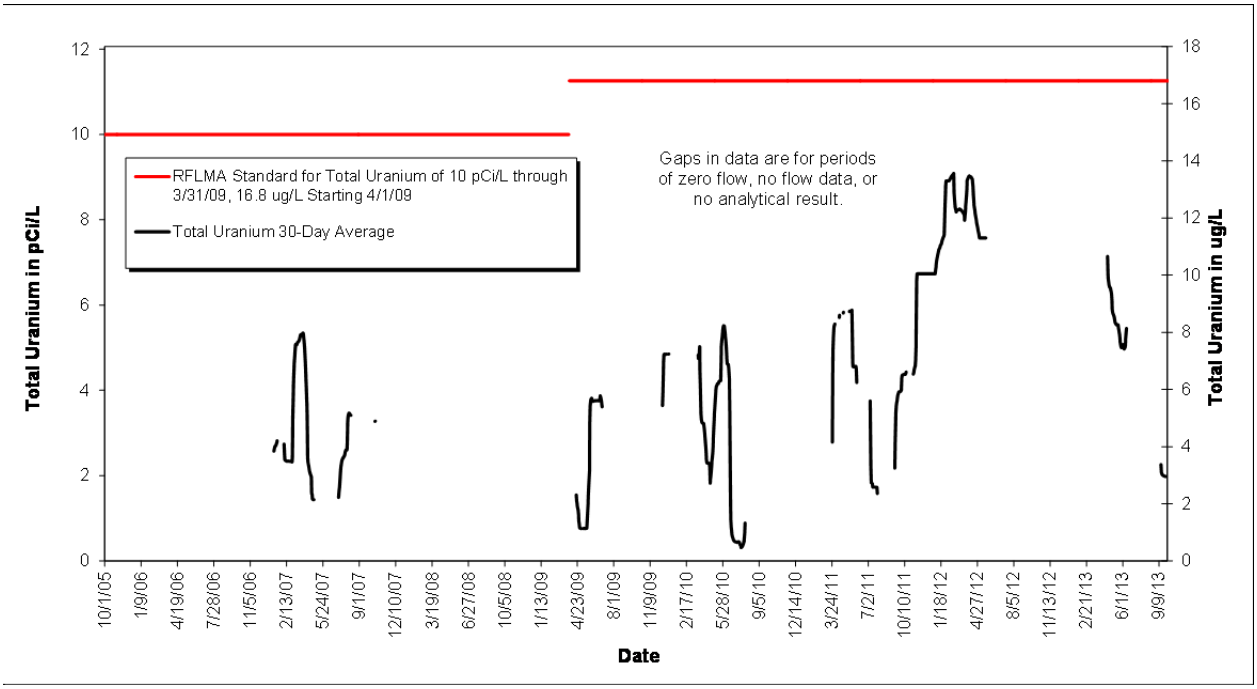
pCi/L = picocuries per liter

Figure 8. Volume-Weighted 30-Day Average Plutonium and Americium Activities at GS03: Postclosure Period Ending Third Quarter CY 2013



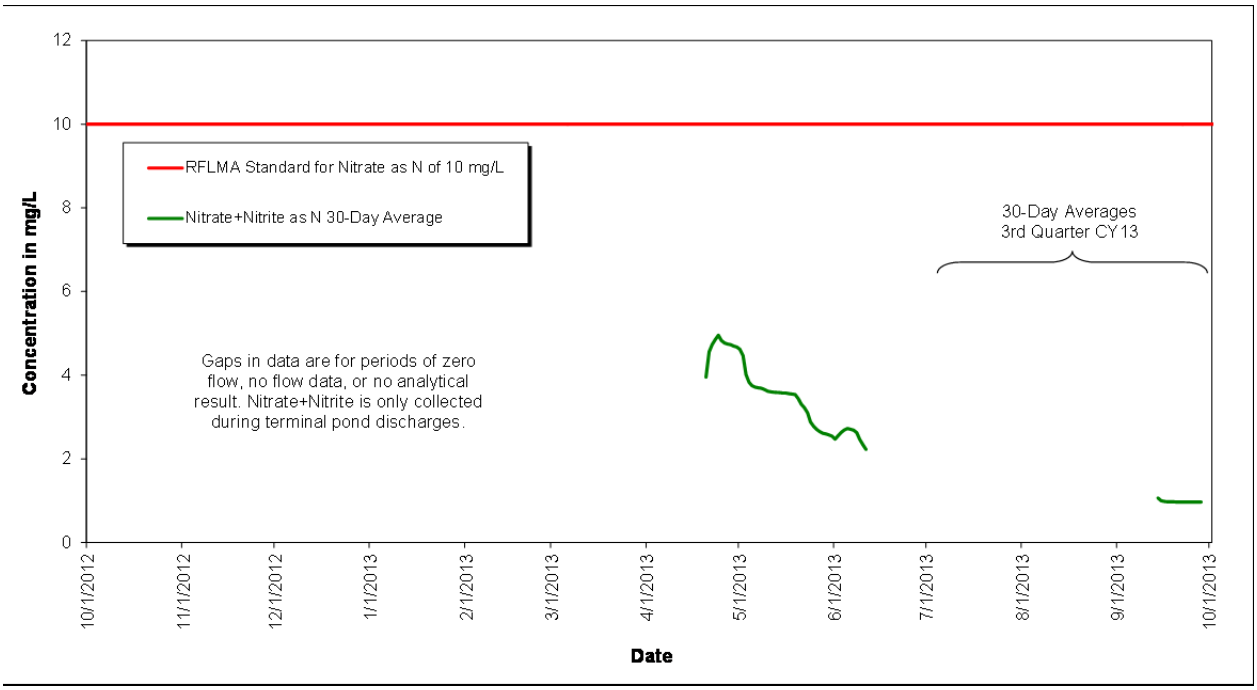
ug/L = µg/L = micrograms per liter

Figure 9. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS03: Year Ending Third Quarter CY 2013



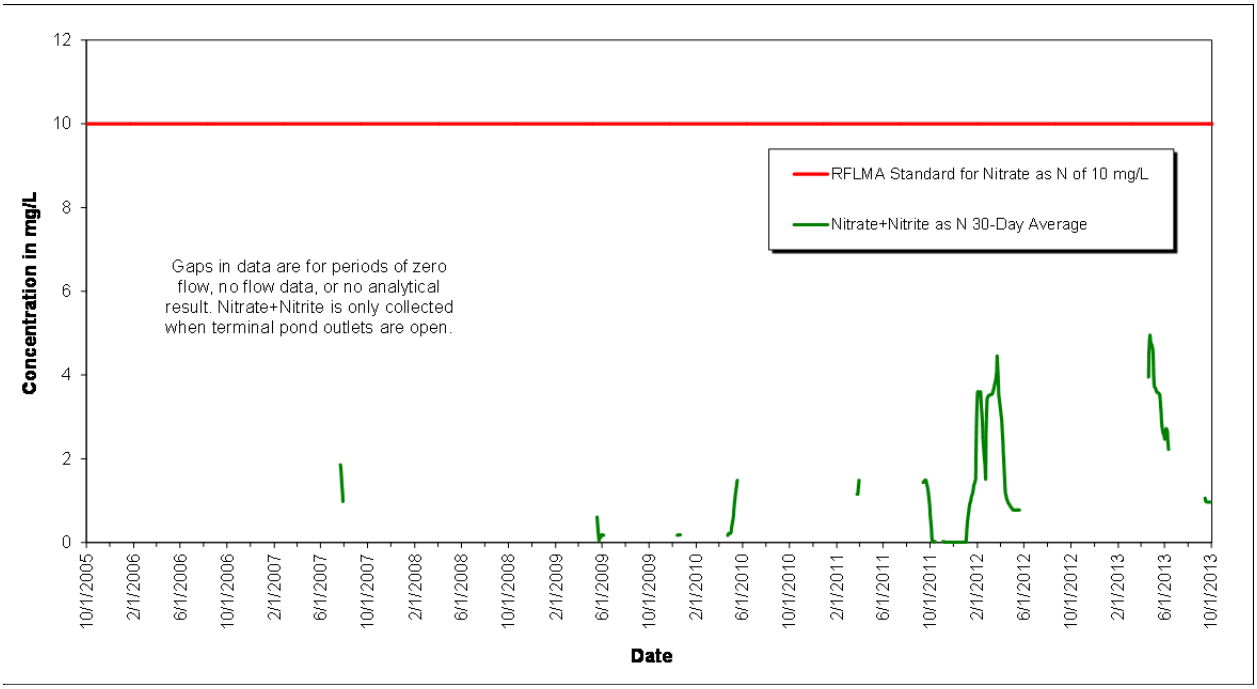
ug/L = µg/L = micrograms per liter
pCi/L = picocuries per liter

Figure 10. Volume-Weighted 30-Day Average Total Uranium Concentrations at GS03: Postclosure Period Ending Third Quarter CY 2013



mg/L = milligrams per liter
N = nitrogen

Figure 11. Volume-Weighted 30-Day Average Nitrate + Nitrite as Nitrogen Concentrations at GS03: Year Ending Third Quarter CY 2013



mg/L = milligrams per liter
N = nitrogen

Figure 12. Volume-Weighted 30-Day Average Nitrate + Nitrite as Nitrogen Concentrations at GS03: Postclosure Period Ending Third Quarter CY 2013

3.1.2.3 Monitoring Location WALPOC

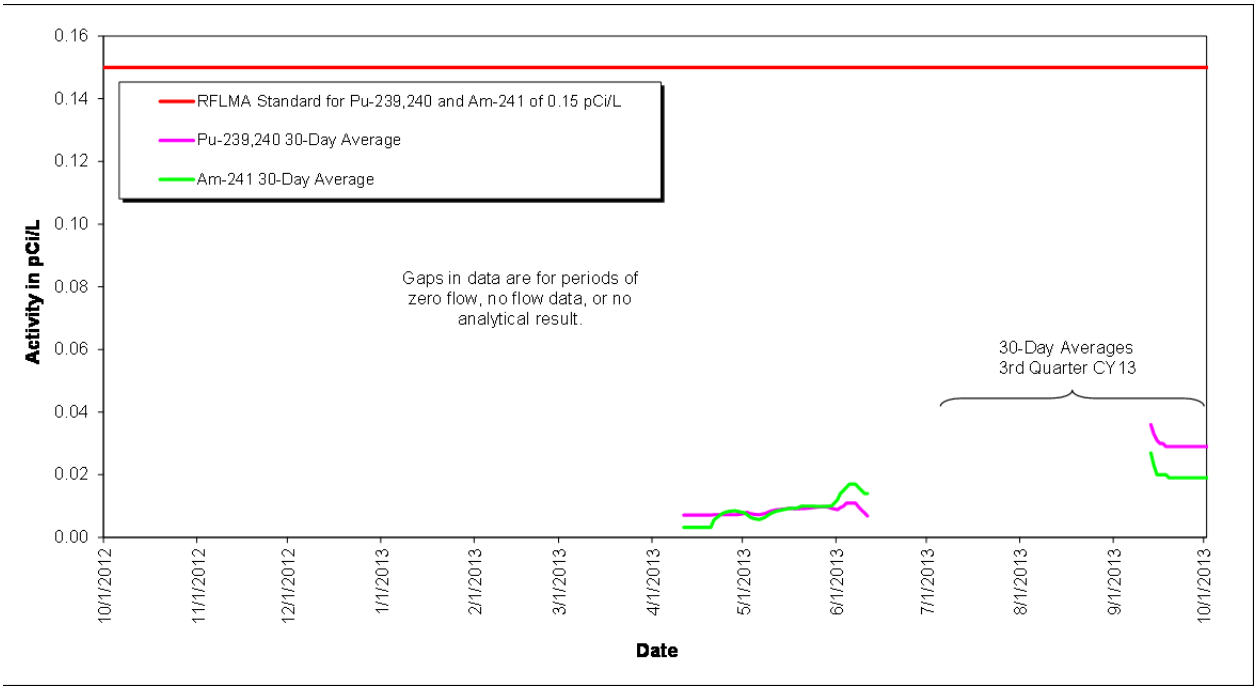
Monitoring location WALPOC is on Walnut Creek at the eastern COU boundary. Figure 13 through Figure 18 show no occurrences of reportable 12-month rolling or 30-day averages for the quarter using the available data.

Table 2 shows automated composite sampling information collected during September 2013. It should be noted that the sampler was full and did not collect any water for the period 9/12/13 7:08 to 9/13/13 14:54. Therefore, no analytical results are available and in accordance with routine evaluation protocols, this period is not included in the calculation of 12-month rolling and 30-day averages.

Table 2. September 2013 Composite Sampling Detail for POC WALPOC

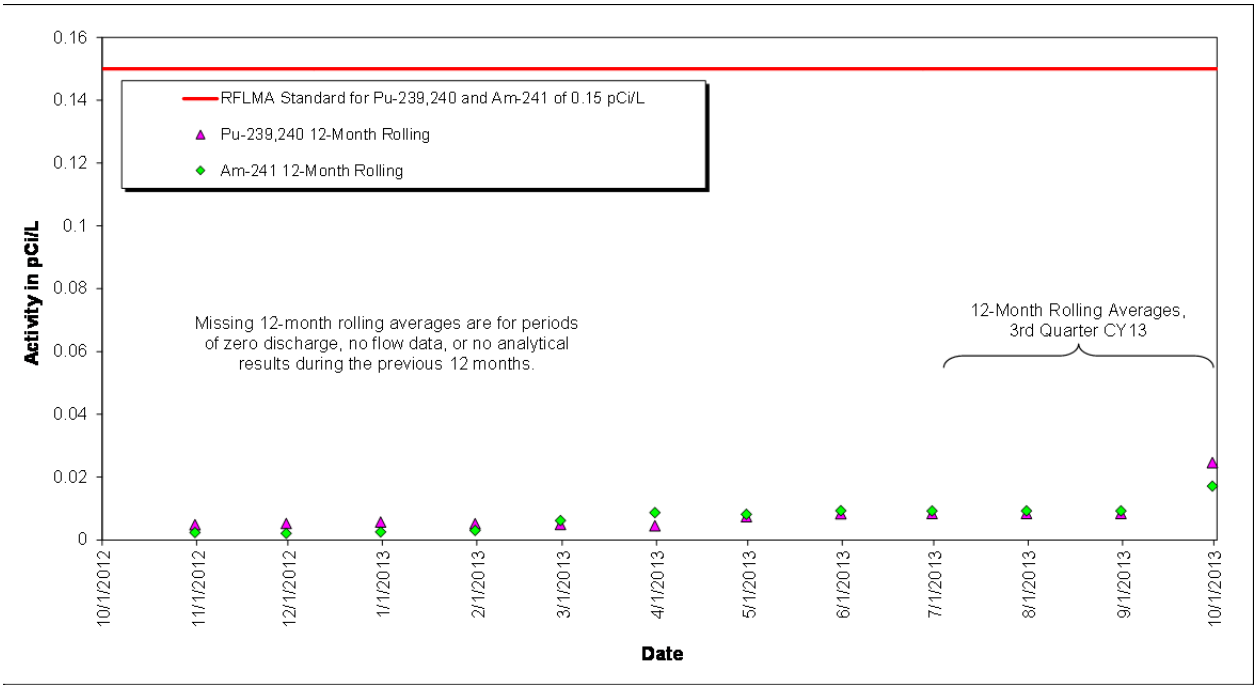
Sampling Period	Number of Grabs	Sample Results			Flow Volume (MG)	Flow Rates (CFS)	Comments
		Am-241 (pCi/L)	Pu-239,240 (pCi/L)	Uranium (µg/L)			
6/4 13:19–9/12 7:08	231	0.007	0.026	3.21	5.14	0.0–30.8 (est)	Sampler filled at 9/12 7:08
9/12 7:08–9/13 14:54	0 NSQ	NA	NA	NA	43.2 (est)	22.3–83.5 (est)	Sampler was full for this period and no water was collected
9/13 14:54–9/14 11:54	62	0.028	0.039	1.99	17.5 (est)	22.5–41.8 (est)	
9/14 11:54–9/16 11:20	89	0.013	0.025	2.55	25.1 (est)	6.2–41.6 (est)	
9/16 11:20–10/25 14:12	32	0.010	0.010	11.5	10.2	0.12–6.1	

Notes:
CFS = cubic feet per second
est = estimated
µg/L = micrograms per liter
MG = million gallons
NA = not analyzed
NSQ = nonsufficient quantity for analysis
pCi/L = picocuries per liter



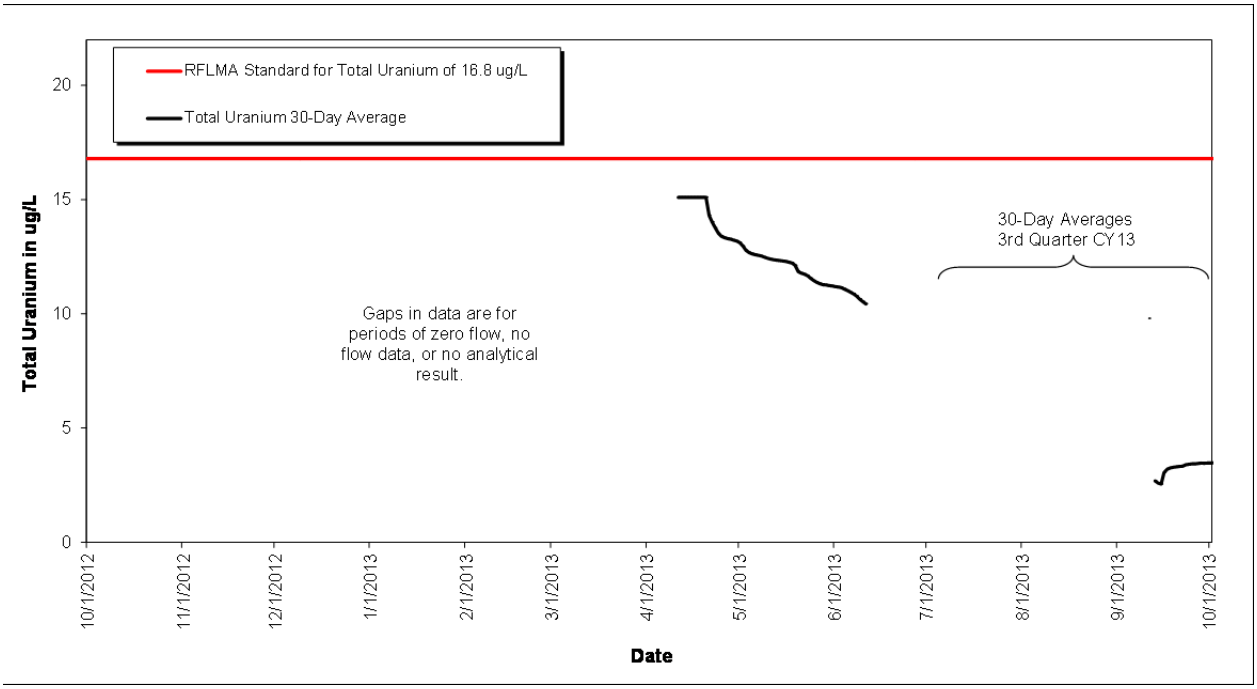
pCi/L = picocuries per liter

Figure 13. Volume-Weighted 30-Day Average Plutonium and Americium Activities at WALPOC: Year Ending Third Quarter CY 2013



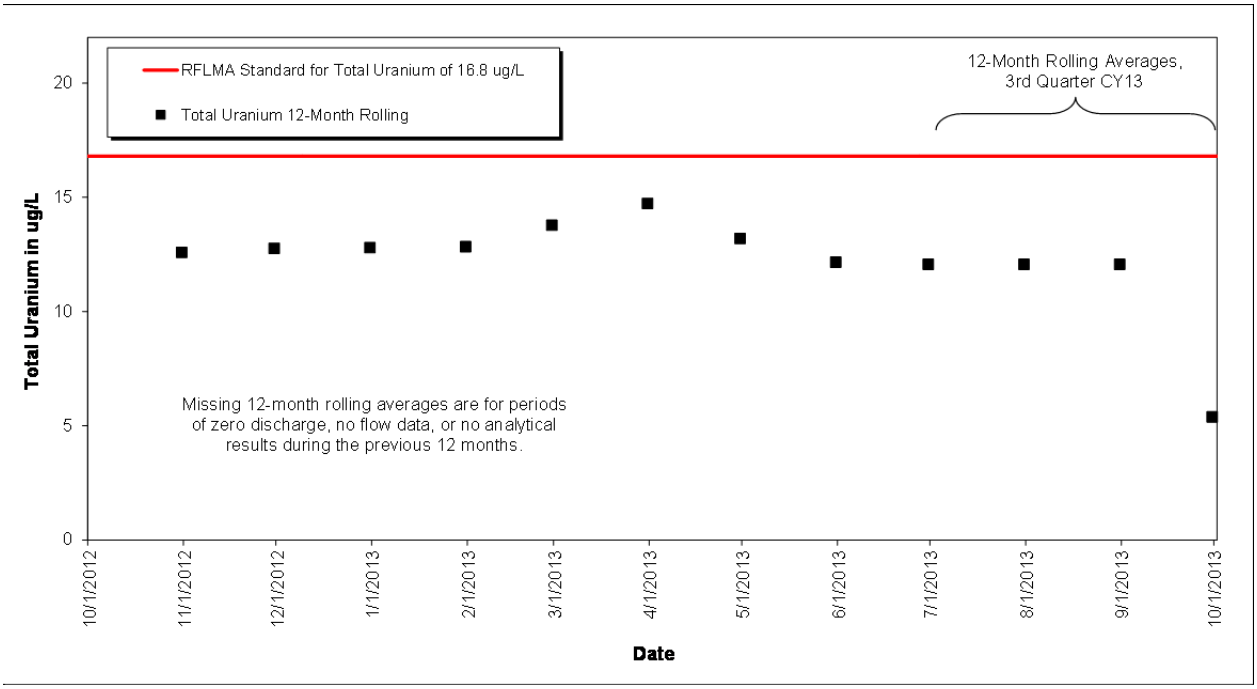
pCi/L = picocuries per liter

Figure 14. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at WALPOC: Year Ending Third Quarter CY 2013



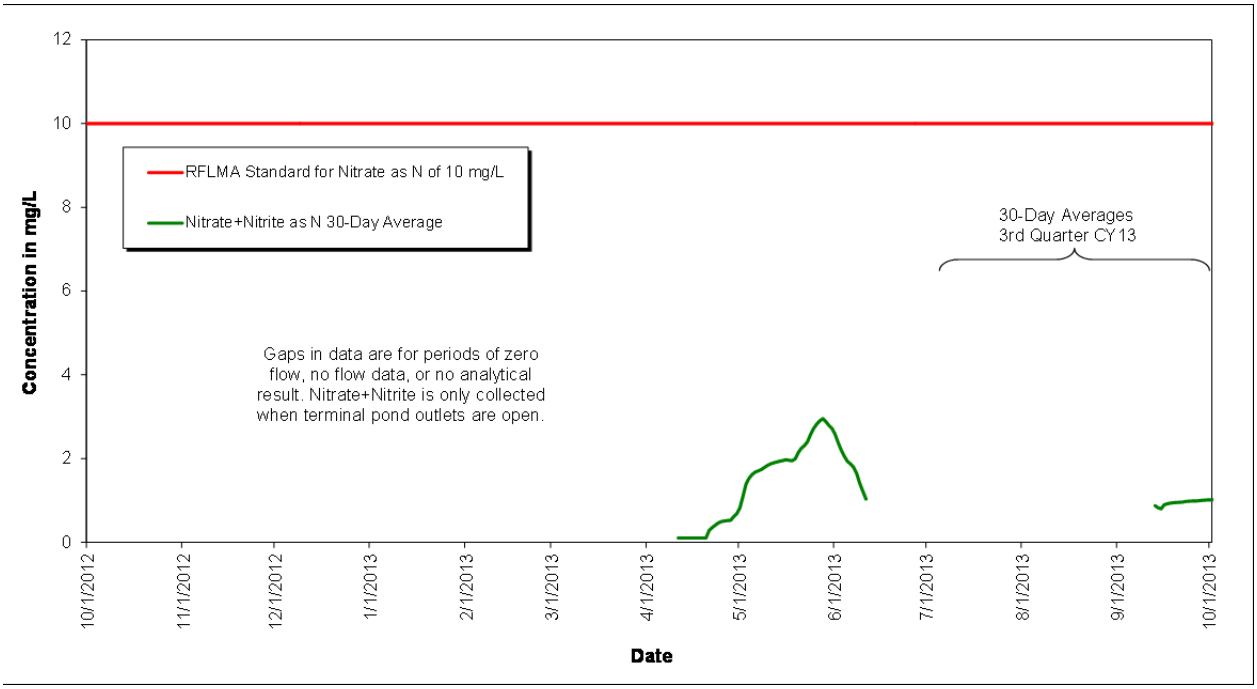
ug/L = µg/L = micrograms per liter

Figure 15. Volume-Weighted 30-Day Average Total Uranium Concentrations at WALPOC: Year Ending Third Quarter CY 2013



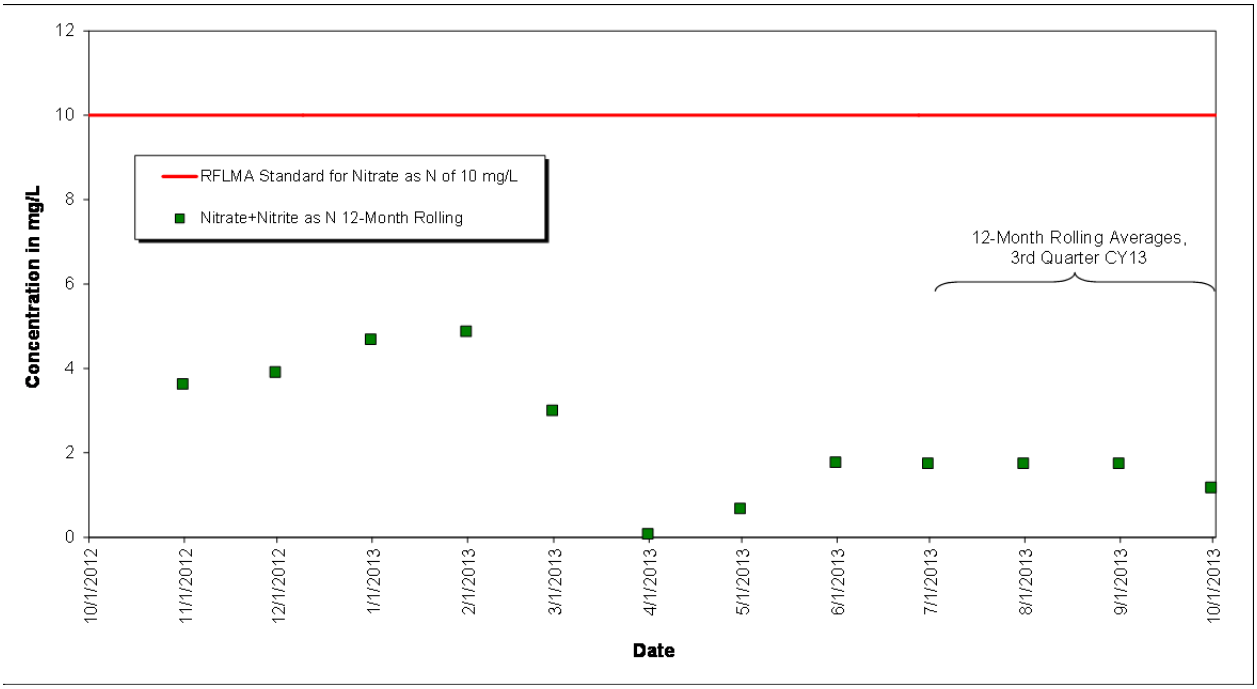
ug/L = µg/L = micrograms per liter

Figure 16. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at WALPOC: Year Ending Third Quarter CY 2013



mg/L = milligrams per liter
N = nitrogen

Figure 17. Volume-Weighted 30-Day Average Nitrate + Nitrite as Nitrogen Concentrations at WALPOC: Year Ending Third Quarter CY 2013



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

Figure 18. Volume-Weighted 12-Month Rolling Average Nitrate + Nitrite as Nitrogen Concentrations at WALPOC: Year Ending Third Quarter CY 2013

3.1.2.4 Monitoring Location WOMPOC

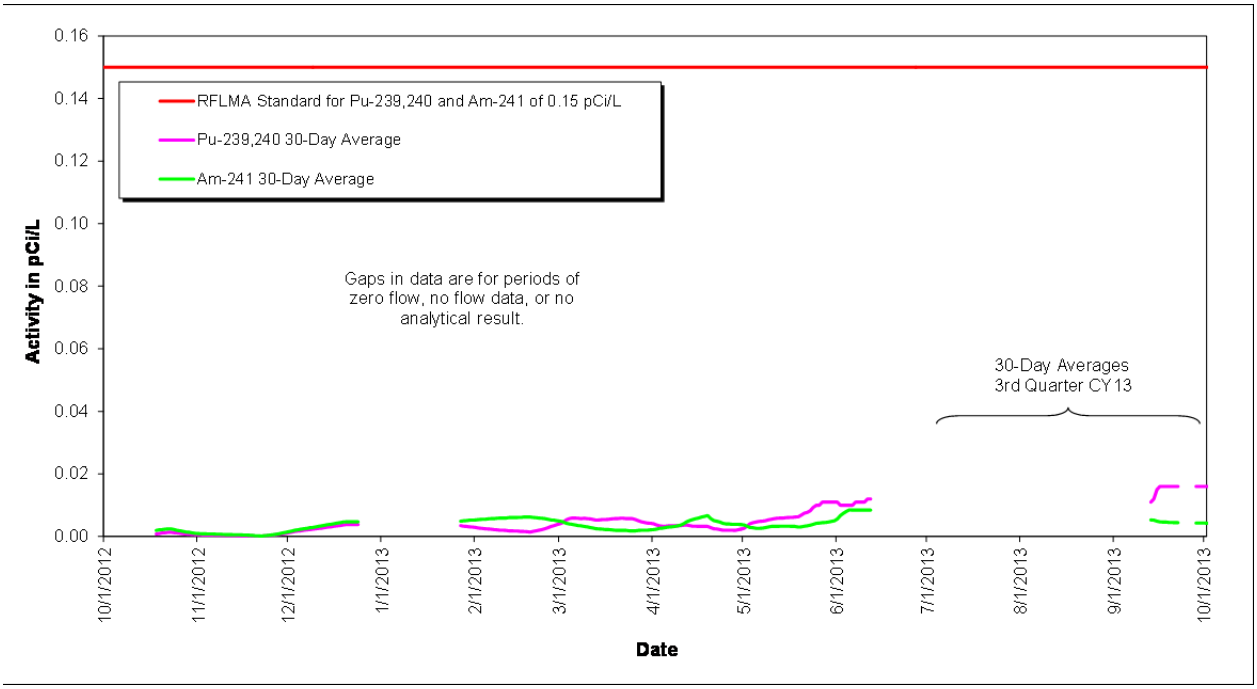
Monitoring location WOMPOC is on Woman Creek at the eastern COU boundary. Figure 19 through Figure 22 show no occurrences of reportable 12-month rolling or 30-day averages for the quarter.

Table 3 shows automated composite sampling information collected during September 2013. It should be noted that the sampler was full and did not collect any water for the period 9/12/13 14:13 to 9/13/13 12:23. For the period 9/23/13 13:37 to 9/28/13 9:24, the sampler pacing was too large for the actual flows and only two grab samples were collected. These two grabs were discarded and a more appropriate pace was selected on September 28, 2013. Therefore, no analytical results are available for these two periods and in accordance with routine evaluation protocols, these periods are not included in the calculation of 12-month rolling and 30-day averages.

Table 3. September 2013 Composite Sampling Detail for POC WOMPOC

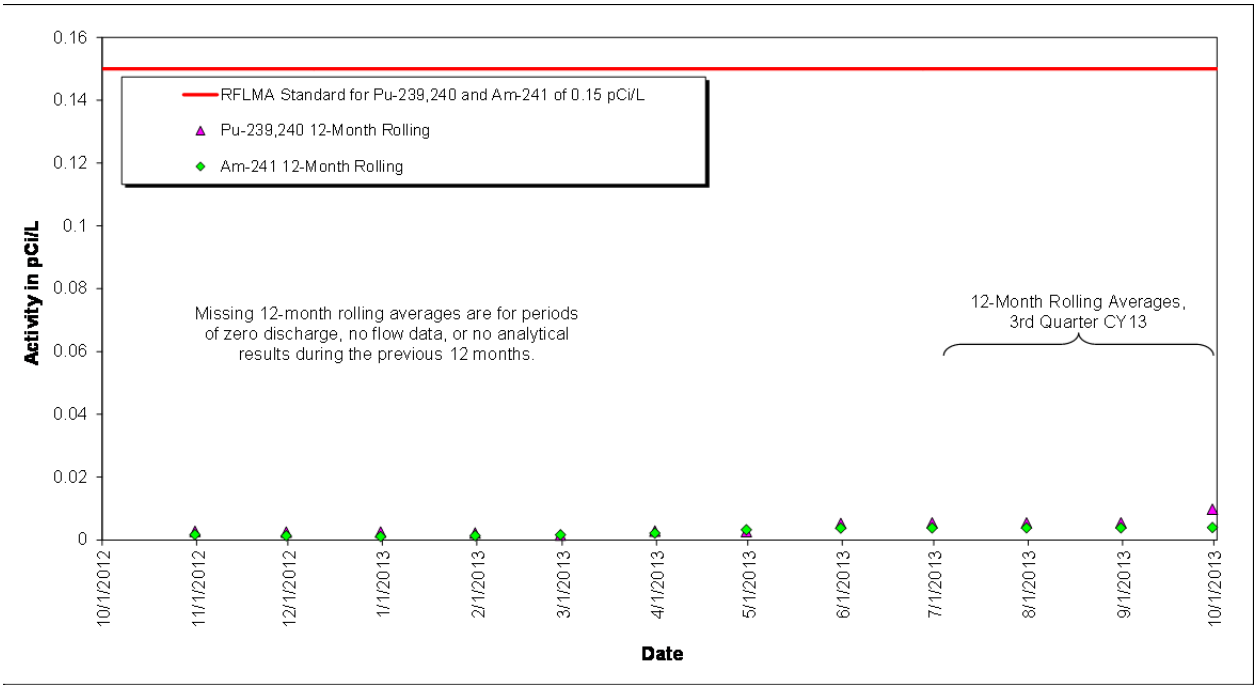
Sampling Period	Number of Grabs	Sample Results			Flow Volume (MG)	Flow Rates (CFS)	Comments
		Am-241 (pCi/L)	Pu-239,240 (pCi/L)	Uranium (µg/L)			
6/6 10:20–9/12 14:13	250	0.007	0.038	7.11	48.5 (est)	0.0–682 (est)	Sampler filled 9/12 14:13
9/12 14:13–9/13 12:23	0 NSQ	NA	NA	NA	74.8 (est)	24.4–414 (est)	
9/13 12:23–9/14 10:50	127	0.005	0.009	1.14	6.44 (est)	3.3–29.8 (est)	Sampler was full on 9/14 from 8:05 to 10:50
9/14 10:50–9/19 11:39	58	0.004	0.023	1.44	16.1 (est)	0.7–33.7 (est)	
9/19 11:39–9/23 13:37	85	0.0	0.002	2.35	1.65 (est)	0.3–4.2 (est)	
9/23 13:37–9/28 9:24	2 NSQ	NA	NA	NA	1.48 (est)	0.2–1.7 (est)	Only two grabs collected and discarded.
9/28 9:24–10/7 14:43	76	0.001	0.002	2.89	3.05	0.2–2.4	

Notes:
CFS = cubic feet per second
est = estimated
µg/L = micrograms per liter
MG = million gallons
NA = not analyzed
NSQ = nonsufficient quantity for analysis
pCi/L = picocuries per liter



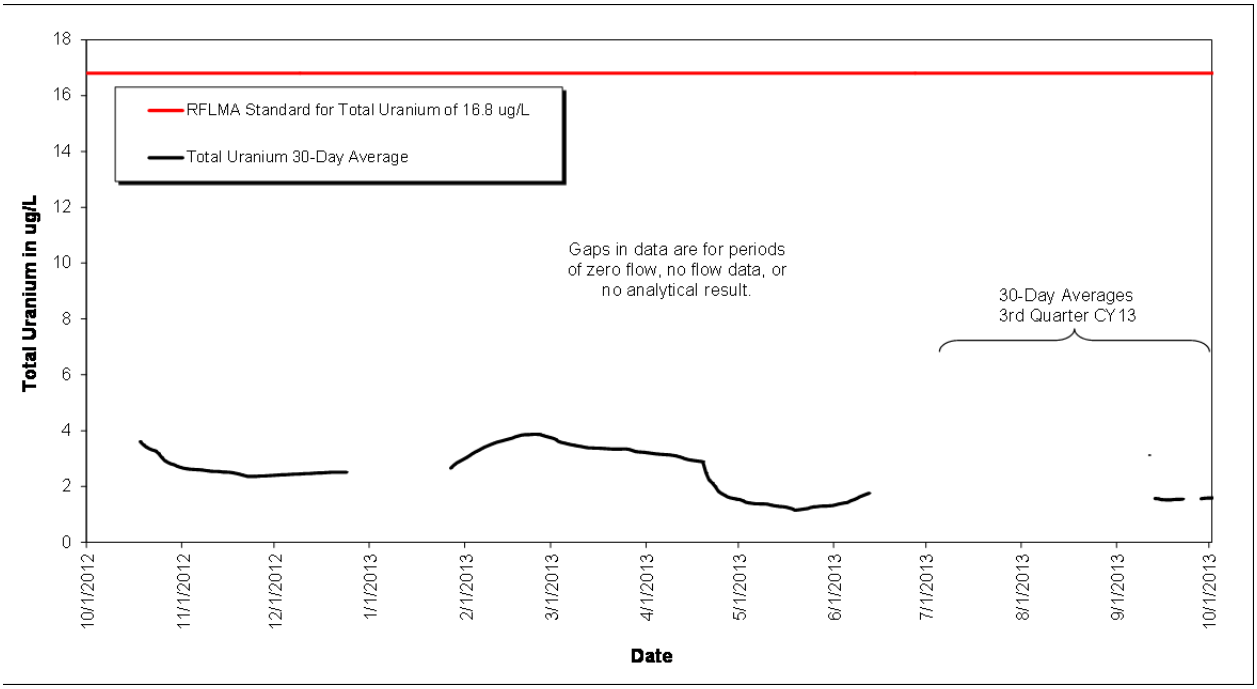
pCi/L = picocuries per liter

Figure 19. Volume-Weighted 30-Day Average Plutonium and Americium Activities at WOMPOC: Year Ending Third Quarter CY 2013



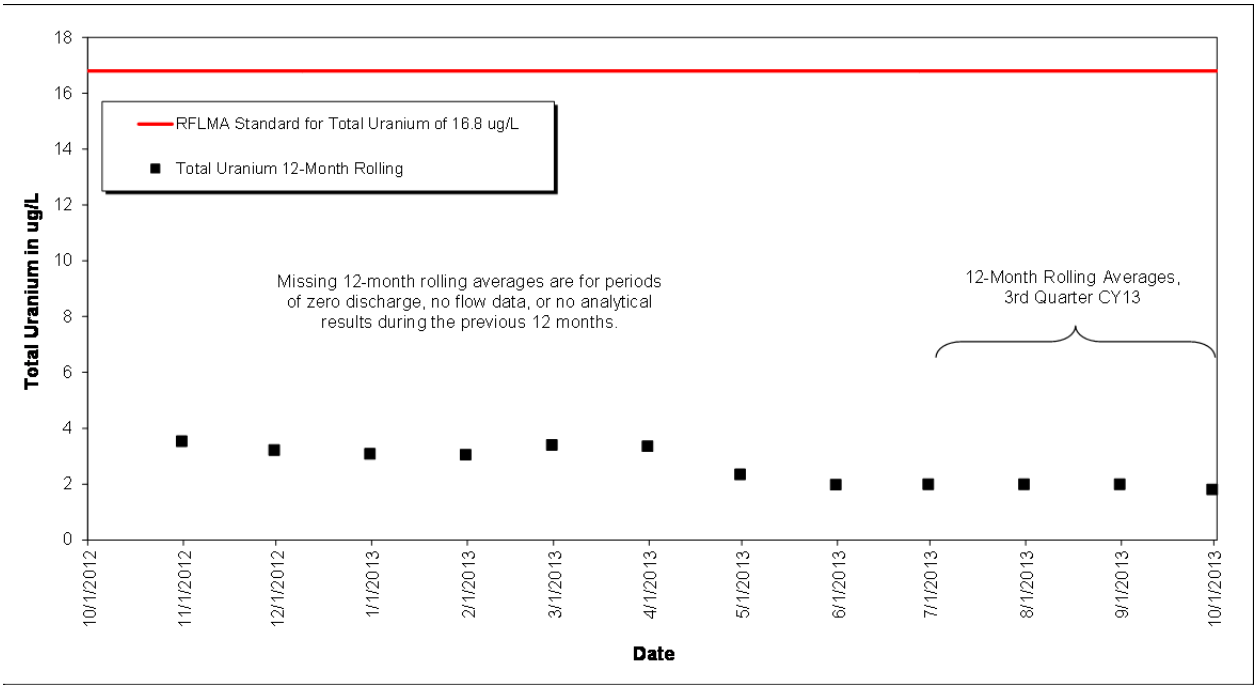
pCi/L = picocuries per liter

Figure 20. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at WOMPOC: Year Ending Third Quarter CY 2013



ug/L = µg/L = micrograms per liter

Figure 21. Volume-Weighted 30-Day Average Total Uranium Concentrations at WOMPOC: Calendar Year Ending Third Quarter CY 2013



ug/L = µg/L = micrograms per liter

Figure 22. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at WOMPOC: Calendar Year Ending Third Quarter CY 2013

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 23 and Figure 25 show the 12-month rolling averages for plutonium, americium, and total uranium values during the quarter. Figure 24 and Figure 26 show sampling data from 2005 through the third quarter of CY 2013.

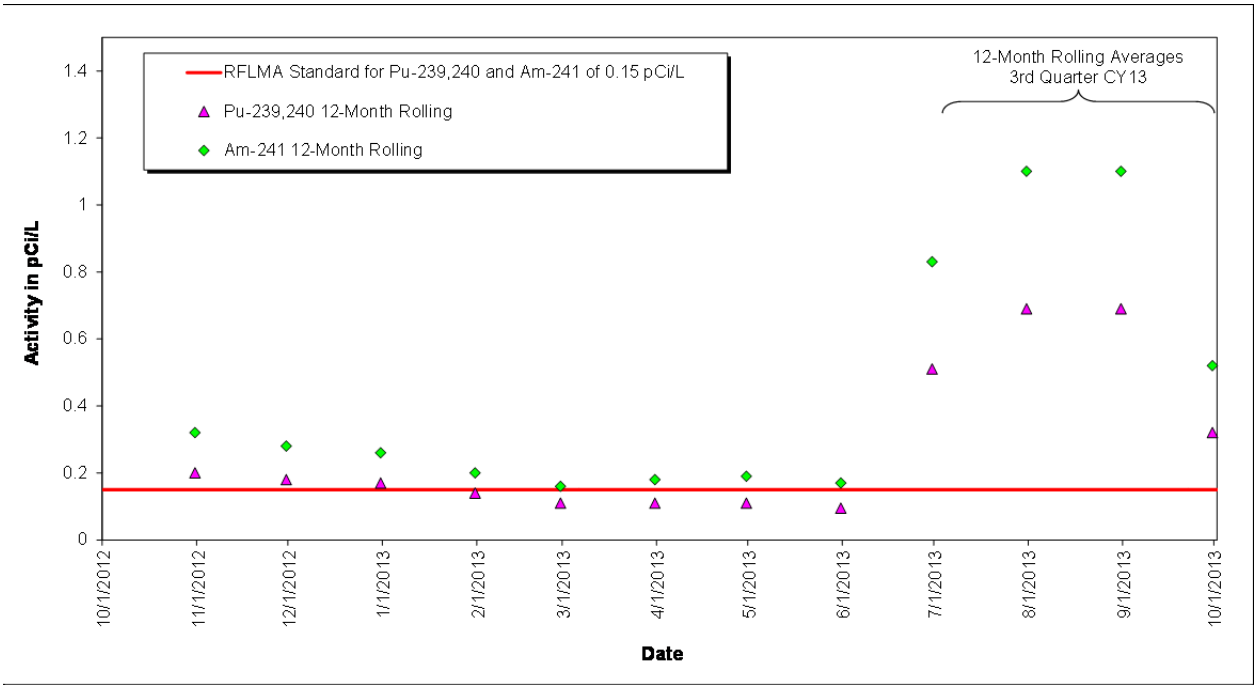
Table 4 shows automated composite sampling information collected during September 2013. It should be noted that the sampler was full and did not collect any water for the period 9/11/13 21:49 to 9/13/13 15:30. Therefore, no analytical results are available for this period and in accordance with routine evaluation protocols, this period is not included in the calculation of 12-month rolling and 30-day averages.

Table 4. September 2013 Composite Sampling Detail for POE GS10

Sampling Period	Number of Grabs	Sample Results			Flow Volume (MG)	Flow Rates (CFS)	Comments
		Am-241 (pCi/L)	Pu-239,240 (pCi/L)	Uranium (µg/L)			
8/9 13:06–9/11 21:49	109	0.041	0.033	5.61	0.85	0.0–15.7	Sampler filled 9/11 21:49
9/11 21:49–9/13 15:30	0 NSQ	NA	NA	NA	16.0 (est)	1.4–65.1 (est)	Sampler full 9/11 21:49–9/13 15:30
9/13 15:30–9/16 12:09	110	0.0	0.012	5.55	3.0	0.2–13.2	Sampler was full 9/15 17:06–9/16 12:09
9/16 12:09–9/24 16:26	41	0.013	0.010	12.7	1.2	0.1–1.3	
9/24 16:26–10/16 14:45	47	0.009	0.002	16.3	1.4	0.04–0.4	

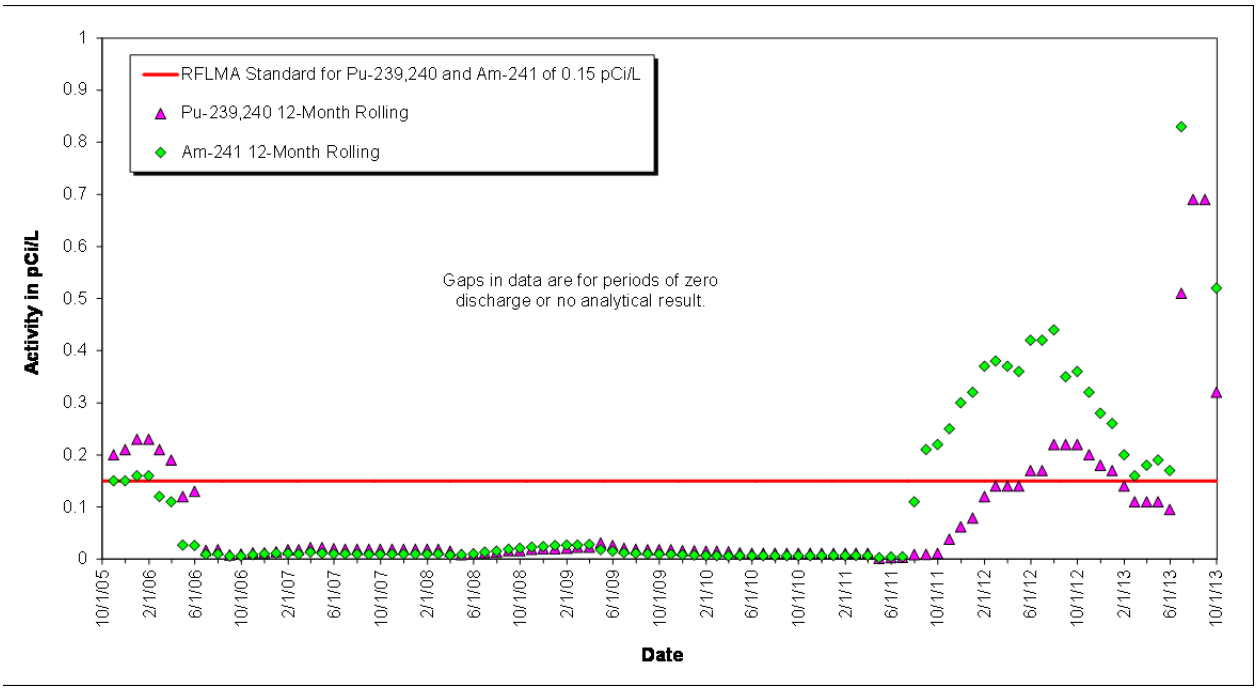
Notes:
CFS = cubic feet per second
est = estimated
µg/L = micrograms per liter
MG = million gallons
NA = not analyzed
NSQ = nonsufficient quantity for analysis
pCi/L = picocuries per liter

Reportable 12-month rolling average uranium concentrations were observed in surface water at RFLMA POE monitoring station GS10 starting on April 30, 2011. Reportable 12-month rolling average americium and plutonium activities were also observed starting on August 31, 2011, and May 31, 2012, respectively. As of the end of the third quarter of CY 2013, only plutonium and americium were still reportable.



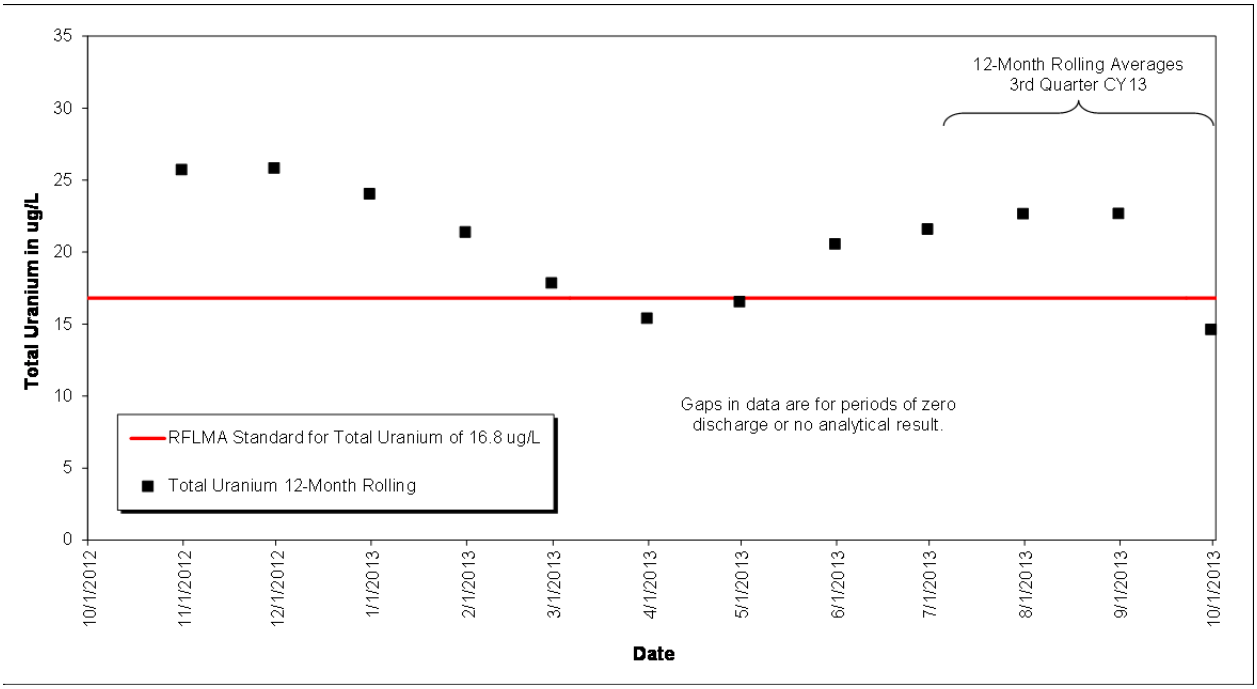
pCi/L = picocuries per liter

Figure 23. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS10: Year Ending Third Quarter CY 2013



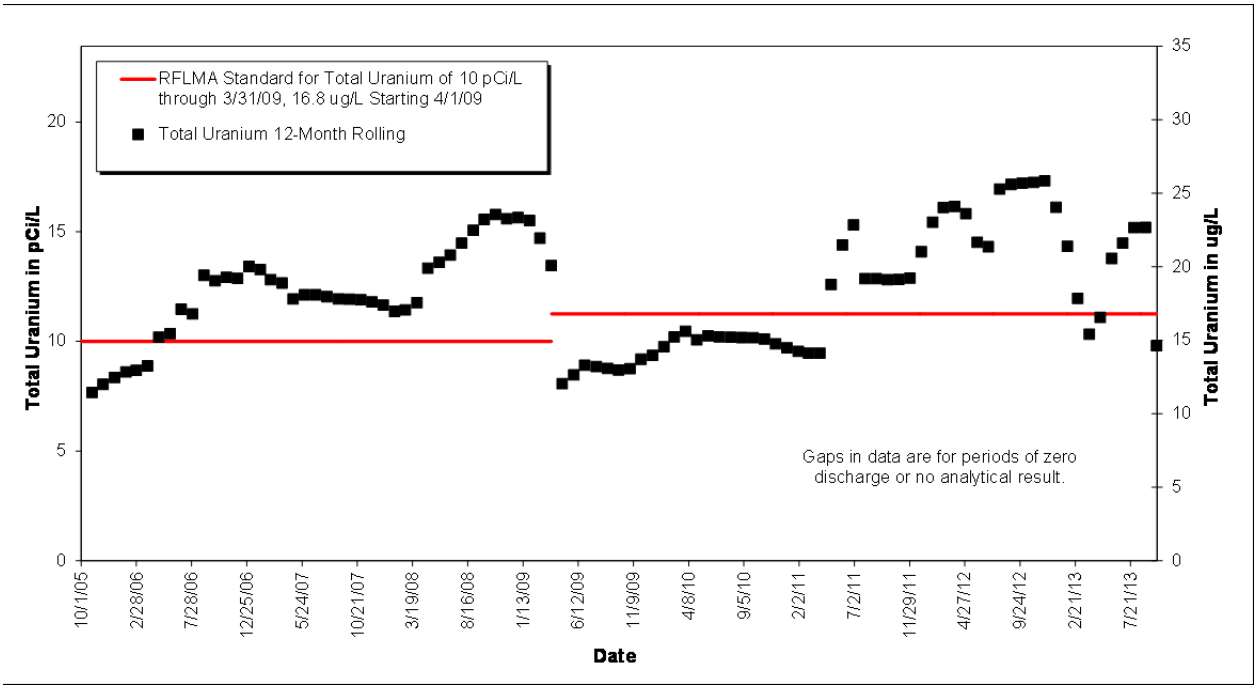
pCi/L = picocuries per liter

Figure 24. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at GS10: Postclosure Period Ending Third Quarter CY 2013



ug/L = µg/L = micrograms per liter

Figure 25. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at GS10: Year Ending Third Quarter CY 2013



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

Figure 26. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at GS10: Postclosure Period Ending Third Quarter CY 2013

The sampling results for plutonium, americium, and uranium from composite samples collected at GS10 during CY 2013 are given in Table 5.

Table 5. CY 2013 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)
12/4/2012–10:44	1/10/2013–10:39	0.054	0.032	12.3
1/10/2013–10:39	3/4/2013–11:22	NSQ	NSQ	NSQ
3/4/2013–11:22	4/1/2013–10:35	0.724	0.325	39.5
4/1/2013–10:35	4/20/2013–18:54	0.183	0.110	28.8
4/20/2013–18:54	4/24/2013–9:51	0.221	0.131	27.2
4/24/2013–9:51	4/29/2013–12:21	0.133	0.085	26.3
4/29/2013–12:21	5/3/2013–12:24	0.191	0.080	36.5
5/3/2013–12:24	5/8/2013–9:01	0.353	0.201	34.2
5/8/2013–9:01	5/16/2013–11:04	0.038	0.029	18.9
5/16/2013–11:04	5/28/2013–10:54	0.023	0.014	26.8
5/28/2013–10:54	6/14/2013–9:12	0.145	0.058	19.4
6/14/2013–9:12	7/3/2013–7:36	8.41	5.28	21.9
7/3/2013–7:36	8/9/2013–13:06	4.54	2.82	28.8
8/9/2013–13:06	9/11/201–21:49	0.041	0.033	5.61
9/11/2013–21:49	9/13/201–15:30	NSQ	NSQ	NSQ
9/13/201–5:30	9/16/201–12:09	0.0	0.012	5.55
9/16/201–12:09	9/24/201–16:26	0.013	0.010	12.7
9/24/201–16:26	10/16/201–14:45	0.009	0.002	16.3
10/16/201–14:45	11/13/201–13:49	[b]	[b]	[b]
11/13/201–13:49	In Progress	[a]	[a]	[a]

Recent results after the second quarter of CY 2013 are not yet validated and are subject to revision.
[a] Sample in progress
[b] Analysis pending
µg/L = micrograms per liter
NSQ = nonsufficient sample quantity due to ice or full sampler due to excessively high runoff
pCi/L = picocuries per liter

Reportable Americium and Plutonium Activities at GS10

Formal notification of a reportable condition for 12-month rolling average americium values at GS10 was made on December 12, 2011. Formal notification of a reportable condition for 12-month rolling average plutonium values at GS10 was made on July 24, 2012.

The above notifications were triggered by routine data evaluation performed in accordance with RFLMA Attachment 2, Figure 6, "Points of Evaluation," which resulted in 12-month rolling average values for americium of 0.21 picocurie per liter (pCi/L) on August 31, 2011, and 0.22 pCi/L on September 30, 2011. As of June 30, 2013, using validated data, the 12-month rolling average for americium remained above the standard at 0.83 pCi/L. Similarly, data evaluation resulted in a 12-month rolling average value for plutonium of 0.17 pCi/L on May 31, 2012. As of September 30, 2013, using validated data, the 12-month rolling average for both americium and plutonium remained above the standard at 0.52 pCi/L and 0.32 pCi/L, respectively. The applicable RFLMA Table 1 standard for americium and plutonium is 0.15 pCi/L.

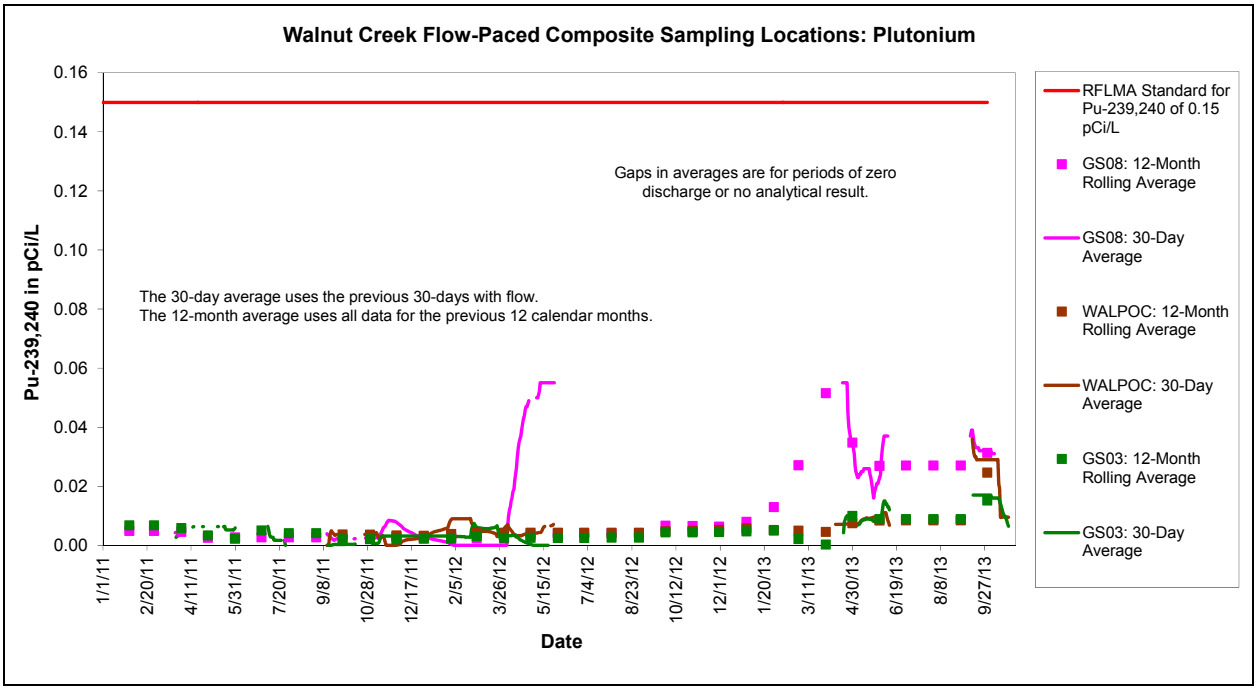
Downstream monitoring at GS08, WALPOC, and GS03 continue to show plutonium and americium activities below the RFLMA standard of 0.15 pCi/L. Recent analytical results from these downstream locations are given in Table 6. The latest available 12-month rolling and 30-day average plutonium and americium activities calculated from flow-paced composite samples are shown on Figure 27 and Figure 28.

An aliquot from each flow-paced composite sample routinely being collected at B5INFLOW (supporting the GS10 uranium evaluation; Figure 29) is also being held for plutonium and americium analysis if upstream sample results at GS10 suggest analysis would inform the evaluation. To date, 10 plutonium and americium results have been obtained and all results are well below the RFLMA standard of 0.15 pCi/L. The highest single result is 0.012 pCi/L of americium for the March 14–April 1, 2013, composite sample.

Table 6. Recent Plutonium and Americium Flow-Paced Composite Sample Results

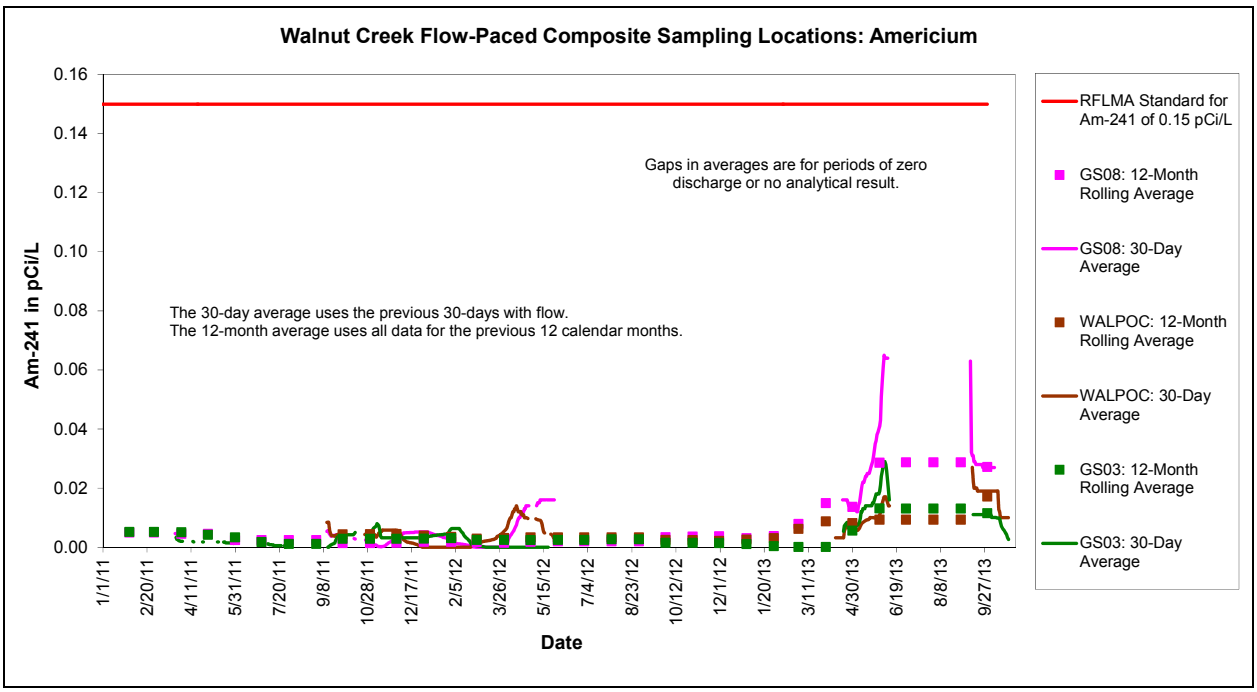
GS08		WALPOC		GS03	
Sample Period	**Result Am/Pu (pCi/L)**	**Sample Period**	**Result Am/Pu (pCi/L)**	**Sample Period**	**Result Am/Pu (pCi/L)**
1/5–2/1/12	0.001/0.0	1/3–2/23/12	0.0/0.009	1/3–2/10/12	0.006/0.003
2/1–4/4/12	0.0/0.0			2/10–2/23/12	0.0/0.003
		2/23–3/6/12	0.003/0.001	2/23–2/27/12	0.0/0.012
				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
4/4/12–4/25/13	0.016/0.055	4/13/12–4/21/13	0.003/0.007	4/4/12–1/15/13	0.0/0.0
				1/15–4/21/13	0.008/0.006
		4/21–4/29/13	0.010/0.007	4/21–4/25/13	0.009/0.012
4/25–5/7/13	0.010/0.004			4/25–4/29/13	0.0/0.009
		4/29–5/3/13	0.001/0.012	4/29–5/3/13	0.0/0.012
		5/3–5/7/13	0.0/0.005	5/3–5/7/13	0.012/0.0
5/7–6/4/13	0.065/0.037	5/7–5/17/13	0.022/0.016	5/7–5/17/13	0.036/0.016
		5/17–6/4/13	0.010/0.0	5/17–6/25/13	0.0/0.009
6/4–9/12/13	0.031/0.039	6/4–9/12/13	0.007/0.026	6/25–9/12/13	0.016/0.036
9/12–9/14/13	NSQ	9/12–9/13/13	NSQ	9/12–9/14/13	0.032/0.042
9/14–9/15/13	0.017/0.006	9/13–9/14/13	0.028/0.039	9/14–10/2/13	0.011/0.017
9/15–9/17/13	NSQ	9/14–9/16/13	0.013/0.025		
9/17–9/24/13	0.008/0.004	9/16–10/25/13	0.010/0.010		
9/24–10/9/13	0.0/0.001			10/2–10/7/13	0.0/0.004
10/9–11/14/13	[a]	10/25/13–	[b]	10/7–10/25/13	0.0/0.002
11/14/13–	[b]			10/25/13–	[b]

Some results are preliminary and subject to revision; negative results are set to zero.
[a] Results pending
[b] Sample in progress
NSQ = nonsufficient sample quantity (no analytical results)



Values for 12-month and 30-day averages shown here are presented for comparison purposes only.

Figure 27. Average Plutonium Activities at Locations Downstream of GS10



Values for 12-month and 30-day averages shown here are presented for comparison purposes only.

Figure 28. Average Americium Activities at Locations Downstream of GS10

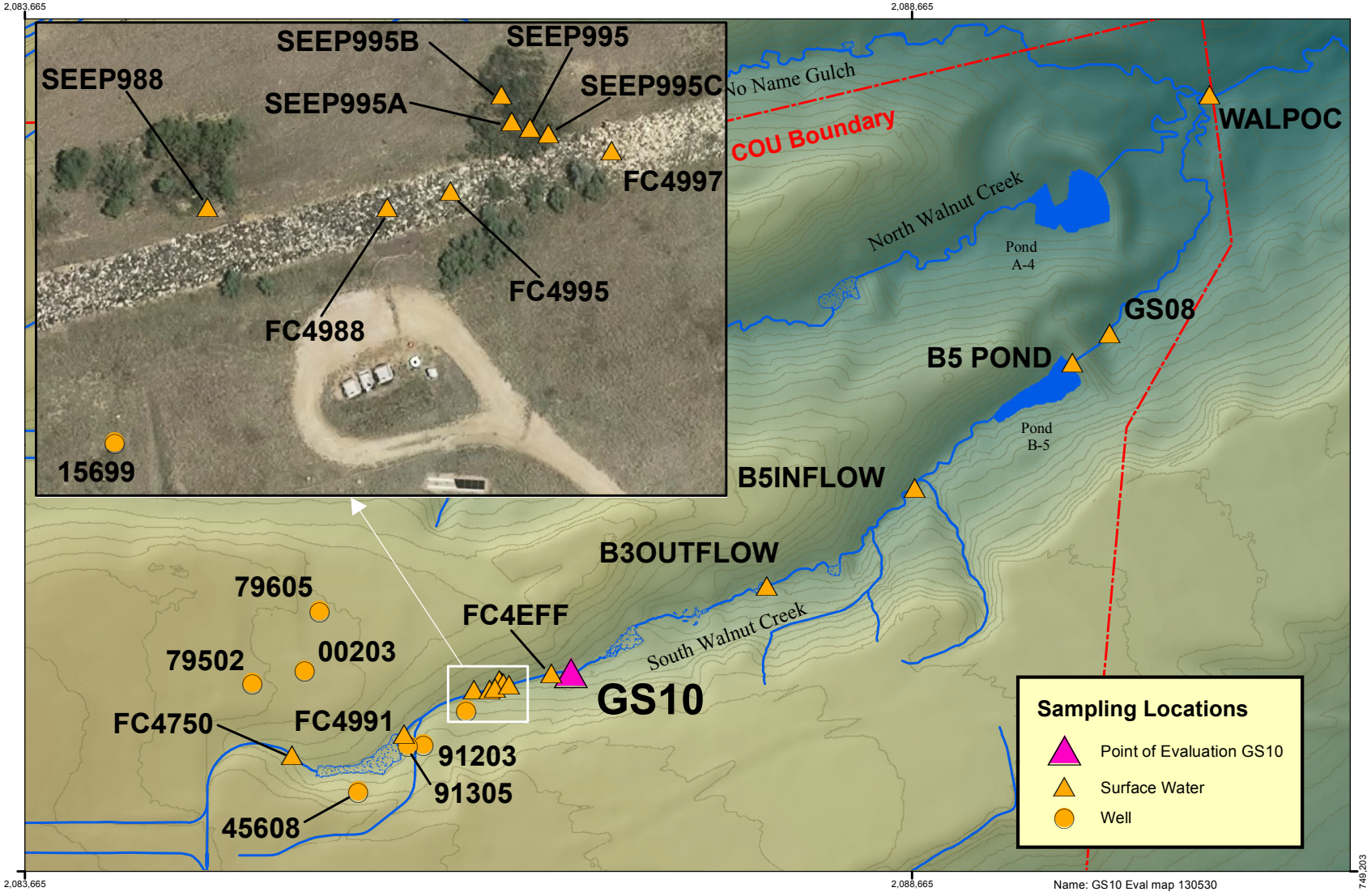


Figure 29. Evaluation Sampling Location Map for GS10 Drainage Area

Many additional water samples have been collected both upstream and downstream of GS10. Although further evaluation and consultation is ongoing, the following list summarizes action to date:

- Rocky Flats site 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 may have been useful, but given that the current water quality does not appear to be a result of soil transport, additional erosion controls were not implemented. A closer examination of the drainage to focus on seeps and former utility corridors was conducted; representatives from DOE and EPA were in attendance. Additional seed was spread and raked into the ground along the riprap areas upstream of GS10 in FC-4 and at the confluence of FC-4/FC-5 on November 29, 2011.
- Historical plutonium and americium 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 evaluation of the reportable condition for uranium at GS10 (FC4991, GS10, and B3OUTFLOW; Figure 29) were grab-sampled on November 25, 2011. Several seep sampling locations (SEEP995, SEEP995A, SEEP995B, and SEEP995C; Figure 29) were also grab-sampled on November 25, 2011. The Seep 995 area was chosen for sampling for the following reasons:
  - GS10 samples with elevated plutonium/americium were collected during low-flow conditions, not during high-flow conditions when soil and 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 7 suggest that the SEEP995 locations could be contributing plutonium and americium to GS10. However, activities at GS10 for this grab sample are low.

Table 7. 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

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

- Additional samples are being collected at the SEEP995 locations when water is available (i.e., unfrozen seep flow not affected by surface flow, such as snowmelt). Table 8 through Table 11 summarize sample results to date. While the activities are not as high as seen at GS10, the results do suggest that the SEEP995 area could be contributing some plutonium and americium to GS10.

  For the January 24, 2012, sample from SEEP995A, analysis was performed for total plutonium and americium (unfiltered) and also for filtered plutonium and americium (sample filtered with 0.45-micron filter) to evaluate for the possibility of colloidal transport. However, the low activities for the January 24 samples do not provide additional insight into colloidal transport.

  Additional samples continue to be collected on a periodic basis.

Table 8. Americium Grab Sampling Results for SEEP995 Locations (pCi/L)

Sample Date(s)	SEEP995	SEEP995A	SEEP995B	SEEP995C
11/25/2011	0.066	0.127	0.035	0.052
1/6/2012	---	0.052	---	---
1/24/2012	---	0.000	---	---
3/6/2012	---	0.003	---	---
4/13/2012	---	0.040	---	---
2/14/2013	---	---	---	0.020
2/20/2013	0.002	---	---	---
3/26/2013	0.028	---	---	---
5/15/2013	0.008	0.045	0.008	---
5/28/2013	0.120	0.074	0.007	---
6/10-6/20	0.135	0.138	0.079	---
9/19/2013	0.023	0.033	0.013	0.005
9/24/2013	0.012	0.010	0.017	0.000
9/30/2013	0.069	0.083	0.045	0.077
10/10/2013	0.016	0.041	0.156	0.045
10/17/2013	0.055	0.056	0.010	0.071
10/24/2013	0.054	0.021	0.031	0.022
10/31/2013	0.071	0.016	0.004	0.079

--- = not sampled

Table 9. Plutonium Grab Sampling Results for SEEP995 Locations (pCi/L)

Sample Date(s)	SEEP995	SEEP995A	SEEP995B	SEEP995C
11/25/2011	0.096	0.156	0.157	0.105
1/6/2012	---	0.079	---	---
1/24/2012	---	0.007	---	---
3/6/2012	---	0.004	---	---
4/13/2012	---	0.052	---	---
2/14/2013	---	---	---	0.043
2/20/2013	0.051	---	---	---
3/26/2013	0.058	---	---	---
5/15/2013	0.007	0.028	0.007	---
5/28/2013	0.135	0.157	0.030	---
6/10-6/20	0.179	0.350	0.122	---
9/19/2013	0.040	0.069	0.045	0.022
9/24/2013	0.015	0.015	0.022	0.000
9/30/2013	0.190	0.245	0.101	0.108
10/10/2013	0.024	0.068	0.512	0.059
10/17/2013	0.150	0.123	0.023	0.145
10/24/2013	0.083	0.055	0.088	0.058
10/31/2013	0.129	0.054	0.015	0.143

--- = not sampled

Table 10. Uranium Grab Sampling Results for SEEP995 Locations (µg/L)

Sample Date(s)	SEEP995	SEEP995A	SEEP995B	SEEP995C
11/25/2011	---	---	---	---
1/6/2012	---	12.3	---	---
1/24/2012	---	13.7	---	---
3/6/2012	---	11.2	---	---
4/13/2012	---	7.8	---	---
2/14/2013	---	---	---	22.4
2/20/2013	23.9	---	---	---
3/26/2013	23.4	---	---	---
5/15/2013	14.1	10.9	11.6	---
5/28/2013	14.7	9.4	11.0	---
6/10-6/20	12.6	7.8	11.1	---
9/19/2013	11.7	10.2	12.0	22.3
9/24/2013	14.8	14.4	14.9	26.5
9/30/2013	16.6	19.1	16.0	19.2
10/10/2013	18.2	19.1	21.9	16.8
10/17/2013	24.2	23.1	22.4	19.7
10/24/2013	22.0	21.4	23.9	19.6
10/31/2013	24.0	23.5	23.7	19.3

--- = not sampled
µg/L = micrograms per liter

Table 11. Filtered Results for SEEP995A

SEEP995A	1/24/12 (total)	1/24/12 (filtered)
Pu [pCi/L]	0.007	0.000
Am [pCi/L]	0.000	0.000
U [ug/L]	13.7	NA

ug/L = µg/L = micrograms per liter
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 rocks (Figure 29). These locations were grab-sampled on March 6, 2012, for both total and filtered analytes.

  The results in Table 12 show low plutonium and americium activities and no significant spatial trends for any of the analytes. Additional samples are being collected on a periodic basis. These results are presented in Table 13.

Table 12. 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

The arrow from the upper table indicates the relative location of SEEP995A along FC-4.
Alk = alkalinity
CaCO3 = calcium carbonate
ug/L = µg/L = micrograms per liter
mg/L = milligrams per liter
TSS = total suspended solids

Table 13. Americium, Plutonium, and Uranium Grab Sampling Results for FC-4 Locations (pCi/L)

Americium

Sample Date(s)	FC4988	FC4995	FC4997	FC4EFF
3/26/2013	---	0.003	0.049	---
9/19/2013	0.005	0.021	0.000	0.005
9/30/2013	0.003	0.025	0.000	0.008
10/17/2013	0.000	0.000	0.008	0.002
10/31/2013	0.004	0.005	0.033	0.000

Plutonium

Sample Date(s)	FC4988	FC4995	FC4997	FC4EFF
3/26/2013	---	0.004	0.046	---
9/19/2013	0.005	0.022	0.006	0.004
9/30/2013	0.000	0.004	0.000	0.000
10/17/2013	0.000	0.006	0.001	0.006
10/31/2013	0.003	0.001	0.003	0.003

Uranium

Sample Date(s)	FC4988	FC4995	FC4997	FC4EFF
3/26/2013	---	31.3	29.5	---
9/19/2013	13.5	13.9	14.0	14.7
9/30/2013	15.5	16.1	15.3	15.5
10/17/2013	19.0	19.6	19.2	17.8
10/31/2013	22.2	23.4	22.0	20.3

--- = not sampled

- To evaluate for any plutonium and americium 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-micron filter.

  A filtered sample is prepared from selected composite carboys collected at GS10. The routine RFLMA sample is analyzed for total (unfiltered) plutonium, americium, uranium, beryllium, chromium, and hardness. If the analytical results show plutonium and americium concentrations above the 0.15 pCi/L standard, then the corresponding filtered sample may be submitted for analysis. To date, three GS10 composite samples have been analyzed as filtered and unfiltered (Table 14).

Table 14. Results for Filtered and Unfiltered Composite Sample Pairs at GS10

Composite Dates	Am-241 (pCi/L)		Pu-239, 240 (pCi/L)		Uranium (µg/L)	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
3/21–4/4/12	0.318	0.000	0.246	0.000	35.5	34.2
4/25–5/9/12	0.478	0.000	0.264	0.026	16.1	NA
7/26–9/12/12	0.464	0.000	0.314	0.002	3.75	3.63
3/4–4/1/13	0.724	0.003	0.325	0.000	39.5	NA
4/1–4/20/13	0.183	0.000	0.110	0.000	28.8	NA
4/20–4/24/13	0.221	0.000	0.131	0.004	27.2	NA
6/14–7/3/13	8.41	0.007	5.28	0.010	21.9	27.2

µg/L = micrograms per liter

Table 14 shows that nearly all of the plutonium and americium was removed by the 0.45-micron filter. Additionally, nearly all of the uranium passed through the filter. These results support the conclusions of previous research showing that plutonium and americium move in association with particulates, while uranium is dissolved. However, these results indicate that the plutonium and americium are only associated with particles larger than 0.45 micron once they reach GS10 and are processed for submittal to the laboratory. It is still possible that plutonium and americium could reach surface water in association with sub-0.45 micron colloids, but then adsorb to other geologic materials or simply aggregate.

Additional unfiltered-filtered sample pairs may periodically be collected from seeps and surface water upstream of GS10.

- Grab samples have been collected upstream of GS10 from both seeps and surface water in an attempt to define the spatial variability of plutonium and americium activities. However, grab samples have failed to show activities similar to those measured in flow-paced composites collected at GS10. This suggests that either the source of the GS10 plutonium and americium is not affecting the grab sample locations, the source could be very close to GS10, the plutonium and americium 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 plutonium and americium, 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 FC4991, FC4997, and GS10 (Figure 29; the latter is a secondary sampler located at GS10) to collect composite samples over the course of a few days. Table 15 presents the results for the May 2012 sampling event, which show very low plutonium and americium activities and give practically no indication of spatial variability (FC4991 did not provide a sample this period). Table 16 presents results for the April 2013 sampling event. Some activity is noted at FC4997, which is located in FC-4 immediately downstream from SEEP995, suggesting that SEEP995 could be contributing plutonium and americium to GS10.

Table 15. Results for Time-Paced Composites at GS10 and FC4997: May 22–28, 2012

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

$CaCO_3$ = calcium carbonate
µg/L = micrograms per liter
mg/L = milligrams per liter

Table 16. Results for Time-Paced Composites at GS10, FC4997, and FC4991: April 22–25, 2013

Analyte	FC4991 (upstream)	FC4997	GS10 (downstream)
Am-241 (pCi/L)	0.003	0.035	0.006
Pu-239, 240 (pCi/L)	0.003	0.054	0.000
Uranium (µg/L)	13.6	21.1	23.4

µg/L = micrograms per liter

- A 2-week turnaround will continue to be requested for analysis of flow-paced composite samples routinely being collected at WALPOC. A 2-week turnaround is also currently being requested for analysis of flow-paced composite samples routinely being collected at GS10 and GS08.

Updates to the ongoing evaluation for GS10 will periodically be communicated through public meetings, routine reports, and contact records. For additional information, go to 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 of 18.8 micrograms per liter (µg/L) on April 30, 2011, exceeding the RFLMA applicable Table 1 standard of 16.8 µg/L. As of September 30, 2013, the 12-month rolling average concentration for uranium is no longer reportable at 14.6 µg/L.

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 in support of the evaluation for GS10. (GS03, which is the current POC on Walnut Creek at Indiana Street, is not shown.)

The following is an update to the ongoing GS10 uranium evaluation:

- Downstream monitoring at B5INFLOW, GS08, WALPOC, and GS03 (Figure 30) continue to show uranium concentrations lower than GS10. All results from the downstream POC (WALPOC) are below 16.8 µg/L. Recent analytical results at these locations are given in Table 17. 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 18. The averages (except for B5 Pond) are shown on Figure 31.

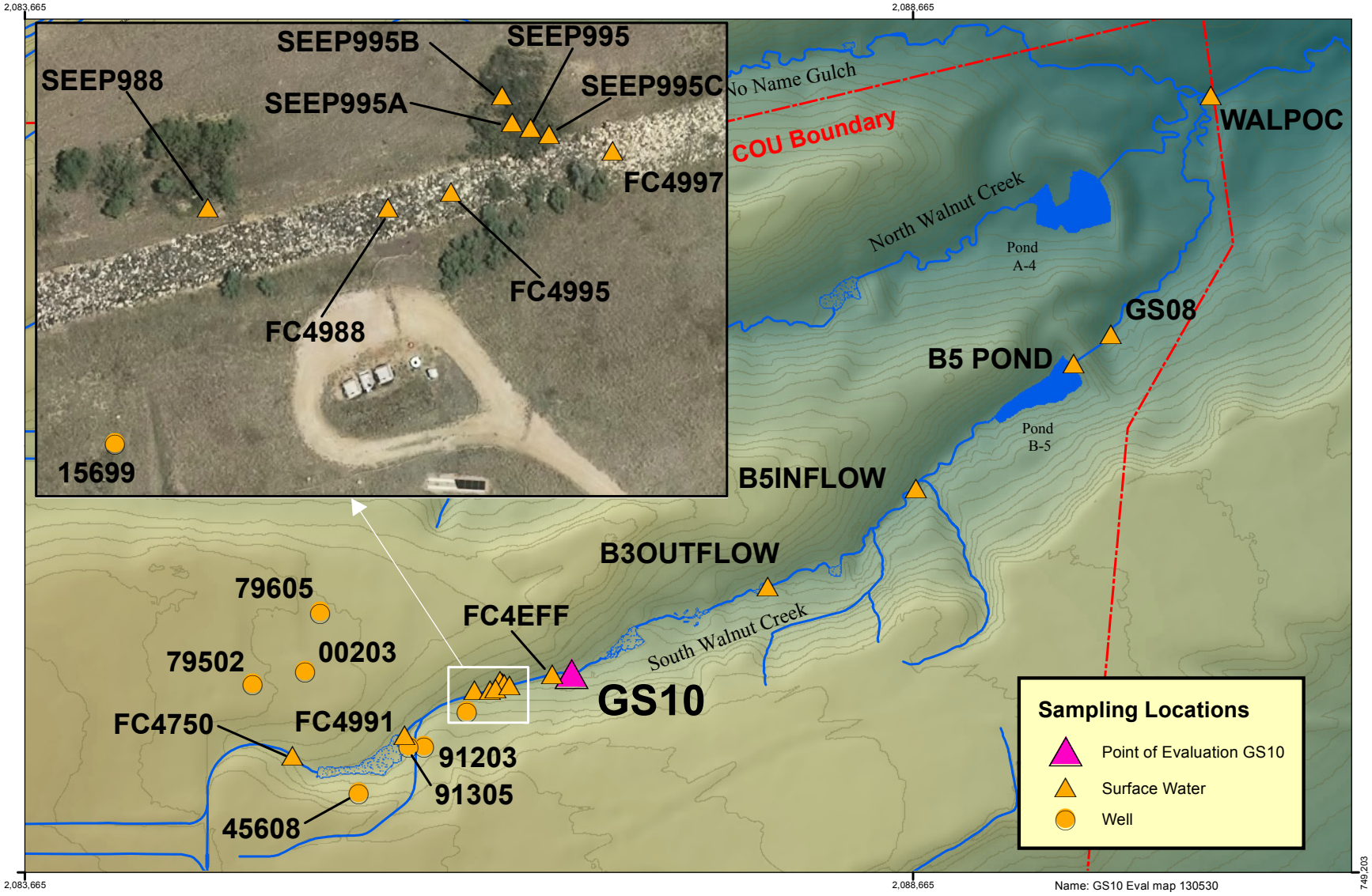
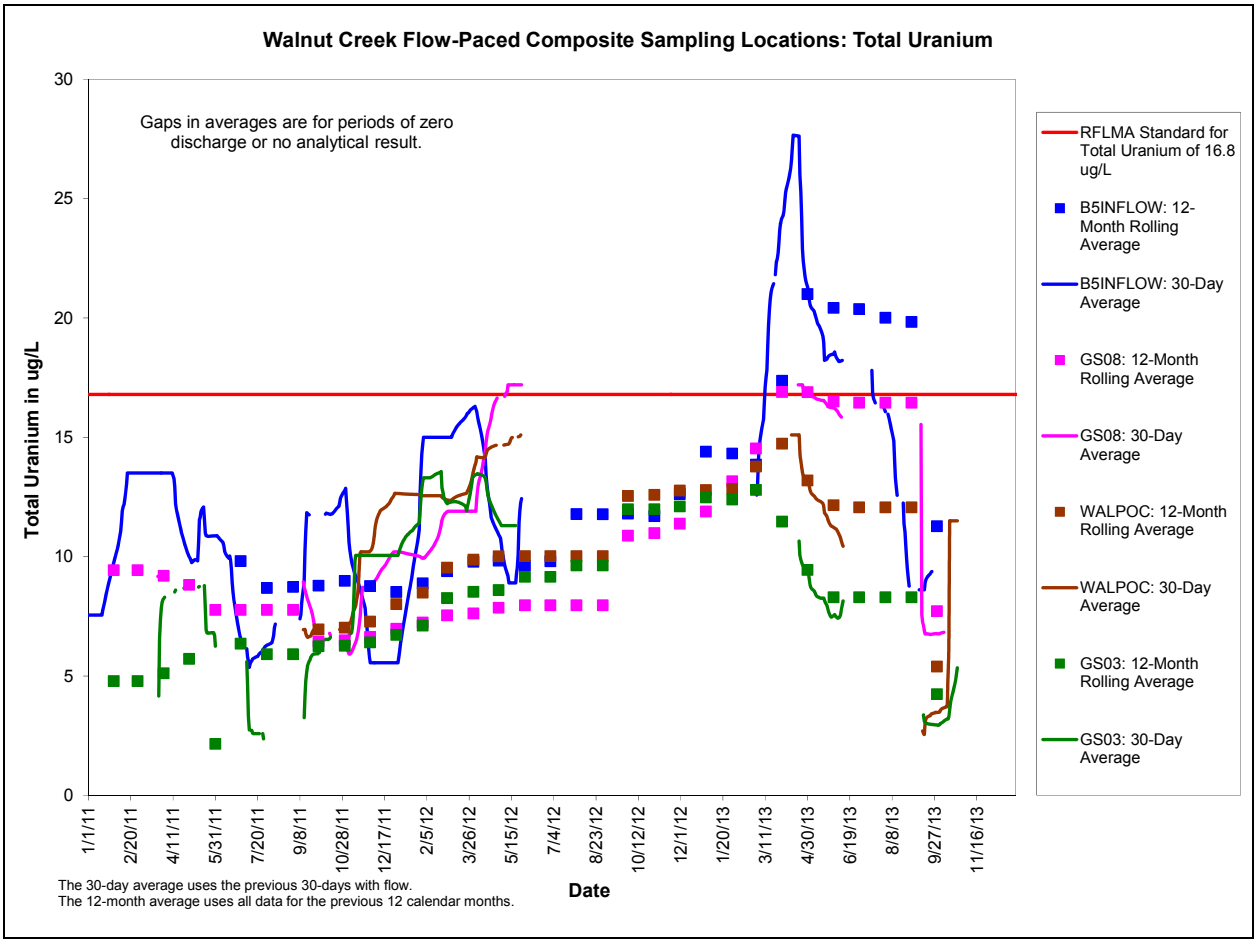


Figure 30. Evaluation Sampling Location Map for GS10 Drainage Area

Table 17. 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)**
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	8.90						
5/21/12–3/14/13	20.5	4/4/12–4/25/13	17.2	4/13/12–4/21/13	15.1	4/4/12–1/15/13	11.3
3/14–4/1/13	27.7					1/15–4/21/13	10.4
4/1–4/21/13	27.6						
4/21–4/29/13	17.8			4/21–4/29/13	12.6	4/21–4/25/13	9.36
		4/25–5/7/13	16.4			4/25–4/29/13	9.37
4/29–5/3/13	17.9			4/29–5/3/13	11.5	4/29–5/3/13	7.18
5/3–5/8/13	19.4			5/3–5/7/13	11.3	5/3–5/7/13	7.74
5/8–5/23/13	18.1	5/7–6/4/13	16.1	5/7–5/17/13	11.4	5/7–5/17/13	7.02
5/23–6/26/13	18.4			5/17–6/4/13	10.6	5/17–6/25/13	9.03
6/26–9/11/13	8.6	6/4–9/12/13	7.1	6/4–9/12/13	3.2	6/25–9/12/13	8.9
9/11–9/16/13	NSQ	9/12–9/14/13	NSQ	9/12–9/13/13	NSQ	9/12–9/14/13	2.2
		9/14–9/15/13	4.3	9/13–9/14/13	2.0	9/14–10/2/13	2.9
		9/15–9/17/13	NSQ	9/14–9/16/13	2.6		
9/16–9/25/13	14.4	9/17–9/24/13	7.4	9/16–10/25/13	11.5		
9/25–10/25/13	[a]	9/24–10/9/13	11.1			10/2–10/7/13	4.9
10/25/13–	[b]	10/9–11/14/13	[a]	10/25–12/18/13	[a]	10/7–10/25/13	7.1
		11/14/13–	[b]	12/18/13–	[b]	10/25/13–	[b]

Some results are preliminary and subject to revision.
[a] Results pending
[b] Sample in progress
NSQ = nonsufficient quantity for analysis



Plot includes unvalidated analytical data that are preliminary and subject to revision.
ug/L = µg/L = micrograms per liter

Figure 31. Average Uranium Concentrations at Locations Downstream of GS10

Table 18. Summary of Biweekly Uranium Grab Sampling in South Walnut Creek

South Walnut Creek		Uranium (ug/L)			
	Location Code	Average	Sample Count	85th Percentile	50th Percentile
Upstream	FC4750	19.2	33	21.6	17.0
⬇	FC4991	13.6	37	22.6	12.0
⬇	GS10	14.6	96	21.8	14.0
⬇	B3OUTFLOW	16.0	70	23.0	16.5
⬇	B5INFLOW	13.2	64	18.0	14.0
Downstream	B5 POND	8.31	98	11.5	7.30

ug/L = µg/L = micrograms per liter

- 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 preclosure and postclosure samples previously analyzed by LANL. The locations described below are shown on Figure 30 and Figure 31:

  — Flow-paced surface water sample from GS10 for the period June 3−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.

- 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 postclosure 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 said data exist).

- The Site is now using the Lawrence Berkeley National Laboratory (LBNL) to perform the high-resolution isotopic analyses. Additional samples listed below were sent to LBNL in July. The locations are shown on Figure 30 and Figure 31 and are described below (GS03 is not shown but is on Walnut Creek at Indiana Street):
  - Selected flow-paced composite samples from GS10 for the period July 2011 to the present.
  - Selected flow-paced composite samples from WALPOC for the period September 2011 to the present.
  - A sample from well 79102, which is located in the Solar Ponds Plume area.

  The results of the LBNL analyses have been reported by LBNL to Stoller staff. The following highlights are noted:
  - GS10 shows variable percentages of natural uranium ranging from 43 percent to 59 percent.
  - WALPOC shows more consistent percentages of uranium, ranging from 76 percent to 80 percent.
  - Well 79102 continues to show a 100 percent depleted uranium signature.
- 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. These additional samples included the following:
  - 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 nitrogen on October 6, 2011.
  - GS10 and hillside seep locations SEEP988 and SEEP995 were also grab-sampled for uranium and nitrate + nitrite as nitrogen 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, go to 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 32 and Figure 34 show no occurrences of reportable 12-month rolling averages for plutonium, americium, and total uranium values during the quarter. Figure 33 and Figure 35 show water-quality data for plutonium, americium, and uranium from 2005 through the third quarter of CY 2013.

Table 19 shows automated composite sampling information collected during September 2013. It should be noted that the sampler was full and did not collect any water for the period 9/12/13 12:21 to 9/13/13 13:17. Therefore, no analytical results are available for this period and in accordance with routine evaluation protocols, this period is not included in the calculation of 12-month rolling averages.

Table 19. September 2013 Composite Sampling Detail for POE SW027

Sampling Period	Number of Grabs	Sample Results			Flow Volume (MG)	Flow Rates (CFS)	Comments
		Am-241 (pCi/L)	Pu-239,240 (pCi/L)	Uranium (µg/L)			
2/4 11:38–9/12 12:21	109	0.026	0.108	1.91	0.24	0–3.5	Sampler filled 9/12 12:21.
9/12 12:21–9/13 13:17	0 NSQ	NA	NA	NA	5.1 (est)	0.8–28.4 (est)	Sampler full from 9/12 12:21–9/13 13:17
9/13 13:17–10/3 17:49	47	0.014	0.126	1.98	1.0	0–4.6	

Notes:
CFS = cubic feet per second
est = estimated
MG = million gallons
NA = not analyzed
NSQ = nonsufficient quantity for analysis

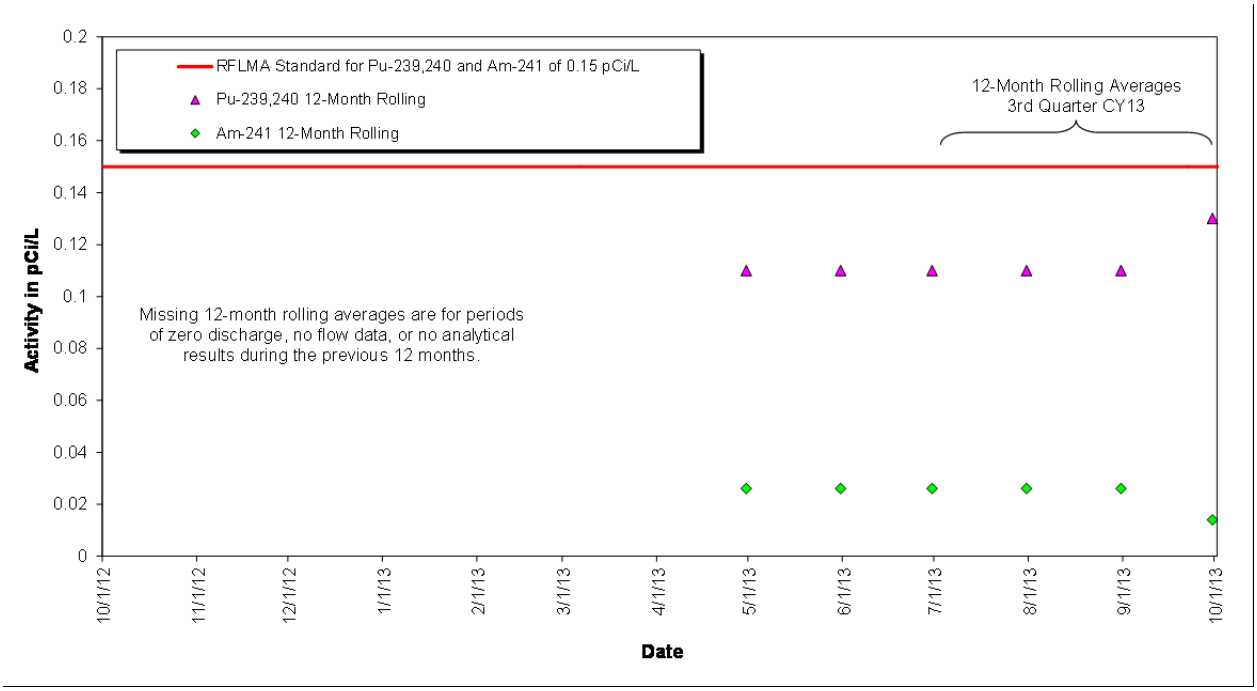


Figure 32. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW027: Year Ending Third Quarter CY 2013

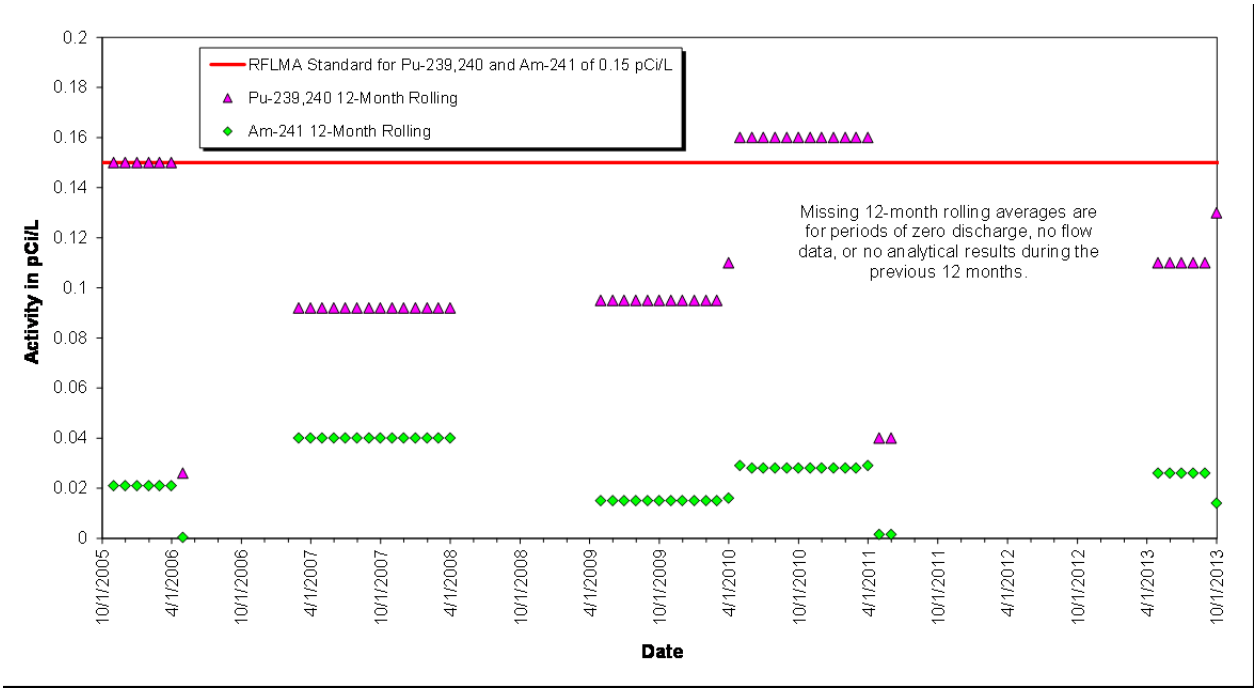
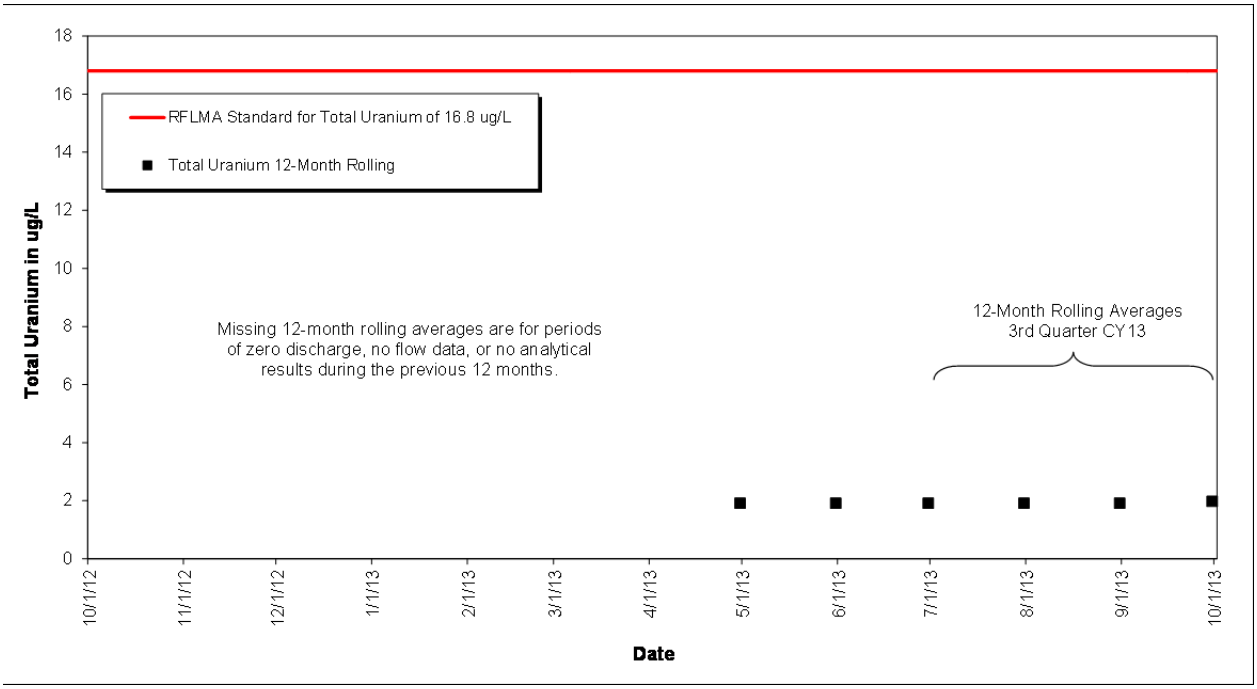
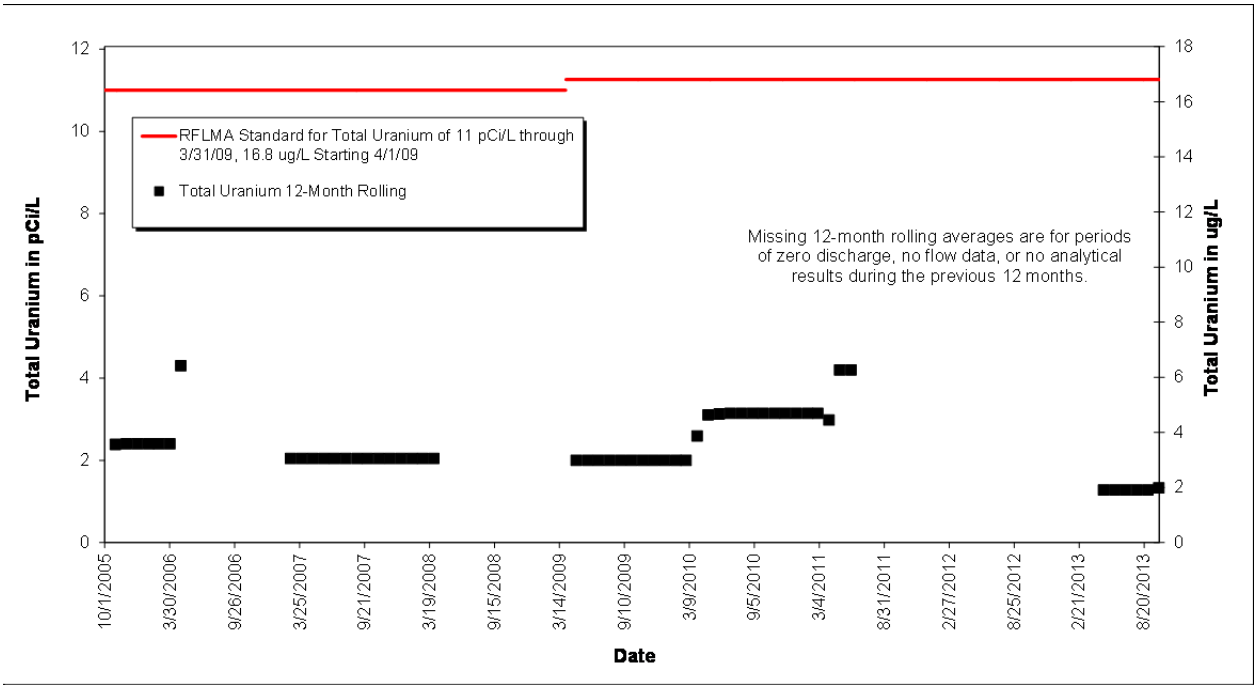


Figure 33. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW027: Postclosure Period Ending Third Quarter CY 2013



ug/L = µg/L = micrograms per liter

Figure 34. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW027: Year Ending Third Quarter CY 2013



ug/L = µg/L = micrograms per liter

Figure 35. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW027: Postclosure Period Ending Third Quarter CY 2013

3.1.3.3 Monitoring Location SW093

Monitoring location SW093 is on North Walnut Creek, 1,300 feet upstream of former Pond A-1. Figure 36 and Figure 38 show no occurrences of reportable 12-month rolling averages for plutonium, americium, or total uranium values during the quarter. Figure 37 and Figure 39 show sampling data from 2005 through the third quarter of CY 2013.

Table 20 shows automated composite sampling information collected during September 2013. It should be noted that the sampler was full and did not collect any water for the period 9/11/13 20:17 to 9/15/13 11:01. Therefore, no analytical results are available for this period and in accordance with routine evaluation protocols, this period is not included in the calculation of 12-month rolling averages.

Table 20. September 2013 Composite Sampling Detail for POE SW093

Sampling Period	Number of Grabs	Sample Results			Flow Volume (MG)	Flow Rates (CFS)	Comments
		Am-241 (pCi/L)	Pu-239,240 (pCi/L)	Uranium (µg/L)			
7/23 12:28–9/11 20:17	110	0.031	0.011	2.88	1.7	0–10.2	Sampler filled 9/11 20:17
9/11 20:17–9/15 11:01	0 NSQ	NA	NA	NA	43.3 (est)	0.7–136 (est)	Sampler full from 9/11 20:17 to 9/15 11:01
9/15 11:01–9/19 12:34	58	0.018	0.0	5.33	4.3	0.3–17.5	
9/19 12:34–10/15 14:15	63	0.003	0.002	12.1	3.6	0.1–2.3	

Notes:
CFS = cubic feet per second
est = estimated
MG = million gallons
NA = not analyzed
NSQ = nonsufficient quantity for analysis

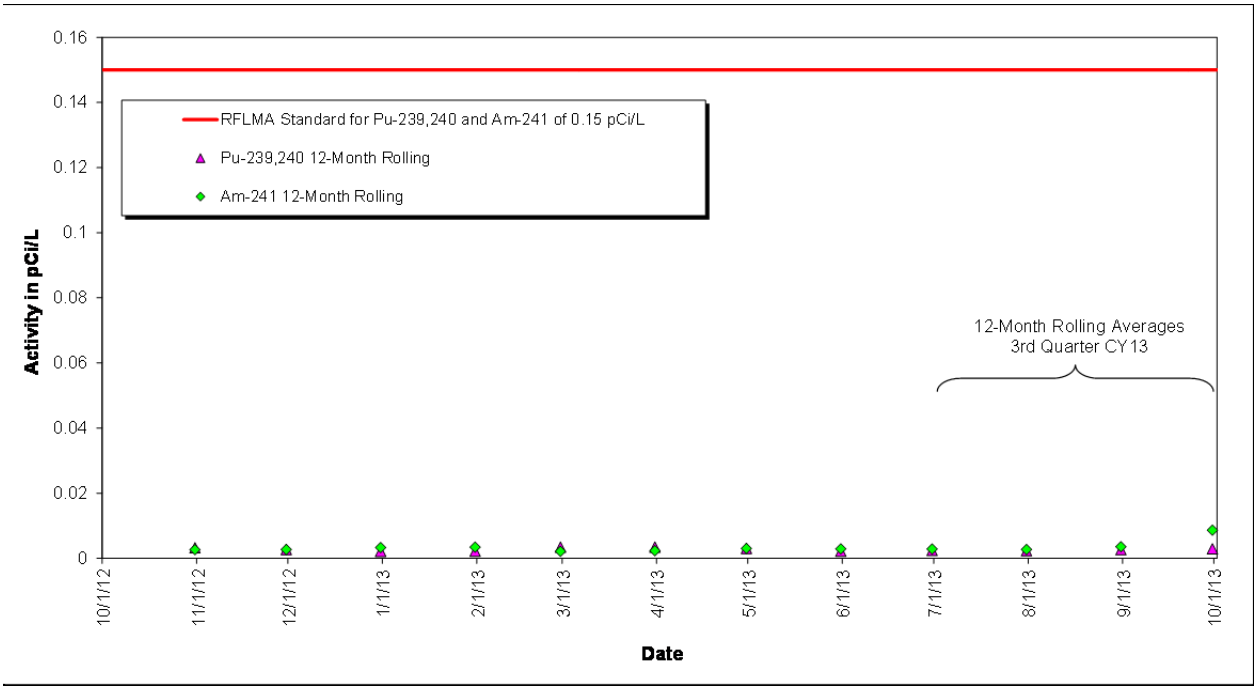


Figure 36. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW093: Year Ending Third Quarter CY 2013

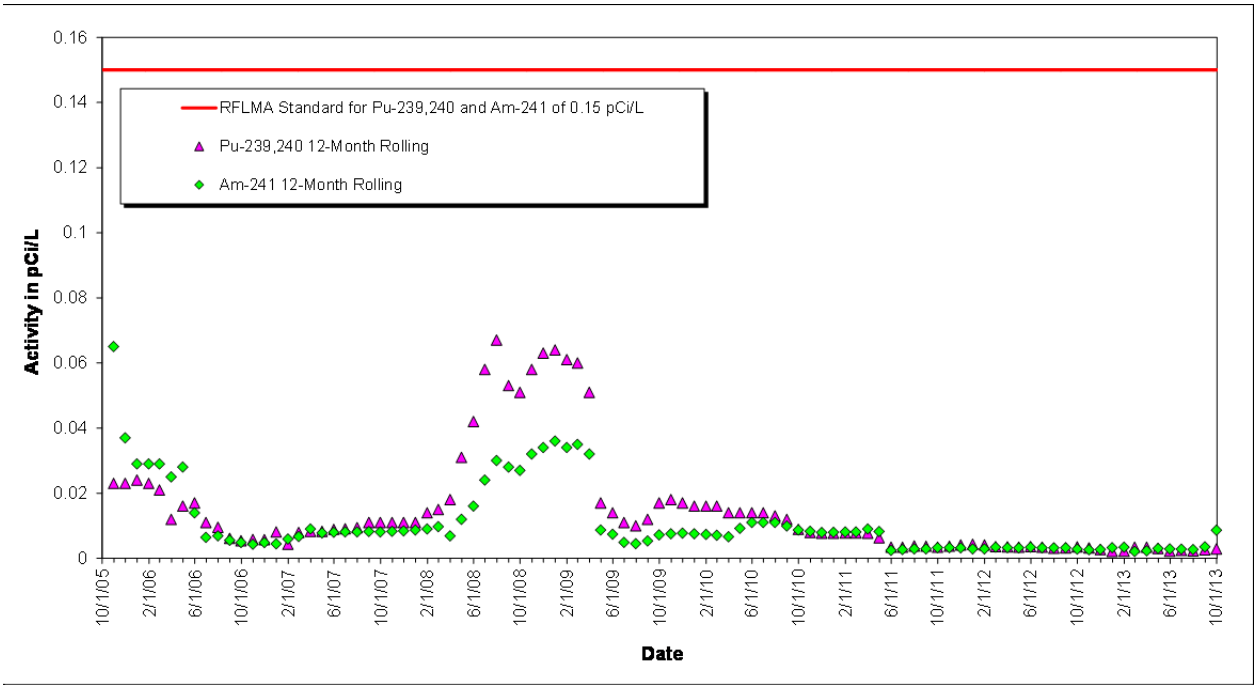
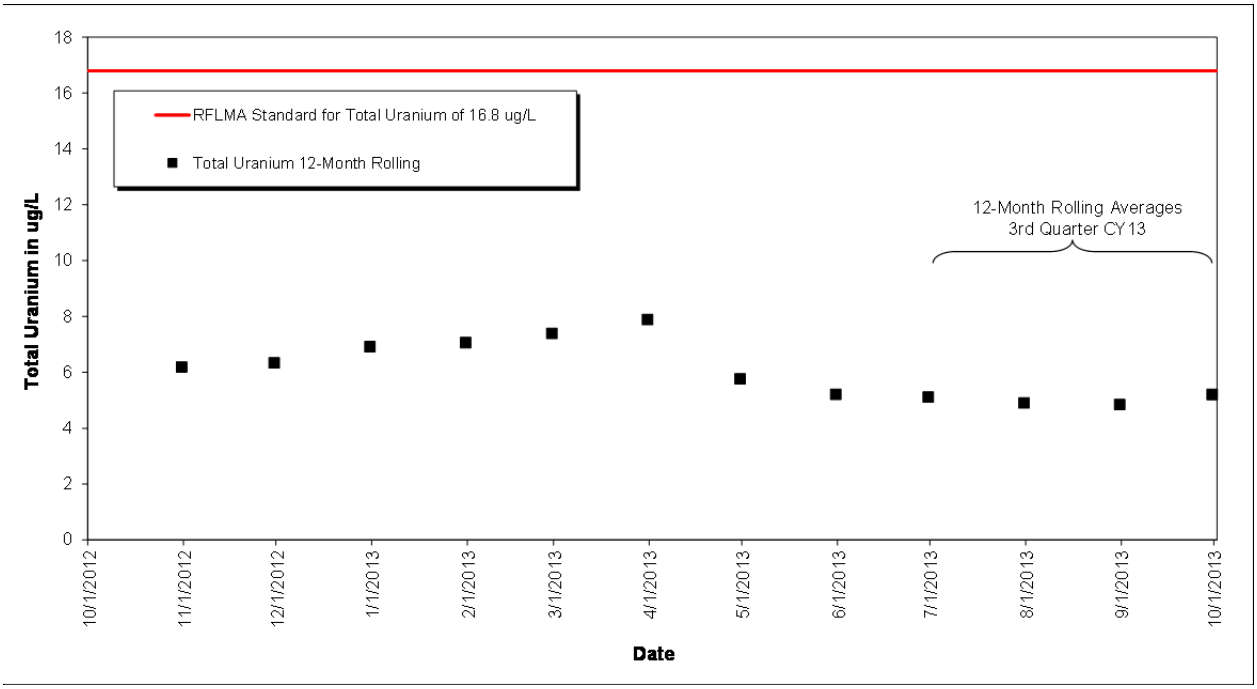
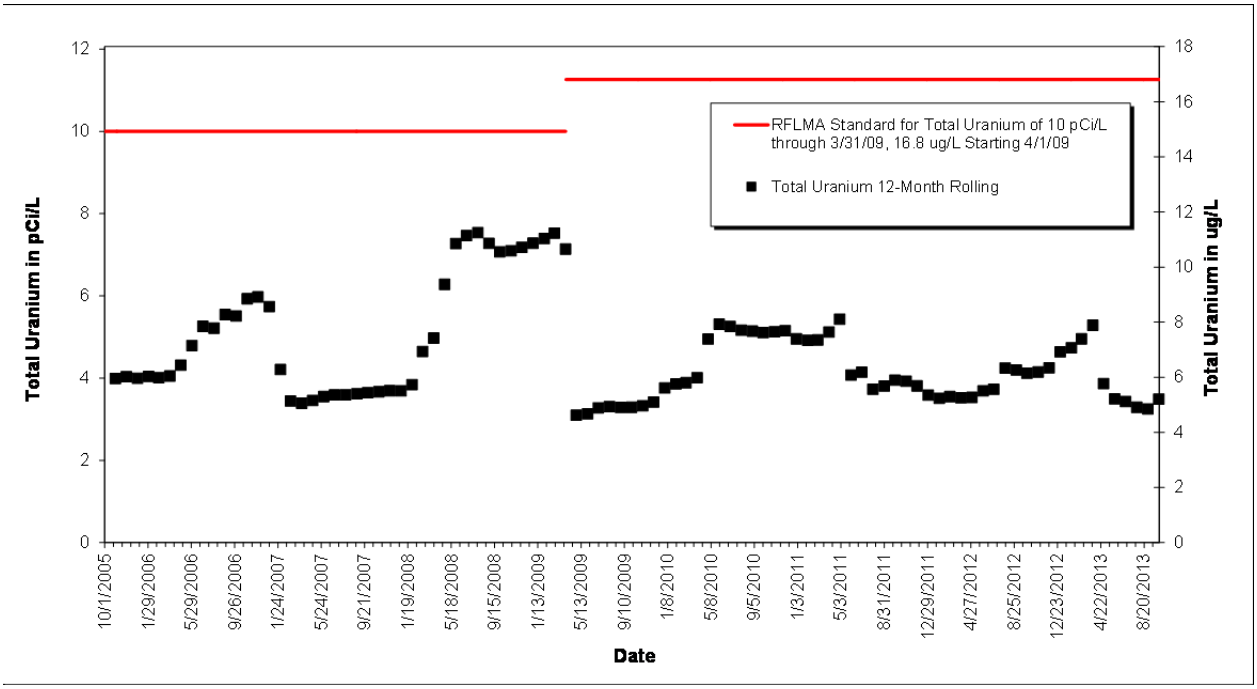


Figure 37. Volume-Weighted 12-Month Rolling Average Plutonium and Americium Activities at SW093: Postclosure Period Ending Third Quarter CY 2013



ug/L = µg/L = micrograms per liter

Figure 38. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW093: Year Ending Third Quarter CY 2013



ug/L = µg/L = micrograms per liter

Figure 39. Volume-Weighted 12-Month Rolling Average Total Uranium Concentrations at SW093: Postclosure Period Ending Third Quarter CY 2013

3.1.4 AOC Wells and Surface Water Location SW018

The AOC wells and SW018 were not scheduled for RFLMA monitoring in the third quarter of CY 2013.

3.1.5 Sentinel Wells

The Sentinel wells were not scheduled for RFLMA monitoring in the third quarter of CY 2013.

3.1.6 Evaluation Wells

The Evaluation wells were not scheduled for RFLMA monitoring in the third quarter of CY 2013.

3.1.7 PLF Monitoring

All RCRA groundwater monitoring wells at the PLF were sampled during the third quarter of CY 2013. Analytical results (Appendix B) were generally consistent with past samples and will be discussed and statistically evaluated as part of the annual report for CY 2013. 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 third quarter of CY 2013. Analytical results (Appendix B) were generally consistent with past samples and will be discussed and statistically evaluated as part of the annual report for CY 2013.

During the third quarter of CY 2013, 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 2.2, 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 drainpipe 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 third quarter of CY 2013. Non-RFLMA samples were collected to support testing of the recently upgraded air stripper. The associated results (Appendix B) will be discussed in the annual report for 2013.

3.1.9.2 East Trenches Plume Treatment System

ETPTS monitoring locations were not scheduled for RFLMA sampling in the third quarter of CY 2013. Non-RFLMA samples were collected to support testing of the recently upgraded air stripper. The associated results (Appendix B) will be discussed in the annual report for 2013.

3.1.9.3 Solar Ponds Plume Treatment System

SPPTS monitoring locations were not scheduled for RFLMA sampling in the third quarter of CY 2013. Non-RFLMA samples were collected, some to support the Adaptive Management Plan (DOE 2011) and others to support continued testing of treatment components (microcells and pilot-scale lagoons). As stated in Section 2.2.3, both of these testing efforts will continue for some time. The associated results (Appendix B) will be discussed in the annual report for 2013, together with additional information regarding these tests.

3.1.9.4 PLF Treatment System

During collection of the August 15, 2013, sample at the system influent (monitoring location PLFSEEPINF), the flow rate was 1.27 gallons per minute. Breaching of the PLF Dam was completed in June 2012, and since then any PLFTS effluent flows through the remaining wetland area. This flow configuration is now essentially equivalent to the historic open valve configuration.

During the third quarter of CY 2013, routine sampling of the treated effluent exiting the system (monitoring location PLFSYSEFF) showed results for arsenic of 11 µg/L, above the surface water standard of 10 µg/L. According to RFLMA evaluation protocols, this result triggered

monthly sampling for arsenic. The first monthly sample was collected on October 29, 2013. This sample also showed selenium above the standard at 34 µg/L (unvalidated as of this report). A second monthly sample for arsenic was then collected on November 27, 2013. Analytical results for this sample are pending.

All other analyte concentrations were below the RFLMA standards.

3.1.10 Predischarge Monitoring

Predischarge 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 predischarge samples were collected at Ponds A-4, B-5, or C-2 during the third quarter of CY 2013. All three ponds were operated in a flow-through configuration during the entire quarter.

3.1.11 High-Resolution Isotopic Uranium Analyses

As noted above in the discussion of the reportable condition at surface-water monitoring location GS10, samples are occasionally submitted to a specialized laboratory for high-resolution analysis of uranium isotopes, and for interpretation of the results to estimate natural versus anthropogenic uranium content. Since the 1990s, this support had been obtained from LANL. However, LANL ceased to provide this support and a search for a different laboratory with these capabilities was undertaken. In the second quarter of 2013, a contract was established with LBNL for this support and the first shipment of samples was made. Results were received in late September 2013. Samples and their associated results are summarized below in Table 21.

Table 21. Data Summary for Samples Submitted to LBNL

Sample Location	Sample Type	Sample Date	Total U (µg/L)[a]	Percent Natural	Percent Depleted	Percent Enriched
WALPOC	SW	9/22/2011	7.6	77.39%	22.53%	0.08%
WALPOC	SW	9/27/2011	10.2	77.57%	22.36%	0.07%
WALPOC	SW	1/3/2012	12.6	79.63%	20.30%	0.07%
WALPOC	SW	2/23/2012	12.2	79.48%	20.44%	0.08%
WALPOC	SW	3/6/2012	14.2	78.35%	21.57%	0.08%
WALPOC	SW	4/13/2012	15.1	77.53%	22.41%	0.06%
WALPOC	SW	4/21/2012	12.6	77.79%	22.15%	0.06%
WALPOC	SW	5/3/2013	11.3	75.95%	23.98%	0.07%
GS10	SW	1/5/2012	49.7	52.59%	47.30%	0.11%
GS10	SW	3/6/2012	38.7	43.29%	56.58%	0.13%
GS10	SW	7/26/2012	4.2	64.33%	35.59%	0.08%
GS10	SW	4/29/2013	36.5	59.07%	40.84%	0.09%
79102	GW	5/14/2012	510	-0.50%	100.00%	0.50%

Notes:
[a] Total uranium data are from contract laboratory; balance of data are from LBNL.
GW = groundwater
SW = surface water

The annual report for 2013 will include additional discussion of these data.

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 third quarter of CY 2013.

5.0 Ecological Monitoring

During the third quarter of CY 2013, Preble's meadow jumping mouse (PMJM) mitigation monitoring and wetland mitigation monitoring were conducted. The PMJM monitoring data will be summarized and delivered to U.S. Fish and Wildlife Service (USFWS) in the 2013 Preble's Meadow Jumping Mouse Mitigation Monitoring Report for Biological Opinions at the Rocky Flats Site. This report was due to USFWS on December 1, 2013. The wetland monitoring data will be summarized and delivered to EPA in the 2013 Rocky Flats Site Annual Wetland Mitigation Monitoring Report, due on March 1, 2014. A brief summary of the information from both reports will be included in the annual report for CY 2013. Revegetation monitoring was conducted at several monitoring locations throughout the COU to evaluate the status of the revegetation parcels. These data will be summarized in the annual report for CY 2013. Other ecological monitoring conducted during the third quarter included weed mapping, prairie dog and nest box surveys, forb nursery monitoring, and photopoint monitoring. The shrubs planted last spring as a habitat enhancement project continued to be irrigated until early September. Mowing and clipping of flower stalks was conducted to help reduce seed set for common mullein and Scotch thistle. Approximately 62 acres were treated with herbicides to help control various noxious weed species during the third quarter.

6.0 References

DOE (U.S. Department of Energy), 2007. *Rocky Flats Legacy Management Agreement*, Rocky Flats Environmental Technology Site, Golden, Colorado, March 14.

DOE (U.S. Department of Energy), 2008a. *Present Landfill Monitoring and Maintenance Plan and Post-Closure Plan, U.S. Department of Energy Rocky Flats Site,* DOE–LM/1592–2008, Rocky Flats Environmental Technology Site, Golden, Colorado, March.

DOE (U.S. Department of Energy), 2008b. *Rocky Flats Site Quarterly Report of Site Surveillance and Maintenance Activities, First Quarter Calendar Year 2008*, LMS/RFS/S04474, Office of Legacy Management, Westminster, Colorado, July.

DOE (U.S. Department of Energy), 2009a. *Rocky Flats Site Original Landfill Monitoring and Maintenance Plan,* LMS/RFS/S05516, Office of Legacy Management, Westminster, Colorado, September.

DOE (U.S. Department of Energy), 2009b. *Rocky Flats Site Quarterly Report of Site Surveillance and Maintenance Activities, Second Quarter Calendar Year 2009*, LMS/RFS/S05823, Office of Legacy Management, Westminster, Colorado, October.

DOE (U.S. Department of Energy), 2010. *Annual Report of Site Surveillance and Maintenance Activities at the Rocky Flats, Colorado, Site, Calendar Year 2009*, LMS/RFS/S05993, Office of Legacy Management, Westminster, Colorado, April.

DOE (U.S. Department of Energy), 2011. *Surface Water Configuration Adaptive Management Plan for the Rocky Flats, Colorado, Site,* LMS/RFS/S07698, Office of Legacy Management, Westminster, Colorado, June.

DOE (U.S. Department of Energy), 2012. *Third Five-Year Review Report for the Rocky Flats Site, Jefferson and Boulder Counties, Colorado*, LMS/RFS/S07693, July.

DOE (U.S. Department of Energy), 2013. *Rocky Flats, Colorado, Site Site Operations Guide*, LMS/RFS/S03037, Office of Legacy Management, Westminster, Colorado, July.

DOE, EPA, and CDPHE (U.S. Department of Energy, U.S. Environmental Protection Agency, and Colorado Department of Public Health and Environment), 2006. *Corrective Action Decision/Record of Decision for Rocky Flats Plant (USDOE) Peripheral Operable Unit and Central Operable Unit*, EPA/541/R-06/197, September 29.

DOE, EPA, and CDPHE (U.S. Department of Energy, U.S. Environmental Protection Agency, and Colorado Department of Public Health and Environment), 2011. *Corrective Action Decision/Record of Decision Amendment for Rocky Flats Plant (USDOE) Central Operable Unit,* U.S. Department of Energy, U.S. Environmental Protection Agency, and Colorado Department of Public Health and Environment, September 21.

Groundwater Briefing

- Cover memo
- Maps

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MEMORANDUM

TO: Stewardship Council Board
FROM: Rik Getty
SUBJECT: Groundwater Briefing
DATE: January 22, 2014

We have scheduled fifty minutes for DOE to present a kickoff briefing on groundwater at Rocky Flats. DOE will delve into these issues in more depth at subsequent meetings this year.

The DOE briefings will cover the following topics:

- groundwater hydrology – explaining how groundwater moves at the site
- principle contaminants of concern – volatile organic compounds, nitrates, actinides, etc.
- how is the groundwater monitoring network set up
- nature and extent of groundwater contamination at Rocky Flats – where the groundwater plumes are located, the levels of contamination in the plumes
- purpose and effectiveness of the groundwater treatment systems to reduce contamination levels

The following provides an overview of groundwater hydrology at Rocky Flats, contaminants of concern, treatment systems, and a few more issues. I'll explore these issues in more depth in subsequent briefing memos.

Groundwater Hydrology

Groundwater is water found below the earth's surface in underground layers of rock, sand or gravel known as aquifers. Groundwater movement at Rocky Flats is governed mainly by geology. Rocky Flats is situated on a plain at the foot of the Rocky Mountains, sloping slightly downward toward the east. Groundwater is located at different depths beneath the Rocky Flats site. The shallow groundwater is found in three geologic formations which vary in thickness:

- alluvium (sands and gravels)
- Arapahoe formation (sandstone and claystone)
- Laramie formation (mostly claystone with a few sandstone "lenses")

Below the shallow groundwater is several hundred feet of claystone composed of tightly fitting clay particles which serve as a natural barrier. Water can move downward through claystone at the rate of inches per year. Below the claystone is a deeper layer of groundwater found in the bedrock Laramie Fox Hills formation. In the western portions of Rocky Flats, where the thickness of the alluvium may exceed 100 feet, the depth to groundwater is 50 to 70 feet. The depth to groundwater generally becomes shallower, and the saturated thickness becomes thinner, from west to east as the alluvial layer thins and the underlying claystones are closer to the surface.

The amount of groundwater in the alluvium is limited. The relatively small portion of infiltrating precipitation that does become shallow groundwater ultimately discharges to surface water before reaching the eastern boundary along Indiana Street. Groundwater flowing horizontally on top of the claystone layer can emerge downslope as springs or seeps, and mix (interchange) with surface water in Walnut Creek and Woman Creek.

Attached to this memo is a map showing groundwater flow directions at Rocky Flats. (See Figure 8, attached)

Groundwater Contaminants of Concern (COCs)
Based on thousands of groundwater monitoring results the primary COCs in contaminated groundwater were determined to be:

- Volatile Organic Compounds (VOCs) – mostly tetrachloroethene, trichloroethene, carbon tetrachloride and breakdown daughter products of these chlorinated solvents such as vinyl chloride
- Uranium isotopes – both man-made and naturally occurring
- Nitrates – water-soluble salt from the extensive nitric acid-based production operations at the site, especially the solar evaporation ponds

While other contaminants can be present, these are the most prevalent. Importantly, COC movement can vary greatly. Nitrates are very soluble in water and can move faster than other contaminants which are less soluble.

Nature and Extent of Groundwater Contamination
Groundwater contaminated with VOCs, uranium and nitrates can be found at several locations, primarily in the former industrial area. Based on the extensive monitoring data, areas where the groundwater contamination showed evidence of a contiguous, mappable plume were identified. (See Figure 13, attached)

The major groundwater plumes contaminated with VOCs, uranium and nitrates, and where groundwater treatment systems are required to treat the water, are:

- East trenches plume – VOCs only
- Mound site plume – VOCs only
- Solar ponds plume – nitrates and uranium

Note: Figure 13 also shows plumes in other areas of the site, but DOE, EPA and CDPHE determined that treatment systems are not needed to protect surface water from contaminated groundwater.

Groundwater Monitoring Network

As the Board knows from its review of the quarterly monitoring data, DOE's responsibilities include managing the extensive groundwater monitoring system. Groundwater monitoring is conducted in or near areas where groundwater contamination might adversely affect surface water quality. These wells and sampling criteria, which are identified in RFLMA, include the following well classifications:

- Area of Concern (AOC) Wells: Located within a drainage and downgradient of a contaminant plume or group of contaminant plumes. These wells are monitored to determine whether the plume(s) may be discharging to surface water.
- Sentinel Wells: Typically located near downgradient edges of contaminant plumes, in drainages, and downgradient of groundwater treatment systems. These wells are monitored to determine whether concentrations of contaminants are increasing, which could indicate plume migration or treatment system problems.
- Evaluation Wells: Typically located within plumes and near plume source areas, or in the interior of the Central OU. Data from these wells will help determine when monitoring of an area or plume can cease. A subset of these wells is located in areas that may experience significant changes in groundwater conditions as a result of closure activities.
- RCRA Wells: Dedicated to monitoring the Present Landfill and Original Landfill.

Attached to this memo is RFLMA Figure 1 which shows the RFLMA Water Monitoring network.

Please let me know if you have any questions.

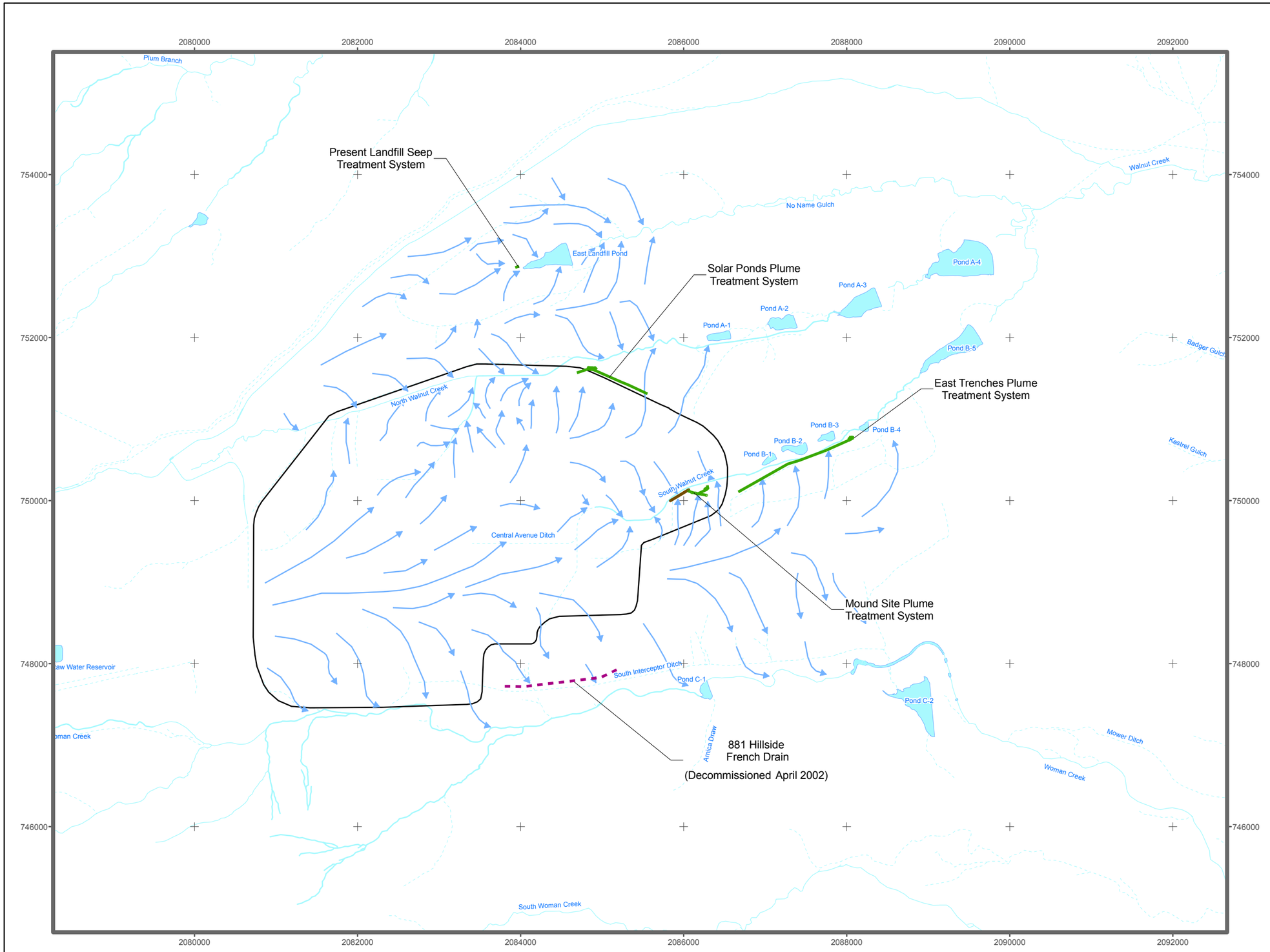

Figure 8

Predicted Groundwater Flow Directions

KEY

- Predicted groundwater flow direction
- Existing groundwater treatment system
- Decommissioned french drain
- Mound french drain
- IA OU boundary

Note:
The length of the arrow does not correspond to the groundwater velocity.

Standard Map Features

- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 600 1,200 Feet

Scale 1:14,400

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental
Technology Site

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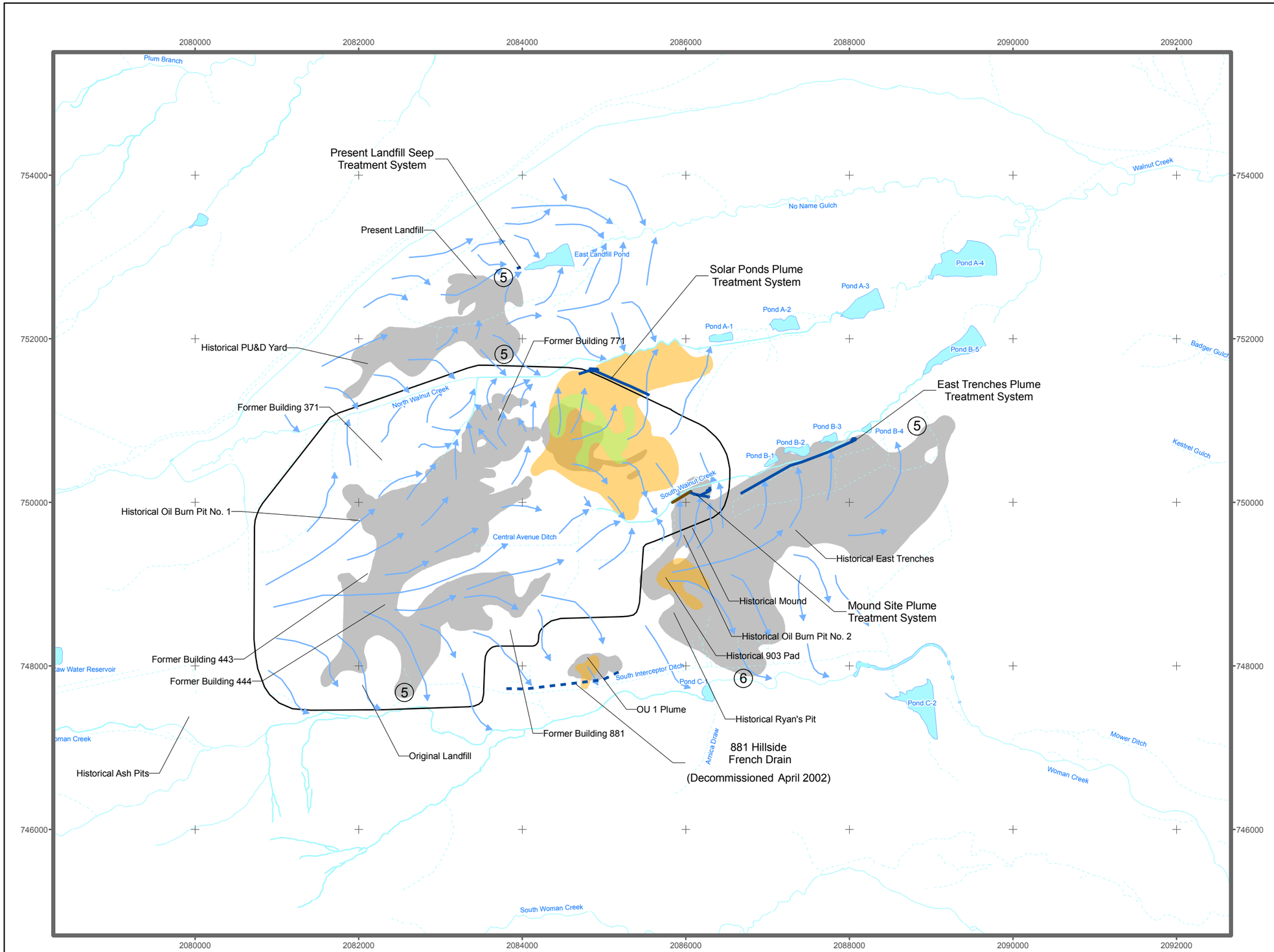
Figure 13

Composite Plume Map[1]



KEY

- Predicted groundwater flow direction (from figure 2.18)[2]
- Groundwater treatment system
- 881 Hillside French drain
- Mound French drain
- Nitrate exceeds the surface water standard
- Uranium (unfiltered) exceeds the surface water standard[3]
- VOC composite plume[4]

Notes:

1) No metals or flouride were included because of their dissimilar transport characteristics.
2) The length of the arrow does not correspond to the groundwater velocity.
3) There is no radionuclide filtered uranium standard and thus it has not been represented on the map. (Uranium that exceeded the metal filtered uranium standard is less than 1% of the data and is also not represented.)
4) The VOC composite plume is all VOC AOIs that exceed the surface water standard.
5) Modeling results indicate that groundwater discharge concentrations will be below surface water standards at these locations.
6) Groundwater in the area is in weathered bedrock and is only saturated during wet years, thus AOI transport is limited to wet years (high groundwater levels). See the Groundwater IM/IRA for details.

Standard Map Features

- IA OU boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream

N
W E
S

0 600 1,200 Feet

Scale 1:14,400

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD 27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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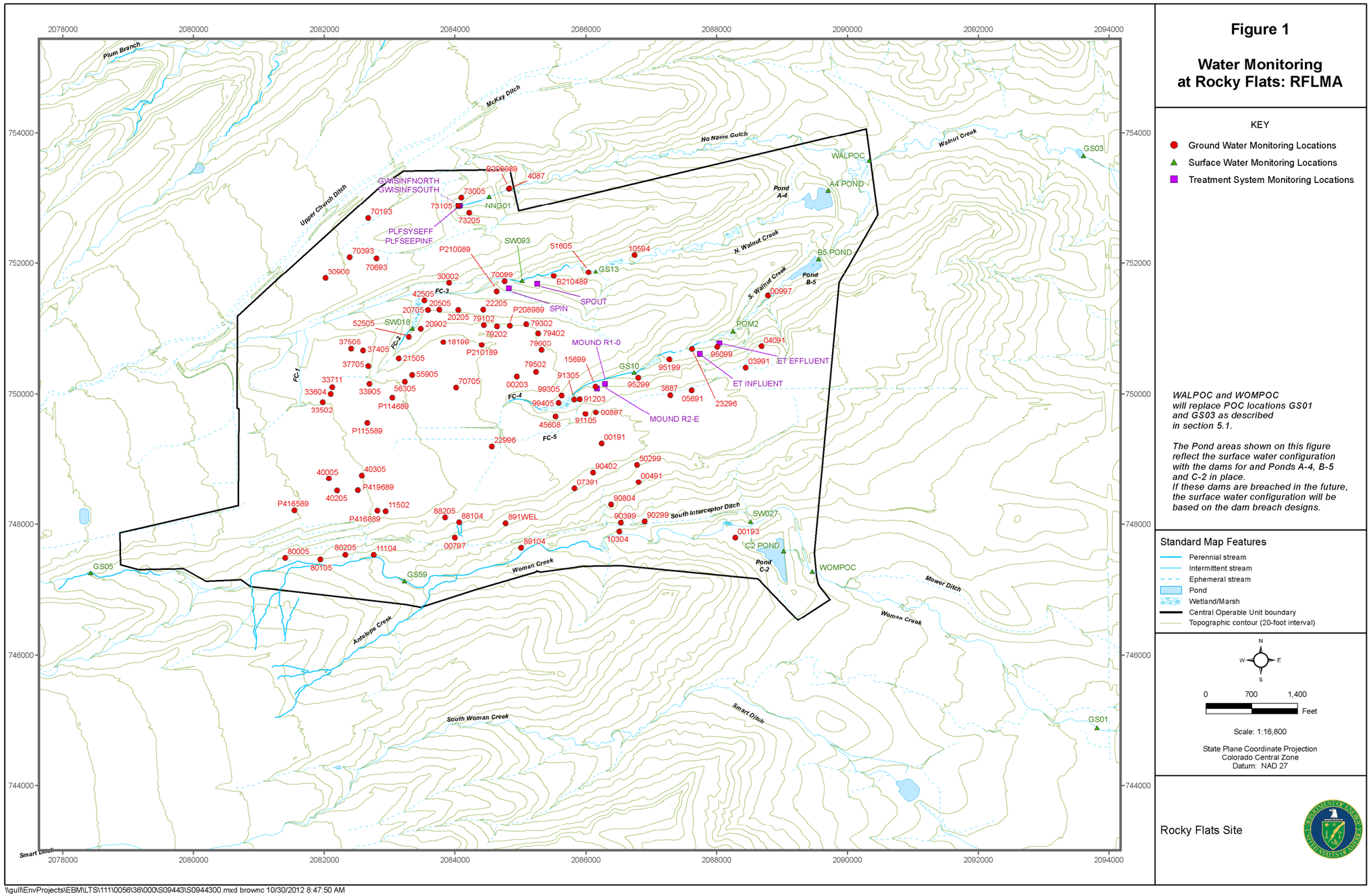

Figure 1. Water Monitoring at Rocky Flats