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

Calendar Year 2019

Operations and Maintenance

April 2020
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<tr>
<td>ATV</td>
<td>all-terrain vehicle</td>
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1.0 2019 Highlights

This report addresses operation and maintenance (O&M) activities conducted at the Rocky Flats Site, Colorado (Site), during calendar year (CY) 2019 (January 1 through December 31, 2019). O&M highlights for 2019 include:

- The annual verification that the Restrictive Notice (formerly the Environmental Covenant) remains in the Administrative Record and on file in Jefferson County records was conducted on March 19, 2019. In addition, it was verified that physical controls (i.e., signs placed along the Central Operable Unit [COU] fence) were in place.

- The annual site inspection was conducted on March 26, 2019. No evidence of violations of institutional or physical controls was observed, and no adverse biological conditions were noted.

- The former building areas (B371, B771, B881, and B991) were inspected each quarter in 2019 as a BMP and after significant precipitation events in March and July. On the southeast side of former B881, a sink hole measuring ~3 feet (ft) in diameter and 3 ft deep was identified during the fourth quarter inspection. The inspections of the COU after precipitation events identified no significant changes in depressions or subsidence, nor were other issues of concern noted at former building areas B371/374, B771/774, B881, B991, remaining Original Process Waste Lines and New Process Waste Lines, the Ash Pits, and East Trenches.

- The Present Landfill (PLF) was inspected quarterly during CY 2019. Two more weather-related inspections were also conducted. No significant issues were observed during these inspections.

- The Original Landfill (OLF) was inspected monthly during CY 2019. In addition, two weather-related inspections were conducted. The OLF was also monitored weekly as a best management practice (BMP).

- There was no slumping at the OLF hillside during CY 2019. The waste footprint area was stable, with the exception of some minor cracking above Berm 4. The area outside the waste footprint was stable with the exception of minor cracking above Berm 5. Soil from the 2017 slump that blocked the East Perimeter Channel (EPC) was removed in CY 2019 as part of the OLF Stabilization Project. Other activities at the OLF are noted as follows:
  - Minor maintenance of the OLF cover was conducted throughout the year as needed to fill small cracks and erosion rills as they were identified, using hand tools such as shovels and rakes.
  - Construction on the OLF Stabilization Project began August 2019 and is scheduled to be completed in 2020. Design work for this project began in 2018; see the 2018 annual report for more information.
  - The pumps in the temporary groundwater intercept (GWI) wells were restarted on May 17, 2019, but a malfunction interrupted their operation in late May. They were fully operational again in mid-June. The pumps in these wells were shut off and winterized on September 25, 2019, and are on standby for potential use in 2020.
The siphon system installed at Seep 10 in 2018 was restarted for the season on March 27, 2019, and was operated until October 9. The system was disassembled in November to prepare for excavation activities related to the OLF Stabilization Project, which will replace this temporary configuration with a more permanent one.

- Measurement of groundwater elevations in the functioning piezometers installed at the North Walnut Creek Slump (NWCS) continued in 2019. The NWCS following regrading has shown a maximum displacement of 3 feet, due to slow creep. A majority of that movement occurred in the June–August 2018 and July–August 2019 periods. This is largely due to infiltrating rainfall. The average monthly creep (i.e., movement downhill) is about 1.7 inches per month, but it varies with precipitation. In October 2019 a swale and rock crossing was completed upgradient of the NWCS to divert storm water away from the slump area.

- Site road maintenance was completed in the summer of 2019. The roads were regraded, road base was added as needed, and dust suppressant was applied on the primary routes to aid in dust control.

- The signs posted on the COU boundary fence were inspected quarterly in CY 2019. No significant maintenance was required. Signs were reinstalled or replaced as needed (usually because they were knocked off by deer or elk or because wires that were attaching them to the fence broke).

- Maintenance, repair, replacement, and monitoring of Site erosion control features continued through 2019.

- Various O&M activities were conducted at the groundwater collection and treatment systems, the details of which are provided in the Groundwater Monitoring volume of this annual report.

A detailed summary of the O&M activities conducted during 2019 is provided in this volume, which is one of the five volumes that comprise the Annual Report of Site Surveillance and Maintenance Activities at the Rocky Flats Site, Colorado, Calendar Year 2019.

The other volumes of the 2019 annual report are:

- Overview
- Groundwater Monitoring
- Surface Water Monitoring
- Ecological Monitoring
2.0 Annual Site Inspection

The Site must be inspected annually for evidence of significant erosion and institutional control (IC) violations, in accordance with Sections 5.3.4 and 5.3.6 in Attachment 2 of the Rocky Flats Legacy Management Agreement (DOE et al. 2007) (RFLMA). The 2019 inspection was conducted on March 26 and reported in the Rocky Flats Site Quarterly Report of Site Surveillance and Maintenance Activities, First Quarter Calendar Year 2019 (DOE 2019). The inspection forms and maps are included in the Errata to the quarterly report for the first quarter of CY 2019 (DOE 2019).

In accordance with RFLMA, the annual site inspection focuses on the following:

- Evidence of significant erosion in the COU and evaluation of the proximity of significant erosion to subsurface features. This monitoring includes visual inspection for precursor evidence of significant erosion (e.g., cracks, rills, slumping, subsidence, and sediment deposition).
- The effectiveness of ICs, as determined by any evidence of violation.
- Evidence of adverse biological conditions, such as unexpected morbidity or mortality, observed during the inspection and monitoring activities.

As part of the IC inspection, verification that the Notice of Environmental Use Restriction remains in the Administrative Record and on file in Jefferson County records is required annually. This verification was conducted on March 19, 2019. In addition, it was verified that physical controls (i.e., signs placed along the COU fence) were in place.

The annual inspection was scheduled so that surface features could be observed after snow cover had melted, when the surface was dry, and before vegetation growth could obscure land surface features. The inspection was conducted on March 26, 2019.

To conduct this work, knowledgeable DOE, Colorado Department of Public Health and Environment (CDPHE), U.S. Environmental Protection Agency (EPA), and Legacy Management Support staff members (the inspection team) walked down the COU surface to observe conditions. The COU was divided into Areas A–E, as shown on the maps included in Appendix C of the Errata to the first quarter report (DOE 2019). These areas include the locations of the subsurface features in Figure 3 and Figure 4 of RFLMA Attachment 2 and the pediment and hillside surfaces in the COU. Inspection team members used maps to inspect their assigned areas. Reference points, such as monitoring wells and roads, were used to orient the inspection team members within designated inspection areas.

Appendix C of the Errata to the first quarter report (DOE 2019) also includes the completed inspection checklists.

Team members used marker flags to identify areas where conditions showed potential evidence of the three categories listed above, as well as hand-held GPS units, to make their location available for follow-up by Site subject matter experts or to mark debris to be removed later. Areas that required evaluation were documented in the Site Observation Log for evaluation and follow-up.
Most items encountered were debris or trash (e.g., fragments of PVC pipes, rebar, wire bundle, grounding rod) on the surface; these items were either picked up during the inspection or subsequently removed. One 8-foot by 2-foot area exhibited a 1-foot-deep subsidence, coinciding with the south side of former B371 (southeast corner). Site field operations subject matter experts evaluated this area and concluded it did not represent an urgent or significant issue of concern. This and other observations were added to the Site’s Geographic Information System database for further observation.

No evidence of violations of institutional or physical controls was observed, and no adverse biological conditions were noted.

3.0 Landfills

The results of 2019 inspections, monitoring data, and maintenance activities for the PLF and OLF are provided below.

3.1 Present Landfill

The PLF consists of an approximately 20-acre engineered cover that is compliant with Resource Conservation and Recovery Act Subtitle C and was placed over a former landfill in 2005. The landfill was operational from 1968 until 1998 and received solid wastes such as construction debris and hazardous wastes such as paints and solvents. A diversion channel surrounds the landfill and diverts storm-water runoff away from the landfill to No Name Gulch. A Groundwater Intercept System (GWIS) is also present in the subsurface; its location is approximately beneath the diversion channel. The landfill has a passive seep interception and treatment system (the Present Landfill Treatment System [PLFTS]) installed to treat landfill seepage and groundwater diverted by the GWIS. Effluent from the PLFTS discharges into the former Landfill Pond area. A passive gas extraction system is also built into the landfill to allow gases to vent to the atmosphere.

Subsidence and consolidation at the PLF is monitored during the quarterly inspections by visually examining the surface of the landfill cover for cracks, depressions, heaving, and sinkholes. Also, 15 landfill settlement monuments are surveyed annually to confirm that conditions lie within the expected calculations.

Inspections and monitoring tasks follow the format and protocol established in the Present Landfill Monitoring and Maintenance Plan and Post-Closure Plan, U.S. Department of Energy Rocky Flats, Colorado, Site (DOE 2014) (PLF M&M Plan) and include the monitoring of groundwater and surface water, subsidence and consolidation, slope stability, soil cover, storm-water management structures, and erosion in surrounding features.

3.1.1 Inspection Results

During CY 2019, quarterly inspections were performed at the PLF on February 14, May 24, August 14, and November 15. Weather-related inspections were also performed on March 18 and July 3. In accordance with the PLF M&M Plan, weather-related inspections are conducted after a storm event of 1 inch or more rain in a 24-hour period, or after a significant melt of a
snowstorm of 10 inches or more (assuming 10 inches of snow is equivalent to 1 inch of water). See the Surface Water Monitoring volume of this annual report for the quarterly precipitation data.

The inspection process followed the format and protocol established in the PLF M&M Plan (DOE 2014). No significant issues were observed during these inspections. Microbial buildup was observed in the north and south manhole outlet pipes of the PLFTS, which is a normal occurrence. These accumulations were removed using a mechanical pipe cleaner during each inspection. In July, cracking grout around the PLFTS north and south manhole covers was replaced with weather-resistant, low-VOC caulking. This grout is a cosmetic feature; the cracking does not constitute a remedy-related concern, as there are no issues in allowing rainwater to enter either manhole.

Landfill inspection forms for the fourth quarter of CY 2019 are provided in Appendix C; earlier 2019 inspection forms are included in the applicable quarterly reports.

### 3.1.2 Settlement Monuments

The 15 landfill settlement monuments are surveyed annually. Nine settlement monuments are located across the top of the landfill cap, and an additional six monuments are on the east face of the landfill. The monument survey data are compared to the expected settlement calculated in the final design to determine the degree of subsidence at the landfill.

The annual settlement monument survey was completed on December 11, 2019. Results of the survey indicate that vertical settling at each monument is within the acceptable limits calculated in the final design and does not trigger any maintenance activity under the PLF M&M Plan (DOE 2014).

### 3.2 Original Landfill

The OLF is a former solid-waste and construction-debris landfill that occupies approximately 20 acres on a hillside. The landfill operated from 1952 until 1968 and received primarily solid sanitary and construction-debris wastes. Other wastes included solvents, paints, oils, pesticides, and items contaminated with beryllium and uranium. As part of the site closure project in 2005, the original surface was regraded to a consistent slope and clean fill was added to achieve a relatively smooth surface. A 20-foot-high, 1000-foot-long soil buttress was placed at the toe of the landfill. The final cover consists of a 2-foot-thick Rocky Flats Alluvium soil cover that was constructed over the regraded surface and the buttress fill. The area was then revegetated. Erosion of the soil cover is controlled by a series of diversion berms that carry storm-water runoff away from the cover to channels on the east and west perimeter of the cover.

The OLF Stabilization Project design commenced in 2018. The design includes controlling infiltration, tieback anchors, and diverting groundwater by installing additional subsurface groundwater collection trenches similar to the East Subsurface Drain (ESSD). The following OLF Stabilization Project activities took place in CY 2019:

- The contract to manufacture and provide tieback anchors for the OLF Stabilization Project was awarded on June 6. Anchor plate fabrication began the week of August 19, and full production was underway on August 26.
The Phase 1 Notice to Proceed for the construction portion of the OLF Stabilization Project was awarded on August 7, 2019. Phase 1 focused on mobilization and setup. Phase 1 activities began on August 8, 2019, and included such activities as installing signs for traffic control and construction area designations, laying fabric in the yard, mobilizing equipment trailers and generators, and receiving deliveries of stone.

The Phase 1B authorization to proceed led to installing two dewatering wells to support the safe and effective installation of the stabilization anchors and three piezometers to evaluate groundwater recharge rates and flow, installing or improving roads to safely access the west and east sides of the OLF hillside, accepting and storing the concrete anchor plates, and installing a temporary bubble-up structure on the west side to receive the water from the two test wells.

The Phase 2 Notice to Proceed for the OLF Stabilization Project was given on September 11, 2019. Phase 2 includes the balance of the project scope, which entails stabilizing the supporting hillside, installing stabilization features (i.e., trench drains and tieback anchors) (Figure 1 and Figure 2), restoring the 2-foot-thick soil cover in select areas, and reconstructing berms and channels to divert storm water.

As of December 31, 2019, OLF Stabilization Project activities were underway across most of the east and west ends of the OLF, including the east supporting hillside and both perimeter channels. Anchor installation began with East Anchor Row 1 (EAR-1), which was nearing completion in November, and drilling began on West Anchor Row 1 (WAR-1) in December while the face of EAR-2 was being cut for anchor block placement. Each anchor row also includes installation of a toe drain meant to divert groundwater away from the anchor blocks. The East and West Perimeter Channels were excavated to construct new underlying drains and subsurface exfiltration galleries (Figure 3).
Figure 1. Permanent Features of Rocky Flats Site OLF Stabilization Project

Figure 2. Typical Cross Section, Ground Anchor, and Interceptor Drain Collection Trench Stabilization System (not to scale)
Figure 3. Subsurface Exfiltration Gallery Features at the Lower Ends of the Trench Drains and Perimeter Channels
3.2.1 Inspection Results and Maintenance Activities

Monthly inspections were performed at the OLF throughout CY 2019. Additional weather-related inspections were conducted on March 18 and July 3. In accordance with the OLF M&M Plan (DOE 2009), weather-related inspections are conducted within 2 days of a storm event of 1 inch or more of rain in a 24-hour period or after significant melt of a snowstorm of 10 inches or more. Weekly monitoring of the OLF initiated in 2015 as a BMP continued through CY 2019. The focus of weekly monitoring is to inspect deficiencies with frequent progression, note new and significant deficiencies that appear between monthly inspections, and note the status of groundwater diversion system components.

The inspection process follows the format and protocol established in the OLF M&M Plan (DOE 2009). In February 2018, the use of a modified OLF landfill inspection form (Appendix A to the OLF M&M Plan) was approved by CDPHE and EPA. Minor modifications to the current OLF inspection form were necessary to (1) capture changes to water management controls resulting from routine maintenance and repairs conducted since 2009, (2) delete the vegetation inspection page, and (3) allow for the use of an electronic inspection form. Modification of the form is discussed in Contact Record (CR) 2018-02, which was approved on February 20, 2018. Use of the modified inspection form began with the March 2018 OLF inspection. The OLF M&M Plan will be revised to adopt the modified form after the long-term hillside stabilization measures are implemented.

Landfill inspection forms for the fourth quarter of CY 2019 are included in Appendix C. Inspection forms for the previous quarters are provided in the respective quarterly reports.

During the first quarter of CY 2019, no significant erosion or slumping was observed.

During the second quarter of CY 2019, holes in diameters of 1–3 inches and depths of 2–4 inches appeared along the west-central section of the Berm 5 channel and along the east end of an existing scarp above the eastern portion of Berm 4. No evidence to suggest that these were created by burrowing animals was observed. The holes were filled in with hand tools. Erosion was identified on the eastern part of the cover and east supporting hillside in June from the late May and early June rainfall. Maintenance was conducted to remove sediment from behind wattles and Georidges, place additional rows of Georidges in the EPC, and repair erosion rills with rakes.

During the third quarter of CY 2019, a July 3 weather-related inspection identified erosion on the east cover and east supporting hillside, including numerous rills with depths up to approximately 1.5 inches along the east supporting hillside. Maintenance was conducted to remove sediment from behind wattles and Georidges, place additional rows of Georidges in the EPC, and repair the deepest rills with rakes. Holes with 0.5 inch diameters and depths of 2–3 inches were found along the east end of an existing scarp above the eastern portion of Berm 4. Cracking appeared near the west and northwest edges of the 2017 slump area on the east supporting hillside. This was later identified as tension cracking after depths went from 1–2 inches in August to 6–13 inches in September. All cracks were filled in with hand tools after consultation with the project lead.
During the fourth quarter of CY 2019, holes in diameters of 1–2 inches and with depths of 1–3 inches appeared throughout the quarter along the west-central section of the Berm 5 channel. No evidence of animal inhabitation was observed. The holes were filled in with hand tools. The Seep 2/3 drain was damaged by elk and was subsequently rerouted into the easternmost Berm 6 drain in October to allow the area downgradient of Seep 2/3 and the EPC outfall area to dry. The EPC and West Perimeter Channel were excavated as part of the OLF Stabilization project in November and December, respectively, to install drain outfall trenches underneath.

### 3.2.2 Settlement Monuments

The OLF settlement monument quarterly surveys were conducted on March 6, June 10, September 3, and December 3, 2019. Figure 4 includes the locations of the settlement monuments. Survey data indicate that vertical settling at each monument is within the acceptable limits specified in Figure 3-1 of the OLF M&M Plan (DOE 2009). The survey results for fourth quarter of CY 2019 are included in Appendix C. Survey data for other quarters are included in the respective quarterly reports.

### 3.2.3 Seeps

Seeps at the OLF (Figure 4) were evaluated during the monthly inspections. Conditions ranged from dry to producing flows as great as 2–3 gallons per minute (see Appendix C), corrugated pipes are used to route seepage in some cases, and seepage was disrupted in some areas by ongoing OLF Stabilization Project activities. Additional seep information can be found in the OLF monthly inspection reports. Additional precipitation information can be found in the Surface Water Monitoring volume of this annual report.

### 3.2.4 East Subsurface Drain

As described in the *Annual Report of Site Surveillance and Maintenance Activities at the Rocky Flats Site, Colorado, Calendar Year 2016* (DOE 2017), additional actions to improve the diversion of groundwater away from the OLF included maintenance and upgrade of the ESSD in the northeast corner of the OLF. In anticipation of the temporary GWI system project described in the next section, a solid wall pipe was paired with the perforated drain to provide a conduit for the intercepted groundwater. This work was conducted in accordance with CR 2016-04.

Subsequently, piezometers (Figure 4) were installed upgradient (85517) and downgradient (85617) of the ESSD to monitor the performance related to lowering groundwater levels in the area of the ESSD (Figure 5).
Figure 4. Original Landfill, Rocky Flats Site, Colorado
Note: Data gap from July 2, 2018, to August 1, 2018, for 85517 datalogger due to user error. Datalogger was not restarted after the July 2, 2018, download.

Figure 5. Groundwater Levels from Piezometers 85517 and 85617 near ESSD and Precipitation

The groundwater elevation downgradient of the ESSD dropped to a historical low of 5983.8 ft in early March 2019, since the observed movement of the east supporting hillside in May 2017 (5978.4 ft on 5/24/2017). Piezometers 85517 and 85617 both show rises of approximately 4 ft during the spring and summer months of 2019, with the difference in groundwater elevations ranging from 3.04 to 5.02 ft. National Renewable Energy Laboratory (NREL) precipitation data, which more accurately capture snowfall totals than the Site’s data, show that there were more frequent or higher precipitation events throughout these months when compared to 2018 daily totals. The strongest evidence for the ESSD functioning properly in 2019 is the number of fluctuations in the groundwater elevation of downgradient piezometer 85617 during the spring and summer months. Whereas upgradient piezometer 85517 shows uninterrupted rises in groundwater elevation after rainfall, downgradient piezometer 85617 shows sudden drops in groundwater elevation shortly after rainfall. Data from August–December may not be representative of normal ESSD function, as several dewatering wells were installed upgradient as part of the OLF Stabilization Project to support the safe and effective installation of the stabilization anchors. Dataloggers were removed from the piezometers in early December to protect them from construction activity in the immediate area.
3.2.5 Temporary Groundwater Intercept Wells

In March 2017, two temporary GWI wells were installed along what were believed to be preferential groundwater flow paths to the OLF (460GWI and 440GWI, Figure 4). These wells resumed operation during the spring and summer of 2019 to collect additional data before the OLF Stabilization Project is implemented. During 2019, a total of approximately 223,000 gallons of groundwater were diverted.

Piezometers 84616 and 83916 monitor groundwater levels north and south of 460GWI, respectively (Figure 4).

On May 20, 2019, three days after season startup, the generator shut off due to insufficient power and again a day later after replacing the battery. The wells were restarted on May 28 after a blown alternator fuse was discovered and replaced inside the generator’s fuse box. This can be seen as brief drops in groundwater elevation in all four piezometers immediately after season startup, followed by noticeable rises in elevation during the temporary shutdown (Figure 6 and Figure 7). On May 31, it was discovered that the motor of the 460GWI pump had burnt out, and it was subsequently replaced on June 17. This is represented by a rise of 5.6 ft in groundwater elevation seen at piezometer 83916. Elevations remained relatively stable throughout the remainder of the year.

![Figure 6. Groundwater Levels from Piezometers 83916 and 84616 near 460GWI and Precipitation](image-url)
Figure 7. Groundwater Levels from Piezometers 85117 and 85217 near 440GWI and Precipitation

Piezometers 85117 and 85217 monitor groundwater levels north and south of 440GWI, respectively (Figure 4). These wells are also likely influenced by the 36-inch line that runs diagonally across the top of the OLF (Figure 4), and presumably the groundwater level here was affected by the operation of the siphon at Seep 10 (see Section 3.2.6). During 2019, a maximum rise of 2.9 ft in groundwater elevation was recorded at piezometer 85217, due to issues with 440GWI pump control settings and not pump failure. These issues were resolved on June 10, and the 440GWI pump continued to lower groundwater elevations through early July, when groundwater elevations dropped below the possible pumping set point for 440GWI.

3.2.6 Seep 10 Sump and Siphon

In April 2018, a geotechnical investigation was completed at the OLF. As part of this geotechnical investigation, a sump was installed in the test pit that was excavated near Seep 10. The sump is near the downgradient terminus of the remnant 36-inch-diameter corrugated metal pipe that was left in place at closure and cut off just east of Seep 10. Prior to 2018, Seep 10 had a discrete discharge point at the ground surface in the spring and early summer, saturating the ground surface and subsurface and potentially contributing to hillslope instability.

Piezometer 85717 is installed near and downgradient of the Seep 10 siphon (Figure 4) and shows the groundwater elevation response to siphon operation (Figure 8).
Siphon operation was started on March 27, 2019. Intermittent siphoning in April and May allowed the groundwater elevation at piezometer 85717 to rise by 4.48 ft (5992.74 to 5997.22 ft). Operations from June through August lowered the groundwater elevation by 4.29 ft (5996.82 to 5992.53 ft). Siphon operations were discontinued October 17 due to a conflict with the siphon’s drain positioning and OLF Stabilization Project activities in the immediate area. In 2019, the Seep 10 siphon diverted approximately 1,410,000 gallons of water around the slump area.

![Groundwater Level from Piezometer 85717 near Seep 10 Siphon and Precipitation](image)

Figure 8. Groundwater Level from Piezometer 85717 near Seep 10 Siphon and Precipitation

### 4.0 COU and Former Building Area Inspections

In accordance with RFLMA, the COU is monitored for significant erosion annually and following major precipitation events. Particular attention is paid to areas proximate to remaining subsurface features (e.g., former building slabs, trenches). In CY 2019, in addition to weather-related inspections, the former building areas were inspected quarterly as a BMP. The areas inspected include former B371, B771, B881, and B991. On the southeast side of former B881, a depression measuring ~3 ft in diameter and 3 ft deep was identified during the fourth quarter inspection. There were no additional notable changes observed in any of the inspected building areas during the quarterly and weather-related inspections, including the subsidence observed along the southeast corner of B371 during the 2019 annual inspection.
5.0 North Walnut Creek Slump

Slumping on the hillside east of the Solar Ponds Plume Treatment System (SPPTS) is referred to as the North Walnut Creek Slump, or NWCS.

In the winter of 2017–2018, a geotechnical investigation project was completed; it included drilling 18 geotechnical borings, 15 of which were completed as piezometers, and 3 were completed as inclinometers. These are shown in Figure 9.

Geotechnical and groundwater data were used to complete a geotechnical slope stability evaluation and to evaluate specific alternatives for hillside stabilization. After reviewing the slope stability evaluation, groundwater information, and cost estimates, it was determined that a streamlined approach to hillside stabilization may be possible with additional data and evaluation. Planning for that additional investigation and data collection continued in CY 2019.

Figure 10 through Figure 12 show the measured groundwater levels in the upgradient, midgradient, and downgradient piezometers, respectively. Most of the piezometers demonstrate a rise in groundwater elevations during the higher precipitation spring months. Upgradient piezometer 72717 shows a continuously rising water level through most of its history, which may be due to the very tight claystone in which it is installed. Upgradient piezometer 72517 experienced a water level rise of nearly 30 ft after heavy rainfall in late April and early May. The cause of this is not certain, but is possibly due to runoff entering the piezometer. Runoff such as this drove the design and construction of the SPPTS Road Area Surface Water Diversion Project, as surface runoff such as this was known to flow to the NWCS, potentially destabilizing it and causing additional hillslope movement. Piezometer 72517 displays the most variation in water levels of all the NWCS piezometers. The downgradient piezometers 74317 and 73917 show little seasonal variation, likely due to their proximity to North Walnut Creek.
Figure 9. North Walnut Creek Slump Geotechnical Project Features, Rocky Flats Site
Figure 10. NWCS Upgradient Groundwater Levels and Precipitation

Figure 11. NWCS Midgradient Groundwater Levels and Precipitation
In September 2019, work commenced on the SPPTS Road Area Surface Water Diversion Project (CR 2019-03). The purpose of this project was to construct a diversion channel that would divert surface water runoff away from the NWCS to minimize infiltration into the slump area. An apron was constructed east of the NWCS at the terminus of the diversion channel to promote sheet flow of the diverted water into a nearby preexisting drainage. In addition, the project included improving and adding rock crossings along the SPPTS access road to divert runoff away from the NWCS. This work was completed on October 8, 2019.

6.0 Site Road Maintenance

Access to different areas of the Site is provided by established gravel roadways and all-terrain vehicle (ATV) paths. These are typically maintained on an annual basis, with smaller, localized improvements as required. Maintenance includes grading and filling ruts on the primary routes and trimming vegetation as needed on the ATV paths. July through September 2019, maintenance was performed and a dust suppressant was applied on the primary routes to enhance long-term dust control. Site roads are continually monitored throughout the year and after significant weather events to ensure safe passage of Site personnel for routine operations.
7.0 Sign Inspections

RFLMA requires that signs be posted at intervals around the perimeter of the COU to notify persons that they are at the COU boundary. In addition, signs that list the use restrictions known as ICs and provide contact information are posted at COU access points. These signs are an important component of the required physical controls of the remedy. Signs are inspected quarterly and are maintained through repair or replacement as needed.

The signs were inspected quarterly in 2019 as required (February 28, May 15, August 12, and November 20). Signs were reinstalled or replaced as needed, usually because they were knocked off by deer or elk or because wires attaching the signs had broken.

8.0 Erosion Control and Revegetation

Existing erosion controls are maintained, repaired, and augmented to protect bare soil areas until vegetation stabilizes the soil. Areas lacking sufficient vegetation are assessed and typically reseeded. In some cases, soil amendments are added to help establish the native vegetation. Additional information on the revegetation activities conducted at the Site during 2019 is provided in the Ecological Monitoring volume of this 2019 annual report.

Maintenance, repair, replacement, and monitoring of the Site erosion control features continued as needed through 2019. Guidance in the Erosion Control Plan for the Rocky Flats Property Central Operable Unit (DOE 2007) was followed for projects conducted in 2019. The plan addresses what regulatory requirements must be met, including monitoring inspections, and the scope of erosion control activities at the Site. It outlines the responsibilities, BMPs, and implementation aspects of erosion control activities before, during, and after projects. Erosion controls were inspected on a regular basis (typically weekly or monthly depending on location and ground conditions), following high-wind events, and after significant precipitation events. Repairs in 2019 included installing, replacing, or securing wattles (by restaking or weighting with rocks) or securing erosion control blankets that had loosened. GeoRidges were installed where needed, to provide added protection.

Elk have become problematic and continue to damage erosion control measures. To evaluate alternatives, compost-filled wattles were installed in one location to determine whether these heavier wattles would withstand the impacts from the elk. Their performance to date has been good, and they will continue to be evaluated.

9.0 References


