

4.0 Durango, Colorado, Disposal Site

4.1 Compliance Summary

The Durango, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, inspected on May 21, 2013, was in excellent condition. Vegetation on top of the disposal cell remains healthy, and the top and side slopes remain relatively free of deep-rooted species. A gap in the retention pond fence was repaired. No additional maintenance needs or cause for a follow-up or contingency inspection was identified.

The transient drainage system from the cell has been closed since November 2011. The water level in the retention pond is low. Decommissioning of the retention pond has been delayed, pending an evaluation of uranium concentrations in groundwater from one of the downgradient wells.

In October 2010, the permeable reactive barrier treatment system, buried in the area east of the retention pond, was decommissioned and removed. Revegetation of this area is proceeding successfully, and sediment-control structures continue to prevent offsite sediment discharges.

4.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Durango Disposal Site, Durango, Colorado* (LTSP) (LMS/DUD/S06297-0.0, U.S. Department of Energy [DOE], January 2011) and procedures that DOE established to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 4-1 lists these requirements.

Table 4-1. License Requirements for the Durango Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0	Section 4.4
Follow-Up or Contingency Inspections	Section 7.0	Section 4.5
Maintenance and Repairs	Section 8.0	Section 4.6
Groundwater Monitoring	Section 5.0	Section 4.7
Corrective Action	Section 5.0	Section 4.8

4.3 Institutional Controls

The 121-acre disposal site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission general license (10 CFR 40.27) in 1996. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, is responsible for the custody and long-term care of the site. Institutional controls at the site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, and a locked gate at the site entrance.

4.4 Inspection Results

The site, southwest of Durango, Colorado, was inspected on May 21, 2013. C. Gauthier, L. Sheader, and D. Depinho of the S.M. Stoller Corporation, the Legacy Management Support

contractor for the DOE office in Grand Junction, Colorado, conducted the inspection. J. Dayvault of the DOE Office of Legacy Management and M. Cosby of Colorado Department of Public Health and Environment attended the inspection.

The purposes of the inspection were to confirm the integrity of visible features at the site, to identify changes in conditions that may affect site integrity, and to determine the need, if any, for maintenance or additional inspections and monitoring.

4.4.1 Site Surveillance Features

Figure 4-1 shows the locations of site surveillance features. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 4-1 by photograph location (PL) numbers.

4.4.1.1 Entrance Gates, Entrance Signs, and Access Road

The entrance gate along County Road 212 was locked and in good condition. The older, original entrance gate was locked and in good condition, and the entrance sign was present and in good condition (PL-1).

4.4.1.2 Perimeter Fence and Perimeter Signs

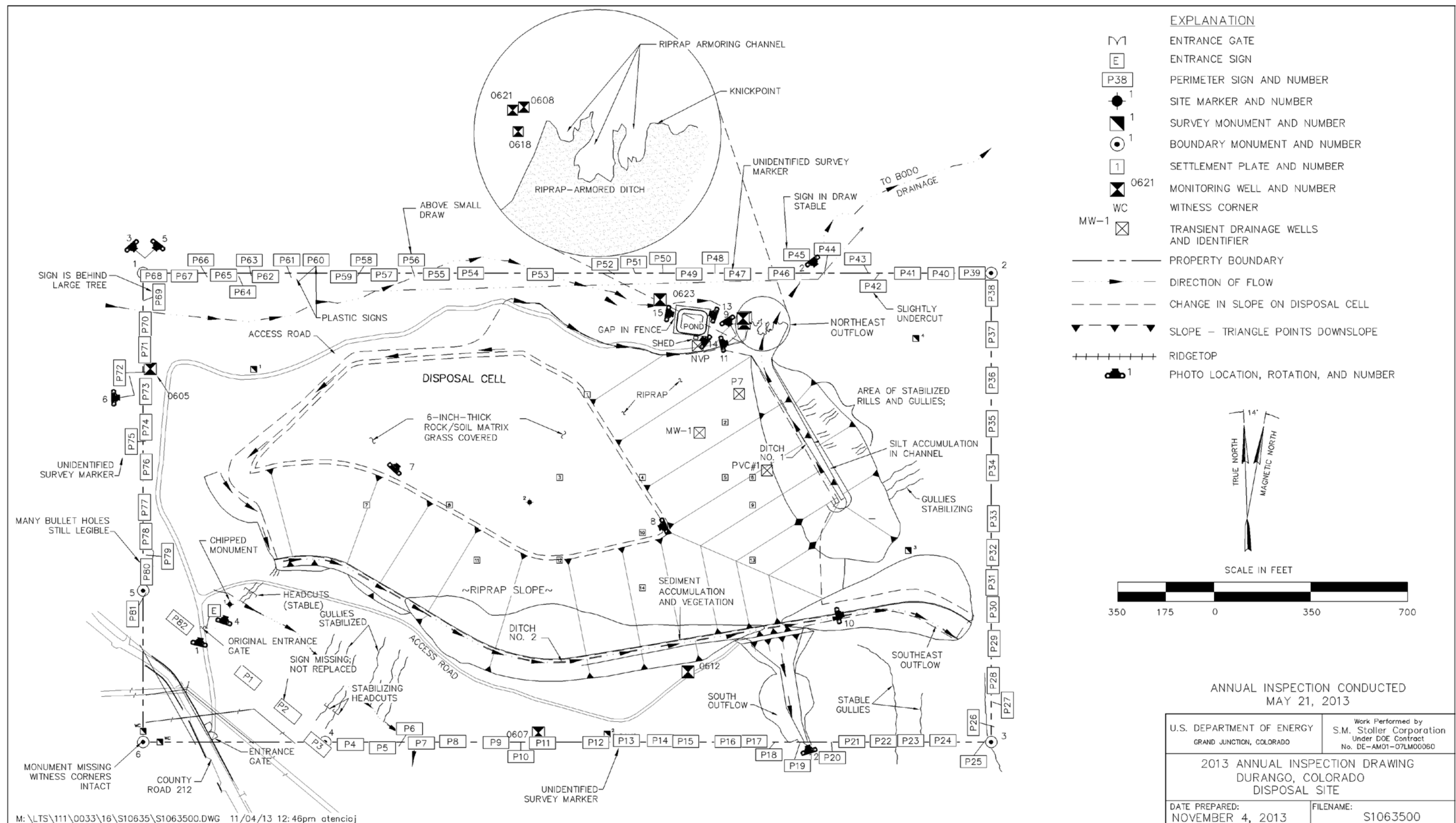
The site is unfenced. Eighty-one perimeter signs mark the site boundary.

Numerous perimeter signs have bullet holes or other markings but remain legible. Perimeter sign P2 has been missing for several years and will not be replaced, as adjacent signs are within sight. In previous years, inspectors noted that the base of perimeter sign P45 was being undercut by erosion; the sign remains stable (PL-2).

Many of the perimeter signs are difficult to find amid the pine trees, thick oak brush, and steep drainages (PL-3). Inspectors used GPS to locate the perimeter signs. All of the perimeter signs were visually located except sign P43 which the inspectors missed in the thick brush. The sign was found during the 2012 inspection; therefore, inspectors did not back track to visually verify.

4.4.1.3 Site Markers

Site marker SMK-1 historically has been superficially pocked from gunfire but has remained legible. During the 2012 inspection inspectors discovered that an additional chip along the bottom edge of the marker had fallen off; however, the information on the face of the marker remains legible, and no new damage was observed (PL-4). SMK-2 remains in excellent condition.



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4.4.1.4 Survey and Boundary Monuments

All survey and boundary monuments are in excellent condition (PL-5) except for BM-3, BM-4, and BM-6, which remain in the same condition as in previous years. Boundary monument BM-3 and two of its reference monuments are situated in a small gully and were threatened by erosion in the past; however, the monuments are now stable. One of the reference monuments for BM-4 has been bent to the ground, and the cap has been removed, but BM-4 is intact. No repair of any of these features is warranted. Boundary monument BM-6 was destroyed prior to the 2004 inspection during construction of a pipeline near the site. It was decided not to replace it because both of its witness corners are present and remain in good condition.

4.4.1.5 Monitoring Wells

Monitoring wells specified in the LTSP (0605, 0607, 0608, 0612, 0618, 0621 and 0623) were locked and in excellent condition (PL-6).

4.4.2 Inspection Areas

To ensure a thorough and efficient inspection, the site was divided into six inspection areas (referred to as “transects” in the LTSP): (1) the top of the disposal cell, (2) the side slopes of the disposal cell, (3) the drainage ditches, (4) the treatment cell and retention pond, (5) the site boundary, and (6) the outlying area.

Within each inspection area, inspectors examined specific site surveillance features, drainage structures, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes that might affect site integrity or long-term performance.

4.4.2.1 Top of Disposal Cell

The top of the disposal cell is in excellent condition. Settling, slumping, and erosion were not observed (PL-7).

Vegetation on top of the cell remains healthy, and no deep-rooted species were observed. The LTSP states, “Woody plants and other unwanted plant species may be eliminated from the cover by selective spraying or mechanical removal. Based on a root-to-shoot ratio of 1.0 to 1.0, an unwanted plant species must be removed when its shoot height equals or exceeds 3.5 feet (1.1 meters) from the base of the plant.” Although the aboveground height of dryland alfalfa (*Medicago sativa*) will never exceed the 3.5-foot criterion listed in the LTSP, it is known to be a deep-rooted plant; therefore, this species is also controlled on the disposal cell cover.

Small animal burrows historically have been present in an area southeast of site marker SMK-2. No new burrows were observed during the 2013 inspection.

4.4.2.2 Side Slopes of Disposal Cell

The riprap-covered side slopes of the disposal cell are in excellent condition. Disturbances resulting from natural processes, such as subsidence, rock deterioration, or slope failure, were not observed (PL-8).

In the past, woody species have become established on the cell's side slopes. Once they reach 3 feet in height, they are removed or treated with herbicide. At the time of the 2013 inspection, no woody species over 3 feet in height were observed.

4.4.2.3 Drainage Ditches

Rock-armored drainage ditches are constructed beneath the toe of the side slope on the northwest, south, and east sides of the disposal cell. These ditches direct runoff into natural drainages that carry storm water away from the disposal site. The ditches have sufficient depth and rock protection to carry runoff from a probable maximum precipitation (PMP) event. Erosion and mass wasting occurred in the past on some of the steep slopes above these channels. The eroded sediment was deposited in the rock-armored channel, creating locales favoring plant growth. The sediment deposits and vegetation will not compromise the drainage ditches' performance in a PMP event. Should sediment deposits or excessive vegetation dam a drainage ditch so as to impound water, the deposits or vegetation will be removed. Inspectors saw no evidence of recent accumulations of sediment or vegetation in the ditches (PL-9, PL-10).

The riprap-covered outflow of Ditch No. 1 (PL-11) was designed to erode back to a rock-filled trench and self-armor in the process. The knickpoint was mapped with GPS in 1999. Significant movement of the knickpoint has not occurred since then, and mapping will not be performed again until a change is noted.

The southeast and south outflows spill into steep, natural channels that are also monitored annually. The channels at these locations are armored by riprap and bedrock. Both outflow channels were stable and in good condition at the time of the 2013 inspection (PL-12).

4.4.2.4 Retention Pond Area

The retention pond contains precipitation and transient drainage water from the disposal cell. Because the water level in the disposal cell has dropped, the transient drainage water is no longer being drained to the retention pond. The drain valve has remained closed since November 2011. The water currently in the pond is low and therefore is not being pumped out and dispersed through drip lines onto the pond side slopes to enhance evaporation (PL-13). If precipitation increases the water level, the pumps will be turned on. The pond and evaporation system were planned to be decommissioned in 2008, but decommissioning has been delayed until the source of elevated uranium concentrations in a downgradient well can be determined.

In October 2010, the permeable reactive barrier treatment system, buried in the area east of the retention pond, was decommissioned and removed. Vegetation has established in disturbed areas, and they are considered to be successfully reclaimed.

Animal burrows were noticed near the shed that houses the transient drainage system instrumentation (PL-14). Because of the proximity to the retention pond, these animal burrows will be monitored, and if the burrows pose a threat to the pond integrity, action will be taken to protect the pond.

A chainlink fence surrounds the retention pond. Inspectors found a gap under the fence on the west side (PL-15). The gap was repaired after the inspection.

4.4.2.5 Site Boundary

The site is not fenced. Six boundary monuments and 81 perimeter signs delineate the boundary, with one exception. In the southwest corner of the site, perimeter signs “shortcut” the corner because DOE had originally intended to transfer the corner land parcel to the Colorado Division of Wildlife. Upon further consideration, however, DOE did not transfer the parcel. Hence, the actual boundary of the site is southwest of the perimeter signs on the opposite side of the county road. Before the guardrail and gate along County Road 212 were installed, the public used the area between the county road and the original entrance gate quite heavily. Since installation of the guardrail, use of this area has been minimal except for the destruction and theft of perimeter signs.

Historical rill and gully erosion on the south-facing slope along the southern boundary of the site is stable for the most part. Establishment of vegetation and exposure of resistant bedrock in the gullies are effectively preventing further erosion in most of the gullies. Inspectors noted fresh headcuts in two gullies in the southwest portion of the site in 2006. No noticeable movement in the headcuts has been observed since then, and the gullies appear to be stabilizing with rock and vegetation. These erosional features do not threaten cell integrity but will continue to be inspected.

Two gullies on the north-facing slope, just north of perimeter sign P3 along the southern boundary of the site, appeared to be actively headcutting in 2004. The headcuts, which were approximately 2.5 feet deep at the time of the 2004 visit, have been monitored each year during the annual inspections. No new headcutting has been noted since then. These headcuts do not threaten the cell.

Erosion rills have been noted on the west-facing hillside east of Ditch No. 1 since construction of the disposal site. Inspectors have considered these rills stable since approximately 2000, as most of them now contain perennial vegetation. The hillside appeared stable at the time of the 2013 inspection.

Deeper gullies (1 to 3 feet deep) in the southeast corner of the disposal site appeared to be active in 2008. This area was examined during the 2010 and 2011 inspections, and no new erosion was found. Natural drainages on the steep hillside were vegetated, contained plant litter and rock, and appeared stable. Inspectors will continue to monitor the drainages, although they pose no threat to the integrity of the disposal cell.

4.4.2.6 Outlying Area

The area beyond the site boundary for a distance of 0.25 mile was visually inspected for signs of erosion, development, or other disturbance. Adjacent land uses primarily include wildlife habitat and recreation. The Colorado Division of Wildlife manages land to the north, west, and east of the site, and the U.S. Bureau of Reclamation manages land to the south. The U.S. Bureau of Reclamation has completed construction of the Animas-La Plata Project, and the reservoir (Lake Nighthorse) is now filled with water. A water intake and pumping plant structure are located at the Animas River on the site of the former raffinate ponds. A pipeline associated with the project is adjacent to County Road 212 and passes just south of the disposal site. Mountain bikers and other recreationists commonly use County Road 212.

4.5 Follow-Up or Contingency Inspections

DOE will conduct follow-up inspections if (1) an annual inspection or other site visit reveals a condition that must be reevaluated during a return to the site, or (2) a citizen or outside agency notifies DOE that conditions at the site are substantially changed.

No need for a follow-up or contingency inspection was identified during the inspection.

4.6 Maintenance and Repairs

- 4A A gap in the retention pond fence was repaired on July 2, 2013.

4.7 Environmental Monitoring

4.7.1 Groundwater Monitoring

- 4B In accordance with the LTSP, groundwater is monitored at the site to verify the initial performance of the disposal cell. The monitoring network consists of seven wells (Table 4-2 and Figure 4-1). Four wells are completed in the uppermost aquifer (bedrock of the Cliff House Sandstone and the Menefee Formation), including one upgradient background well (0605) and three downgradient point-of-compliance (POC) wells (0607, 0612, and 0621). Three wells are completed in the alluvium, one upgradient (0623) and one downgradient (0608) of the disposal cell. The third alluvial well, monitoring well 0618 (screened to the bottom of the alluvial aquifer), was installed adjacent to well 0608 (screened to 10 feet above the base of the alluvial aquifer) and added to the monitoring network in 2002 as a best management practice, because it intercepts the full, saturated thickness of the alluvial aquifer.

Table 4-2. Groundwater Monitoring Network at the Durango Disposal Site

Monitoring Well	Well Compliance Type	Hydrologic Relationship
0605	Background	Upgradient (uppermost aquifer)
0607	Point-of-Compliance	Downgradient (uppermost aquifer)
0612	Point-of-Compliance	Downgradient (uppermost aquifer)
0621	Point-of-Compliance	Downgradient (uppermost aquifer)
0623	Background	Upgradient (alluvial aquifer)
0608	Best Management Practice	Downgradient (alluvial aquifer)
0618	Best Management Practice	Downgradient (alluvial aquifer)

Groundwater samples are collected annually and analyzed for three indicator parameters: molybdenum, selenium, and uranium. The site-specific standards used for the three indicator parameters are the respective maximum observed background concentrations reported in groundwater samples collected from wells completed in the bedrock aquifer as identified in Table 5-4 of the LTSP. These site-specific standards are provided below in Table 4-3.

*Table 4-3. Site-Specific Groundwater Standards for the Durango Disposal Site,
Based on Background*

Constituent	Standard (mg/L)
Molybdenum	0.22
Selenium	0.042
Uranium	0.077

mg/L = milligram per liter

Note: Site-specific groundwater standards represent the maximum observed background concentrations reported in samples collected from wells completed in the bedrock aquifer (LTSP, Table 5-4).

Uranium, molybdenum, and selenium concentrations in the POC wells in the uppermost aquifer are well below the respective standards, and the site is in compliance with the LTSP.

Though not required for compliance, wells completed in the alluvial aquifer are also monitored. Uranium concentrations in well 0618 have consistently been higher than concentrations in the other wells onsite. To monitor the increased uranium observed in well 0618, wells 0608, 0618, and 0621 have been increased to monthly sampling as weather permits. Uranium concentrations in monitoring well 0618 had increased until 2009 when the well was redeveloped and the purging method and pump materials were evaluated, resulting in a decrease in concentration (0.044 milligram per liter [mg/L]) observed in May 2010. Uranium concentrations rebounded and continued to increase with a peak of 0.235 mg/L in September 2012. Uranium concentrations in well 0618 have decreased since September 2012, but still have an increasing trend overall. Because well 0618 is not a POC well and is not screened in the uppermost aquifer, the concentrations in this well do not affect compliance with the LTSP and do not pose a risk to human health and the environment. However, the potential cause of this increase is being investigated.

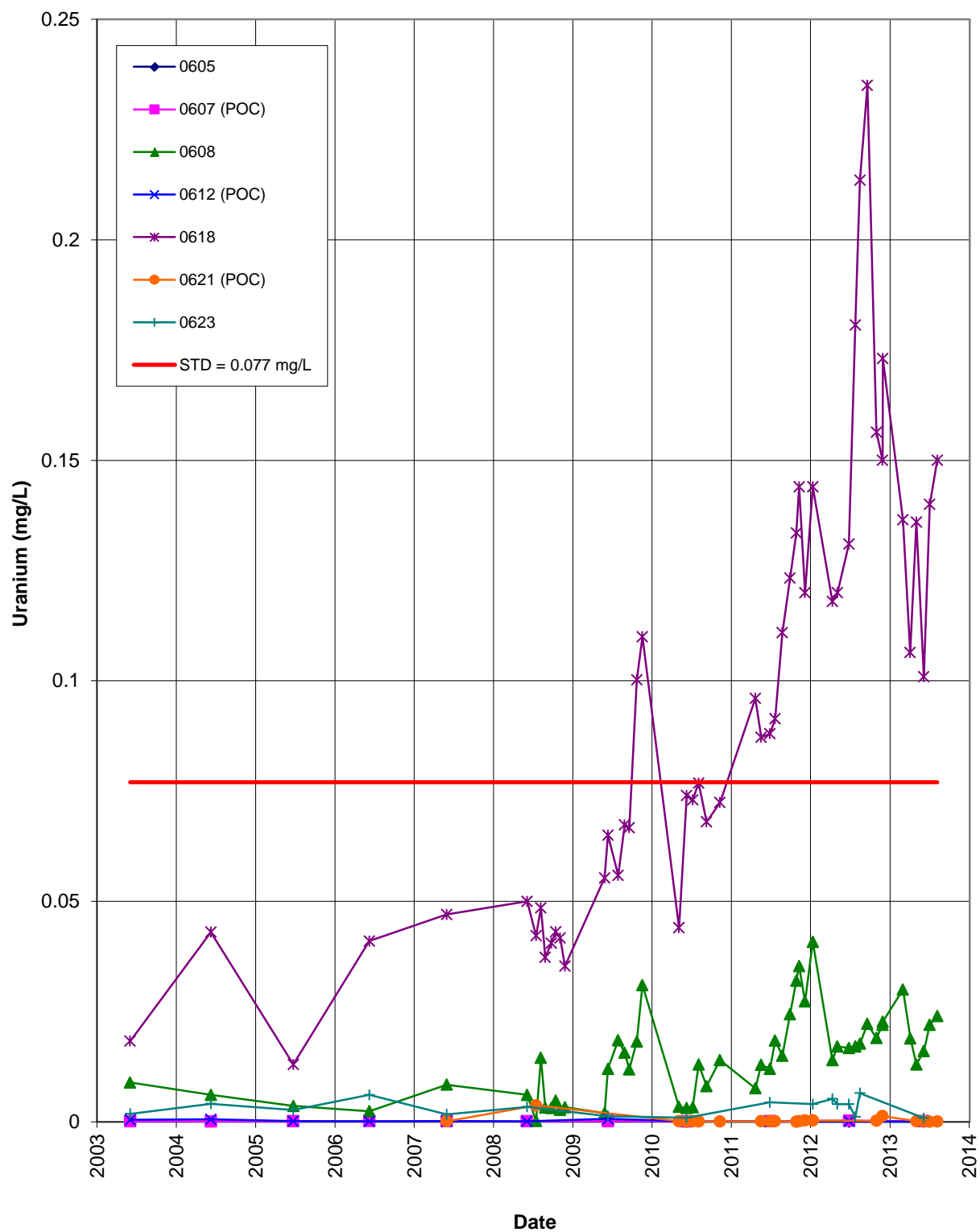


Figure 4-2. Time-Concentration Plot of Uranium in Groundwater at the Durango Disposal Site

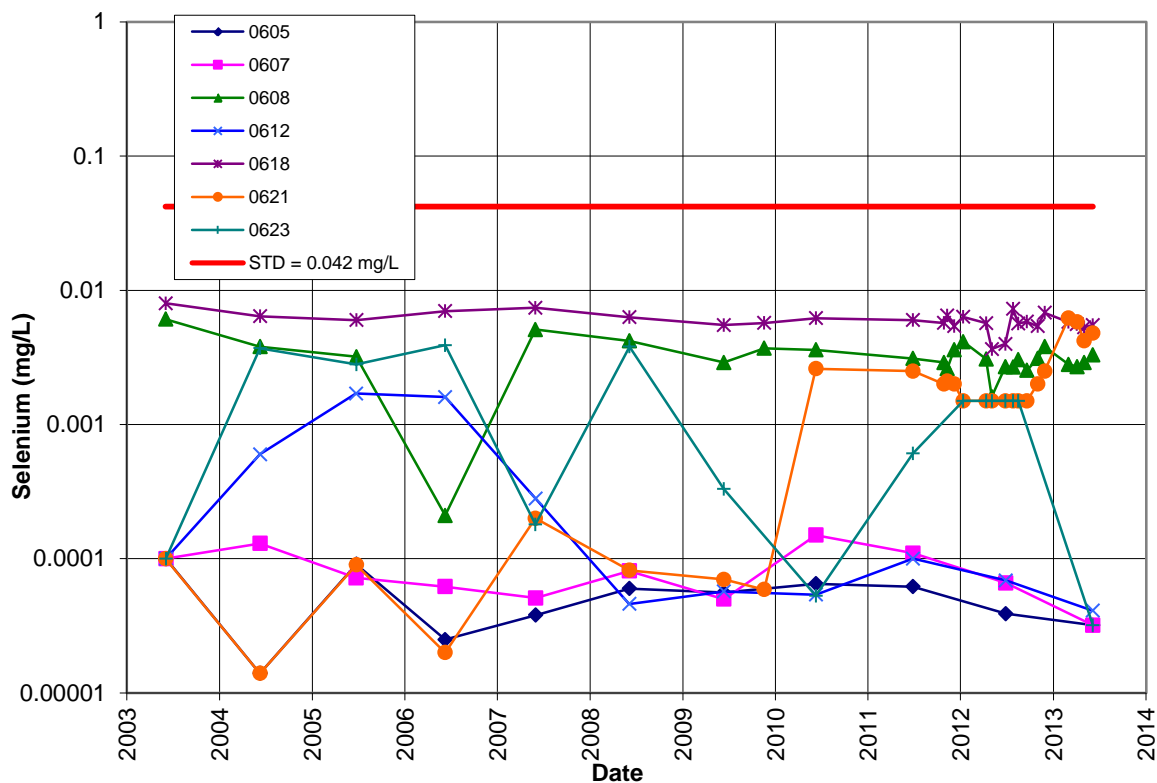


Figure 4-3. Time-Concentration Plot of Selenium in Groundwater at the Durango Disposal Site

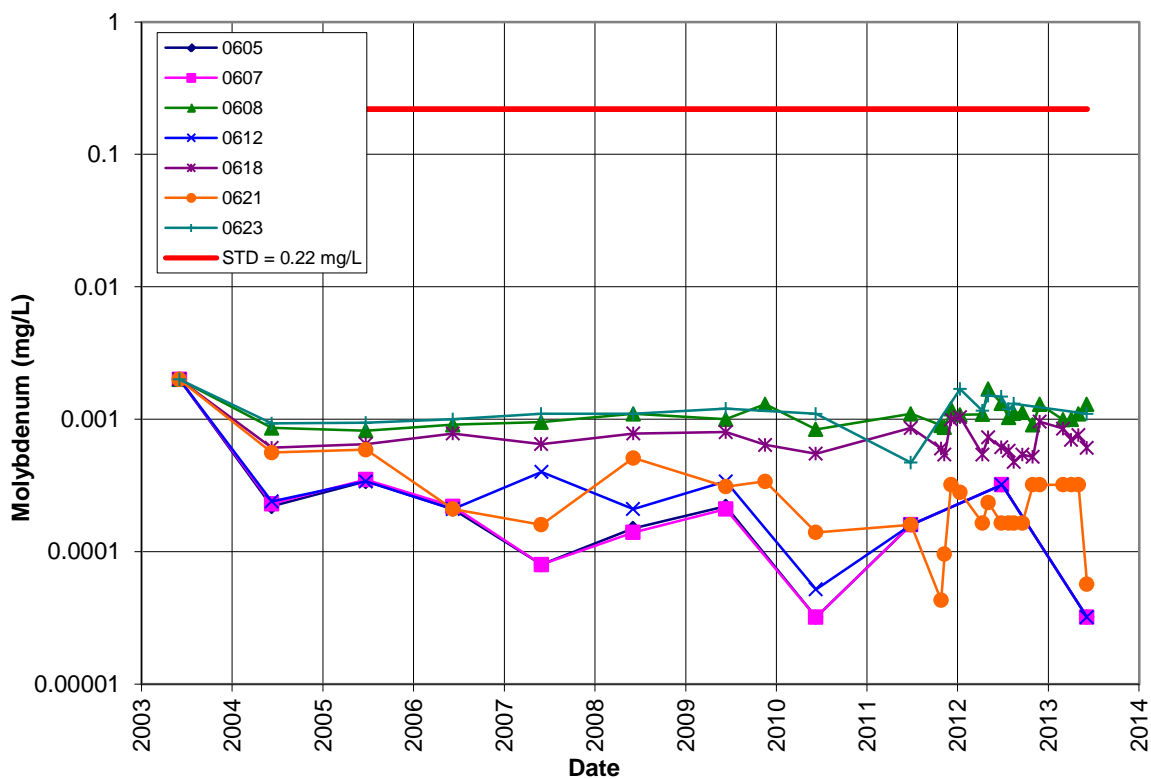


Figure 4-4. Time-Concentration Plot of Molybdenum in Groundwater at the Durango Disposal Site

4.8 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192.

No corrective action was required in 2013.

4.9 Photographs

Photograph Location Number	Azimuth	Description
PL-1	15	Original entrance gate, site marker SMK-1, and perimeter sign E.
PL-2	145	Perimeter sign P45, in draw.
PL-3	140	Perimeter sign P68, showing bullet hole damage.
PL-4	20	Site marker SMK-1, showing damage.
PL-5	220	Boundary monument BM-1.
PL-6	90	Well 0605.
PL-7	45	Disposal cell cover, view to the northeast.
PL-8	250	View of south side slope of disposal cell from the southeast corner of cell top.
PL-9	150	Ditch No. 1 and the east slope of the disposal cell.
PL-10	80	Portion of Ditch No. 2 downslope from disposal cell.
PL-11	80	Northeast outflow, showing erosion areas.
PL-12	345	South outflow, view toward repository.
PL-13	290	Side and liner of evaporation pond.
PL-14	310	Animal burrow under east side (front) of shed. Edge of pond liner is at top of photo.
PL-15	100	Gap under evaporation pond fence, west side.



DUD 5/2013. PL-1. Original entrance gate, site marker SMK-1, and perimeter sign E.



DUD 5/2013. PL-2. Perimeter sign P45, in draw.



DUD 5/2013. PL-3. Perimeter sign P68, showing bullet hole damage.



DUD 5/2013. PL-4. Site marker SMK-1, showing damage.



DUD 5/2013. PL-5. Boundary monument BM-1.



DUD 5/2013. PL-6. Well 0605.



DUD 5/2013. PL-7. Disposal cell cover, view to the northeast.



DUD 5/2013. PL-8. View of south side slope of disposal cell from the southeast corner of cell top.



DUD 5/2013. PL-9. Ditch No. 1 and the east slope of the disposal cell.



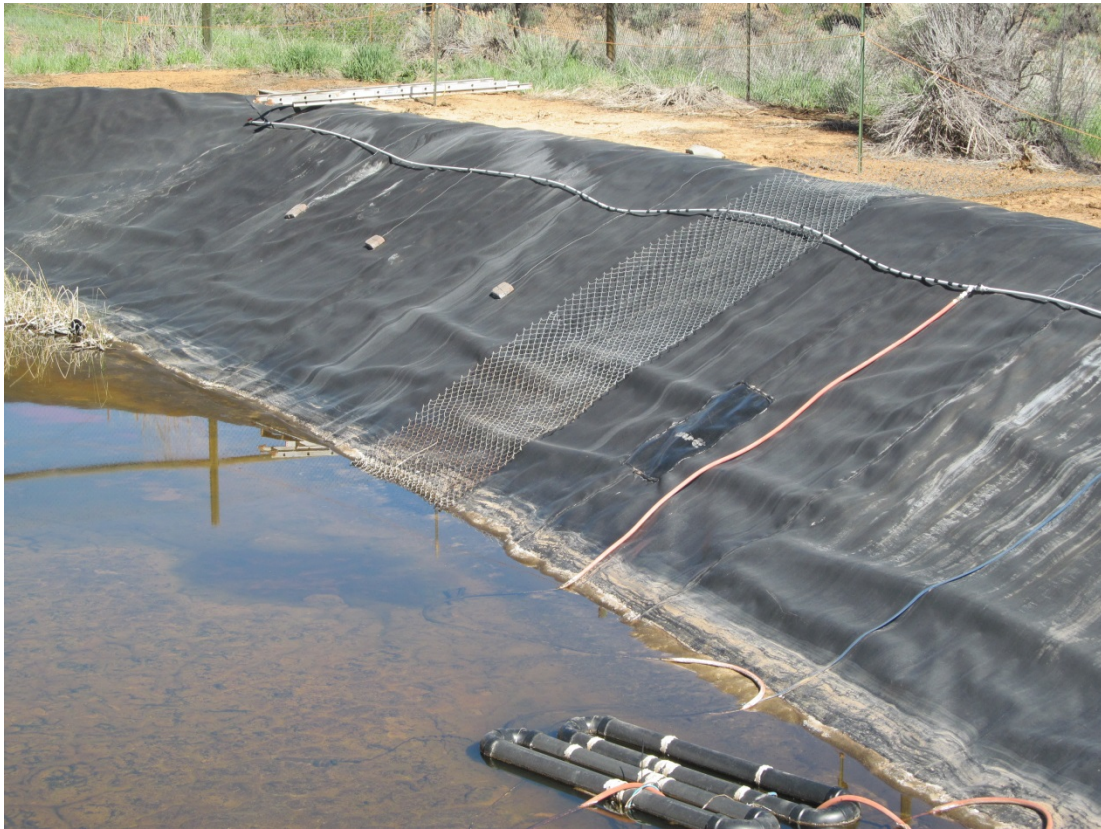
DUD 5/2013. PL-10. Portion of Ditch No. 2 downslope from disposal cell.



DUD 5/2013. PL-11. Northeast outflow, showing erosion areas.



DUD 5/2013. PL-12. South outflow, view toward repository.



DUD 5/2013. PL-13. Side and liner of evaporation pond.



DUD 5/2013. PL-14. Animal burrow under east side (front) of shed. Edge of pond liner is at top of photo.



DUD 5/2013. PL-15. Gap under evaporation pond fence, west side.