

4.0 Annual Inspection of the Durango, Colorado, UMTRCA Title I Disposal Site

4.1 Compliance Summary

The Durango, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, inspected on May 30, 2012, 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.

Inspectors discovered a chip in site marker SMK-1, however; the chip does not adversely affect the information on the face of the marker. Two active gullies downgradient of the southwest corner of the disposal cell, monitored since 2006, appeared to be stabilizing with rock and vegetation; they do not pose a threat to the stability of the disposal cell. No additional maintenance needs or cause for a follow-up or contingency inspection was identified.

Transient drainage water from the cell in the retention pond is being pumped out and dispersed through drip lines onto the pond side slopes to enhance evaporation. 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.

Numbers in the left margin of this report refer to items summarized in the “Executive Summary” table.

4.2 Inspection 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* (LMS/DUD/S06297-0.0, U.S. Department of Energy [DOE], January 2011; LTSP) and procedures established by DOE 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 4.7.1
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 June 10, 2011. M. Kastens and L. Sheader, both 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; L. Gersey, of the U.S. Nuclear Regulatory Commission; and S. Woods, of the S.M. Stoller Corporation, participated in 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

The locations of site surveillance features are shown in Figure 4–1. 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 and the older, original entrance gate were locked and in good condition.

The entrance sign was present and in good condition.

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–1).

Many of the perimeter signs are difficult to find amid the pine trees, thick oak brush, and steep drainages. To make identification easier, inspectors have recorded the signs' locations with a GPS unit and placed permanent, adhesive numbers on them.

4.4.1.3 Site Markers

Site marker SMK–1 historically has been superficially pocked from gunfire but has remained legible. Inspectors discovered that an additional chip along the bottom edge of the marker had fallen off (PL–2); however, the information on the face of the marker remains legible. The chipped area will be protected from further erosion with a protective epoxy-glue compound. SMK–2 remains in excellent condition.

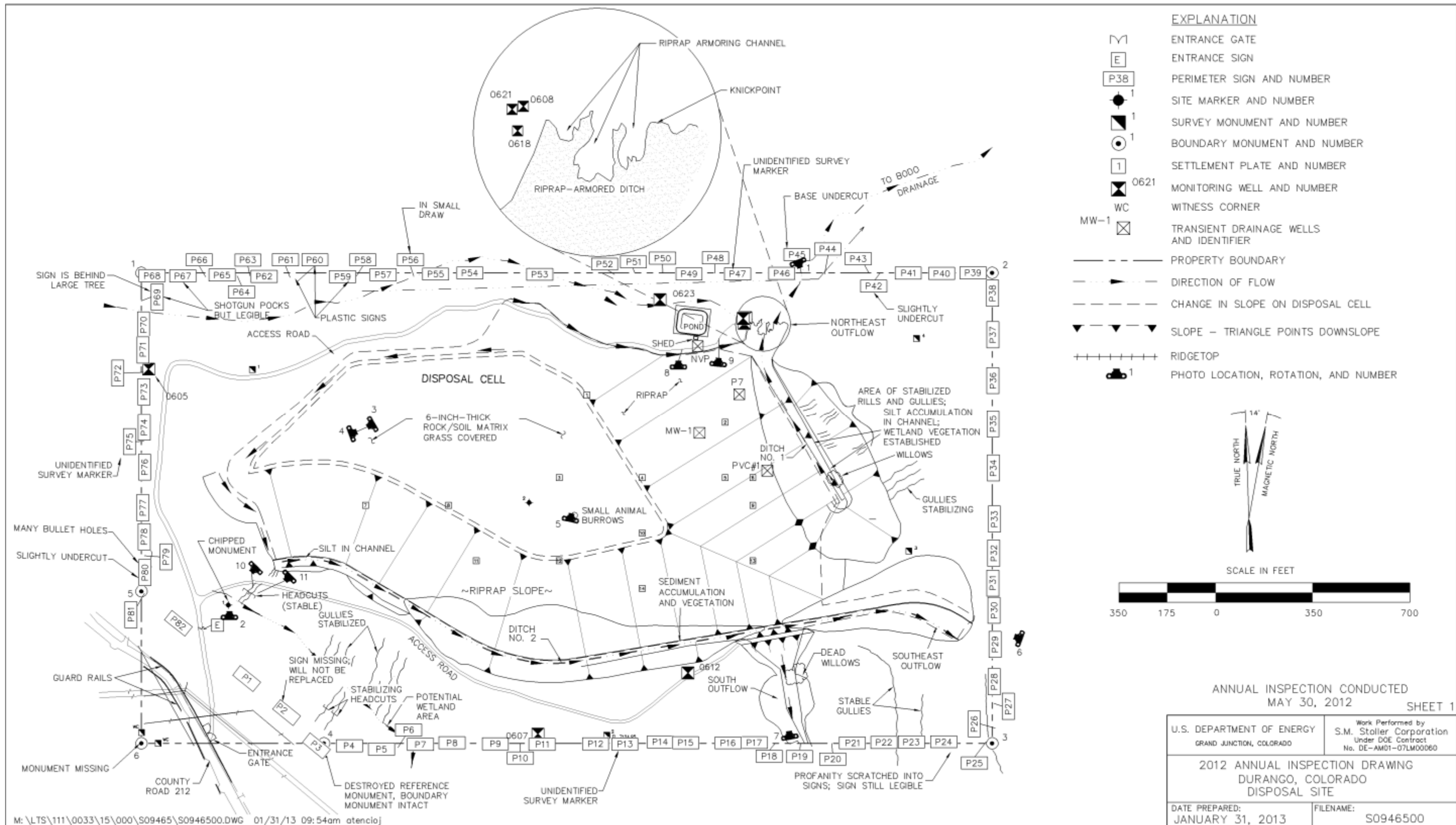


Figure 4-1. 2012 Annual Compliance Drawing for the Durango Disposal Site

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4.4.1.4 Survey and Boundary Monuments

All survey and boundary monuments are in excellent condition except for BM-3, BM-4, and BM-6, which remain in the same condition as 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 are locked and in excellent condition. The cap on a drainage system vent well, PVC #1, is cracked but remains functional. The drainage system portal well, NVP, is located inside the equipment shed.

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.

Vegetation on top of the cell remains healthy (PL-3, PL-4).

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, 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 now being controlled with herbicide on the disposal cell cover. At the time of the 2012 inspection, only a few, small alfalfa plants were identified. Two small, gray rabbitbrush (*Ericameria nauseosa*) shrubs were also discovered on the cell top. The alfalfa and rabbitbrush plants will be treated with herbicide.

Small animal burrows historically have been present in an area southeast of site marker SMK-2. A few burrows were observed during the 2012 inspection (PL-5). These features do not affect

the integrity of the cell cover. They appear small in extent and shallow in depth (as surmised by the amount of discarded soil material adjacent to the burrows).

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.

In the past, woody species (primarily ponderosa pine [*Pinus ponderosa*], narrowleaf cottonwood [*Populus angustifolia*], boxelder [*Acer negundo*], gray rabbitbrush, Siberian elm [*Ulmus pumila*], and tamarisk [*Tamarix ramosissima*]) 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 2012 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. 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. At places in Ditch No. 1, moist sediments associated with the colluvial deposits support wetland vegetation, including willows (*Salix* sp.). In other places, boxelder trees as tall as 10 and 15 feet grow in the drainage ditches. Inspectors saw no evidence of recent accumulations of sloughed material in the ditches.

The sediment deposits and vegetation will not compromise the drainage ditches' performance in the event of a large storm. Elevations of ditch inverts are about 7,035 to 7,040 feet. This is approximately the same elevation as the tailings in the bottom of the disposal cell. Water impounded in a ditch could migrate laterally to saturate tailings in the lower part of the disposal cell; however, the bedrock dips to the southeast, away from the disposal cell. Impounded water would probably drain away from the disposal cell along bedding planes and permeable zones in the bedrock. Should colluvial deposits or excessive vegetation dam a drainage ditch so as to impound water, the deposits or vegetation will be removed.

The riprap-covered outflow of Ditch No. 1 was designed to erode back to a rock-filled trench and self-armor in the process. The knickpoint was mapped with GPS equipment 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 and 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 2012 inspection (PL-6, PL-7).

4.4.2.4 Retention Pond Area

The retention pond contains precipitation and transient drainage water from the disposal cell, the latter of which in past years has been collected and treated with zero-valent iron. Because the water level in the disposal cell has dropped, the transient drainage water is no longer being

withdrawn and treated although it is pumped to the pond occasionally. The water currently in the pond is being pumped out and then dispersed through drip lines onto the pond side slopes to enhance evaporation. The pond and evaporation system were planned to be decommissioned in 2008, but decommissioning has been delayed until the source of a recent spike in uranium concentrations in a downgradient well can be determined. The tear in the pond liner discovered during the 2011 inspection had been repaired by the time of the 2012 inspection (PL-8).

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 (PL-9), and sediment-control structures continue to prevent offsite sediment discharges. Inspectors will continue to monitor the integrity of the sediment-control structures until the disturbed area is considered reclaimed.

An equipment shed near the pond contains instrumentation to measure the transient drainage flow from the gallery. The door on this shed was in need of repair at the time of the 2011 inspection. In 2012, inspectors noted that the door had been repaired.

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 (PL-10, PL-11). 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 2012 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 Site marker SMK-1 has a new chip in it. The chipped area will be covered with a protective coating to reduce the potential for further chipping.

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 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 zone 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. To monitor the increased uranium observed in well 0618, wells 0608, 0618, and 0621 have been increased to monthly sampling as weather permits. 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. Time-concentration plots for uranium, selenium, and molybdenum monitoring results are included as Figures 4–2, 4–3, and 4–4, respectively.

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 concentrations in monitoring well 0618 had decreased since 2009, when the well was redeveloped and the purging method and pump materials were evaluated. Uranium concentrations were below the standard until an increase observed during the June 2011 sampling event. Concentrations continued to increase, and the September 2012 results of 0.227 milligram per liter (mg/L) are the highest observed in well 0618. The results for October and November 2012 have decreased, but still remain over the standard. The potential cause of this increase is being investigated; however, because well 0618 is not a point-of-compliance well, site levels remain in compliance with the LTSP. All other concentrations of uranium, along with all concentrations of both selenium and molybdenum, remain on trend and well below their respective standards.

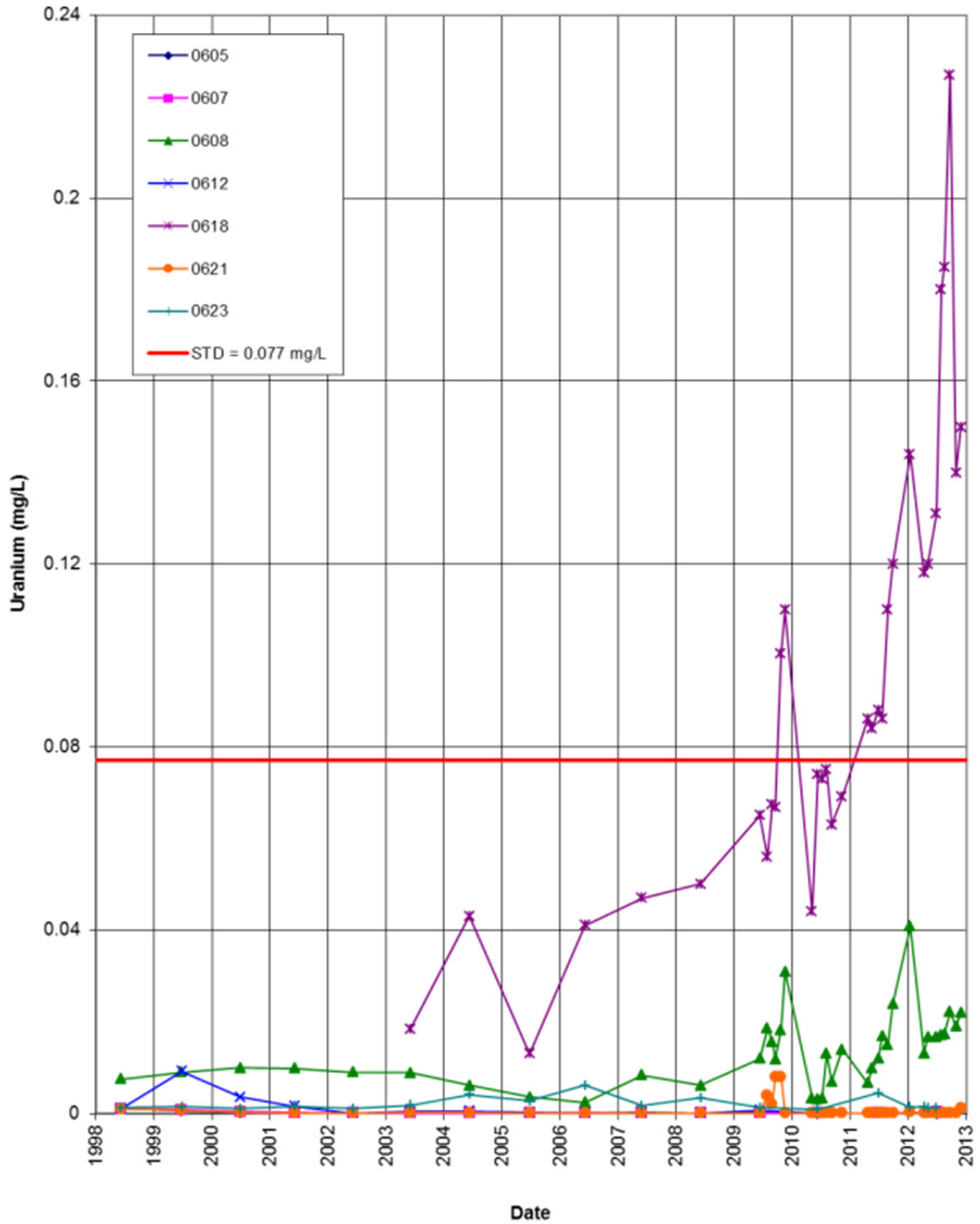


Figure 4–2. Time-Concentration Plot of Uranium in Groundwater at the Durango Disposal Site

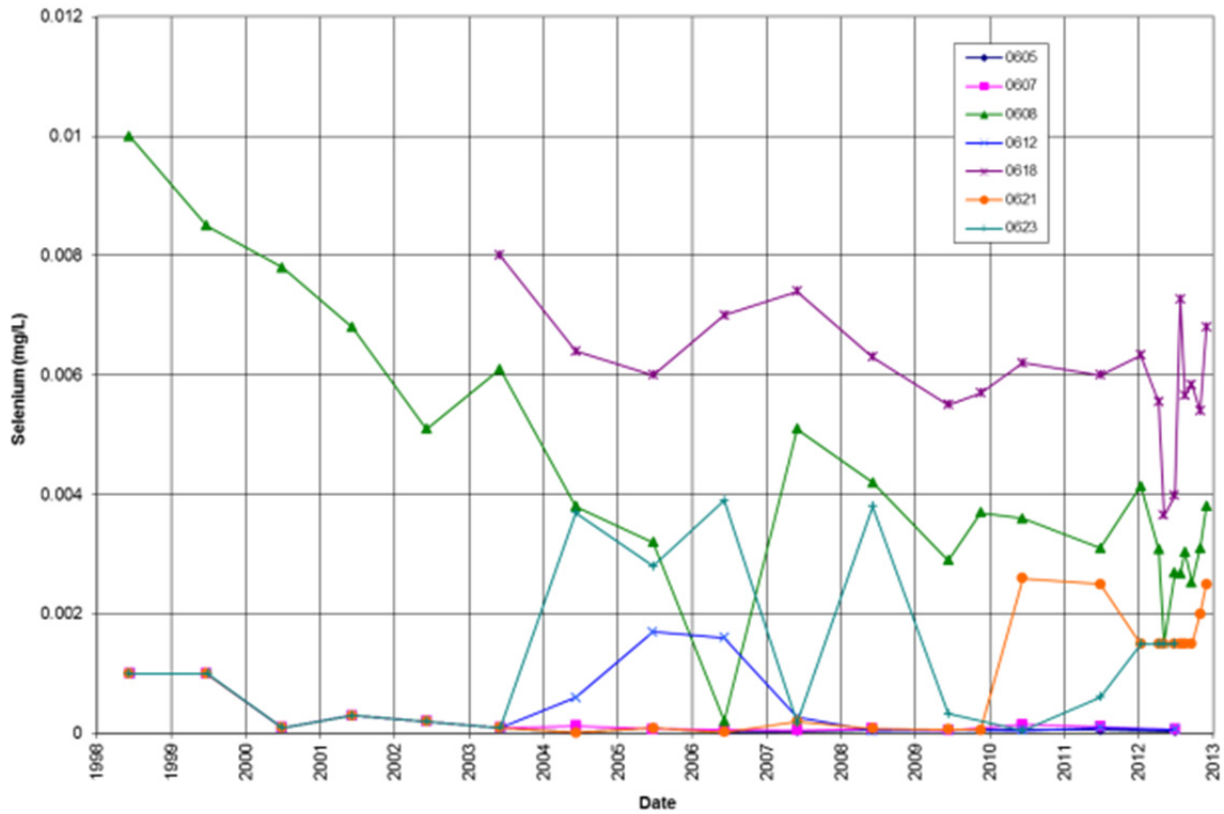


Figure 4-3. Time-Concentration Plot of Selenium in Groundwater at the Durango Disposal Site

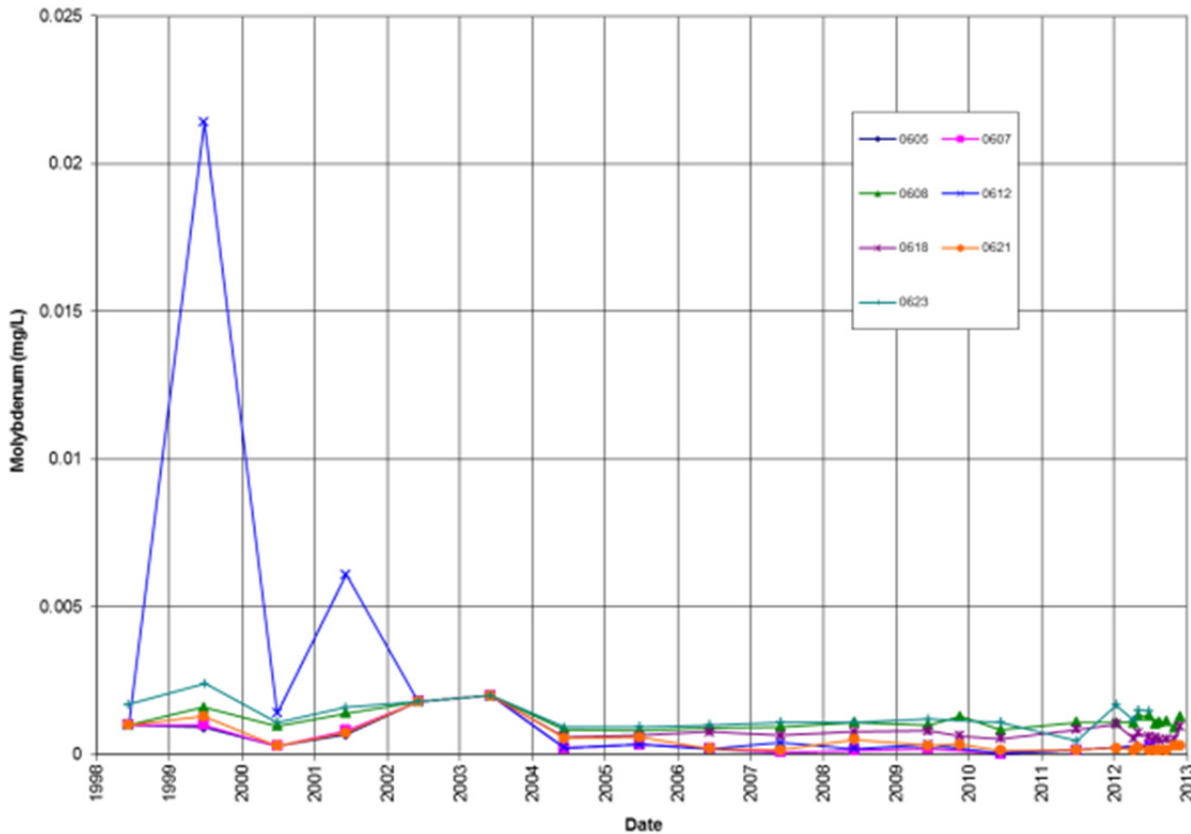


Figure 4-4. Time-Concentration Plot of Molybdenum in Groundwater at the Durango Disposal Site

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 2012.

4.9 Photographs

Photograph Location Number	Azimuth	Description
PL-1	160	Perimeter sign P45, showing undercut area.
PL-2	0	Chipped portion of site marker SMK-1.
PL-3	70	Vegetation on cell top, view west-southwest.
PL-4	240	Vegetation on cell top, view east-northeast.
PL-5	120	Revegetated area associated with removal of permeable reactive barrier treatment system.
PL-6	290	Below the southeast outflow channel.
PL-7	350	South outflow channel.
PL-8	0	Evaporation pond.
PL-9	5	Revegetated area associated with removal of permeable reactive barrier treatment system.
PL-10	225	West gully (southwest of cell) stabilizing with rock.
PL-11	225	East gully (southwest of cell) stabilizing with vegetation.



DUD 5/2011. PL- 1. Perimeter sign P45, showing undercut area.



DUD 5/2012. PL-2. Chipped portion of site marker SMK-1.



DUD 5/2012. PL-3. Vegetation on cell top, view west-southwest.



DUD 5/2012. PL-4. Vegetation on cell top, view east-northeast.



DUD 5/2012. PL-5. Revegetated area associated with removal of permeable reactive barrier treatment system.



DUD 5/2012. PL-6. Below the southeast outflow channel.



DUD 5/2012. PL-7. South outflow channel.



DUD 5/2012. PL-8. Evaporation pond.



DUD 5/2012. PL-9. Revegetated area associated with removal of permeable reactive barrier treatment system.



DUD 5/2012. PL-10. West gully (southwest of cell) stabilizing with rock.



DUD 5/2012. PL-11. East gully (southwest of cell) stabilizing with vegetation.