Annual Report of Site Surveillance and Maintenance Activities at the Rocky Flats, Colorado, Site

Calendar Year 2014

April 2015
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Appendixes

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Appendix E Technical Memorandum Regarding Instrumentation and Monitoring at the Rocky Flats OLF
Appendix F U Isotopic Compositions and Concentrations of Rocky Flats Water Samples Submitted to LBNL
Appendix G 2014 RFLMA Contact Records

DVD

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag</td>
<td>silver</td>
</tr>
<tr>
<td>Am</td>
<td>americium</td>
</tr>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
</tr>
<tr>
<td>AOC</td>
<td>Area of Concern</td>
</tr>
<tr>
<td>B</td>
<td>boron</td>
</tr>
<tr>
<td>B</td>
<td>Applies to analytical data for organics, indicating that the constituent was also detected in the blank</td>
</tr>
<tr>
<td>Be</td>
<td>beryllium</td>
</tr>
<tr>
<td>BMP</td>
<td>best management practice</td>
</tr>
<tr>
<td>Ca</td>
<td>calcium</td>
</tr>
<tr>
<td>CAD/ROD</td>
<td>Corrective Action Decision/Record of Decision</td>
</tr>
<tr>
<td>Cd</td>
<td>cadmium</td>
</tr>
<tr>
<td>CDPHE</td>
<td>Colorado Department of Public Health and Environment</td>
</tr>
<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act (also known as “Superfund”)</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>cfs</td>
<td>cubic feet per second</td>
</tr>
<tr>
<td>COU</td>
<td>Central Operable Unit</td>
</tr>
<tr>
<td>Cr</td>
<td>chromium</td>
</tr>
<tr>
<td>CR</td>
<td>Contact Record</td>
</tr>
<tr>
<td>Cu</td>
<td>copper</td>
</tr>
<tr>
<td>CY</td>
<td>calendar year</td>
</tr>
<tr>
<td>DCB</td>
<td>dichlorobenzene</td>
</tr>
<tr>
<td>DCE</td>
<td>dichloroethene</td>
</tr>
<tr>
<td>DER</td>
<td>duplicate error ratio</td>
</tr>
<tr>
<td>DG</td>
<td>Discharge Gallery</td>
</tr>
<tr>
<td>DNAPL</td>
<td>dense nonaqueous-phase liquid</td>
</tr>
<tr>
<td>DOC</td>
<td>dissolved organic carbon</td>
</tr>
<tr>
<td>DOE</td>
<td>U.S. Department of Energy</td>
</tr>
<tr>
<td>DQA</td>
<td>data quality assessment</td>
</tr>
<tr>
<td>DUP</td>
<td>duplicate sample</td>
</tr>
<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>EPC</td>
<td>East Perimeter Channel</td>
</tr>
<tr>
<td>ERP</td>
<td>Emergency Response Plan for Rocky Flats Site Dams</td>
</tr>
<tr>
<td>ESL</td>
<td>Environmental Sciences Laboratory</td>
</tr>
<tr>
<td>ETPTS</td>
<td>East Trenches Plume Treatment System</td>
</tr>
<tr>
<td>FC</td>
<td>Functional Channel</td>
</tr>
<tr>
<td>FR</td>
<td>Federal Register</td>
</tr>
</tbody>
</table>
ft/yr  feet per year
GIS   geographic information system
gpm   gallons per minute
GWIS  Groundwater Intercept System
HDPE  high-density polyethylene
HRC   Hydrogen Release Compound
HRT   hydraulic residence time
IA    Industrial Area
IC    institutional control
IHSS  Individual Hazardous Substance Site
IMP   Integrated Monitoring Plan
ITSS  Intercept Trench System Sump
J     For sampling data, a laboratory and/or validation qualifier that indicates an estimated value.
K     hydraulic conductivity
kg    kilograms
K-H   Kaiser-Hill Company LLC
L     liters
LANL  Los Alamos National Laboratory
LBNL  Lawrence Berkeley National Laboratory
LCS   laboratory control sample
LM    Office of Legacy Management
M&M  monitoring and maintenance
M-K   Mann-Kendall
MCL   maximum contaminant level
µg    micrograms
µg/L  micrograms per liter (sometimes expressed as ug/L)
mg/L  milligrams per liter
MS    matrix spike
MSD   matrix spike duplicate
MSPTS Mound Site Plume Treatment System
n     effective porosity
N     nitrogen
Ni    nickel
NOIPD Notice of Intent for Partial Deletion
NPL   National Priorities List
NREL  National Renewable Energy Laboratory
NTU   nephelometric turbidity units
OBP   Oil Burn Pit
OLF   Original Landfill
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCA</td>
<td>trichloroethane</td>
</tr>
<tr>
<td>TCB</td>
<td>trichlorobenzene</td>
</tr>
<tr>
<td>TCE</td>
<td>trichloroethene</td>
</tr>
<tr>
<td>TOC</td>
<td>total organic carbon</td>
</tr>
<tr>
<td>U</td>
<td>uranium</td>
</tr>
<tr>
<td>U</td>
<td>For sampling data, a laboratory and/or validation qualifier that indicates an analyte not detected at the indicated concentration.</td>
</tr>
<tr>
<td>UHSU</td>
<td>upper hydrostratigraphic unit</td>
</tr>
<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers</td>
</tr>
<tr>
<td>USFWS</td>
<td>U.S. Fish and Wildlife Service</td>
</tr>
<tr>
<td>v</td>
<td>seepage velocity</td>
</tr>
<tr>
<td>V&amp;V</td>
<td>validation and verification</td>
</tr>
<tr>
<td>VC</td>
<td>vinyl chloride</td>
</tr>
<tr>
<td>VOC</td>
<td>volatile organic compound</td>
</tr>
<tr>
<td>WQP</td>
<td>water quality parameter</td>
</tr>
<tr>
<td>WWTP</td>
<td>Wastewater Treatment Plant</td>
</tr>
<tr>
<td>Zn</td>
<td>zinc</td>
</tr>
<tr>
<td>ZVI</td>
<td>zero-valent iron</td>
</tr>
</tbody>
</table>
Executive Summary

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) is responsible for implementing the final response action selected in the final Corrective Action Decision/Record of Decision for Rocky Flats Plant (USDOE) Peripheral Operable Unit and Central Operable Unit (CAD/ROD) (DOE 2006a) issued September 29, 2006, for the Rocky Flats, Colorado, Site (Site).

Under the CAD/ROD, two Operable Units were established within the boundaries of the Rocky Flats property: the Peripheral Operable Unit (POU) and the Central Operable Unit (COU). The COU consolidates all areas of the Site that require additional remedial or corrective actions while also considering practicalities of future land management. The POU includes the remaining, generally unimpacted portions of the Site and surrounds the COU. The response action in the Final CAD/ROD is no action for the POU and institutional and physical controls with continued monitoring for the COU. The CAD/ROD determined that conditions in the POU were suitable for unrestricted use. The U.S. Environmental Protection Agency (EPA) subsequently published a Notice of Partial Deletion from the National Priorities List for the POU on May 25, 2007.

DOE, EPA, and the Colorado Department of Public Health and Environment (CDPHE) have chosen to implement the monitoring and maintenance requirements of the CAD/ROD under, and as described in, the Rocky Flats Legacy Management Agreement (RFLMA), executed March 14, 2007, and subsequently revised in 2012 (CDPHE et al. 2012). RFLMA Attachment 2 defines the COU remedy surveillance and maintenance requirements. 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.

LM prepared and continually updates the Rocky Flats Site Operations Guide (DOE 2013b). It is the primary document to guide work performed to satisfy the requirements of RFLMA and to implement best management practices at the Site.

This report addresses all surveillance and maintenance activities conducted at the Site during calendar year (CY) 2014 (January 1 through December 31, 2014). Highlights of the surveillance and maintenance activities are as follows:

- The RFLMA references the use of contact records to document CDPHE approvals of field modifications to implement approved response actions. RFLMA Attachment 2 references the use of contact records to document the outcome of consultation related to addressing any reportable conditions. This report discusses the 10 RFLMA contact records issued in 2014 and the contact record status as of December 31, 2014.

- Inclinometers were installed at the Original Landfill (OLF) as part of the 2008 geotechnical investigation to address localized slumping and settling of the OLF cover observed in 2007. The localized instability is caused by the weakening of one or more soil layers in the shallow subsurface due to moisture in these layers. This annual report includes the annual review of the inclinometer data by a qualified geotechnical engineer. The data indicate that movement at the OLF is exacerbated by precipitation events and elevated water levels. While the large-scale, overall OLF slope is stable, localized failures have occurred on the landfill under elevated water level conditions. Continued monitoring and routine maintenance of the OLF cover are recommended. Minor localized cracking and subsidence
in the northeast portion of the OLF were observed in the first half of the year. Cracks were filled to minimize infiltration of additional precipitation as required by the M&M Plan. A 2014 project to recontour sideslopes in the East Perimeter Channel to increase slope stability in that area began construction in October 2014 and was completed in January 2015. Berm-height criteria were redefined in 2013 based on the observed performance of the berm channels during the September 2013 heavy precipitation event. In July 2014, the berms were regraded where necessary to restore the appropriate berm height, using the new approved criteria, and to repair damaged berm outfalls.

- Reportable 30-day average uranium concentrations occurred from December 18, 2013, through May 17, 2014, for surface water at RFLMA Point of Compliance (POC) monitoring station WALPOC, which is located on Walnut Creek at the eastern COU boundary. The same sample results causing the reportable 30-day average also caused the 12-month rolling average to subsequently become reportable on October 31, 2014. As of December 31, 2014, the 12-month rolling average remained at a reportable level (17.0 micrograms per liter). Water quality at WALPOC is evaluated in Section 3.1.2.1 of this report.

- All other RFLMA POC analyte concentrations/activities remained below reporting levels throughout CY 2014.

- Reportable 12-month rolling average americium (Am) and plutonium (Pu) activities were observed during the first half of CY 2014 in surface water at RFLMA Point of Evaluation (POE) monitoring station GS10, which is located on South Walnut Creek upstream of former Pond B-1. As of June 30, 2014, the 12-month rolling averages for Am and Pu were no longer reportable.

- All other RFLMA POE analyte concentrations/activities remained below reporting levels throughout CY 2014.

- The results of statistical evaluations of groundwater quality at the OLF and Present Landfill (PLF) were largely identical to the results of these evaluations performed in 2013.

- Water monitoring at the Present Landfill Treatment System during CY 2014 showed two analytes, arsenic and vinyl chloride, detected above the applicable standards for individual sample results collected at the system effluent during routine quarterly sampling. The observed arsenic concentrations did not reoccur and RFLMA consultation regarding arsenic was not required during CY 2014.

Vinyl chloride was detected above the standard in three successive monthly samples following the routine quarterly sample. In accordance with the evaluation protocols in RFLMA Attachment 2, Figure 11, “Groundwater Treatment Systems,” these consecutive results triggered consultation among the RFLMA Parties and sampling at location NNG01 (outfall of the former PLF Pond area) for vinyl chloride. NNG01 was sampled on March 26, 2014. Vinyl chloride was not detected in the sample from NNG01, and consequently the PLFSYSEFF quarterly sampling frequency was resumed. The consultation is documented in Contact Record 2014-06 (http://www.lm.doe.gov/Rocky_Flats/ContactRecords.aspx).

- The East Trenches Plume Treatment System (ETPTS) was reconfigured in 2014 to eliminate the original relatively costly and wasteful treatment approach, and replace it with a more effective method that should sharply reduce long-term costs. The original treatment media, zero-valent iron (ZVI), did not meet RFLMA treatment targets and had to be replaced every
3 to 4 years, and the spent media required proper disposal, sometimes as low-level radioactive waste. The ZVI was eliminated from the reconfigured system, and other system components were modified and adapted to support a commercially available air stripper. The electricity powering this air stripper is from the ETPTS solar/battery facility (installed in 2013 to support a smaller air stripper designed and built by Rocky Flats staff), with some additional solar capacity installed in 2014 using repurposed solar panels that were no longer used for their original application. The project to reconfigure the ETPTS was nearing completion as 2014 ended and represents the only solar-powered air stripper known to the manufacturer in the U.S.

- The Solar Ponds Plume Treatment System was the focus of continued study in an effort to improve cost and treatment effectiveness. Pilot-scale lagoons continued to support studies of better ways to treat nitrate. Using small containers (“microcells”) of various forms of treatment media—on the order of 1 to 2 gallons—continued being tested to treat uranium. Both of these approaches are being optimized for potential full-scale implementation.

- All RFLMA wells were sampled in 2014 (including Evaluation wells, which are routinely sampled every other year). Groundwater quality and flow at the Site were generally consistent with previous years. No reportable conditions were indicated. Statistical trending calculations indicated numerous significant concentration trends. Conditions observed at some locations, particularly with respect to groundwater elevations, suggested climatic causes: the effects of the extremely heavy precipitation received in September 2013 continued to be observed through the first portion of 2014.

- All RFLMA-required ecological data collection, analysis, and reporting were completed as scheduled.

- Revegetation monitoring data continued to demonstrate the establishment and sustainability of desirable grassland species at the Site.

- The annual data quality assessment showed that the Site continues to collect high-quality data sufficient for decision making.
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