9.0 Lakeview, Oregon, Disposal Site

9.1 Compliance Summary

The Lakeview, Oregon, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, inspected on July 14 and 15, 2009, was in good condition. No cause for a follow-up or contingency inspection was identified.

Degradation of the rock riprap observed at the site since the mid-1990s has been monitored annually as part of the inspection to determine the mean diameter (D_{50}) of the riprap on the western side slope. The D_{50} value measured during the 2009 monitoring is 2.47 inches, which falls below the original D_{50} design size range of 2.7 to 3.9 inches for the side slope riprap. The 2009 D_{50} value is 0.14 inch greater than the value of 2.33 inches measured in 2008. The U.S. Department of Energy (DOE) initiated annual rock durability monitoring during the 2009 annual inspection to quantify the various rock types and general durability classes of the west side slope rock. The results of the durability monitoring showed that most of the rocks (63.4 percent) monitored on the west side slope were classified as having a general durability class of "highly durable" or "durable." DOE is evaluating the rock types, durability, rock sizes, and D_{50} calculation methods, and is working to resolve the riprap degradation issue to ensure the long-term protection of the cell from erosion during a severe precipitation event.

An ongoing pilot study of water fluxmeters used to monitor percolation through the disposal cell cover is in its fourth year. The effects of deep-rooted vegetation on the performance of the disposal cell cover continue to be monitored by modeling the movement of water through the radon barrier using water fluxmeters. An investigation of root intrusion and soil permeability has shown that tens to hundreds of centimeters of rainwater infiltrate through the cover during dry and wet years. Results of the pilot study indicate that percolation rates may be high; these conditions raise concerns about cell performance as it pertains to contaminant isolation and slope stability. DOE will further evaluate the disposal cell cover performance and suspected infiltration of water into the cell to ensure that a long-term solution, which continues to isolate the mill tailings, is identified and implemented, as necessary.

9.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Lakeview Disposal Site are specified in the *Long-Term Surveillance Plan for the Collins Ranch Disposal Site, Lakeview, Oregon* (DOE/AL/62350–19F, Rev. 3, DOE, August 1994) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). These requirements are listed in Table 9–1.

Table 9–1. License Requirements for the Lakeview Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.1	Section 9.3.1
Follow-Up or Contingency Inspections	Section 7.0	Section 9.3.2
Routine Maintenance and Repairs	Section 8.0	Section 9.3.3
Groundwater Monitoring	Section 5.3	Section 9.3.4
Corrective Action	Section 9.0	Section 9.3.5

Institutional Controls—The 40-acre disposal site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) in 1995. 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 disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing signs along the property boundary, and a locked gate at the entrance to the site. Inspectors found no evidence that these institutional controls were ineffective or violated.

9.3 Compliance Review

9.3.1 Annual Inspection and Report

The site, northwest of Lakeview, Oregon, was inspected on July 14 and 15, 2009. The results of the inspection are described below. Figure 9–1 shows features and the photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

Seismic Activity—The Lakeview Disposal Site is in a seismically active region. The United States Geological Survey National Earthquake Information Center notifies DOE when earthquakes of magnitude 3.0 or greater occur within 0.3 degrees (about 20 miles) of a disposal cell and when earthquakes of magnitude 5.0 or greater occur within 1.0 degree (about 70 miles) of a disposal cell. Although there were some seismic events near the site in the recent past (2005), no seismic activity was reported in 2009.

9.3.1.1 Specific Site-Surveillance Features

Access Road, Entrance Gate, Fence, and Signs—Access to the site is gained by traveling a gravel road that heads west off County Road 2–16B. The access road is in good condition. DOE was granted a perpetual easement on the 1.2-mile access road between the County road and the DOE property boundary. A new gate was installed during the past year across the access road on the adjacent privately owned land. It is located about 1,800 feet southeast of the site entrance gate. The new gate replaced a former locked cable gate.

A barbed-wire boundary fence surrounds the site and is in good condition. General fence repairs were made in 2008, and a pedestrian gate was installed at the north end of the west fence to facilitate inspection activities and to provide a second exit from the site. The pedestrian gate was locked and in excellent condition.

The site entrance sign was in good condition. A sticker providing the DOE Office of Legacy Management (LM) website address was added to the entrance sign during the inspection to direct stakeholders to both site-related and LM-related information available online. The 12 perimeter signs were in good condition. Vegetation that was partially obscuring perimeter sign P1 was cleared during the inspection.

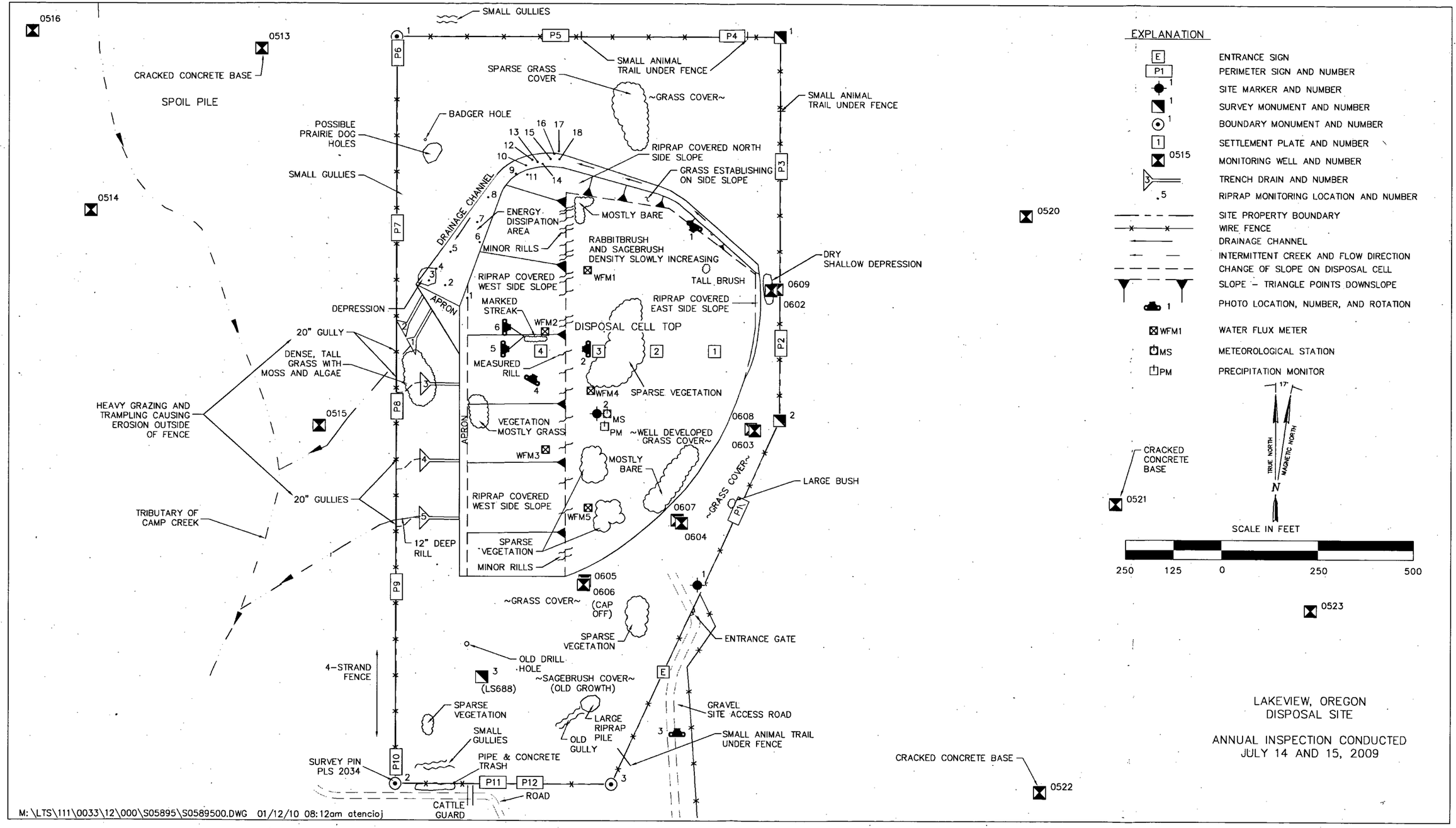

Figure 9-1. 2009 Annual Compliance Drawing for the Lakeview Disposal Site

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Site Markers and Monuments—The two site markers, three survey monuments, and three boundary monuments were in good condition. Survey monument SM–3, which could not be located during last year's inspection due to dense vegetation, was located and inspected this year and in good condition. A t-post was placed next to the survey monument to assist with locating the monument in the future.

Monitoring wells—Nine monitoring wells are in the groundwater monitoring network. Eight point-of-compliance (POC) wells (four monitoring well pairs: MW–0602/MW–0609, MW–0603/MW–0608, MW–0604/MW–0607, and MW–0605/MW–0606) are east of the cell; a POC well (MW–0515) is west of the disposal site. Seven additional DOE-owned monitoring wells (MW–0513, MW–0514, MW–0516, MW–0520, MW–0521, MW–0522, and MW–0523) exist near the site but are not part of the compliance monitoring network. All 16 wells were inspected either during the inspection or during the groundwater sampling conducted the week before the inspection. They were locked and in fair to good condition. The concrete bases of monitoring wells MW–0513, MW–0521, and MW–0522 are cracked, but the wells remain in acceptable condition. The well cap for MW–0606 was not on the well because the protective well casing could not be locked with the well cap in place. A new well cap, such as an expansion-plug-type cap, will be used to replace the existing well cap during the next site visit. T-posts were placed next to the western, off-site monitoring wells to assist with locating these features in the future

9.3.1.2 Transects

To ensure a thorough and efficient inspection, inspectors divided the site into three areas called "transects": (1) the top of disposal cell; (2) the side slopes of the disposal cell and adjacent drainage channel, aprons, and trench drains; and (3) the site perimeter and outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, the 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 the site's integrity or long-term performance.

Top of the Disposal Cell—At the time of cell construction, the entire cell top slope was covered in 12 inches of Type A riprap followed by 4 inches of soil placed over the riprap. The soil was included to allow for a grass cover to be established, which would help minimize the visual impacts of the cell. Grasses and forbs growing on the top of the disposal cell have gradually increased over the years, and patches of deeper-rooted wheatgrasses have spread. The design for the top of the disposal cell has created conditions that favor the growth of deep-rooted plants. The growth of shrubs is favored by the movement of precipitation through the riprap, bedding, and compacted soil (radon barrier) layers. Many mature rabbitbrush, sagebrush, and bitterbrush plants continue to spread on top of the disposal cell. Some sparsely vegetated to bare areas still exist on top of the disposal cell, but to a lesser extent than was observed during last year's inspection. PL–1 shows the vegetative cover. Some small animal tracks were observed on the top cover.

Riprap was observed in several small areas through the soil on the top slope during the inspection. The areas ranged in size from approximately 4 inches to 1½ feet. These areas are likely caused by the infilling of the soil into the riprap void spaces. No structural or cell performance concerns are associated with the riprap becoming visible on the top slope.

The contact boundary between the cell top and side slopes was inspected. No evidence of erosion was observed along the north contact; however, approximately 25 areas with minor erosion rills were observed in the top slope soil cover along the west contact. The largest of the minor rills (PL–2) was measured and had maximum dimensions of 11 inches long, 20 inches wide, and 4 inches deep. Dispersed soil was deposited as delta formations in the rock riprap adjacent to where the rill channels entered the side slope, showing how the water contacted the rock and became dispersed and expanded. The largest delta was approximately 52 inches long. These delta formations indicate that flow channelization does not occur when runoff water enters the side slope. The riprap rock cover is present beneath the top slope soil cover and under the slope crest, and continues as the side slope. No structural or cell performance concerns are associated with the rills, but they will continue to be evaluated during annual inspections.

9A **Disposal Cell Cover Performance Evaluation**—Field investigations at the site indicate that a combination of soil development and root intrusion by the deep-rooted shrubs has increased the hydraulic conductivity of the radon barrier in the cell cover, allowing meteoric water to percolate into the underlying tailings.

Encroachment by deep-rooted shrubs was observed shortly after the construction of the disposal cell. As designed and constructed, the cover is a favorable habitat for deep-rooted plants. Root intrusion and soil development have increased the permeability of the radon barrier. In situ tests have shown that the saturated hydraulic conductivity of the radon barrier ranges between 1×10^{-6} and 1×10^{-4} centimeters per second (cm/s) (the design target was 1×10^{-7} to 1×10^{-8} cm/s).

In fall 2005, LM began an evaluation of a new device called a water fluxmeter, a passive wicking lysimeter, to directly measure percolation flux through the Lakeview disposal cell cover. Three water fluxmeters installed in holes augered through the top slope of the cover and into tailings capture percolation just below the compacted soil layer in the cover. Monitoring results show significant percolation through the cover. Cumulative percolation averaged 996 millimeters during 2006, 186 millimeters during 2007, 444 millimeters during 2008, and 155 millimeters during 2009. These values are assumed to be greater than the mean percolation for the cover because the three water fluxmeters were intentionally placed in downslope locations where water accumulates in the sand drainage layers. The evaluation also includes monitoring moisture content in the tailings. Tailings beneath the side slope of the disposal cell remained saturated during the entire 4-year period. The combination of high percolation flux and saturated tailings raises concerns about the potential for the leaching of contaminants and the protection of groundwater. DOE plans to evaluate the fate and transport of tailings constituents and associated human-health and ecological risks.

The saturated tailings are also a potential indication of a phreatic surface at approximately 5.5 meters below the side slope crest as indicated by a cursory evaluation conducted in August 2008. The cursory evaluation suggested that seismic activity might render the disposal cell slope unstable. This information is presented in *Demonstration of Water Fluxmeter at the Lakeview, Oregon, Disposal Cell: Fiscal Year 2008 Progress Report.* DOE will further evaluate the potential of slope instability, the extent and depth of the phreatic surface if one is present, and the potential for liquefaction.

Additionally, studies of natural systems in the area (natural analog studies) have provided evidence for scenarios of the long-term performance of the cover. Some inferences that have emerged from these natural analog studies follow:

- Plant succession and soil development on the cover may lead to even greater permeability of the radon barrier.
- Soil development and plant succession on the cover may also lead to an increase in evapotranspiration, keeping the radon barrier unsaturated and, hence, effectively offsetting the increase in permeability.
- As rock riprap on the cover is degraded, vegetation growing in the rocky soil that will likely develop on side slopes may be adequate for long-term erosion control.

Side Slopes of the Disposal Cell and Adjacent Drainage Channel, Aprons, and Trench Drains—The side-slope cover shows no sign of cell settlement, displacement, or slumping. The contact boundary between the cell top and side slopes shows no evidence of vertical or horizontal movement. Concerns about the size and durability of the riprap are discussed below under "Riprap Condition Evaluation."

Grass has encroached on the riprap on the north side slope, on the upper (eastern) part of the drainage channel, on the energy dissipation area (EDA) at the lower end of the drainage channel, and on the western apron area. Grasses in these areas are now well established. Relatively sparse plant growth in the drainage channel is not significant and does not degrade the channel function.

Riprap Condition Evaluation—Riprap for the disposal cell was sized to withstand the erosive energy of a probable maximum precipitation event—a conservative, worst-case scenario in
9B which the most severe meteorological conditions possible occur at the same time. Deterioration of riprap on the west and north side slopes and in the EDA at the lower end of the drainage channel had noticeably increased since the mid-1990s. The deterioration is likely due to weathering processes and is an ongoing concern because the percentage of crumbling rocks on the surface indicates that the riprap may continue to deteriorate.

DOE initiated annual riprap gradation monitoring of the west side slope in 1997. Addendums to the Lakeview LTSP require that DOE annually determine the D_{50} value of the west side slope riprap to ensure that it is large enough to protect the disposal cell from a major precipitation event. Gradation monitoring was performed for the 13th consecutive year. An additional sieve size (less than 1 inch) was added to the procedure during this monitoring. Sampling locations are randomly selected prior to each monitoring event. Particle size distribution by count data was collected at 20 locations where 25 rocks are sampled. An evaluation of the rock size measurement data indicates that the side slope riprap D_{50} is 2.47 inches with a 95 percent confidence interval between 2.27 and 2.67 inches (Figure 9–2). The results of the 2009 gradation monitoring are provided as Appendix A. The 2009 D_{50} value is 0.14 inch greater than the value of 2.33 inches measured during monitoring in 2008. The 2008 result basically replicated the 2007 result of 2.32 inches, which was greater than the 2006 result of 2.26 inches. These D_{50} values show an upward trend since 2006, which may indicate that the degradation rate of the riprap has slowed in recent years. Prior results, from 1997 through 2006, indicated a gradual overall decrease in the cover rock D_{50} size by about 20 percent. Ongoing inspections of the north side slope riprap continue to support the determination that although rock degradation is occurring in this area, it is not nearly as prevalent as that which is occurring on the west side slope.

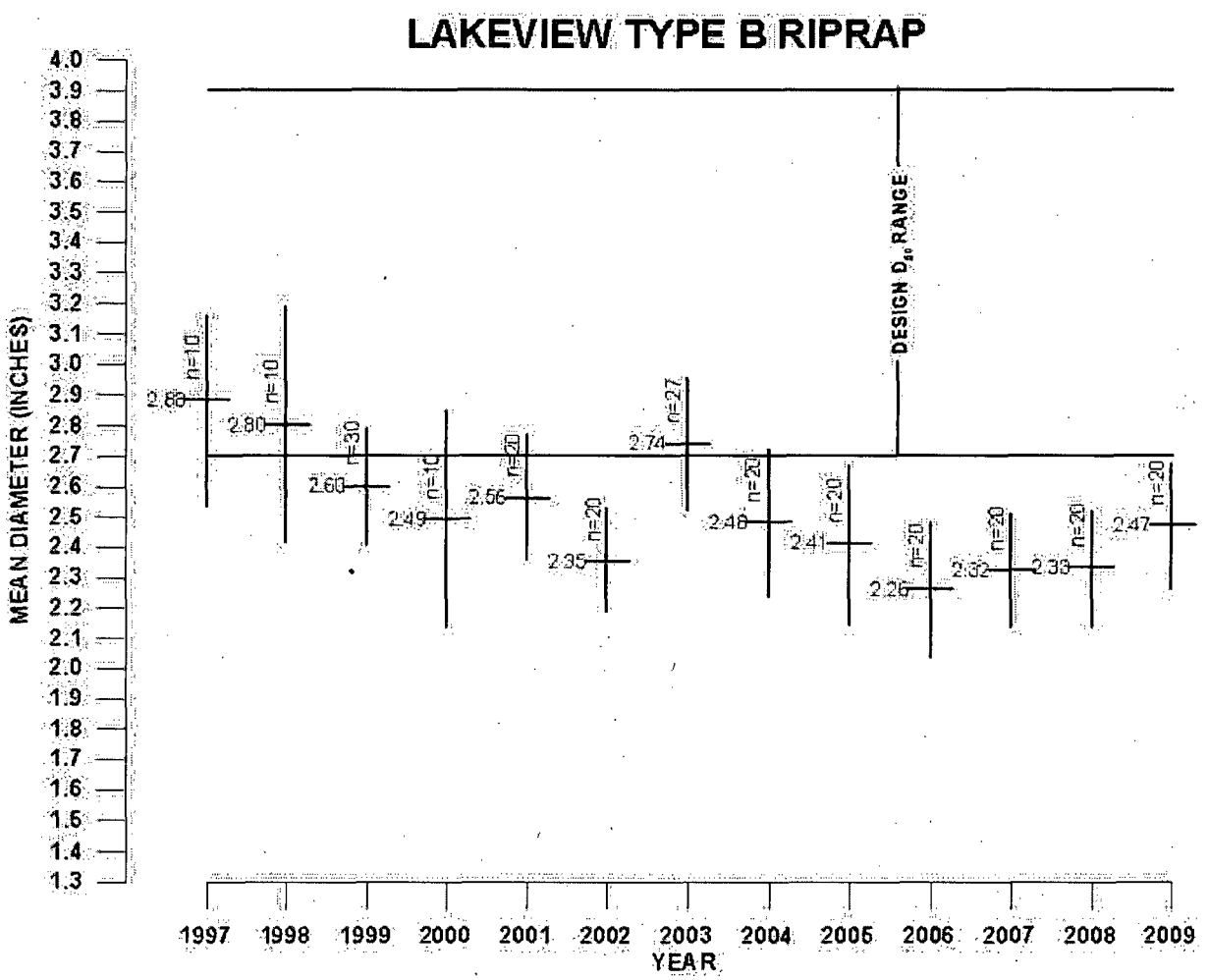


Figure 9-2. Side Slope Riprap Size Monitoring Results for the Lakeview Disposal Site

As specified in the Lakeview LTSP, the original cell design required a D_{50} design range envelope of 2.7 to 3.9 inches for Type B side slope riprap gradation to ensure that the cell is protected from erosion. Because the D_{50} value is below this size, DOE is currently considering D_{50} recalculations using more current site information and other options to ensure that the side slope riprap is of adequate size and durability to provide long-term erosion protection for the cell.

A rock catalog of the various types of basalt rocks on the side slopes was collected during the 2008 annual inspection. A rock type table to go with the catalog was prepared. The table identified the rock types, provided rock descriptions, and assigned a general durability classification and code (ranging from "highly durable" to "nondurable – crumbled/rubblized"). The rock catalog and table were brought to the site as a reference for the 2009 inspection, during which the project geologist/mineralogist refined them further (PL–3). This resulted in the determination that eight rock types, with seven durability classes, represented the side slope riprap. The revised rock type and durability class table is provided as Table 9–2 and is also included in Appendix A.

Table 9–2. Rock Type and Durability Class

Rock Type Identification Number	Rock Type Description	Durability Class	Durability Class Code
1	Dense, hard, very fine-grained, dark gray basalt with no joints, white deposits, or alteration. Some hairline fractures and a few grayish brown, case-hardened surfaces may be present.	Highly Durable	A
2	Dense, hard, dark gray to grayish brown, olivine basalt. No joints or white deposits; olivine phenocrysts have altered to amber and brown material representing various minerals such as iddingsite, antigorite, chlorite, and nontronite. On some exposed surfaces, altered olivine phenocrysts have weathered out to give a vesicular appearance.	Durable	B
3a	Dense, fine-grained, grayish brown to brown basalt with hairline fractures. Basalt is slightly altered, and fractured outer surfaces have a brown, limonite-like coating.	Moderately Durable	Ca
3b	Greenish gray to green, dense basalt with hairline fractures. Some fractures may have white or light brown coatings. Deuteric and hydrothermal alteration have imparted a distinctive greenish cast to the basalt resulting from alteration of calcic plagioclase to the more sodic plagioclase, albite-oligoclase.	Moderately Durable	Cb
4a	Fine-grained, highly fractured gray to greenish gray basalt. Hairline to open fractures are mostly coated with white to pink calcite and commonly with the zeolite mineral analcime.	Susceptible to Near-Term Degradation	Da
4b	Greenish gray to grayish brown olivine basalt that is highly fractured. Olivine phenocrysts have altered to brown material, possibly nontronite.	Susceptible to Near-Term Degradation	Db
5	Fine- to medium-grained, soft, grayish green, highly altered basalt. Rock has a granular appearance, has relatively low specific gravity, is probably highly chloritized, and has commonly disintegrated (rubblized) into pieces smaller than 1 inch in diameter.	Nondurable – Crumbled/ Rubblized	E
6	Non-basaltic rocks such as sandstone or quartzite.	Highly Durable to Nondurable	A through E

DOE initiated annual rock durability monitoring during the 2009 inspection using a draft procedure that NRC reviewed. The durability monitoring was conducted in conjunction with the gradation monitoring, using the same rocks. After a rock's size was determined, the rock was handed to the geologist/mineralogist for rock type identification (PL–4). The associated durability class code was then recorded under the appropriate rock size column for that sample location. It should be noted that these general durability classes were assigned by a geologist/mineralogist's examination of the rocks and are not based on laboratory durability testing standards.

Results of the 2009 durability monitoring, including the dovetailing of rock types to rock size, are provided as Appendix A. Results of the durability monitoring showed that the majority of the rocks (37.5 percent) were classified as Class A (with a general durability class of "highly durable"), 25.9 percent of the rocks were classified as Class B (with a general durability class of

"durable"), and 21.4 percent of the rocks were classified as Class Ca (with a general durability class of "moderately durable"). The final four rock classifications comprised single digit percentages of the total number of rocks (491) classified. These rock classifications had general durability classes ranging from "moderately durable" to "nondurable-crumbled/rubblized."

The summary table spreadsheet (Appendix A) also reveals the rock size related to general durability classifications. Data indicate that most rocks (36.7 percent) between 1.5 inch and 2.5 inches in diameter are Class A. Class B rocks make up most of the sizes greater than 2.5 inches in diameter, while Class A rocks are the majority retained on a 1-inch sieve. These data may indicate that while the Class A rocks are the most resistant, they have weathered into smaller sizes (less than 2.5 inches in diameter) over the life of the disposal cell. Class B rocks have remained the largest rocks; however, all rocks have weathered and become smaller than the original design sizes.

The side slopes were closely examined for "streaks," defined as areas with smaller-sized rocks generally elongated down the slope. The identification of the streaks and the delineation of their boundaries were determined to be highly subjective. No streak areas were identified on the north side slope. It was estimated that approximately 6 to 12 semi-well-defined streaks were identified on the west side slope. The combined area of these streaks was conservatively estimated to constitute less than 5 percent of the area of the west side slope. One of the better-delineated streaks was outlined with yellow paint, photographed, and measured. The maximum length of the streak was 27 feet (PL–5), and the maximum width of the streak (midway down the streak) was 3 feet 6 inches (PL–6). Identifying the streak boundaries was difficult. The general size of the streak area rocks ranged from approximately 1.5 to 1 inch in diameter; larger rocks were interspersed within the streak area. The objective of marking the streak boundary was to provide a way to determine if the streak size increases over time. Therefore, the marked streak area will be examined and measured during future inspections. This method for monitoring streaks was developed in the field with NRC concurrence.

The annual photographic monitoring of the 18 photograph points for long-term rock monitoring was conducted in the EDA. Minor rock degradation has been observed since monitoring began at the original 10 photographic locations established in 1997 and at the eight additional locations established in 2000. The rocks in the EDA and drainage channel were closely evaluated during the inspection. The rock type used in these areas was much more homogeneous than the varied rock types on the side slopes. It is estimated that 99 percent of the rock used in this area is Rock Type 2, with a corresponding Durability Class B, "durable" (see Table 9–2). Overall, the rock in the EDA and drainage channel was in good condition. Based on July 2009 visits to the two quarries used as rock sources for the disposal site, it was concluded that this rock likely came from the Deadman Canyon (formerly Sheer) Quarry.

Standing water previously observed at times in the large depression in the EDA at the lower end of the drainage channel was absent during the 2007, 2008, and 2009 inspections. Water is potentially a concern because inundation may accelerate deterioration of the large riprap by the freeze-thaw process, although Durability Class B rock is not as susceptible to freeze-thaw as other rock types present on the cell.

Site Perimeter and Outlying Area—This transect includes the area extending from the disposal cell to the site boundary and the area within 0.25 mile surrounding the site.

An area (approximately 50 feet by 15 feet) upgradient of the drainage channel near monitoring wells MW–0602 and MW–0609 was observed as a shallow depression. The area was dry but showed evidence of previously ponded water (with a maximum depth of approximately 6 inches). The depression did not appear significant, and no repairs are recommended now. This area will be watched to see if ponding recurs.

Gullies that formed in seeded areas extending west of Trench Drains 1, 2, 3, 4, and 5 were filled with rock in 2000. The rock has mostly arrested the headcutting that was proceeding from the adjacent private property onto the DOE property. Small gullies observed forming downslope of the rock were not large enough to warrant repair now. Additional small gullies have been observed in the southwest corner of the site just inside the perimeter fence and downhill of an inclined road that intersects the fence line. These small gullies are likely the result of runoff from the road during rain events. The gullies did not show recent erosion and present no immediate cause for concern.

The area within 0.25 mile of the site boundary was unchanged from 2008.

9.3.2 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 follow-up or contingency inspections were required in 2009.

9.3.3 Routine Maintenance and Repairs

In 2009, DOE performed minor maintenance at the site that included placing t-posts next to survey monument SM–3 and the western, off-site monitoring wells to assist with locating these features in the future, and removing vegetation that was obscuring perimeter sign P1.

9.3.4 Groundwater Monitoring

9C DOE monitors groundwater quality in the uppermost aquifer at this site once every 5 years to demonstrate that the disposal cell is not leaching contaminants. The most recent sampling event was performed in July 2009.

Nine monitoring wells are in the groundwater monitoring network. Eight POC wells (four monitoring well pairs: MW–0602/MW–0609, MW–0603/MW–0608, MW–0604/MW–0607, and MW–0605/MW–0606) are east of the cell. POC well (MW–0515), an upgradient well, is west of the disposal site. Monitoring wells MW–0602, MW–0603, MW–0604, and MW–0605 were dry and could not be sampled.

Constituents analyzed every 5 years include arsenic, cadmium, and uranium. Their respective maximum concentration limits, established by the U.S. Environmental Protection Agency in Table 1 to Subpart A of 40 CFR 192, are 0.05 milligrams per liter (mg/L), 0.01 mg/L, and 0.044 mg/L. Concentrations of these constituents remained well below their respective limits in 2009. Arsenic concentrations in the cell performance network remained within the historical

range, and either decreased or remained stable, as shown on the time-concentration plot in Figure 9–3. Cadmium concentrations decreased slightly in MW–0515 and remained undetected at the method detection limit in the other wells (Figure 9–4). Uranium concentrations increased slightly in all five wells but remained within the historical range (Figure 9–5). Based on the monitoring results to date, there is no indication of any degradation of groundwater near the site. The next cell performance monitoring is scheduled for 2014.

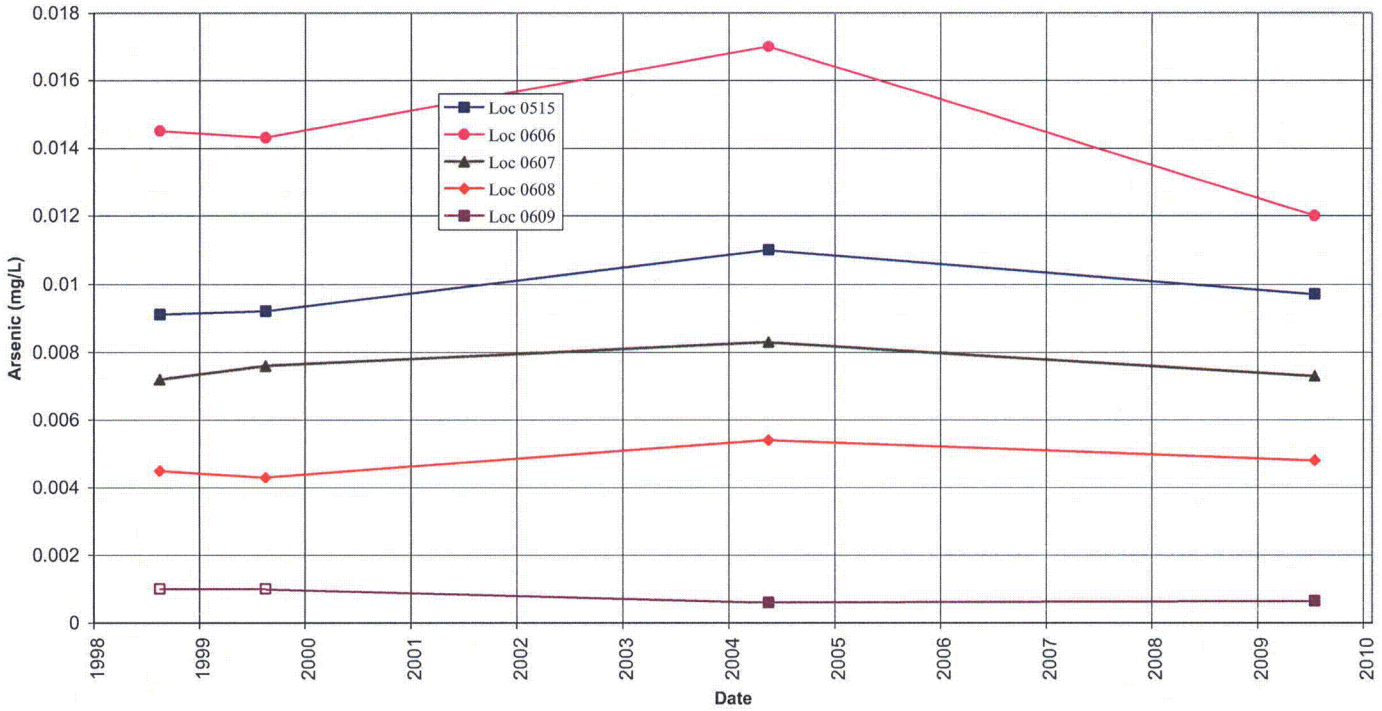


Figure 9-3. Time-Concentration Plot of Arsenic in Groundwater at the Lakeview Disposal Site

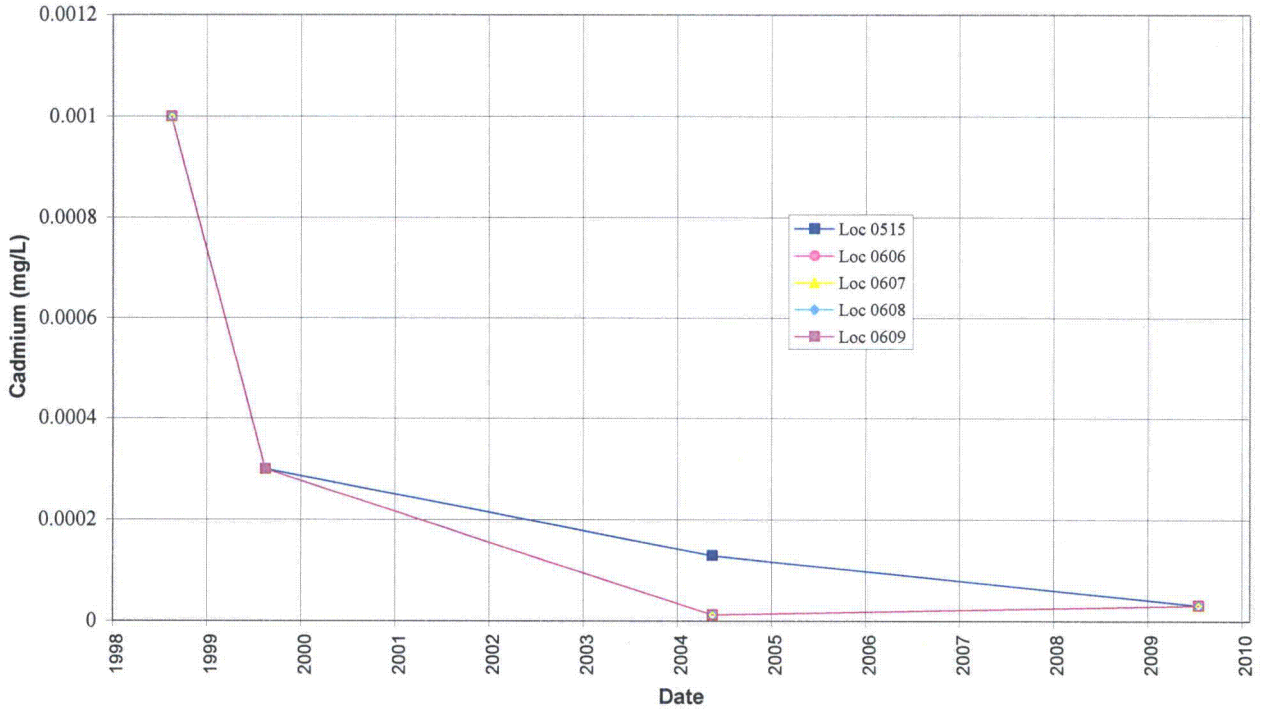


Figure 9-4. Time-Concentration Plot of Cadmium in Groundwater at the Lakeview Disposal Site

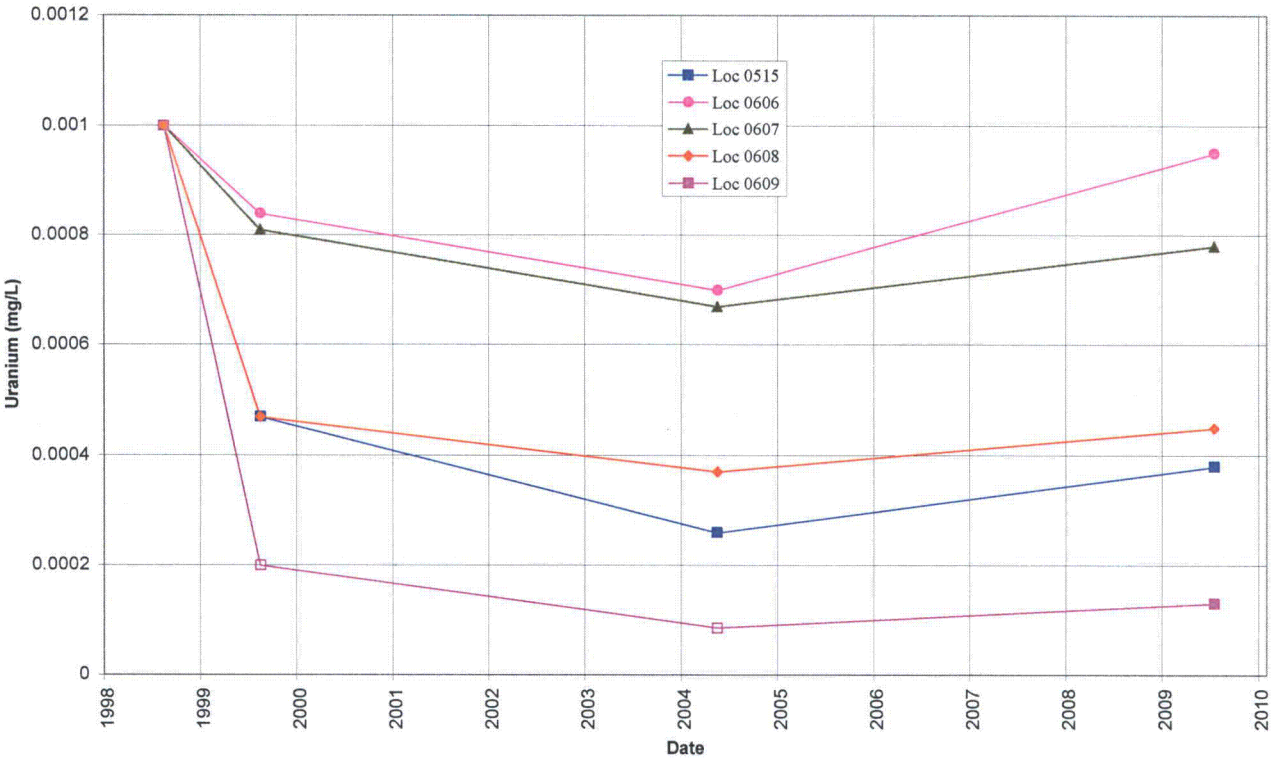


Figure 9-5. Time-Concentration Plot of Uranium in Groundwater at the Lakeview Disposal Site

9.3.5 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.

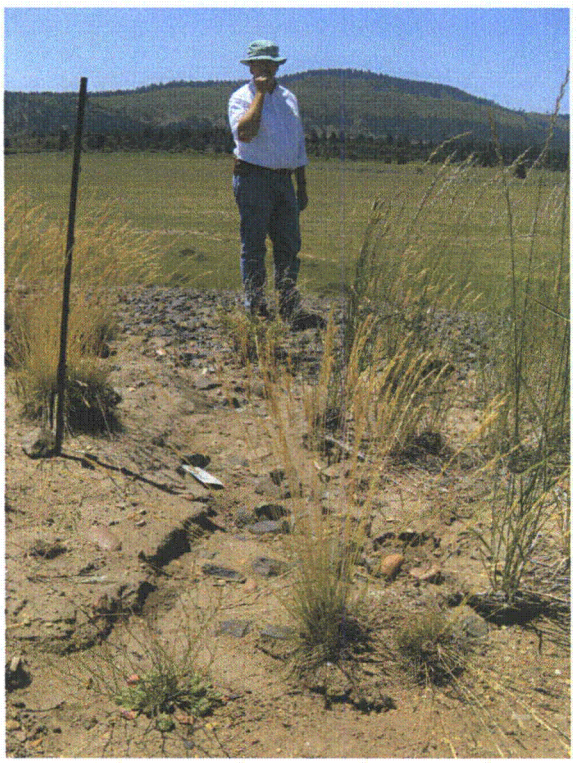
No corrective action was required in 2009.

9.3.6 Photographs

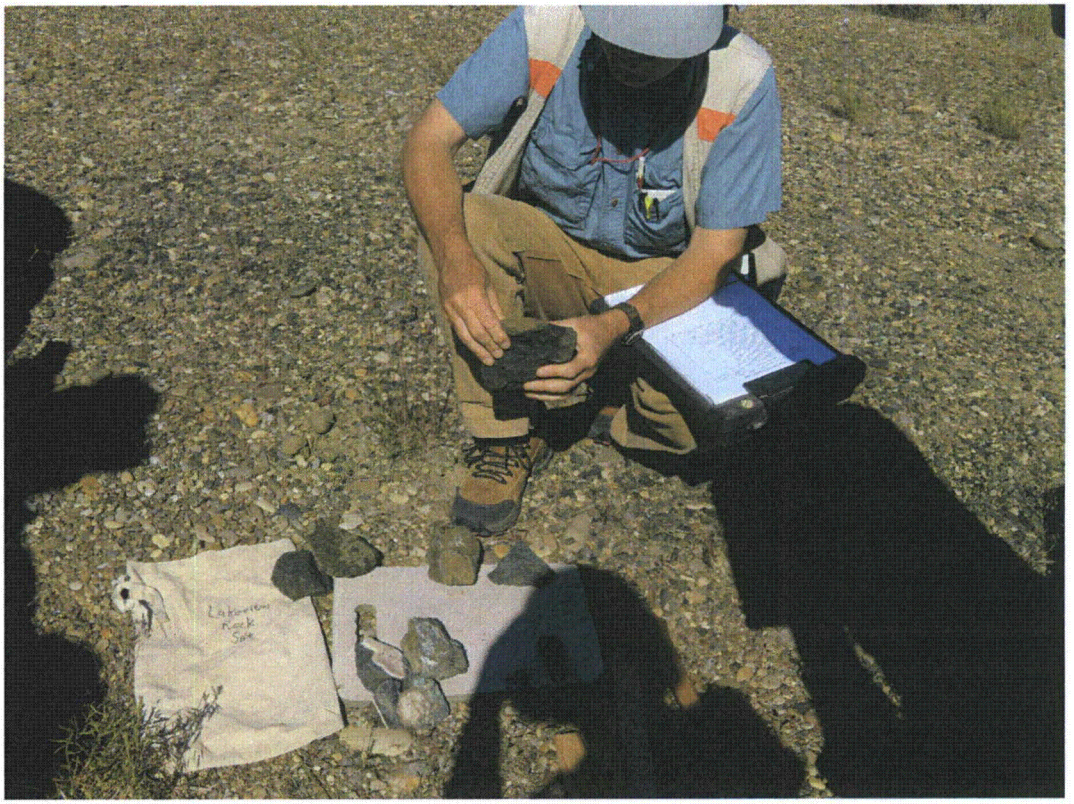
Table 9–3. Photographs Taken at the Lakeview Disposal Site

Photo Location Number	Azimuth	Photograph Description
PL–1	210	View south across the disposal cell top, showing vegetative cover.
PL–2	270	Minor erosion rills at the contact between the top cover and west side slope.
PL–3	NA	Discussing "rock set" library representing various side slope rock types.
PL–4	NA	Inspectors conducting rock gradation and durability monitoring.
PL–5	90	"Streak" area with smaller-sized rocks on west side slope.
PL–6	90	"Streak" area with smaller-sized rocks on west side slope.

LKV 7/2009. PL–1. View south across the disposal cell top, showing vegetative cover.



LKV 7/2009. PL–2. Minor erosion rills at contact between the top cover and west side slope.



LKV 7/2009. PL–3. Discussing "rock set" library representing various side slope rock types.

LKV 7/2009. PL–4. Inspectors conducting rock gradation and durability monitoring.

LKV 7/2009. PL–5. "Streak" area with smaller-sized rocks on west side slope.

LKV 7/2009. PL–6. "Streak" area with smaller-sized rocks on west side slope.

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Appendix A

2009 Gradation and Durability Results
for
Type B Riprap
at the
Lakeveiw, Oregon, Disposal Site

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July 23, 2009

Ann Houska
Lakeview Site Lead
S.M. Stoller
2597 B ¾ Rd.
Grand Junction, CO 81503

Re: 2009 Gradation and durability results for Type B riprap, Lakeview, OR

Dear Ann:

Results of July 15, 2009 riprap gradation testing performed on the Lakeview Collins Ranch disposal cell are presented herein. A mean diameter (D_{50}) of **2.47** inches was determined following procedures discussed in the Lakeview Long-Term Surveillance Plan (LKV LTSP). The 2009 results fall below the current D_{50} design range envelope for Type B gradation of 2.7 to 3.9 inches.

Tests were performed on the west face side slope which is covered by an approximate 12-inch thick layer of Type B gradation basalt riprap. Testing was performed by Mr. Greg Smith and Mr. Craig Goodknight, accompanied by yourself and Ms. Jalena Maestas from the Department of Energy.

Field gradation test procedures are outlined in a revision to the LKV LTSP submitted in 1998, *Attachment 8, Procedure for Gradation Testing of Riprap*. This procedure specifies the use of 3 sieves: a 4 inch, 3.5 inch and 2.5 inch, to estimate the mean diameter of side slope riprap. The procedure was amended in 2000 by adding an additional sieve, a 1.5" sieve, accounting for small pieces of stone. This year we added another sieve, a 1" sieve to account for even smaller pieces of rock encountered in the procedure. Additionally, the procedure calls for marking 25 stones at each test location for size determination. Stones are marked that lie below intersections of a wire mesh at each test location. Twenty randomly selected test locations taken from uniformly distributed discrete starts over the west side slope have been shown to provide enough distribution in sample locations to provide statistical surety to the determined mean riprap diameter, D_{50}. Accordingly, 500 stones are theoretically measured during the procedure. However, if a large stone lies beneath 2 mesh intersections, only 24 stones are marked at that test location. During testing performed in 2009, this occurred 9 times resulting in 491 stones used in the procedure.

A mean diameter of **2.47** inches possesses 95% confidence interval limits of **2.27** inch to **2.67** inch. This size range was designed to resist overland water erosion from the Probable

Maximum Precipitation (PMP) event. The 2009 mean diameter is approximately 0.15 inches greater than the measured D_{50} in 2008 of 2.33 inches.

Each stone used in field gradation test determination was classified during the test into one of 7 durability classifications by Mr. Craig Goodknight. Results are provided on the accompanying 2009 Durability Summary Table spreadsheet, also indicating a total of 491 stones were classified. A majority of the stones are Class A (37.5%), followed by Class B (25.9%) and Class Ca (21.4%). The final 4 classifications possess single digit percentages of the total number classified. The summary table spreadsheet also reveals the stone size related to durability classification. Data indicates the majority of stones retained on a sieve (36.7%) are Class A, and were between 1.5 inch and 2.5 inch. Class B stones make-up the majority of the sizes greater than 2.5 inch, while Class A stones are the majority retained on a 1 inch sieve.

These data may indicate that while the Class A stones are the most resistant, they have weathered into smaller sizes (less than 2.5 inch), over the life of the disposal cell. Class B stones have remained as the largest stones, however all stones have weathered and become smaller than the original design sizes.

Attached to this letter are the original data collection sheets, hard copies of the Excel spreadsheet used to compute D_{50} and durability classifications, in addition to an updated graphic plot of the D_{50} trend from 1997 to 2009.

GMS/gms

Gregory M. Smith, Manager
Geo-Smith Engineering, LLC

enclosures

07/15/09 LAKEVIEW

D_{50} by size - 5 sieves

sample number	total painted	number retained					cumulative number passing					cumulative percent passing					D_{50} (inch)	P/F
		4 - inch	3 - inch	2.5 - inch	1.5 - inch	1-inch	4 - inch	3 - inch	2.5 - inch	1.5 - inch	1.0 - inch	4 - inch	3 - inch	2.5 - inch	1.5 - inch	1.0 - inch		
CP 1	25	0	9	8	6	0	25	16	8	2	2	100	64	32	8	8	2.78	P
CP 11	25	1	7	5	8	3	24	17	12	4	1	96	68	48	16	4	2.55	F
CP 2	24	0	4	6	10	2	24	20	14	4	2	100	83	58	17	8	2.30	F
CP 12	23	3	6	3	5	4	20	14	11	6	2	87	61	48	26	9	2.58	F
CP 3	24	1	11	5	6	1	23	12	7	1	0	96	50	29	4	0	3.00	P
CP 13	25	0	2	3	16	3	25	23	20	4	1	100	92	80	16	4	2.03	F
CP 4	25	0	6	6	12	0	25	19	13	1	1	100	76	52	4	4	2.48	F
CP 14	25	1	6	2	12	4	24	18	16	4	0	96	72	64	16	0	2.21	F
CP 5	22	3	10	2	5	2	19	9	7	2	0	86	41	32	9	0	3.20	P
CP 15	25	1	11	2	8	1	24	13	11	3	2	96	52	44	12	8	2.88	P
CP 6	25	0	1	0	15	7	25	24	24	9	2	100	96	96	36	8	1.73	F
CP 16	25	1	5	5	11	3	24	19	14	3	0	96	76	56	12	0	2.36	F
CP 7	25	1	5	8	11	0	24	19	11	0	0	96	76	44	0	0	2.64	F
CP 17	25	1	2	2	10	9	24	22	20	10	1	96	88	80	40	4	1.75	F
CP 8	25	0	3	4	14	3	25	22	18	4	1	100	88	72	16	4	2.11	F
CP 18	25	3	5	5	10	1	22	17	12	2	1	88	68	48	8	4	2.55	F
CP 9	24	2	15	3	3	0	22	7	4	1	1	92	29	17	4	4	3.33	P
CP 19	25	1	3	6	6	8	24	21	15	9	1	96	84	60	36	4	2.08	F
CP 10	24	4	9	6	3	1	20	11	5	2	1	83	46	21	8	4	3.11	P
CP 20	25	0	2	6	9	5	25	23	17	8	3	100	92	68	32	12	2.00	F
																	30% passing	
	491	23	122	87	180	57	468	346	259	79	22	95	70	53	16	4	2.43	F

7/15/2009	
Mean	2.47
Standard Error	0.104
Median	2.41
Mode	2.55
Standard Deviation	0.466
Sample Variance	0.217
Range	1.6
Minimum	1.73
Maximum	3.33
Sum	49.4
Count	20
Confidence Level(95.0%)	0.218

computed S.E. =	0.104
95% conf. int.	2.67
	2.26

n req'd (within 0.1")	α (%)
18	5
13	10
8	20

LAKEVIEW TYPE B RIPRAP
2009 DURABILITY SUMMARY TABLE
(NUMBER OF OCCURRANCES RETAINED ON SIEVE)

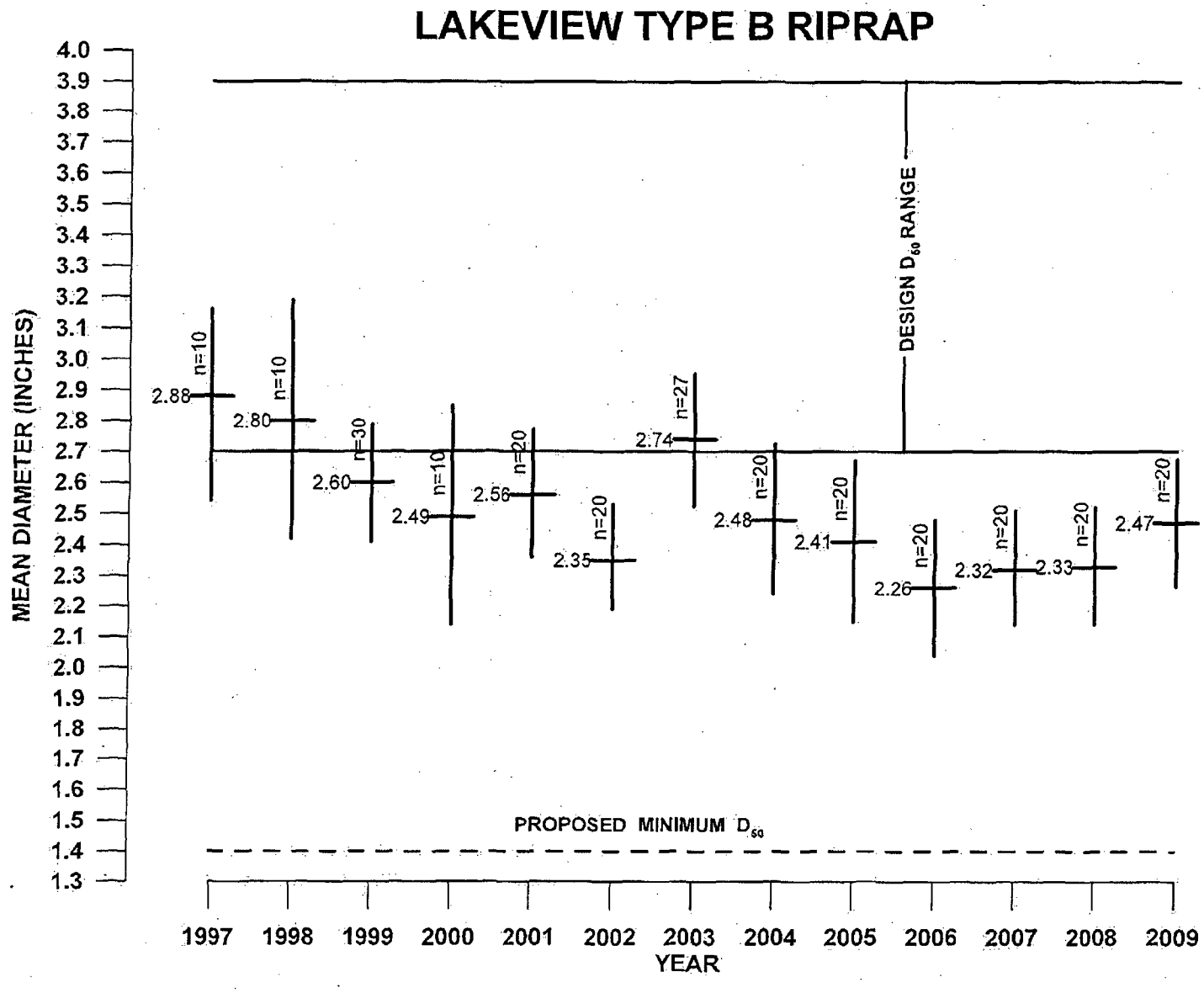
	SIEVE SIZE							
DURABILITY CLASS	4 - inch	3 - inch	2.5 - inch	1.5 - inch	1-inch	< 1 - inch	total by durability class	% of total
class A	10	41	26	84	22	1	184	37.5
class B	11	52	30	26	7	1	127	25.9
class Ca	1	22	23	43	13	3	105	21.4
class Cb	0	2	6	16	8	2	34	6.9
class Da	1	3	1	7	6	4	22	4.5
class Db	0	2	1	4	1	0	8	1.6
class E	0	0	0	0	0	11	11	2.2
							491	
total by sieve size	23	122	87	180	57	22	491	total
% of total	4.7	24.8	17.7	36.7	11.6	4.5		

PERCENTAGE BY SIEVE SIZE

DURABILITY CLASS	4 - inch	3 - inch	2.5 - inch	1.5 - inch	1-inch	< 1 - inch
class A	43.5	33.6	29.9	46.7	38.6	4.5
class B	47.8	42.6	34.5	14.4	12.3	4.5
class Ca	4.3	18.0	26.4	23.9	22.8	13.6
class Cb	0.0	1.6	6.9	8.9	14.0	9.1
class Da	4.3	2.5	1.1	3.9	10.5	18.2
class Db	0.0	1.6	1.1	2.2	1.8	0.0
class E	0.0	0.0	0.0	0.0	0.0	50.0

PERCENTAGE BYDURABILITY CLASS

DURABILITY CLASS	4 - inch	3 - inch	2.5 - inch	1.5 - inch	1-inch	< 1 - inch
class A	5.4	22.3	14.1	45.7	12.0	0.5
class B	8.7	40.9	23.6	20.5	5.5	0.8
class Ca	1.0	21.0	21.9	41.0	12.4	2.9
class Cb	0.0	5.9	17.6	47.1	23.5	5.9
class Da	4.5	13.6	4.5	31.8	27.3	18.2
class Db	0.0	25.0	12.5	50.0	12.5	0.0
class E	0.0	0.0	0.0	0.0	0.0	100.0


LAKEVIEW TYPE B RIPRAP
MEAN DIAMETER (INCHES)
4.0
3.9
3.8
3.7
3.6
3.5
3.4
3.3
3.2
3.1
3.0
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
DESIGN D_{50} RANGE
n=10
2.88
n=10
2.80
n=30
2.60
n=10
2.49
n=20
2.56
n=20
2.35
n=27
2.74
n=20
2.48
n=20
2.41
n=20
2.26
n=20
2.32
n=20
2.33
n=20
2.47
PROPOSED MINIMUM D_{50}
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
YEAR

Rock Type and Durability Class

Rock Type Identification Number	Rock Type Description	Durability Class	Durability Class Code
1	Dense, hard, very fine-grained, dark gray basalt with no joints, white deposits, or alteration. Some hairline fractures and a few grayish brown, case-hardened surfaces may be present.	Highly Durable	A
2	Dense, hard, dark gray to grayish brown, olivine basalt. No joints or white deposits; olivine phenocrysts have altered to amber and brown material representing various minerals such as iddingsite, antigorite, chlorite, and nontronite. On some exposed surfaces, altered olivine phenocrysts have weathered out to give a vesicular appearance.	Durable	B
3a	Dense, fine-grained, grayish brown to brown basalt with hairline fractures. Basalt is slightly altered, and fractured outer surfaces have a brown, limonite-like coating.	Moderately Durable	Ca
3b	Greenish gray to green, dense basalt with hairline fractures. Some fractures may have white or light brown coatings. Deuteric and hydrothermal alteration have imparted a distinctive greenish cast to the basalt resulting from alteration of calcic plagioclase to the more sodic plagioclase, albite-oligoclase.	Moderately Durable	Cb
4a	Fine-grained, highly fractured gray to greenish gray basalt. Hairline to open fractures are mostly coated with white to pink calcite and commonly with the zeolite mineral analcime.	Susceptible to Near-Term Degradation	Da
4b	Greenish gray to grayish brown olivine basalt that is highly fractured. Olivine phenocrysts have altered to brown material, possibly nontronite.	Susceptible to Near-Term Degradation	Db
5	Fine- to medium-grained, soft, grayish green, highly altered basalt. Rock has a granular appearance, has relatively low specific gravity, is probably highly chloritized, and has commonly disintegrated (rubblized) into pieces smaller than 1 inch in diameter.	Nondurable – Crumbled/ Rubblized	E
6	Non-basaltic rocks such as sandstone or quartzite.	Highly Durable to Nondurable	A through E

10.0 Lowman, Idaho, Disposal Site

10.1 Compliance Summary

The Lowman, Idaho, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on July 7, 2009. The disposal cell and site features were in excellent condition and functioning as designed. Vegetation continues to naturally encroach on the disposal cell cover. Noxious weed infestations continue to be monitored; herbicide and insects are used to control the infestations. No other maintenance needs or cause for a follow-up or contingency inspection was identified.

10.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Lowman Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the U.S. Department of Energy Lowman, Idaho, (UMTRCA Title I) Disposal Site* (DOE–LM/GJ771–2005, Revision 2, U.S. Department of Energy [DOE], January 2005) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). These requirements are listed in Table 10–1.

Table 10–1. License Requirements for the Lowman Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.3	Section 10.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 10.3.3
Routine Maintenance and Repairs	Section 3.5	Section 10.3.4
Corrective Action	Section 3.6	Section 10.3.6

Institutional Controls—The 18-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 1994. 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 disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, warning/no-trespassing signs along the property boundary, and a locked gate across the access road that leads to the site. The site is not fenced. Verification of these institutional controls is part of the annual inspection.

Inspectors found no evidence that these institutional controls were ineffective or violated.

10.3 Compliance Review

10.3.1 Annual Inspection and Report

The site, approximately ½ mile northeast of Lowman, Idaho, was inspected on July 7, 2009. The results of the inspection are described below. Features and photograph locations (PLs) mentioned in this report are shown on Figure 10–1. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

10.3.1.1 Specific Site-Surveillance Features

Access Road, Entrance Gate, and Signs—The site is at the end of a hard-packed gravel road about 650 feet north of Idaho State Highway 21. The road, which crosses U.S. Forest Service land, was in excellent condition. A locked gate spans the road about 150 feet from the State highway and was in excellent condition.

One entrance sign and 18 perimeter signs delineate the unfenced site boundary. The entrance sign is just inside the site boundary near site marker SMK–1. Although the sign has several bullet holes, it was still legible and does not need to be replaced. The 18 perimeter signs are on steel posts along the site boundary. Four signs have bullet holes or dents, but they were legible and do not need to be replaced. The other perimeter signs were in excellent condition.

Site Markers and Monuments—There are two site markers (PL–1), four boundary monuments, and three combination survey/boundary monuments. All were in excellent condition.

Monitoring wells—Groundwater monitoring is not required at the site. All monitoring wells were decommissioned in 2006.

10.3.1.2 Transects

To ensure a thorough and efficient inspection, the site is divided into three "transects": (1) the top and side slope of the disposal cell, (2) the area between the disposal cell and the site boundary, and (3) the outlying area.

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

Top and Side Slope of the Disposal Cell—The 8-acre disposal cell was completed in 1991. Basalt riprap armors the top and west-facing side slope of the disposal cell. An apron of larger riprap surrounds the disposal cell on all sides. The riprap was in excellent condition, and no evidence of instability, such as subsidence, slumping, or cracking, was observed on any of the cell surfaces (PL–2).

Vegetation encroachment by tree, shrub, and wildflower species continues on the top and side slopes of the disposal cell (PL–3). Encroachment is a natural process operating at this location and will be allowed to continue in accordance with the LTSP. Although DOE is not required to remove ponderosa pine trees as they mature, the LTSP states that DOE will repair any damage that occurs to the riprap cover and underlying cover layers caused by blowdown or other processes to maintain protection from erosion and possible consequent dispersion of cell contents. The largest ponderosa pine trees on the cover are now approximately 10 feet tall.

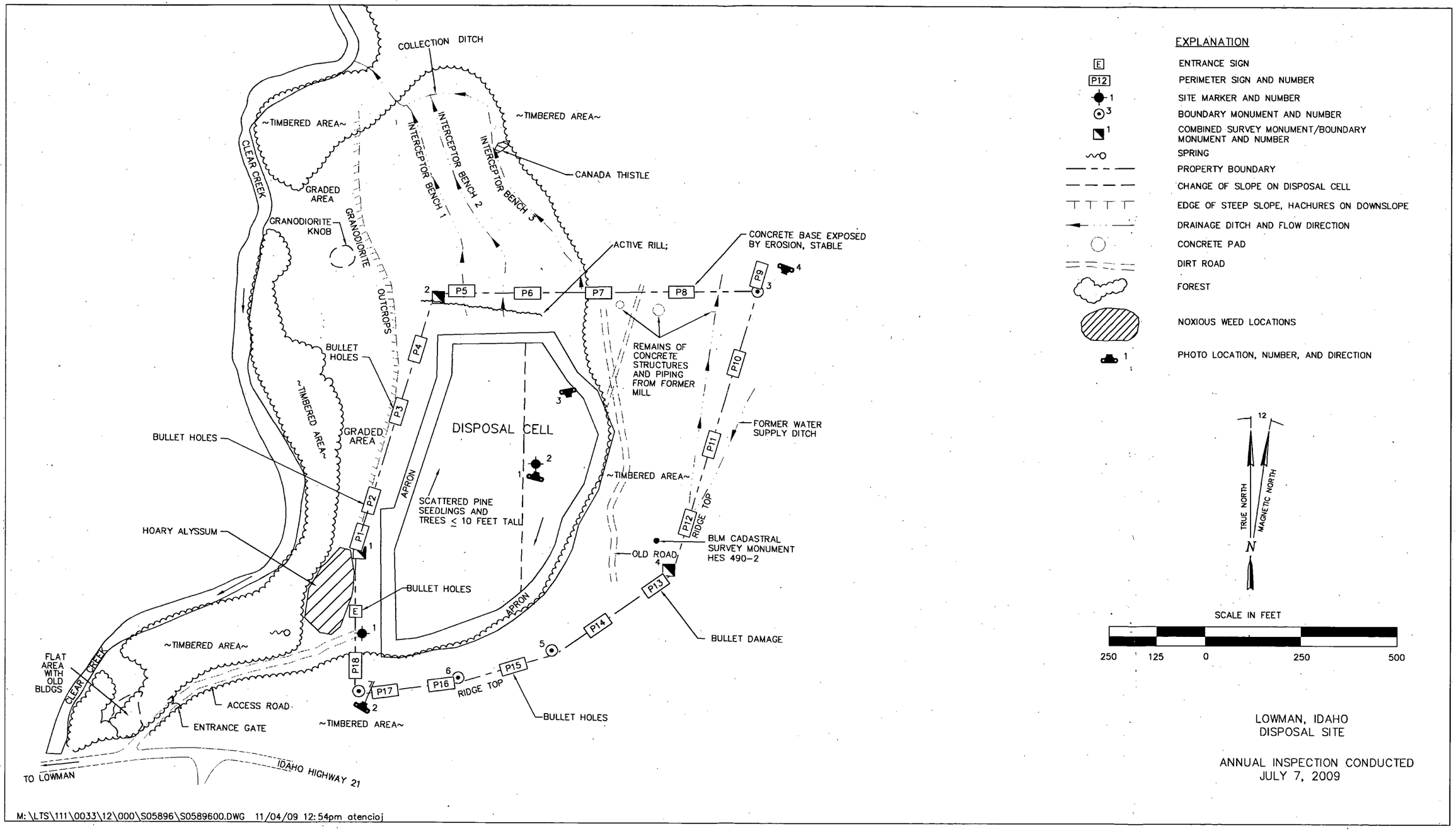


Figure 10–1. 2009 Annual Compliance Drawing for the Lowman Disposal Site

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Area Between the Disposal Cell and the Site Boundary—The steep slopes east (PL–4) and south of the site are stable and vegetated with well-established grasses and ponderosa pine trees. Concrete structures and metal pipes from the former mill remain in an area northeast of the disposal cell and were undisturbed. There was no evidence of intrusion along the site boundary.

Outlying Area—An area within 0.25 mile of the site was visually inspected for evidence of construction, development, logging, or change in land use that might affect the site. No changes were noted to the area across Clear Creek to the west, where several summer cabins are located. The area east and south of the site is U.S. Forest Service land and remains unchanged.

DOE's erosion control activities on the State of Idaho parcel north of the property are complete. Erosion will continue to be monitored during annual site inspections to ensure protection of the disposal cell and other site-surveillance features such as property signs and boundary monuments. If significant erosion is observed on the State parcel and it appears that sediment could enter Clear Creek, DOE will notify the State. No erosion issues were identified during the inspection.

10.3.2 Noxious Weeds

Infestations of six State-listed noxious weed species are present on and adjacent to the site. Herbicide is applied to five of the species (spotted knapweed, Canada thistle, rush skeletonweed, oxeye daisy, and hoary alyssum) annually. In 2008, DOE began biocontrol of the other noxious weed (Dalmatian toadflax) by releasing several cartons of a stem-boring weevil that specifically targets that weed. Other biocontrol and ecologically friendly methods of weed control will be used as they become available.

10A

10.3.3 Follow-Up or Contingency Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2009.

10.3.4 Routine Maintenance and Repairs

In 2009, noxious weeds were treated with herbicide applications.

10.3.5 Groundwater Monitoring

Groundwater monitoring is not required at the site according to the LTSP. All monitoring wells have been decommissioned.

10.3.6 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 2009.

10.3.7 Photographs

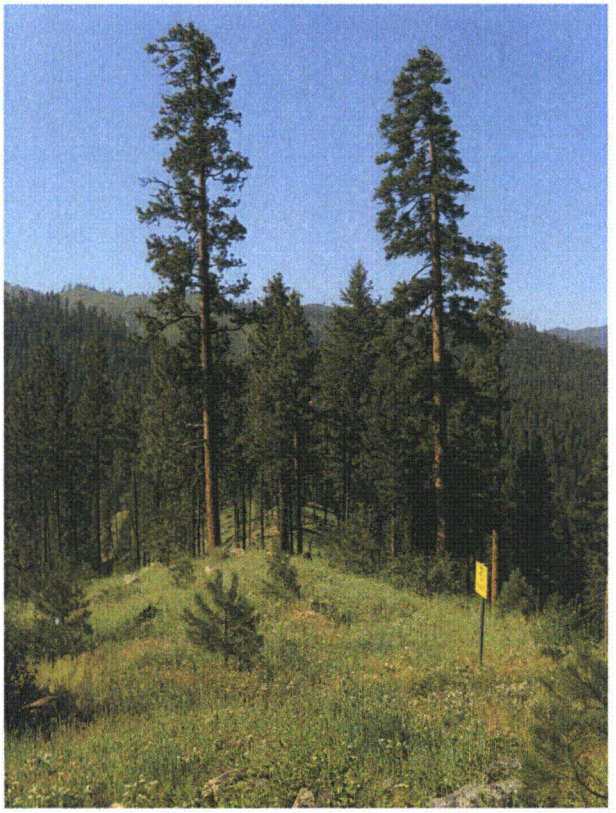
Table 10–2. Photographs Taken at the Lowman, Idaho, Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	15	Site marker SMK–2 on the disposal cell cover.
PL–2	30	West slope and apron of the disposal cell.
PL–3	170	Vegetation on the disposal cell cover.
PL–4	200	East ridgeline.

LOW 7/2009. PL–1. Site marker SMK–2 on the disposal cell cover.

LOW 7/2009. PL–2. West slope and apron of the disposal cell.

LOW 7/2009. PL–3. Vegetation on the disposal cell cover.



LOW 7/2009. PL–4. East ridgeline.

11.0 Maybell, Colorado, Disposal Site

11.1 Compliance Summary

The Maybell, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Disposal Site was inspected on August 6, 2009. The disposal cell and all associated diversion and drainage structures were in good condition and functioning as designed. The outlet to Swale No. 1 was washed out, but riprap placed within the swale is armoring the downstream channel created. Deep-rooted plants growing on the disposal cell top will be cut and treated in 2010. Another mining claim stake was found on site, on top of the disposal cell. This claim, like the ones discovered previously, is considered a "nuisance claim" since protection of the disposal cell is provided through the U.S. Nuclear Regulatory Commission (NRC) general license. The relocation of three boundary monuments is planned for 2010 to correct an error discovered in the property boundary along the north and northwest portion of the site; however, the site map was corrected, and the revised *Long-Term Surveillance Plan* [LTSP] *for the Maybell, Colorado, Disposal Site* (DOE–LM/1605–2008, U.S. Department of Energy [DOE], April 2008) was submitted to NRC in 2008.

In 2009, maintenance consisted of treating noxious weeds on the disposal cell top and repairing the perimeter fence. The fence was extended at several gullies to ensure that cattle do not access the site. During the inspection, no activity that would raise concern over the integrity of the site was noted in the surrounding area, and inspectors identified no cause for a follow-up inspection.

11.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Maybell Disposal Site are specified in the LTSP and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 11–1 lists these requirements.

Table 11–1. License Requirements for the Maybell Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 11.3.1
Follow-Up or Contingency Inspections	Section 3.5	Section 11.3.2
Routine Maintenance and Repairs	Section 3.6	Section 11.3.3
Groundwater Conditions	Section 2.5	Section 11.3.4
Corrective Action	Section 3.6	Section 11.3.5

Institutional Controls—The 251-acre disposal site is owned by the United States of America and was accepted under the NRC general license (10 CFR 40.27) in 1999. 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 disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing (perimeter) signs along the property boundary, and a locked gate at the site entrance. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

11.3 Compliance Review

11.3.1 Annual Inspection and Report

The site, northeast of Maybell, Colorado, was inspected on August 6, 2009. The results of the inspection are described below. Figure 11–1 shows features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

11.3.1.1 Specific Site-Surveillance Features

Access, Gates, Fence, and Signs—Access to the site is via Moffat County Road 53, a gravel road that turns north from U.S. Highway 40 and ends at the disposal site just east of the site entrance gate. A sign indicating the end of County Road 53 is posted where the road ends at the northeast corner of the site. From that point, a dirt track continues west, along the north property boundary and past an abandoned open pit mine (Robb Pit) to the Umetco Minerals Corporation (Maybell West) UMTRCA Title II Disposal Site, which is in the process of transitioning to DOE.

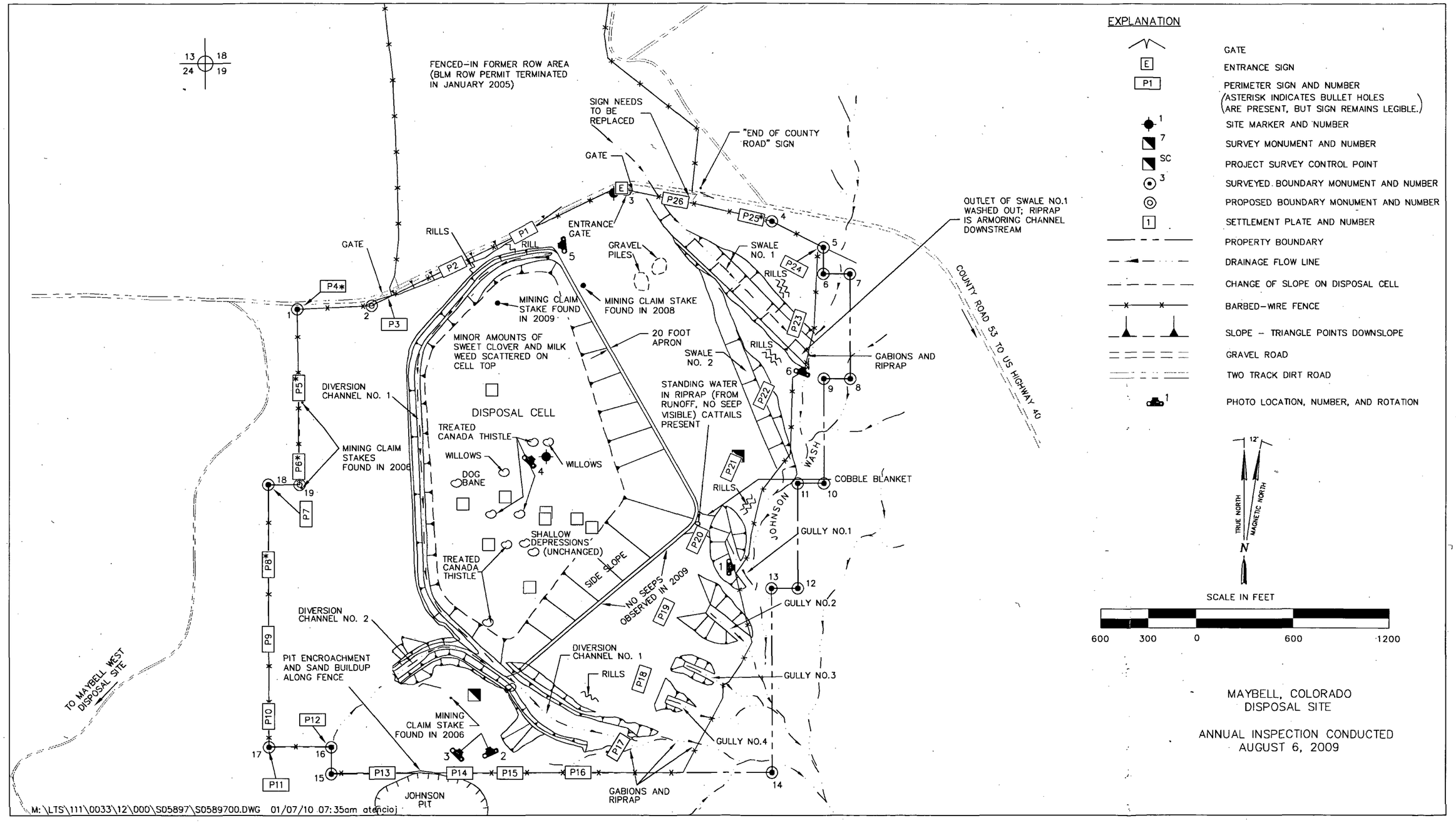
The access road was in good condition. Because the access road to the Maybell Disposal Site is a County road, maintenance up to that point is performed by Moffat County. From the "End of County Road" sign to the Maybell West Disposal Site, DOE is responsible for road maintenance under a U.S. Bureau of Land Management (BLM) right-of-way permit.

Two gates are installed in the site perimeter fence and provide access to the site. The first gate is the locked entrance gate on the north end of the site. The second gate, also locked, is directly west of perimeter sign P3 in the northwest corner of the property. Both gates are tubular metal stock gates and were in good condition.

A standard four-strand barbed-wire stock fence surrounds the disposal cell and drainage structures. The Maybell Disposal Site is on wintering grounds frequented by big-game animals (e.g., deer, elk, antelope) and surrounded by open range land used to graze cattle; periodic damage to the perimeter fence is to be expected. In 2009, several breaks in the perimeter fence
11A were repaired, as were loose wires and bent posts at several locations. As part of this maintenance work, the fence was extended where it crosses Gullies No. 1, 2, 3, and 4 in order to keep cattle from accessing the site (PL–1). In 2009, no cattle were observed grazing on the site, and the fence was in good condition.

The entrance sign, near the entrance gate and mounted on a t-post in the fence line, was in good condition.

Twenty-seven perimeter (warning/no-trespassing) signs are at the site. On the north, west, and south sides of the site, perimeter signs are on t-posts in the fence line. On the east side of the site, perimeter signs are on the bench about midway between the disposal cell and Johnson Wash,



EXPLANATION

- GATE
- E — ENTRANCE SIGN
- P1 — PERIMETER SIGN AND NUMBER (ASTERISK INDICATES BULLET HOLES ARE PRESENT, BUT SIGN REMAINS LEGIBLE.)
- 1 — SITE MARKER AND NUMBER
- 7 — SURVEY MONUMENT AND NUMBER
- SC — PROJECT SURVEY CONTROL POINT
- 3 — SURVEYED BOUNDARY MONUMENT AND NUMBER
- PROPOSED BOUNDARY MONUMENT AND NUMBER
- 1 — SETTLEMENT PLATE AND NUMBER
- PROPERTY BOUNDARY
- DRAINAGE FLOW LINE
- CHANGE OF SLOPE ON DISPOSAL CELL
- BARBED-WIRE FENCE
- SLOPE – TRIANGLE POINTS DOWNSLOPE
- GRAVEL ROAD
- TWO TRACK DIRT ROAD
- 1 — PHOTO LOCATION, NUMBER, AND ROTATION

SCALE IN FEET

600 300 0 600 1200

MAYBELL, COLORADO
DISPOSAL SITE

ANNUAL INSPECTION CONDUCTED
AUGUST 6, 2009

Figure 11–1. 2009 Annual Compliance Drawing for the Maybell Disposal Site

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where they are mounted on steel posts set in concrete. Several of the signs along the dirt road have bullet holes but remain legible and do not currently require replacement. However, perimeter sign P26 will be replaced because the number of bullet holes has made it illegible. The remaining signs were in good condition.

Site Markers and Monuments—The site has two granite site markers, 27 boundary monuments, and two survey monuments. All markers and monuments inspected were in good condition.

In 2008, during a real property assessment, an error was discovered in the property boundary along the north and northwest portion of the site (as it was depicted following a 2002 land survey). The property boundary was found not to match the legal description in the permanent withdrawal posted in the *Federal Register* (April 13, 1995, vol. 60, no. 71, page 18,778). The correct property boundary along the north and northwest portion of the site was determined to follow the perimeter fence line, as shown in Figure 11–1. As a result, in 2008, the site base map was corrected, and the LTSP was revised and submitted to NRC. Because of this error, nine boundary monuments will be removed, and three new monuments will be installed along the correct property boundary. Figure 11–1 shows the location of the three new boundary monuments proposed (No. 2, 3, and 19), but no longer shows property boundary error and the associated monuments to be removed.

Settlement Plates—Nine settlement plates are on top of the disposal cell. They were installed on the cell top during construction to detect any significant settlement resulting from slimes that were placed in the south-central part of the disposal cell. The former mill slimes were compacted before the completion of the radon barrier, but the potential for additional consolidation and possible stress to the radon barrier still existed. All of the settlement plates were secure and in good condition. No evidence of settlement on the disposal cell cover was observed.

The elevations of the nine settlement plates on top of the disposal cell were last surveyed in July 2004. This survey concluded the 5-year post-construction annual settlement survey requirement stipulated in the LTSP. These land surveys confirmed that no significant settlement had occurred on the disposal cell top. Variation from baseline measurements ranged from 0.04 to 0.19 foot (ft). Visual observation of the area surrounding the settlement plates continues during annual inspections. If settlement is observed, the settlement plates will be resurveyed.

Monitoring wells—The four remaining monitoring wells at the site were decommissioned in accordance with State of Colorado requirements in May 2006 (see Section 11.3.4 for additional information). Healthy vegetation continues to become reestablished on the restored areas.

11.3.1.2 Transects

To ensure a thorough and efficient inspection, inspectors divided the site into three areas called "transects": (1) the disposal cell, (2) the other areas on site, and (3) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, the inspectors examined specific site-surveillance features, drainage structures, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes.

Disposal Cell—The disposal cell covers approximately 66 acres of the approximately 251-acre disposal site property (PL–2 and PL–3). The roughly pentagonal disposal cell measures approximately 1,600 ft by 2,400 ft and is in the center of the site. The above-grade disposal cell rises to a height of approximately 30 ft and is capped with a multiple-component cover that is approximately 7 ft thick. The cover consists of a 1.5-ft-thick radon/infiltration barrier, a 4-ft-thick compacted soil layer for protection from freeze-thaw cycles, a 0.5-ft-thick bedding layer to promote drainage, and an 8- to 12-inch-thick layer of riprap to prevent the erosion of the underlying materials. The side slopes of the disposal cell are at a 20 percent grade to create a stable slope, and the top of the disposal cell has a 3 percent grade to promote drainage toward the west.

The disposal cell displayed no evidence of settlement, slumping, erosion, or rock degradation. No change was observed in the two slight depressions noted in 2008 on the disposal cell top
11B between settlement plates No. 6 and 7. These areas are thought to be the result of inconsistencies in grade that occurred during cell construction, and not from the settlement of the underlying materials. However, these areas will continue to be visually monitored during inspections to determine if the disposal cell is settling.

In accordance with the LTSP, inspectors looked for seeps on the east and southeast side slopes of the disposal cell because large quantities of slimes were encapsulated in this portion of the cell. No moisture was evident on the surfaces of these side slopes, nor were any seeps observed at the toe of the disposal cell in this area. The east corner of the disposal cell is also a topographic low point for runoff draining from the top of the cell. Standing water from recent precipitation events was observed on the cobble blanket at the toe of the east corner of the cell. Additionally, cattails continue to grow at this location, indicating the presence of moisture that is the result of repeated surface runoff from the cell, rather than any seepage from within the cell. In 2003, a sample of the evaporite minerals from this location was collected for laboratory analysis, and no analytes attributable to the cell contents were present. Observation of this area will continue.

Minor accumulations of various plants were observed on the cell top and side slopes. Species include thistle, yellow sweet clover, dogbane, and various grasses and annual weeds. Occasionally, deep-rooted woody plants, such as sagebrush and rabbitbrush, are found growing on the disposal cell and are cut and treated with herbicide. A small patch of willows, deep-rooted woody plants, was found growing on the top of the cell (PL–4) and will be cut and treated.
11C Canada thistle, a noxious weed observed growing on the disposal cell cover in recent years, reemerged in 2009; treatment with herbicide will continue.

Other Areas Inside the Site Boundary—Two diversion channels, along with a combination of rock armoring and contouring, provide the final constructed surface conditions to achieve the necessary surface water drainage control and erosion protection to satisfy the design's requirements for longevity. Other surfaces at the site have been revegetated with a mix of native and adaptive grasses to stabilize the soil.

The rock-armored diversion channels, swales, and gullies were in excellent condition (PL–5). Recent erosion observed directly downgradient of the outlet to Diversion Channel No. 1 remains protected by the rock armoring within the channel. In addition, the outlet to Swale No. 1 was observed to have been washed out by recent precipitation events, but riprap within the swale is

protective and armoring the downgradient erosion as designed (PL–6). These areas of erosion do not currently threaten the disposal cell's integrity, but they will continue to be monitored.

Minor rills were observed adjacent to Swale No. 1 and Gully No. 1. Several of the armored drainages had standing water or moisture present during the inspection—the result of recent precipitation events. Erosion on site will continue to be monitored during annual site inspections.

There was no evidence of new erosion or of sediment moving off site into Johnson Wash, and formerly active rills and gullies appear to be stabilizing due to self-armoring and increased vegetation. No significant head-cutting was observed. Gabions and riprap installed in 2000, and reinforced in 2001 and 2002, to control erosion in drainage structures east of the cell continue to remain intact, demonstrating the success of these repairs.

There were abundant signs of wildlife on site and in the surrounding area. Vegetation diversity and density in graded and disturbed areas between the disposal cell and the site boundary continue to progress.

In 2006, uranium exploration lode claim stakes were first discovered inside the perimeter fence several hundred feet west and southwest of the disposal cell. BLM confirmed that they were uranium exploration claims staked by Western Fuels Incorporated. No action regarding these claims has occurred, and the claims remain present. They are considered nuisance claims, as protections pursuant to the NRC general license for the disposal site preclude any mining activity that would jeopardize the disposal cell and its associated drainage control structures. BLM has indicated that all BLM property withdrawn by DOE for the disposal site included the subsurface mineral rights. However, the two private parcels of land purchased in fee simple by the State of Colorado, and transferred to DOE for the site, need to be researched to determine if the subsurface mineral rights were included in the transaction. This research is pending. In 2008, a
11D claim stake was found at the base of the northeast corner of the disposal cell. In 2009, a claim stake was found on top of the north end of the disposal cell. These claims are also considered nuisance claims.

Outlying Area—The area outside the site boundary for 0.25 mile was visually inspected. There was no evidence of erosion, development, change in land use, or other activities that might affect the site's long-term performance. However, increased traffic associated with the recent construction of a natural gas line west of the site was noted.

A former open pit uranium mine, called the Johnson Pit, is directly south of the site. Minor encroachment (approximately 5 ft) of the Johnson Pit onto DOE property has occurred. No evidence of additional recent encroachment was observed. The perimeter fence in this location diverts approximately 15 feet off of an east–west line to accommodate this minor encroachment. The Johnson Pit's encroachment onto DOE property does not harm the disposal cell or any of its associated surface water diversion structures.

In September 2004, DOE received written concurrence from BLM that the right-of-way reservation directly north of the site had revegetated successfully, with no erosion occurring, and terminated the permit. Revegetation continues to progress in this area.

11.3.2 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 follow-up or contingency inspections were required in 2009.

11.3.3 Routine Maintenance and Repairs

In 2009, several breaks in the perimeter fence were repaired, loose wires were tightened, and bent posts were replaced at several locations. As part of this maintenance work, the fence was extended where it crosses Gullies No. 1, 2, 3, and 4 in order to keep cattle from accessing the site. Noxious weeds on the disposal cell were treated with herbicide.

11.3.4 Groundwater Conditions

Groundwater at this site is contaminated as a result of widespread, naturally occurring uranium mineralization and mining activities not related to on-site legacy uranium-processing operations. The groundwater in the area is designated "limited use." "Limited use" is a designation given to groundwater that is not a current or potential source of drinking water because it contains widespread ambient contamination that cannot be cleaned up by methods reasonably employed in public water systems. Narrative supplemental standards, per 40 CFR 192.21 (g), have been applied to groundwater at the site.

Groundwater level monitoring was conducted in accordance with the LTSP from November 1995 through March 2004 to determine how transient drainage from the disposal cell was interacting with the local groundwater system. In 2004, following the required 5-year monitoring period, water level measurements were discontinued because there was no evidence that transient drainage was interacting with the local groundwater system near the disposal cell. In January 2005, NRC concurred in this conclusion. In May 2006, the four remaining monitoring wells at the site were decommissioned in accordance with State of Colorado requirements. In November 2007, the LTSP was revised to reflect regulatory concurrence to discontinue water level monitoring and submitted to NRC.

Therefore, in accordance with the revised LTSP, groundwater quality monitoring is not required at the site.

11.3.5 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 2009.

11.3.6 Photographs

Table 11–2. Photographs Taken at the Maybell Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	90	Fence repairs to close the gap at the outlet of Gully No. 1.
PL–2	345	Western portion of the disposal cell and confluence of Diversion Channels No. 1 and 2.
PL–3	45	Eastern portion of the disposal cell; Diversion Channel No. 2. in foreground.
PL–4	45	Willows on the disposal cell top adjacent to site marker SMK–2.
PL–5	265	Diversion Channel No. 1 north of the disposal cell.
PL–6	20	Washout riprap at the outlet of Swale No. 1.

MAY 8/2009. PL–1. Fence repairs to close the gap at the outlet of Gully No. 1.

MAY 8/2009. PL–2. Western portion of the disposal cell and confluence of Diversion Channels No. 1 and 2.

MAY 8/2009. PL–3. Eastern portion of the disposal cell; Diversion Channel No. 2. in foreground.

MAY 8/2009. PL–4. Willows on the disposal cell top adjacent to site marker SMK–2.

MAY 8/2009. PL–5. Diversion Channel No. 1 north of the disposal cell.

MAY 8/2009. PL–6. Washout riprap at the outlet of Swale No. 1.

12.0 Mexican Hat, Utah, Disposal Site

12.1 Compliance Summary

The Mexican Hat, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on April 28, 2009. The disposal cell and all associated surface water diversion and drainage structures were in good condition and functioning as designed. Runoff from storm events continues to transport sediment into the west diversion channel, resulting in low-density vegetation growth within the entire length of the channel; however, the performance of the diversion channel has not been impaired. New bullet holes in several perimeter signs indicate that vandalism continues at the site.

In accordance with approved recommendations presented in the seep monitoring evaluation report (*Resolution of Seep and Ground Water Monitoring at the Mexican Hat, Utah, UMTRCA Title I Disposal Site* [DOE-LM/GJ1139-2006, U.S. Department of Energy (DOE), March 2006]), annual observation of six designated seeps was conducted during the inspection. No significant change from the previous year was noted; one of the seeps was dripping, the other five were dry.

No maintenance was performed or cause for a follow-up or contingency inspection was identified.

12.2 Compliance Requirements

Requirements for long-term surveillance and maintenance of the Mexican Hat Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the Mexican Hat Disposal Site, Mexican Hat, Utah* (DOE–LM/1530–2007, DOE, October 2007) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 12–1 lists these requirements.

Table 12–1. License Requirements for the Mexican Hat Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 12.3.1
Follow-Up or Contingency Inspections	Section 3.5	Section 12.3.2
Routine Maintenance and Repairs	Section 3.6	Section 12.3.3
Groundwater Monitoring	Section 3.7	Section 12.3.4
Corrective Action	Section 3.6	Section 12.3.6

Institutional Controls—The United States Bureau of Indian Affairs holds the 119-acre disposal site in trust. The Navajo Nation retains title to the land. DOE and the Navajo Nation executed a Custodial Access Agreement (CAA) that conveys to the federal government title to the residual radioactive materials stabilized at the repository site and ensures that DOE has perpetual access to the site. UMTRCA authorized DOE to enter into Cooperative Agreement DE–FC04–85AL26731 with the Navajo Nation, and the U.S. Nuclear Regulatory Commission (NRC) required it prior to bringing the site under the general license. The purpose of the Cooperative Agreement was to perform remedial actions at the former processing site. The site was accepted under the NRC general license (10 CFR 40.27) in 1997. 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 disposal site, as defined by DOE Policy 454.1, consist of federal control of the property, a site perimeter fence, warning/no-trespassing signs placed along the property boundary, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

12.3 Compliance Review

12.3.1 Annual Inspection and Report

The site, south of Mexican Hat, Utah, was inspected on April 28, 2009. The results of the inspection are described below. Figure 12–1 shows features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

12.3.1.1 Specific Site-Surveillance Features

Access, Fence, Gate, and Signs—The site is accessed via a short, unmarked dirt road off U.S. Highway 163, approximately 1 mile south of the San Juan River, which heads east and ends at a graded parking area. The access road crosses Navajo Nation land, and access is granted under the CAA. Erosion continues to occur along the dirt road, but the site is still accessible; no repairs are necessary at this time. Trash, including substantial quantities of broken glass, accumulates along the entrance road and in the parking area.

A barbed-wire perimeter fence surrounds the disposal cell and is on the site boundary. Other than loose wires present at one location near the north diversion channel, the perimeter fence was in good condition. Periodically, the fence is damaged by livestock or erosion and requires repair.

The entrance sign at the gate is in good condition. There are 43 perimeter sign locations, each with a pair of signs: a property ownership sign and a radioactive materials disposal site warning sign. Perimeter sign P37, along the west property boundary, is missing the radioactive materials disposal site warning sign. The DOE website address was added to the entrance sign and to perimeter sign P41 adjacent to the gravel parking area. The remaining perimeter signs were present and legible, although several were bent or damaged by bullet holes. Several perimeter signs, including P23 (PL–1), have new bullet holes. Sign P23 will be replaced.

Site Markers and Monuments—The two site markers, four survey monuments, and 12 boundary monuments were inspected. All were in good condition. Boundary monument BM–11, in an area subject to erosion, remains stable.

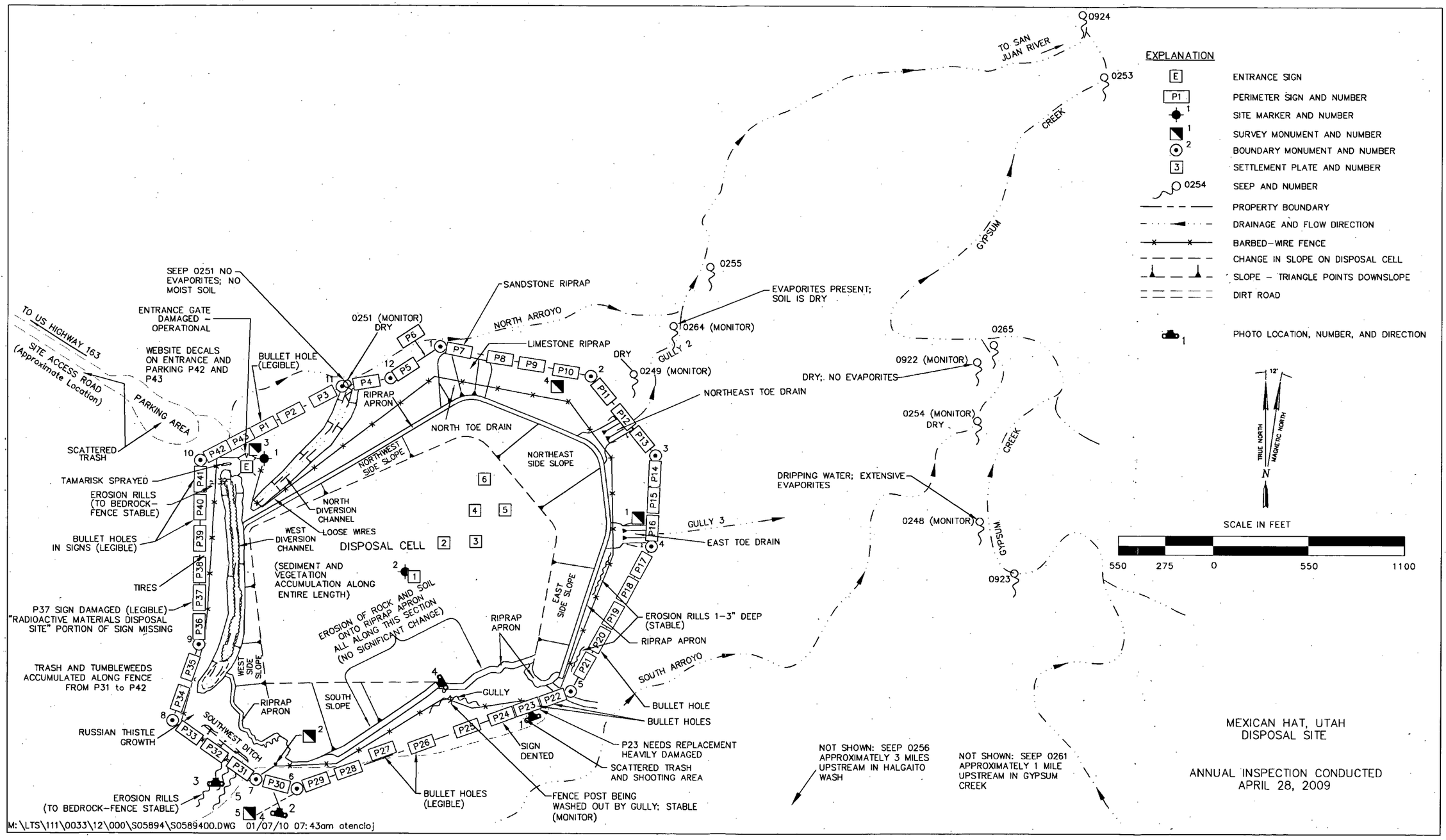

Figure 12-1. 2009 Annual Compliance Drawing for the Mexican Hat Disposal Site

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Settlement Plates—There are six settlement plates on top of the disposal cell. All were secure and in good condition. No evidence of settlement on the disposal cell cover was observed. The settlement plates were surveyed for several years following cell construction, but the surveying is no longer required.

Monitoring wells—In 2007, the four remaining monitoring wells (MW–0899, MW–0934, MW–0935, and MW–0909) at the site were decommissioned following the Navajo Nation concurrence that groundwater monitoring is not required to maintain protectiveness.

12.3.1.2 Transects

To ensure a thorough and efficient inspection, inspectors divided the site into four areas called "transects": (1) the riprap-covered disposal cell top slope, (2) the riprap-covered side slopes and diversion ditches, (3) the area between the disposal cell and the site boundary, and (4) the outlying area.

Within each transect, inspectors examined specific site-surveillance features, such as the entrance gate and sign, survey and boundary monuments, perimeter signs and fences, and site markers. Inspectors examined each transect for evidence of erosion, settling, slumping, and other disturbances that might harm the site's integrity or long-term performance.

Top of the Disposal Cell—The top of the disposal cell is in good condition (PL–2). There was no evidence of differential settling, cracking, erosion, or burrowing. All visible components of the disposal cell and cover were functioning as designed. No vegetation was observed growing on top of the disposal cell.

Side Slopes, Toe Drains, Aprons, and Diversion Channels—The disposal cell side slopes, toe drains, aprons, and diversion channels were in good condition and functioning as designed (PL–3).

The sloughing of red country rock and soil along the south apron does not appear to have increased significantly during the past year (PL–4). Because the apron in this area is immediately adjacent to the steep rocky cliff face along the southern edge of the disposal cell cover, it is anticipated that a certain amount of sediment and unstable rock from the cliff face will, over time, continue to fall onto the apron. This area has been inspected for several years, with little or no change being observed from year to year. As a best management practice, inspectors will continue to monitor this area; however, this fallen material is not expected to impact the performance of the disposal cell.

Areas off-site and upgradient continue to erode and transport sediment onto the site and into the west diversion channel (PL–4). The sediment accumulation has promoted the growth of vegetation in the channel, including perennial grasses and annual weeds; however, the sediment and vegetation are not affecting the performance of these drainage structures.

Though present in the arroyos outside of the site, and previously within the west diversion channel, no tamarisk plants were observed on the site. Growth of tamarisk will continue to be controlled on the site.

Area Between the Disposal Cell and the Site Boundary—Erosional rills and gullies continue forming along the western edge of the site boundary primarily upgradient of, and between, boundary monuments BM–7 and BM–8. This is an expected natural process and a result of the site stabilizing and coming to equilibrium with the outlying areas. Erosion in these areas will continue to be monitored, but it is not a concern unless it damages the perimeter fence or impacts the performance of the west diversion channel.

Scattered trash (broken glass, bottles, cans, cardboard, and paper containers) is accumulating in the more accessible portions of the site where vehicular access is available. The most noticeable accumulations of trash were along the entrance road and in the parking area, along the perimeter fence between perimeter signs P31 and P42, and in the southern portion of the site between perimeter signs P22 and P27. Two discarded automobile tires are on the property edge between perimeter signs P38 and P39. Trash may need to be removed periodically to maintain the integrity of the perimeter fence and to keep the trash from entering the fenced area.

Tumbleweeds continue to accumulate along the west and southwest sections of the perimeter fence, primarily between perimeter signs P31 and P42. However, the accumulation is not significant, and the tumbleweeds do not appear to be damaging the fence.

Trespassing just inside the disposal site property boundary (outside the perimeter fence) occurs in the same areas where trash accumulations are noted, as evidenced by vehicle and all-terrain vehicle (ATV) tracks. New bullet holes in several perimeter signs indicate that vandalism has increased. This is anticipated to be an ongoing problem at the site.

Outlying Area—The area surrounding the site was visually inspected for signs of erosion, development, or other disturbances that might affect site integrity or security. As discussed above, trash continues to accumulate primarily in areas immediately adjacent to the site property boundary. The area within 0.25 mile of the site boundary appears to be popular with ATV and four-wheel-driving enthusiasts. No other changes were observed that would impact the integrity of the site.

12.3.2 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 follow-up or contingency inspections were required in 2009.

12.3.3 Routine Maintenance and Repairs

No routine maintenance or repairs were made at the site in 2009.

12.3.4 Groundwater Monitoring

An effective aquitard and an upward hydraulic gradient prevent any overlying water from migrating downward into the uppermost aquifer. Therefore, contamination from either the disposal cell or the former uranium-processing-site activities have not impacted groundwater in the uppermost aquifer, and the LTSP does not require that groundwater in the uppermost aquifer be monitored.

However, due to concerns raised by the Navajo Nation, groundwater was monitored at the site from November 2000 to August 2002, as a best management practice. This monitoring was performed to demonstrate that no site-related contamination had entered the uppermost aquifer and that the upward hydraulic gradient was present. The groundwater monitoring results from this 2-year period confirmed these conditions, and the results were presented in the report *Resolution of Seep and Ground Water Monitoring at the Mexican Hat, Utah, UMTRCA Title I Disposal Site*. This report was submitted to the Navajo Nation in March 2006. In July 2006, the Navajo Nation concurred that continued groundwater monitoring of the uppermost aquifer at the site was not necessary. As a result, DOE decommissioned the remaining four monitoring wells at the site in April 2007.

12.3.5 Seep Monitoring

From 1998 through 2005, in accordance with the LTSP, and when sufficient flows have allowed,
12A seep water quality monitoring was performed as a best management practice due to concerns raised by the Navajo Nation over cell performance and historical processing-site-related contamination. In 2006, an evaluation of the Seep-Monitoring Program was conducted and presented in the report *Resolution of Seep and Ground Water Monitoring at the Mexican Hat, Utah, UMTRCA Title I Disposal Site*. Based on the monitoring results, the hydrogeological conditions at the site, the continued low flows from the seeps, and the absence of any receptors, a recommendation was made to discontinue water quality monitoring of the seeps in lieu of annual observation of seep flow rates during site inspections. The recommendation stated that if a significant increase in seep flows was observed, an evaluation would be performed to determine if water quality monitoring should resume. In July 2006, the Navajo Nation conditionally concurred with these recommendations. The report was submitted to NRC in August 2006.

The site LTSP was revised and submitted to NRC in October 2007 to reflect the Navajo Nation's concurrence in discontinuing water quality monitoring of the seeps in lieu of continuing annual observations of seep flows, and to present the results of the best-management-practice groundwater monitoring performed, as discussed previously. The revised LTSP states that the annual observation of seep flows will continue for a minimum of 10 years, at which time, an evaluation will be performed to determine the need to continue seep-flow monitoring. The revised LTSP states that if the seep flows significantly increase, the need to resume water quality monitoring would be reevaluated.

In accordance with the revised LTSP, visual monitoring of seep flows was conducted during the 2009 annual inspection. The flows of six seeps were observed and documented to be negligible or nonexistent. The seeps are primarily the result of perched water that leaked from the former-processing-site tailings pond for many years, and to a lesser degree, they are also the result of transient drainage from the wet tailings placed in the disposal cell. Seep flows are expected to diminish over time; however, a minor amount of recharge does occur, as evidenced by the presence of seeps upgradient of the former processing site and disposal cell. Historical documentation and records also indicate the presence of seeps prior to former-processing-site operations. Warning signs advising the public to not drink the water remain posted at the seep locations.

The flow and small pool observed in seep 0248, located in Gypsum Creek and cross-gradient from the disposal cell, were similar to those observed during previous years. Seep 0264, directly

downgradient of the disposal cell at the confluence of North Arroyo and Gully 2, was dryer than in 2008 (only a small moist area was present at that time). Seeps 0249 and 0254 continue to be dry.

Table 12–2. Description of Seep Flows at the Mexican Hat Disposal Site

Seep Location Number	Drainage	Hydrological Relationship to Disposal Cell	Observations and Qualitative Descriptions of Seep Flow
0248	Gypsum Creek	Downgradient	Minimal flow running down and dripping from adjacent rock face. Very small pool of standing water (~1 foot in diameter, ~1 inch in depth); no flow from the pool or the immediate area. Soils moist in immediate area surrounding the seep. Vegetation consists primarily of tamarisk (very little other riparian vegetation).
0249	Gully 2	Downgradient	Dry; no evidence of a seep (i.e., no moist soils or riparian vegetation were present).
0251	North Arroyo	Downgradient	Dry; no flow, standing water, moist soil, or evaporites present. Minimal vegetation—primarily tamarisk (very little other riparian vegetation).
0254	South Arroyo	Downgradient	Dry; no flow, standing water, or moist soil present. The minor amount of evaporites present is the only evidence of soil moisture or seep. Very little riparian vegetation besides tamarisk. Location is not posted with a warning sign.
0264	North Arroyo	Downgradient	Dry; no flow, standing water, moist soil; evaporites present. Vegetation consists primarily of tamarisk.
0922	South Arroyo	Downgradient	Dry; no flow, standing water, moist soil, or evaporites present. Vegetation consists primarily of tamarisk.

12.3.6 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.

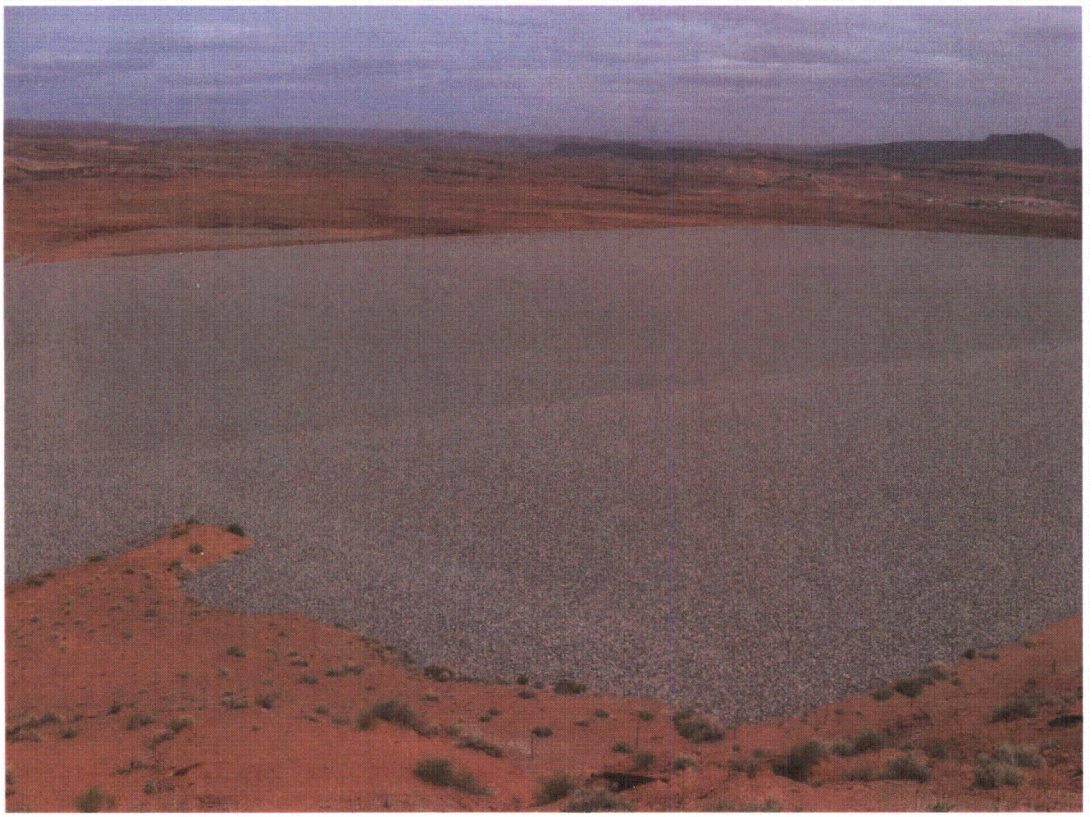
No corrective action was required in 2009.

12.3.7 Photographs

Table 12–3. Photographs Taken at the Mexican Hat Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	340	Damaged perimeter sign P23.
PL–2	10	Central portion of the disposal cell.
PL–3	0	West diversion channel and west portion of the disposal cell.
PL–4	240	Erosion of rock and soil onto the riprap apron all along this section.

HAT 4/2009. PL–1. Damaged perimeter sign P23.



HAT 4/2009. PL–2. Central portion of the disposal cell.

HAT 4/2009. PL–3. West diversion channel and west portion of the disposal cell.

HAT 4/2009. PL–4. Erosion of rock and soil onto the riprap apron all along this section.

13.0 Naturita, Colorado, Disposal Site

13.1 Compliance Summary

The Naturita, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on May 12, 2009. The site was in good condition and the disposal cell and all associated surface water diversion and drainage structures were functioning as designed. Minor erosion and rock debris were again identified along and on the access road. One of these areas, a small hole that had begun to erode along the access road on the northwest side of the cell, was repaired in August 2009. Other maintenance issues, including the removal of rock debris along the access road and minor fence repair, will be addressed in 2010. No other maintenance needs or cause for a follow-up or contingency inspection was identified.

13.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Naturita Disposal Site are specified in the *Long-Term Surveillance Plan for the Upper Burbank Disposal Cell, Uravan, Colorado* (DOE/AL/62350–250, Rev. 1, U.S. Department of Energy [DOE], July 1999) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 13–1 lists these requirements.

Table 13–1. License Requirements for the Naturita Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.1 and 6.2	Section 13.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 13.3.2
Routine Maintenance and Repairs	Section 4.0	Section 13.3.3
Groundwater Monitoring	Section 2.6.2	Section 13.3.4
Corrective Action	Section 5.0	Section 13.3.5

Institutional Controls—The 26.65-acre disposal site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) in 1999. 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 disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing signs along the property boundary, and a locked gate at the entrance to the site access road. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

13.3 Compliance Review

13.3.1 Annual Inspection and Report

The site, approximately 1 mile west-southwest of the former community of Uravan, Colorado, was inspected on May 12, 2009. Results of the inspection are described below.

Figure 13–1 shows features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

13.3.1.1 Specific Site-Surveillance Features

Access Roads, Gates, Fence, and Signs—Access to the Naturita Disposal Site is from Montrose County Road EE22, which intersects State Highway 141 at Uravan, Colorado. Road EE22 approaches the site from the southeast and continues (off-site) along the northeast side of the disposal cell. The paved or graveled county road was in good condition.

The site entrance gate, north of the disposal cell off of Road EE22, consists of a locked pair of tubular metal gates suspended from galvanized steel gateposts. The gates are in good condition. The road through the entrance gate provides access to monitoring wells adjacent to the north and west sides of the cell. Two additional metal gates along this access road were also secure and in good condition.

The access road was generally in good condition. However, erosion initially identified in 2007 (and again in 2008) was still evident along the west side of the road (PL–1). This eroded area, the
13A result of an old abandoned mine, was repaired in August 2009. Farther to the south (near perimeter sign P–17), boulders have again fallen onto the access road. These boulders will be removed from the access road in 2010. This occasional rockfall is a continuing maintenance issue at the site due to the surrounding terrain. For example, in September 2005, fallen rocks were removed from the road, the road was regraded, and several loads of gravel were used to fill gullies. No significant erosion of these gullies was evident in 2009.

A barbed-wire stock fence encloses the site. Except for two small sections with loose wires (between perimeter signs P5 and P6, and P16 and P17), the fence was in good condition. The loose wires will be repaired in 2010. As a safety precaution, pedestrian stiles (fence ladders) were installed in 2008 at three locations around the perimeter of the site— near boundary monuments BM–15 and BM–16, and the third near perimeter sign P19 (see Figure 13–1).

The site has 25 perimeter signs and one entrance sign. Perimeter signs, mounted on steel posts, are set approximately 5 feet inside the perimeter fence. Perimeter sign P2 has bullet holes but remains legible. The other 24 perimeter signs and the entrance sign were in good condition.

Site Markers and Monuments—The two granite site markers, SMK–1 and SMK–2, were undisturbed and in good condition. As first observed during the 2008 inspection, SMK–1 has a chip off the northeast corner of the concrete pad on which it is placed. The chip is still minor, but it will be examined again during the next inspection to determine if repairs are necessary.

The site property boundary has 17 corners, which are marked by either boundary monuments or survey monuments. Boundary monuments are designated BM–1 through BM–17. Three survey monuments, SM–3, SM–4, and SM–11, are used in lieu of boundary monuments BM–3, BM–4, and BM–11.

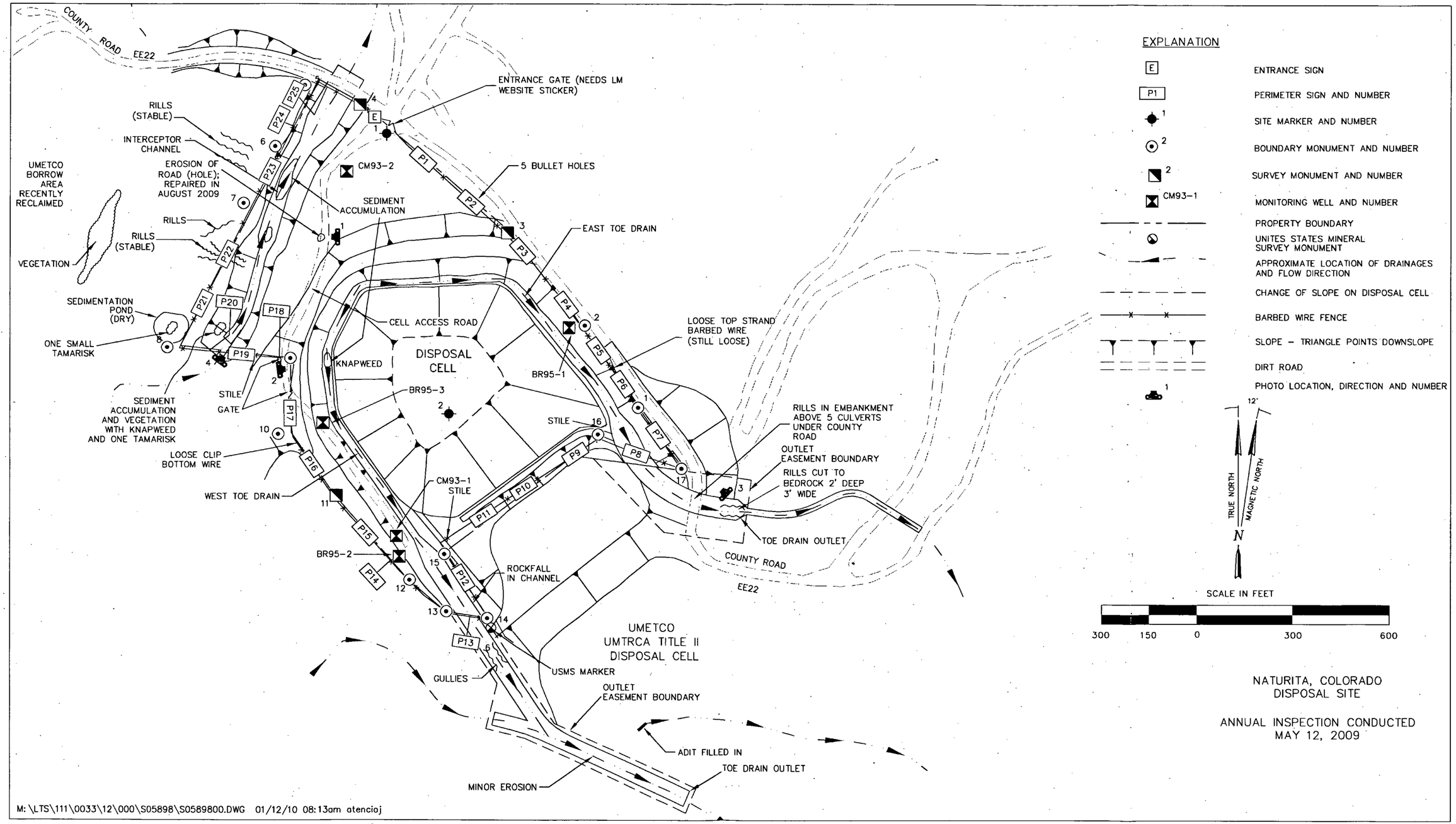


Figure 13–1. 2009 Annual Compliance Drawing for the Naturita Disposal Site

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Survey monuments were installed during site construction for survey control; boundary monuments were installed after construction was completed to delineate the final property boundary. Both types of monuments are located with the same precision. All boundary and survey monuments were undisturbed and in good condition.

Monitoring wells—The groundwater-monitoring network has five wells: BR95–1, BR95–2, BR95–3, CM93–1, and CM93–2. Monitoring wells BR95–1, BR95–2, and BR95–3 were completed at the top of the Summerville Formation, which forms an aquitard above the Wingate Sandstone. Wells CM93–1 and CM93–2 were completed in the Wingate Sandstone, which is the uppermost aquifer at the site. All monitoring wells were secure and in good condition. However, markings on CM93–1 and BR95–2 well casings are not legible; these wells should be relabeled in the future.

13.3.1.2 Transects

To ensure a thorough and efficient inspection, inspectors divided the site into four areas called "transects": (1) the riprap-covered top slope and side slopes of the disposal cell, (2) the riprap-covered toe drains and toe drain outlets, (3) the riprap-covered interceptor channel, and (4) the outlying area. Within each transect, inspectors examined specific site-surveillance features, such as monitoring wells, survey and boundary monuments, signs, and site markers. Inspectors examined each transect for evidence of erosion, settling, slumping, or any other disturbance that might affect the site's integrity or long-term performance.

The LTSP identified a fifth transect, no longer applicable, consisting of the reclaimed areas surrounding the disposal cell. Vegetation cover in this area is well established, and a storm water discharge permit that previously addressed this area was terminated by the State of Colorado in November 2001. Therefore, this transect is no longer formally inspected.

Top Slope and Side Slopes of Disposal Cell—The disposal cell was completed in 1998. Rock riprap covers the 2-acre top of the disposal cell and the approximate 8 acres of side slopes. The rock is rounded and is larger on the side slopes than on the top of the cell. The rock-covered surfaces were in good condition and showed no signs of disturbance (PL–2). As observed during the previous (2008) inspection, the only exception is a small area on the southwest side of the cell exhibiting a slightly irregular surface, the result of removing a standpipe several years ago. The remaining portions of the top and side slopes of the disposal cell were in excellent condition. No evidence of subsidence, differential settlement, slumping, or other modifying process was noted, and no vegetation was evident on the cell.

Toe Drains and Toe Drain Outlets—Two riprap-armored toe drains collect water from the cell side slopes and divert it to the southeast. The toe drain on the west and southwest sides of the cell exits through a channel quarried through the wall of the Burbank Pit, into Hieroglyphic Canyon, and finally to the San Miguel River. Although some sediment has accumulated in the upper end of the western toe drain, allowing scattered weeds and grasses to grow, the drain is still functioning as designed. Farther down this drain, beyond the lined armored portion, water is beginning to erode softer bedrock. As noted in previous inspections, a knickpoint has formed at the intersection of shale and overlying sandstone units within the Salt Wash Member of the Morrison Formation. This erosion does not affect the performance of the toe drain but will continue to be monitored.

The east toe drain extends through the adjacent Umetco Minerals Corporation's (Umetco's) Uravan UMTRCA Title II Disposal Site and crosses beneath County Road EE22 through five culverts. Rills are present in the road embankment over the culvert outlets but are not affecting the road surface at this time. Minor erosion of loose material has occurred in the drain outlet area, but the underlying sandstone bedrock limits further erosion (PL–3). Water was not observed in the drain during the inspection.

Russian knapweed, a noxious weed, has been found in the past in the lower drainage area and on the land separating the drainage area from the adjacent Umetco UMTRCA Title II disposal cell. This noxious weed was found in one area in the upper end of the western toe drain during the 2009 inspection (Figure 13–1); this area was sprayed later in the season as part of routine weed-control efforts.

Interceptor Channel—A riprap-armored interceptor channel, upgradient and northwest of the disposal cell, diverts storm water and snowmelt to the northeast across County Road EE22. Some erosion has occurred outside the property, uphill from perimeter sign P23 and between perimeter signs P22 and P23, resulting in sediment deposition in the channel (PL–4). In 2009, the rills appear to have continued to erode and deposit sediment in the channel, and vegetation has increased slightly in the accumulated sediment area inside the channel. Otherwise, the channel was in good condition, and the sediment and vegetation do not impair the function of the channel. A culvert was not installed where the channel crosses the road, so the road could be damaged in the event of heavy storm water flow. However, to date, storm water has not affected the road. The stability of this channel crossing will be reexamined during the 2010 inspection.

Three species of noxious weeds—halogeton, Russian knapweed, and tamarisk—have been found during previous inspections of the area within and adjacent to the interceptor channel. Therefore, this area had been treated with herbicide the previous 3 years (2006–2008). This consecutive treatment appears to have been effective, as no noxious weeds were observed during the 2009 inspection.

Outlying Area—The site boundary and the area within 0.25 mile of the site boundary have been highly disturbed by mining, quarrying, and road-building activities. Umetco has recently completed remedial activities on the main Uravan UMTRCA Title II disposal cell, across County Road EE22 east of the Title I site. A separate Umetco UMTRCA Title II disposal cell abuts the Naturita disposal cell on the southeast cell boundary. The Uravan Site is in the process of being transferred to DOE's Office of Legacy Management for long-term care (transfer is scheduled for 2011). Numerous weeds, none noxious, were observed on this Title II cell during the 2009 inspection.

Russian knapweed and tamarisk previously found in a sedimentation pond above the interceptor channel adjacent to the property boundary (near boundary monument BM–8) were sprayed with herbicide in 2006. One tamarisk plant, still present since the 2008 inspection, was observed in 2009, but no other live noxious weeds were found. Because this area provides a seed source to the site, it will continue to be monitored and treated again where necessary.

The most significant disturbance in an outlying area is the Umetco reclamation of a large borrow area northwest of the DOE disposal site. Sediment could erode off this freshly disturbed region if heavy rains occur before vegetation is reestablished. This area could also serve as a source of new, possibly noxious, weed growth. DOE will continue to carefully monitor this outlying area over the next several years.

13.3.2 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 follow-up or contingency inspections were required in 2009.

13.3.3 Routine Maintenance and Repairs

Apart from routine weed control, the only maintenance conducted in 2009 was the repair of a small hole that had begun to erode along the access road on the northwest side of the cell. Several additional maintenance issues identified during the 2009 inspection will be addressed in 2010, including the removal of rocks from the lower access road, and repair of loose portions of the perimeter fence.

13.3.4 Groundwater Monitoring

Groundwater monitoring was not conducted during 2009. Groundwater monitoring was last performed in July 2008 and will be conducted again in 2010.

Groundwater Monitoring Strategy—In accordance with the LTSP (beginning in 2000), DOE has monitored groundwater at the site every 2 years as a best management practice to demonstrate the initial performance of the disposal cell; the last sampling event was in July 2008. The compliance strategy is to not exceed maximum concentration limits (MCLs) established in Table 1 to Subpart A of 40 CFR 192 or background levels in a point-of-compliance (POC) well (CM93–2) in the uppermost aquifer (Wingate Sandstone) downgradient of the disposal cell. The Wingate Sandstone lies approximately 600 feet beneath the disposal cell and is hydrologically isolated from the surface by unsaturated sandstone of the Salt Wash Member of the Morrison Formation and relatively impermeable shale layers (aquitard) of the Summerville Formation.

Groundwater monitoring is performed in three shallower monitoring wells (BR95–1, BR95–2, and BR95–3), completed at the contact between the Salt Wash Member and the Summerville Formation, to provide early warning of possible migration of contaminants. If contamination suspected to be related to the disposal cell is observed at this horizon, DOE will sample two deeper wells (CM93–1 and CM93–2) screened in the uppermost aquifer (Wingate Sandstone). Indicator analytes are arsenic, molybdenum, and uranium. Monitoring wells CM93–1 and CM93–2 in the uppermost aquifer (Wingate Sandstone) were last sampled in May 1997, and concentrations of all indicator analytes were at or near detection limits and, thus, well below the respective MCLs.

Groundwater Monitoring Evaluation—In the last (2008) annual compliance report, DOE reported the following four major findings based on the historical groundwater monitoring results. First, the uppermost aquifer is hydrologically isolated from the surface by an aquitard consisting of unsaturated sandstone and relatively impermeable shale layers. Second, historical monitoring has demonstrated that contamination does not occur within the uppermost aquifer. Third, naturally occurring uranium mineralization affects water quality within the surface formation on which the disposal cell is constructed. And finally, concentrations of indicator compounds have remained essentially static since the onset of sampling (arsenic and molybdenum concentrations remain one to two orders of magnitude less than respective MCLs). Based on these findings, initially documented in 2006,[1] DOE concluded that continued sampling and analysis of the BR-series wells would provide little useful data for evaluating cell performance and that, in accordance with the LTSP, the groundwater monitoring program at the Naturita Site could be terminated.

Although no groundwater sampling was conducted this year, as a best management practice, and given the impending transfer of the adjacent Umetco (Uravan) Title II cell and concomitant need for a spatially comprehensive data set, DOE is postponing any revisions to the existing groundwater monitoring program at the Naturita Site. DOE will continue to monitor groundwater every two years to evaluate cell performance.

13.3.5 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 2009.

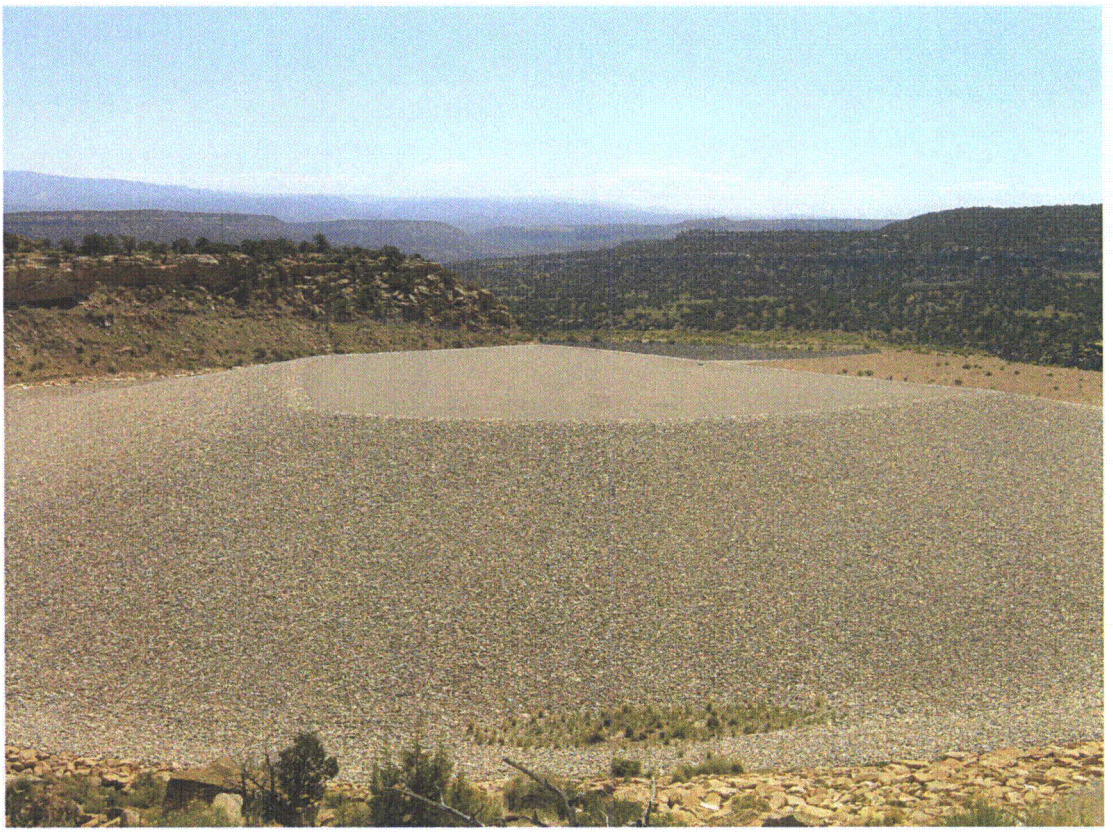
13.3.6 Photographs

Table 13–2. Photographs Taken at the Naturita Disposal Site

Photograph Location Number	Azimuth	Description of Photograph
PL–1	270	Erosion along west side of lower access road (repaired in August 2009).
PL–2	85	View of top of cell (view to east).
PL–3	315	View of gullies developing along culverts under the county road.
PL–4	40	Sediment deposition in interceptor channel; small tamarisk/knapweed in center.

[1] On March 14, 2006, DOE submitted the document entitled *Termination of Monitoring for the Naturita Disposal Site* to NRC.

NAD 5/2009. PL–1. Erosion along west side of lower access road (repaired in August 2009).



NAD 5/2009. PL–2. View of top of cell (view to east).

NAD 5/2009. PL–3. View of gullies developing along culverts under the county road.

NAD 5/2009. PL–4. Sediment deposition in interceptor channel; small tamarisk/knapweed in center.

14.0 Rifle, Colorado, Disposal Site

14.1 Compliance Summary

The Rifle, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on August 19, 2009. The disposal cell and all associated surface water diversion and drainage structures were in good condition and functioning as designed. Rock covering the disposal cell and toe ditch is in good condition, and no new erosion was evident in the interceptor trench at the top of the cell (an area repaired in 2005) or at other places around the disposal cell. The fourth-year survey of settlement plates conducted just prior to the annual inspection (in July 2009) continues to indicate negligible movement in the disposal cell cover.

Pore water continues to be removed from the disposal cell to maintain the water level below the action level (6,016 feet [ft]). Water continues to be removed from one standpipe, MW–03, in the toe of the cell and sent to the evaporation pond. Standpipe MW–02, which was pumped in previous years, contains little water and is no longer being pumped. Monitoring conducted for this reporting period indicates that pore water levels in both standpipes were consistently below the action level. As observed historically, levels were highest during the late fall and winter, when pumping is discontinued (average and maximum water levels were 6,015 ft and 6,015.6 ft, respectively). Water levels then declined to between 6,012 ft and 6,013 ft in the summer during pumping. To date, approximately 4.74 million gallons of water have been pumped from the toe of the disposal cell.

One new fence break was noted during the 2009 inspection; this break will be repaired prior to the next annual inspection. No cause for a follow-up or contingency inspection was identified.

14.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Rifle Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the Estes Gulch Disposal Site near Rifle, Colorado* (DOE/AL/62350–235, Rev. 1, U.S. Department of Energy [DOE], November 1997) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 14–1 lists these requirements.

Table 14–1. License Requirements for the Rifle, Colorado, Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 14.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 14.3.2
Routine Maintenance and Repairs	Section 4.0	Section 14.3.3
Groundwater Monitoring	Section 2.6 and Appendix	Section 14.3.4
Corrective Action	Section 5.0	Section 14.3.5

Institutional Controls—The 205-acre disposal site is owned by the United States of America and was accepted under U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) in 1998. 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 disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, access control fencing, warning/no-trespassing signs along the disposal cell boundary, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. With the exception of a missing perimeter sign (refer to Section 14.3.1.1), inspectors found no evidence that these institutional controls were ineffective or violated.

14.3 Compliance Review

14.3.1 Annual Inspection and Report

The site, located 5 miles north of Rifle, Colorado, was inspected on August 19, 2009. Results of the inspection are described below. Figure 14–1 shows the features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

14.3.1.1 Specific Site-Surveillance Features

Access Road, Gates, Fence, and Signs—The site is accessed by driving northwest of Rifle, Colorado, for 5 miles on State Highway 13 and turning northeast on an improved gravel road. A perpetual right-of-way across U.S. Bureau of Land Management (BLM) property provides access to the site. Two locked gates are installed on the access road—a lower gate closer to State Highway 13 and, farther up the hill, a second tubular metal gate at the site perimeter limiting access to the site proper. The access road and gates were in good condition.

The barbed-wire perimeter fence that limits access to the site was in good condition. The only exception is a broken strand of barbed wire between perimeter signs P6 and P7 (PL–1); this fence section will be repaired in 2010. The fence extends to the edge of steep-sided arroyos that bound the site on the east and west to prevent livestock from entering and grazing near the cell. No evidence of cattle or sheep grazing inside the site boundary was noted. However, signs of deer and elk grazing in the revegetated areas adjacent to and inside the disposal cell site boundary were common.

One entrance sign and 26 perimeter signs were placed at the site. Perimeter sign P9, just east of the entrance sign, has been missing for several years and will not be replaced. All remaining signs are legible and in good condition. Perimeter signs P8 and P9, located on either side of the entrance gate, are missing but will not be replaced, as the remaining signs adequately delineate the perimeter. Perimeter sign P12, located about 900 ft north of the second entrance gate, was missing and will be replaced. Its absence suggests that trespassing has occurred; however, no other evidence of trespassing was found. Remaining perimeter signs are legible, although a few have bullet holes; they will continue to be monitored for signs of further vandalism. The numbered decals on perimeter signs were in good condition.

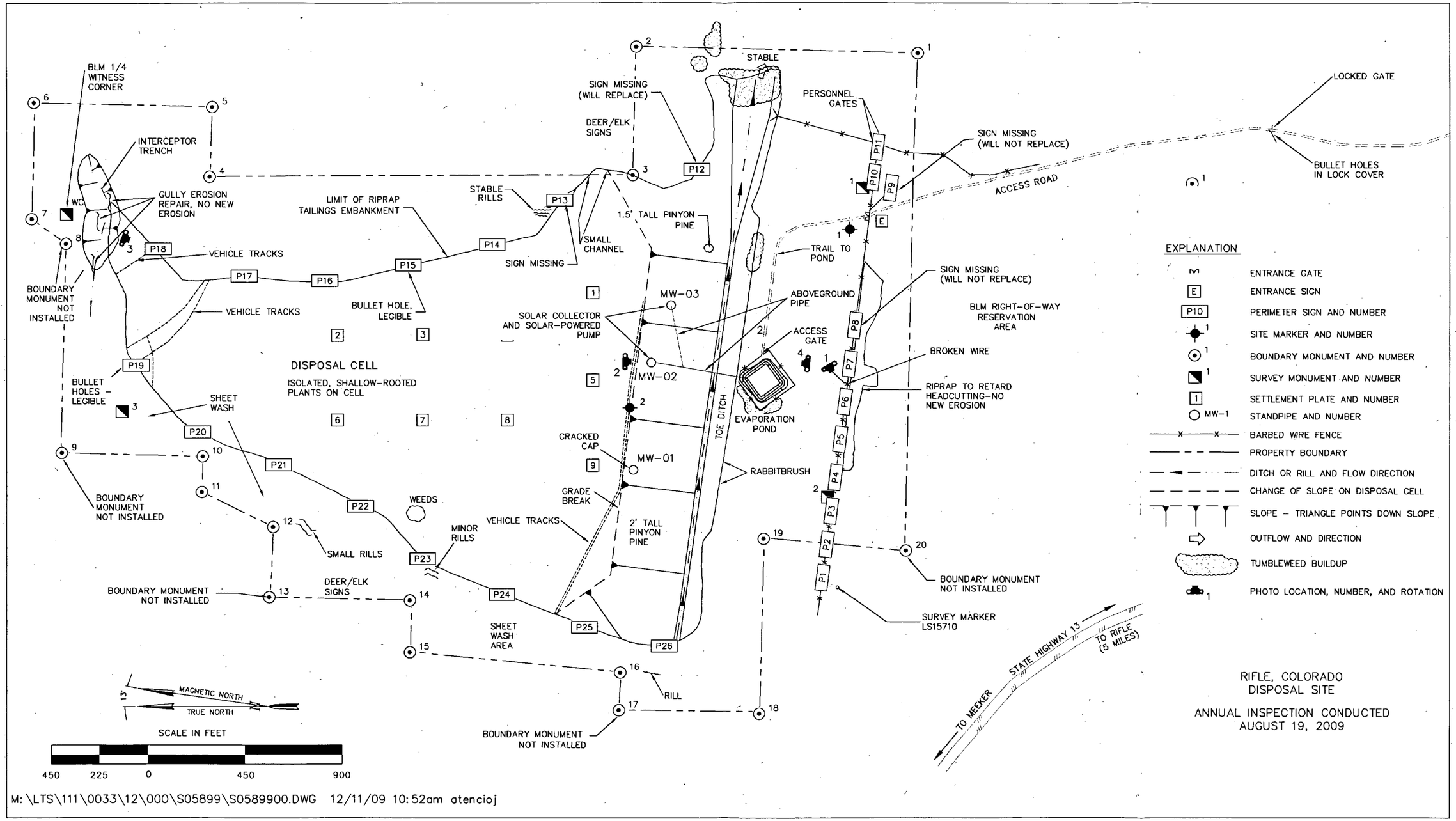


Figure 14–1. 2009 Annual Compliance Drawing for the Rifle Disposal Site

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Markers and Monuments—Two granite site markers, one just inside and left of the entrance gate (SMK–1) and the other on the disposal cell (SMK–2), were undisturbed and in good condition.

There are three survey monuments and 15 boundary monuments at this site. Boundary monuments are set at corners along an irregular site boundary. According to the LTSP, 20 corner monuments were set along the site boundary; however, previous field investigations indicated that only 15 monuments were actually set because of the rough terrain. Consequently, boundary monument locations BM–8, BM–9, BM–13, BM–17, and BM–20 were only marked with wooden laths, and are not included as part of the annual inspection. Several of the survey and boundary monuments at this site are difficult to locate because deadfall and underbrush obscure them, or rough terrain makes them inaccessible. All survey and boundary monuments inspected were in good condition.

Standpipes—Three standpipes—MW–01, MW–02, and MW–03—are located on the south side slope of the disposal cell and were in good condition. These standpipes were installed during cell construction to monitor water levels in the toe of the cell. Dataloggers with remote data transfer systems (i.e., telemetry) were installed in MW–02 and MW–03 to measure water level fluctuations. Standpipes MW–02 and MW–03 have solar-powered pumps installed in them so that water may be removed and discharged to a lined evaporation pond directly south of the cell (PL–2). Water level data for MW–02 and MW–03 are discussed in Section 14.3.5 and plotted in Figure 14–2.

There is no datalogger or pump in MW–01 because it is too shallow to intercept water that accumulates at the base of the cell; the bottom elevation for MW–01 is above the 6,016 ft elevation that constitutes the LTSP action level for pumping.

Evaporation Pond—An evaporation pond was constructed adjacent to the cell in 2001 to receive water pumped from standpipes MW–02 and MW–03 (PL–2). A datalogger, also with a remote data transfer system, measures water level fluctuations in the evaporation pond. The evaporation pond continues to function as designed because water in the pond is evaporating as fast as, or faster than, influent arrives.

The lined pond, surrounding security fence, and locked gate were in good condition. The small-diameter plastic aboveground water line to the pond was also in good condition. New attachment ties to a support cable were installed in the fall of 2007 and 2008, and the line is no longer sagging. A circular flotation device with a life line attached to a steel post on one side of the pond was installed for safety purposes.

14.3.1.2 Transects

To ensure a thorough and efficient inspection, inspectors divided the site into four areas called "transects": (1) the top of the disposal cell and interceptor trench, (2) the toe ditch and toe ditch outlet, (3) on-site reclaimed areas, and (4) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, 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 the site's integrity or long-term performance.

Disposal Cell and Interceptor Trench—Rock armor covers the 71-acre disposal cell, which was in good condition at the time of the inspection (PL–3). No evidence of subsidence, differential settling, or slumping was found. During the 2009 inspection, only small, isolated patches of annual weeds or annual grasses were found on the cell top; no deep-rooted plants or noxious weeds occurred.

14A In 2005, it was noted that standpipes MW–02 and MW–03 were not vertical and were tilting slightly downhill. Therefore, surveys of the standpipe inclinations and lateral locations were initiated in December 2005. Surveys were also conducted for nine settlement plates that were installed on the disposal cell during construction (the prior survey was performed in 1997). Results of surveys conducted in 2005 and 2006 indicate that the stickup sections of the standpipes (about 36 inches) were inclined as much as 5 degrees downhill. No record of the original inclination of the standpipes was found, and they may not have been vertical when installed. Neither standpipes nor settlement plates have moved laterally since they were installed in 1996; however, minor settling of the settlement plates (up to 0.46 ft) was indicated. This amount of settlement is not unexpected, and the lack of lateral movement suggests that the cell has been stable for the past 10 years. Subsequent surveys, from 2007 through 2009, have not shown any further movement of the settlement plates beyond the survey error of 0.01 ft. Over the past 4 years, the standpipes appeared to be tilting slightly, but in differing directions around a vertical axis. Surveys of these features will continue annually for the next several years.

A revegetated interceptor trench was constructed at the top of the disposal cell to protect the cell from storm-water and snowmelt run-on. The trench diverts water to the arroyo west of the site. Significant erosion occurred during a major rain event in 2005, and repairs to the interceptor trench were performed in November 2005. Rocks were moved into the eroded channel, and the erosion was stabilized. No new erosion was evident in this area at the time of the 2009 inspection; the erosional channel was filling in with sediment. This trench will continue to be monitored.

Toe Ditch and Toe Ditch Outlet—A toe ditch runs along the downslope (south) edge of the disposal cell and is armored with the same rock that protects the disposal cell. The toe ditch diverts surface runoff from the disposal cell off site to the east. Small trees and large weeds have begun to grow around the perimeter of the rock-covered cell. This vegetation will be monitored in the future. Tumbleweeds continually collect in the southeastern end of the toe ditch; buildup is not yet sufficient to warrant removal.

Minor erosion, anticipated in the design, has occurred in the channel at the toe ditch outlet. Bedrock is now exposed in this area. Rock previously placed in the outlet to stabilize the erosion continues to drop into the eroded area (self-armoring). A comparison with a photograph taken during the 2003 inspection indicates that no new erosion has occurred during the past several years. No new erosion was found in 2009. This area will continue to be monitored.

On-Site Reclaimed Areas—Disturbed areas around the edges and south of the disposal cell were reseeded in 1996 and, overall, have been successfully reclaimed. The vegetation, primarily grasses, is composed of desirable grasses and some undesirable cheatgrass and annual weeds. Over time, the number of undesirable species has steadily decreased. Although the vegetation was drought-stressed in 2006 and 2007, conditions in the last two years have not been as dry, and the vegetation in these reclaimed areas was healthy and robust (PL–4). Spotted knapweed,

halogeton, and Canada thistle have been identified in the past on the disposal site, but no signs of these noxious weeds were observed in 2009. There was no evidence of cattle or sheep grazing within the site boundaries during the past year, but evidence of deer and elk grazing was commonly observed.

Three arroyos are present in the reclaimed area south of the disposal cell. A rock apron was placed between the stock fence and the headcuts in these arroyos to prevent headward migration toward the disposal cell. As erosion has migrated into the rock apron, the rock has self-armored the arroyos and effectively stabilized them from further erosion. This process, which has been ongoing for a number of years, continued in 2009. This area will continue to be monitored.

Rills noted during previous inspections in the vicinity of perimeter sign P13 were still stable in 2009. The runoff collected by the rills flows along the interface between the riprap and the adjacent reclaimed soil area. The runoff has scoured a small channel that currently averages about 1 ft wide and less than 1 ft deep, exposing some of the gravel bedding material. A comparison with photographs taken last year at this location indicates that the channel has not changed. While this feature is not threatening the integrity of the disposal cell at this time, continued observation during subsequent site inspections is warranted.

Outlying Area—The area beyond the site for a distance of 0.25 mile was visually inspected for signs of erosion, development, or other disturbance. The primary land use in the area is grazing and wildlife habitat. No activity or development was observed that might affect site integrity or the long-term performance of the disposal cell.

The 16-acre revegetated area directly south of the disposal cell on BLM-managed land was inspected. During the construction of the cell, BLM granted DOE a Right-of-Way Reservation Permit to use this area for topsoil storage and other purposes. This reclamation area was seeded at the same time as the disturbed areas adjacent to the cell on DOE-owned land. Because it did not successfully revegetate, it was reseeded in 2000 and again in 2005. Despite these reseeding efforts, due to two consecutive drought years in 2006 and 2007, cheatgrass, an aggressive, weedy species, had once again reestablished itself as the dominant plant species. Therefore, in the fall of 2008, DOE applied Plateau herbicide to the entire 16-acre area. At the time of the 2009 inspection, plant cover was greatly improved, as it was dominated by desirable perennial grasses and less-aggressive annual weeds. Inspectors will continue to monitor plant composition in this area.

14.3.2 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 follow-up or contingency inspections were required in 2009.

14.3.3 Routine Maintenance and Repairs

In 2009, the second pump in standpipe MW–03 was replaced with a new submersible pump. A circular flotation device with a life line attached to a steel post on one side of the evaporation pond was installed for safety purposes.

14.3.4 Groundwater Quality Monitoring

Monitoring of groundwater quality is not required at this site because groundwater in the uppermost aquifer is of limited use and the disposal cell is geologically isolated from the first usable aquifer by approximately 3,800 ft of low-permeability siltstones, shales, and sandstones. The nine monitoring wells that had been at the site were decommissioned in 2002.

14.3.5 Disposal Cell Pore Water Monitoring

Disposal Cell Pore Water Level Monitoring— In accordance with the LTSP, DOE continues to monitor pore water levels from transient drainage in the disposal cell at standpipes MW–02
14B and MW–03, installed at the downgradient end of the cell on the south side slope. An action level elevation of 6,016 ft was established in the LTSP for pumping the pore water from the cell. This monitoring is performed to ensure that water does not rise above a geotextile liner that was installed in the toe of the cell at an elevation of 6,020 ft.

Pumping from standpipes MW–02 and MW–03 was initiated when water reached an action level of 6,016 ft above sea level in 2001. In December 2003, a solar-powered pump (similar to the one in MW–02) was installed in MW–03, and a plastic aboveground water line was plumbed into the existing water line to increase the amount of water being removed from the disposal cell. Pumping from both standpipes continued until September 2006, when it was determined that MW–02 could not sustain prolonged pumping due to consistent lack of sufficient recharge. Pumping at MW–02 was discontinued at that time, although the datalogger remains, and water level monitoring at this standpipe continues. After cessation of pumping at MW–02, the pump in MW–03 was lowered about 9 ft to near the bottom of the well so that it could pump for longer
14C periods and produce more water. The pump from MW–02 was removed and installed in MW–03 in August 2008 but was replaced with a new submersible pump in June 2009.

At the time of the 2009 inspection, telemetry from the site indicated that MW–03 was pumping at about 4 gallons per minute (gpm). This rate is greater than that reported in 2008 (2.5 gpm) but is consistent with that recorded in 2007 (also 4 gpm). About 390,000 gallons of water were produced (i.e., pumped from the toe of the disposal cell) during the 2009 season (an increase from 145,000 gallons reported in 2008). To date, approximately 4.74 million gallons of water have been pumped from the disposal cell. This includes the volume pumped during the construction of the disposal cell and the volume pumped since dewatering was initiated again in 2001.

Datalogger information for the 2009 reporting period indicates that pore water levels in both standpipes were consistently below the 6,016 ft action level (Figure 14–2).[1] As observed historically, levels were highest during late fall and winter, when pumping is discontinued (average and maximum water levels were 6,015 ft and 6,015.6 ft, respectively). Water levels then declined to between 6,012 ft and 6,013 ft in the summer during pumping; these (pumping) water levels are the lowest recorded since monitoring began. Pumping ceased this season on October 16, 2009. According to the LTSP requirement, pumping will continue until the water level in the standpipes stabilizes at an elevation of 6,014 ft or lower.

1 The graph in Figure 14–2 differs from those presented in the last two annual reports, in that plotted data were limited to early morning daily observations reflecting nonpumping conditions. This presentation yields a much more representative plot than the continuous (every 5 to 10 minutes) data plotted in previous years, which exhibited large fluctuations reflecting summer pumping conditions.

Disposal Cell Pore Water and Evaporation Pond Water Quality Monitoring—One possible explanation for the sustained water level in the toe of the disposal cell is infiltration of rainwater through the cover. To test this theory, effluent from MW–03 has been analyzed for uranium and vanadium since 2005. A decrease in the concentrations of metals in the toe of the disposal cell over time might suggest that clean meteoric water was diluting the residual tailings pore water. Results collected to date are still preliminary and inconclusive; no trends in contaminant levels are apparent. The latest time-concentration plot for vanadium showed a decrease in concentration from an earlier 2001 sampling of 28 parts per million (ppm) to 7 ppm in 2006 and, since then, an increase to 17 ppm in 2009. Concentrations of uranium during this same period increased from 1.2 ppm in 2001 to 2.3 ppm in 2006 and, since then, have decreased to 0.09 ppm in 2009. Sampling of MW–03 will continue in 2010.

14.3.6 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.

The LTSP establishes that corrective action will be taken if the water level in the disposal cell reaches 6,016 ft in elevation. In 2001, when the action level of 6,016 was reached, corrective action was initiated with the installation of the cell dewatering system and associated evaporation pond. This continued corrective action has maintained the water level at an acceptable elevation (below the action level) and prevents water from overtopping the disposal cell liner. Dewatering of the cell continued in 2009 and will continue in 2010.

No other corrective action was required in 2009.

14.3.7 Photographs

Table 14–2. Photographs Taken at the Rifle, Colorado, Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	240	Broken wire strand in the south fence.
PL–2	180	View of the evaporation pond and solar panel at MW–02 to the south.
PL–3	200	View from the top of the disposal cell (toward southwest).
PL–4	5	Healthy grass cover in on-site reclaimed area.

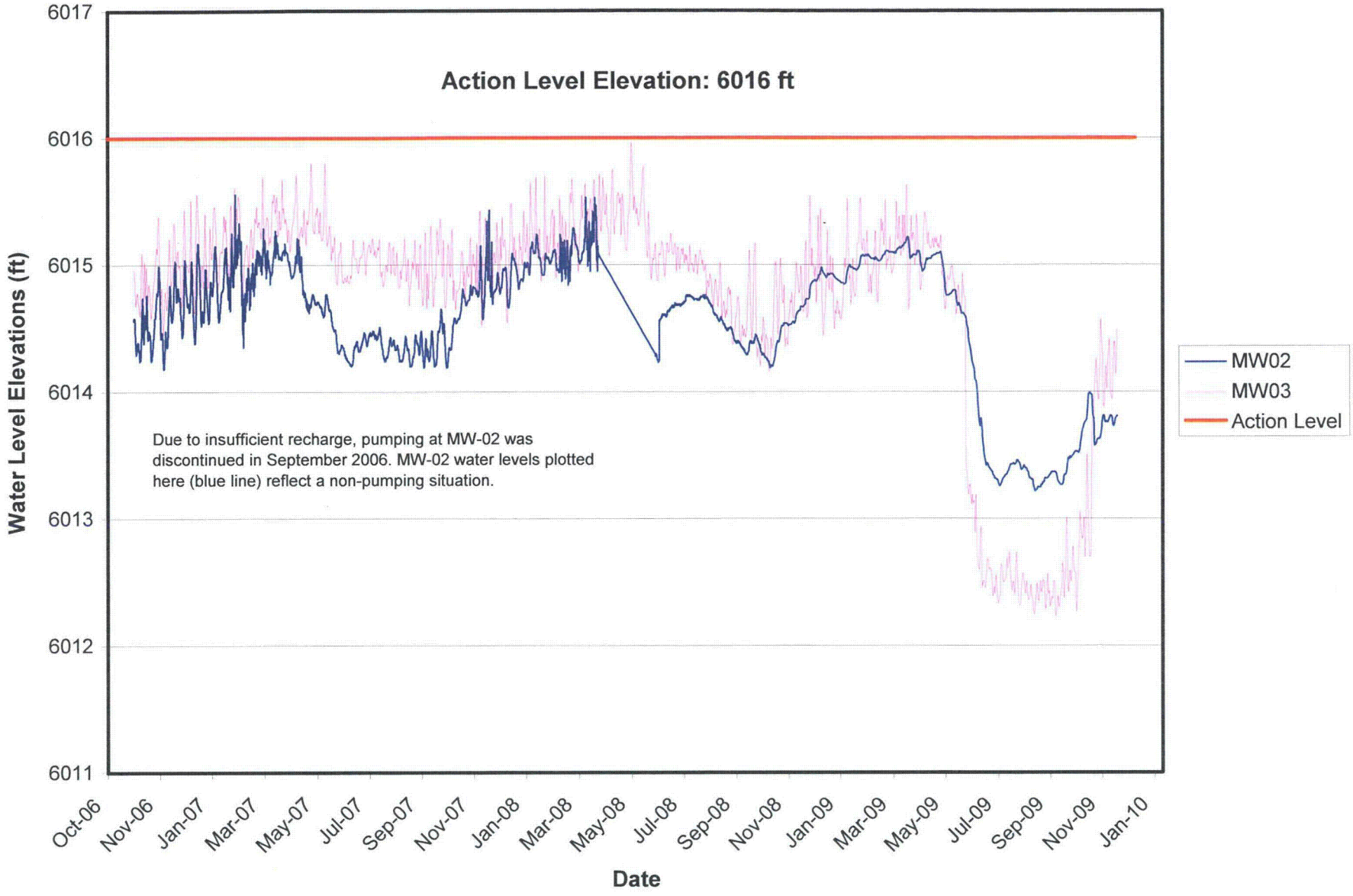

Figure 14–2. Disposal Cell Pore Water Levels in Standpipes MW–02 and MW−03 at the Rifle Disposal Site.

RFL 8/2009. PL–1. Broken wire strand in the south fence.

RFL 8/2009. PL–2. View of the evaporation pond and solar panel at MW–02 to the south.

RFL 8/2009. PL–3. View from the top of the disposal cell (toward southwest).

RFL 8/2009. PL–4. Healthy grass cover in on-site reclaimed area.

15.0 Salt Lake City, Utah, Disposal Site

15.1 Compliance Summary

The Salt Lake City, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on April 7, 2009. The disposal cell and all associated surface water diversion and drainage structures were in excellent condition and functioning as designed. No change was observed in the three slight depressions on the disposal cell top; monitoring for settlement will continue. A minor amount of weathered riprap was noted (less than 0.5 percent); no current impact to cell performance, monitoring will continue. No waste debris or indication of windblown or spillover contamination from EnergySolutions' adjacent radioactive-waste-disposal operations was noted. Inspectors noted adjacent road grading had covered three corner boundary monuments with soil and that tumbleweeds had accumulated along the perimeter fence. Follow-up correspondence with EnergySolutions confirmed that the monuments were uncovered and the tumbleweeds along the perimeter security fence were removed. No other maintenance needs or cause for a contingency inspection was identified.

15.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Salt Lake City Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the South Clive Disposal Site, Clive, Utah* (DOE/AL/62350–228, Rev. 2, U.S. Department of Energy [DOE], September 1997) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 15–1 lists these requirements.

Table 15–1. License Requirements for the Salt Lake City Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 15.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 15.3.2
Routine Maintenance and Repairs	Section 5.0	Section 15.3.3
Groundwater Monitoring	Section 4.0	Section 15.3.4
Corrective Action	Section 6.0	Section 15.3.5

Institutional Controls—The 100-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 1997. 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 disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing signs along the perimeter fence, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

15.3 Compliance Review

15.3.1 Annual Inspection and Report

The site, 85 miles west of Salt Lake City, Utah, was inspected on April 7, 2009. The results of the inspection are described below. Figure 15–1 shows features and photograph locations (PL) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

15.3.1.1 Specific Site-Surveillance Features

Access Road, Gates, Fences, and Signs—Access to the Salt Lake City Disposal Site is attained by following paved and graded roads to the EnergySolutions facility in Clive, Utah. The DOE disposal site is completely surrounded by EnergySolutions' active radioactive-waste-disposal operations. A perpetual right-of-way easement is in place and ensures DOE (and its representatives) continued access across EnergySolutions' property to the DOE disposal site. Access to the DOE disposal cell is via a route across EnergySolutions' property to the southwest corner of the disposal site (site access was rerouted from the northwest corner in 2002 to accommodate EnergySolutions' waste-disposal activities). All personnel entering the EnergySolutions facility must sign in at the security building near the northwest corner of the disposal site.

Because EnergySolutions' radioactive-waste-disposal activities surround the DOE disposal site, posted radiological control areas have to be crossed in order to access the site. Therefore, EnergySolutions requires inspectors and other site visitors to receive a radiological hazard awareness briefing, sign in on a Radiological Work Permit, and wear a dosimeter before entering the site. In addition, the escort provided by EnergySolutions is typically a health physics technician. Upon leaving the radiological control area after the inspection, all personnel and equipment are scanned. Before leaving EnergySolutions' facility, inspectors and other visitors are again monitored with a personnel contamination monitor for any radiological surface contamination. Hard hats, safety glasses, and steel-toed shoes are required on EnergySolutions' property.

Four locked gates provide access to the DOE disposal cell. One is in the southwest corner of the chain-link perimeter fence that EnergySolutions maintains around the entire DOE property and three are in the interior security fence that DOE maintains around the disposal cell (two in the northwest corner and one in the southwest corner). The EnergySolutions escort provides inspectors access through their perimeter gate. DOE provides EnergySolutions access to the entire disposal site to perform periodic maintenance through a signed access agreement. EnergySolutions is to notify DOE anytime access to the site is needed. All gates were locked and in good condition.

In 2008, EnergySolutions repaired the fence after their road grading operations damaged it. The damage occurred in the southwest and northwest corners of the site. During the 2009 inspection, the entire fence, including the repaired portions, was found to be in good condition (PL–1).

15A Tumbleweeds were found to have accumulated against the fence in the northeast corner (PL–2); as per follow up correspondence with EnergySolutions the tumbleweeds had been removed.

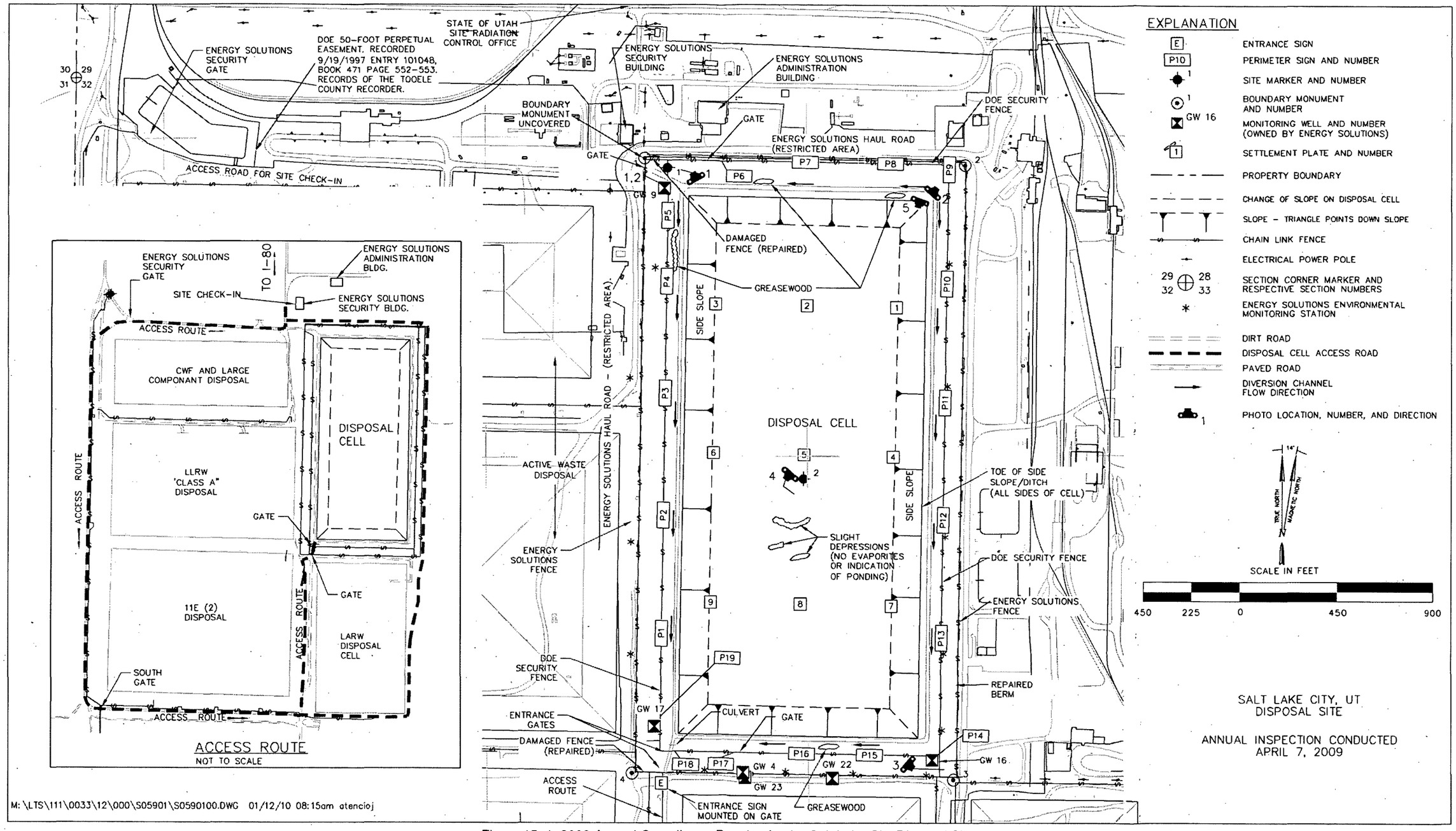

Figure 15–1. 2009 Annual Compliance Drawing for the Salt Lake City Disposal Site

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The site entrance sign and all perimeter warning signs were in good condition. Decal number designations (1 through 18) have been placed on all perimeter signs that correspond with the numbered designations on the site map.

Site Markers and Monuments—Three of the four boundary monuments were found covered with soil as a result of road grading performed by EnergySolutions (PL–3). After the 2009
15B inspection EnergySolutions uncovered the boundary monuments BM–2, BM–3, and BM–4. Boundary monument BM–1 was in good condition. EnergySolutions offered to install protective casings over all boundary monuments to prevent re-covering or future damage. Both of the granite site markers were in good condition. EnergySolutions also removed vegetation around site marker SMK–1 following the inspection.

Settlement Plates—All nine settlement plates on top of the disposal cell were secure and in good condition. Surveying of the settlement plates was conducted for several years following cell construction but is no longer required.

Monitoring wells—In accordance with the LTSP, groundwater monitoring is not required at the Salt Lake City disposal site (see Section15.3.4). However, four groundwater monitoring wells belonging to EnergySolutions are located on DOE's disposal site property. These wells, originally owned by DOE, were transferred to EnergySolutions in 2000. EnergySolutions informed DOE that the four wells are no longer needed as part of their monitoring network and will likely be decommissioned. No decommissioning date has been set. DOE provides EnergySolutions access to the wells through an agreement signed in 2006. All four wells were properly secured and in good condition at the time of the inspection.

15.3.1.2 Transects

To ensure a thorough and efficient inspection, inspectors divided the site into three areas called "transects": (1) the top and side slopes of the disposal cell, (2) the area between the disposal cell and the site boundary, and (3) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, the inspectors examined specific site-surveillance features, drainage structures, and vegetation, along with other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes that might affect the site's integrity or long-term performance.

Top and Side Slopes of the Disposal Cell—The top and side slopes of the disposal cell are armored with riprap. Inspectors walked the perimeter road that surrounds the base of the disposal cell and traversed the top and side slopes of the disposal cell. The crest of each side slope was inspected in order to provide a vantage point to view the planes of both the side slopes and the top of the disposal cell. The riprap was in good condition, and no evidence of erosion or slumping of the side slopes was observed. Several slight depressions in the riprap were observed along the slopes of the cell; they appeared to have been created by the heavy equipment during the riprap's installation. These depressions will continue to be observed to ensure that settlement is not occurring.

Three minor depressions first noted in 2006 on the disposal cell top were inspected; no change was observed (PL–4). These slight depressions, which had not been noticed previously, were likely caused by irregularities in the surface grading during the initial construction of the cell. They currently do not present a problem and will continue to be visually monitored for

settlement (photographic documentation will continue). There was no evidence of surface water ponding in any of the depressions (i.e., no evaporites were observed).

A minor portion (estimated to be less than 0.5 percent) of the riprap was beginning to weather
15C (PL–5). The rock type was consistent, and the weathering effects were all similar. This minor amount of degradation is not currently impacting the performance of the cell; however, it will continue to be monitored during inspections.

No deep-rooted plants were found growing on the top or side slopes of the cell.

Area Between the Disposal Cell and the Site Boundary—The principle features examined in the area between the toe of the disposal cell and the security fence are the toe drain, surface water diversion channels, and perimeter road. All were in good condition.

A few scattered greasewood plants are growing along the top edge of the diversion channels; however, this vegetation does not interfere with the channels' performance. No standing water was observed in the diversion channels. EnergySolutions personnel have indicated that considerable water drains off the disposal cell during storm events and is routed off site via the diversion channels to an evaporation pond southwest of the disposal site.

Cursory scanning for spillover and windblown contamination was not performed on site in 2009. Scanning was performed during the 2006 and 2007 inspections to determine if EnergySolutions' radioactive-waste-disposal operations were cross-contaminating DOE's site. All surface contamination measurements taken during these inspections were below DOE *RadCon Manual* (LMS/POL/SO4322–1.0) limits, indicating that spillover and windblown radiological contamination is not currently an issue on site. Periodic scanning will be performed during future site inspections.

Outlying Area—The site perimeter transect extends from the security fence to 0.25 mile beyond the site boundary. This transect includes the EnergySolutions perimeter fence, the enclosed area between the two fences, the outflow channel, and monitoring wells. All features were in good condition.

A variety of features and ongoing waste-disposal activities managed by EnergySolutions surround the DOE disposal site. The most obvious waste-disposal activities are directly west of the site, where a Class A (low-level radioactive waste) disposal cell is being filled. On the northeast and east sides of the site, incoming wastes are unloaded from rail cars and transferred to haul trucks. Decontamination facilities are also present. Directly to the south is a completed disposal cell for low-level radioactive waste, to the southwest is an 11e(2) waste disposal cell, and to the southeast is an operating mixed-waste treatment and disposal facility. Administration, security, and maintenance buildings lie to the north-northwest. A shredding facility, rotary dump, and railroad spur delivery loop are also located to the northwest.

All areas surrounding DOE's property are restricted due to radiological hazards resulting from EnergySolutions' waste-disposal activities. However, EnergySolutions ensures perpetual access to the DOE disposal site, and radiological protection procedures are enforced, as discussed in Section 15.3.1.1.

15.3.2 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 follow-up or contingency inspections were required in 2009.

15.3.3 Routine Maintenance and Repairs

In 2009, routine maintenance and repairs included uncovering boundary monuments BM–2, BM–3, and BM–4 and removal of tumbleweeds along the perimeter security fence. EnergySolutions performed these activities following the inspection.

15.3.4 Groundwater Monitoring

In accordance with 40 CFR 192.21 (g), groundwater at the site qualifies for narrative supplemental standards. Groundwater was determined to be of limited use as per the LTSP due to naturally occurring concentrations of total dissolved solids in the uppermost aquifer, which exceed 10,000 milligrams per liter. Consequently, the LTSP does not require groundwater monitoring at the site.

15.3.5 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 2009.

15.3.6 Photographs

Table 15–2. Photographs Taken at the Salt Lake City Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	330	Repaired fence in the northwest corner of the site.
PL–2	40	Tumbleweed accumulation within the inner northeast fence corner.
PL–3	130	Covered boundary monument BM–3 in southeast corner of the site.
PL–4	220	Slight depressions southwest of site marker SMK–2 on the disposal cell top.
PL–5	NA	Weathering riprap on the disposal cell.

SLC 4/2009. PL–1. Repaired fence in the northwest corner of the site.

SLC 4/2009. PL–2 Tumbleweed accumulation within the inner northeast fence corner.

SLC 4/2009. PL–3. Covered boundary monument BM–3 in the southeast of the site.

SLC 4/2009. PL–4. Slight depressions southwest of site marker SMK–2 on the disposal cell top.

SLC 4/2009. PL–5. Weathering riprap on the disposal cell.

16.0 Shiprock, New Mexico, Disposal Site

16.1 Compliance Summary

The Shiprock, New Mexico, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on May 29, 2009. The disposal cell and all associated surface water diversion and drainage structures remained in good condition and were functioning as designed.

During the inspection, few, if any, deep-rooted woody shrubs were found on the top and side slopes of the cell. A conical depression was found on the southeast edge of the disposal cell cover. Since then, several similar conical depressions have been found, but these appear to be vestiges of test pits dug for initial cell cover studies. Although no displacement of materials is apparent in these areas, these depressions will be monitored in the future. Vehicle ruts, probably the result of herbicide application in 2008, are not deep enough to warrant concern but will also continue to be monitored.

The U.S. Department of Energy (DOE) continues to evaluate the effectiveness of using phreatophyte shrubs to remove contaminated groundwater from the terrace. These studies are conducted at four phytoremediation test plots—two in the borrow pit area, and two on the terrace between the disposal cell and the escarpment.

Except for two minor exceptions, all structures, including access roads, gates, entrance signs, fences, monitoring wells, site markers, perimeter signs, survey monuments, and erosion control markers, were in good condition. A section of loose erosion fabric found on a side slope of the lower outflow channel requires removal or repair. Portions of the perimeter fence were bent or damaged but are still functional. No other maintenance needs or cause for a follow-up or contingency inspection was identified.

16.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Shiprock Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the Shiprock Disposal Site, Shiprock, New Mexico* (DOE/AL/62350–60F, Rev. 1, DOE, September 1994) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 16–1 lists these requirements.

Table 16–1. License Requirements for the Shiprock Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0	Section 16.3.1
Follow-Up or Contingency Inspections	Section 7.0	Section 16.3.2
Routine Maintenance and Repairs	Section 8.0	Section 16.3.3
Groundwater Monitoring	Section 5.0	Section 16.3.4
Corrective Action	Section 9.0	Section 16.3.5

Institutional Controls—The 105-acre disposal site is held-in-trust by the United States Bureau of Indian Affairs. The Navajo Nation retains title to the land. The site was accepted under U.S. Nuclear Regulatory Commission (NRC) 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. DOE Order 454.1 defines institutional controls as federal control of the property, site perimeter fencing, warning/no-trespassing signs along the property boundary, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

16.3 Compliance Review

16.3.1 Annual Inspection and Report

The results of the Shiprock Disposal Site inspection, conducted on May 29, 2009, are discussed below. Figure 16–1 shows features and photograph locations (PLs) mentioned in this report. Numbers in the left margin refer to items in the "Executive Summary" table.

16.3.1.1 Specific Site-Surveillance Features

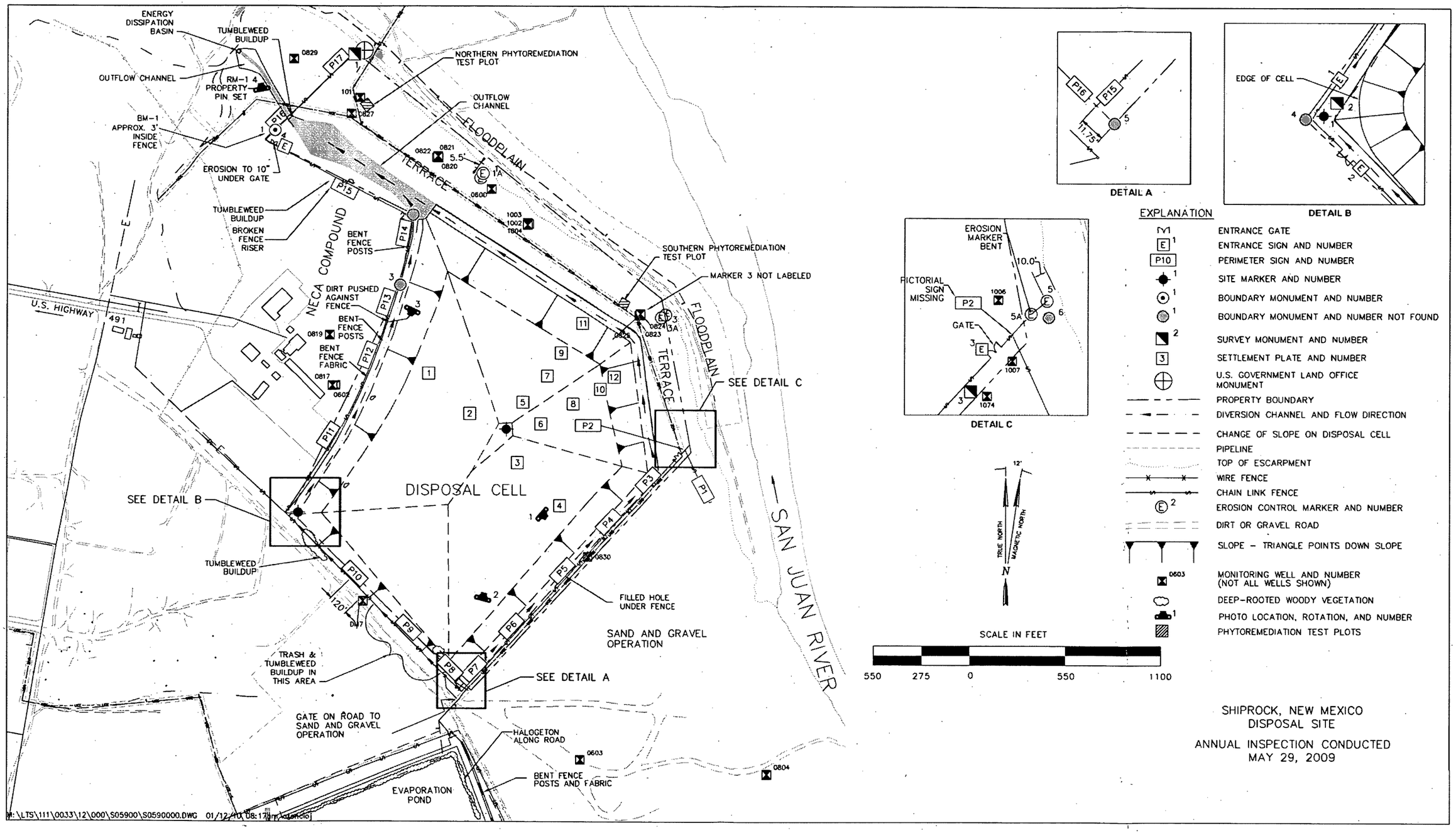
Access Road, Gates, Fence, and Signs—Access to the site is via a gravel road off U.S. Highway 491 and through a sand and gravel processing facility, operated by the Navajo Engineering and Construction Authority (NECA), to the main entrance gate. DOE retains perpetual access to the site through a Custody and Access Agreement with the Navajo Nation (DE–FC04–83AL16258, October 7, 1983).

All three vehicle access gates—the main entrance gate at the east corner of the site (near the terrace escarpment), the gate providing terrace access at the northwest corner of the site, and the former entrance gate at the west corner of the site—were locked and in good condition. The four entrance signs (two signs are near the former main entrance gate) were also in good condition, and all had decals listing correct telephone numbers for DOE and the Navajo AML/UMTRA Office.

The security fence along the perimeter was in good condition except for several bent poles and a section of bent fence fabric between perimeter signs P11 and P12. Poles were also bent near perimeter sign P14, and a broken fence riser was observed near perimeter sign P15. The fence was still intact, however, and no signs of trespassing were apparent. As observed in 2008, dirt was mounded against the fence near perimeter sign P13, but the fence was intact.

Tumbleweeds and trash have accumulated near perimeter sign P15, between perimeter signs P8 and P10, and in the overflow channel near perimeter sign P16. Although these accumulations are minor, neither presenting a fire hazard nor obstructing water flow through the channel, tumbleweed and trash around all site fences will be removed prior to the next annual inspection.

There are gaps beneath the fence, most formed by animals, along the site perimeter. One gap
16A near perimeter sign P5 was filled with rock during the 2009 inspection. Inspectors will continue to monitor gaps and fill those that are large enough to provide access by children, who live and play immediately west of the site.



DETAIL A

DETAIL B

DETAIL C

EXPLANATION

- ENTRANCE GATE
- ENTRANCE SIGN AND NUMBER
- PERIMETER SIGN AND NUMBER
- SITE MARKER AND NUMBER
- BOUNDARY MONUMENT AND NUMBER
- BOUNDARY MONUMENT AND NUMBER NOT FOUND
- SURVEY MONUMENT AND NUMBER
- SETTLEMENT PLATE AND NUMBER
- U.S. GOVERNMENT LAND OFFICE MONUMENT
- PROPERTY BOUNDARY
- DIVERSION CHANNEL AND FLOW DIRECTION
- CHANGE OF SLOPE ON DISPOSAL CELL
- PIPELINE
- TOP OF ESCARPMENT
- WIRE FENCE
- CHAIN LINK FENCE
- EROSION CONTROL MARKER AND NUMBER
- DIRT OR GRAVEL ROAD
- SLOPE – TRIANGLE POINTS DOWN SLOPE
- MONITORING WELL AND NUMBER (NOT ALL WELLS SHOWN)
- DEEP-ROOTED WOODY VEGETATION
- PHOTO LOCATION, ROTATION, AND NUMBER
- PHYTOREMEDIATION TEST PLOTS

SCALE IN FEET

550 275 0 550 1100

SHIPROCK, NEW MEXICO
DISPOSAL SITE

ANNUAL INSPECTION CONDUCTED
MAY 29, 2009

Figure 16–1. 2009 Annual Compliance Drawing for the Shiprock Disposal Site

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All perimeter signs were in good condition, with no vandalism evident, except for one missing pictorial sign (P2) near the entrance gate. This sign will be replaced before the next annual inspection.

Site Markers and Monuments—Two site markers are placed at the site: site marker SMK–1 is just inside the former main entrance gate, and site marker SMK–2 is on top of the disposal cell. Minor cracking in the concrete around the base of SMK–1 was sealed in May 2003. Both site markers were in good condition at the time of the 2009 inspection.

All three survey monuments were inspected and in good condition. As was the case in previous inspections, only boundary monument BM–1 was located in 2009. The five remaining boundary monuments were buried by windblown sand or inadvertently removed during past construction activities. Because DOE does not own the land, the presence or exact location of these boundary monuments is not critical to managing the disposal site. However, if locating all boundary monuments becomes important in the future, DOE will subcontract a licensed surveyor to find or reestablish the monuments. In the interim, no action will be taken. The perimeter fence also defines the site boundary along all sides except the east and northeast, where the edge of the terrace escarpment serves as a boundary.

Erosion Control Markers—The four sets of erosion control markers (ECMs) along the edge of the terrace escarpment were in good condition except for the marker near the east entrance gate (ECM–5A on Figure 16–1). This marker was previously damaged by a vehicle, but the marker is still functional and does not require repair at this time.

Monitoring wells—Cell performance groundwater monitoring is not required by the LTSP for this site. Numerous monitoring wells are present along the terrace and at off-site locations, however. These wells are not included in the annual inspection because the DOE groundwater restoration staff maintains the wells during the frequent sampling events. All wells encountered during the 2009 inspection were secure, locked, and in good condition.

16.3.1.2 Transects

To ensure a thorough and efficient inspection, inspectors divided the site into three areas called "transects": (1) the disposal cell (including the riprap-covered top and side slopes, diversion channels, and outflow channel), (2) the terrace area north and northeast of the disposal cell, and (3) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, the 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.

Disposal Cell, Diversion Channels, and Outflow Channel—The riprap-covered top and side slopes of the cell are in good condition; no evidence of settling or slumping was found. A conical depression was identified along the southeast edge of the disposal cell cover (PL–1). Since the inspection, several similar conical depressions have been found, but these appear to be vestiges of test pits dug for initial cell cover studies. Although no displacement of materials is apparent in

these areas, these depressions will be measured and monitored in the future, and follow-up actions will be taken if necessary.

Vehicle ruts are apparent on the surface of the cell (PL–2); these ruts were probably formed in the fall of 2008 during vegetation spraying. This treatment was effective, as all vegetation on the cell cover and in the diversion channels and outflow channel was dead at the time of the 2009 inspection (PL–3).

Diversion channels around the base of the disposal cell were in good condition. Minor buildup of tumbleweeds in the outflow channel is not a concern at this time because it is not expected to inhibit flow.

Site drainage is ultimately directed toward the outflow channel at the northwest corner of the site. The outflow channel was reconstructed in 2003 to repair damage caused by severe storms in 2001 and 2002, and an energy dissipation basin was constructed immediately above Bob Lee Wash. An erosion area along the southwest bank of the off-site portion of the outflow channel, fully repaired in 2008, was in good condition. The lower, steeper portion of the off-site outflow channel and the energy dissipation structure also remained in good condition. However, erosion control fabric installed on the side slopes of the lower channel had come loose along one edge; this section of fabric requires repair or removal (PL–4).

16B

In general, shallow-rooted vegetation growing in the diversion and outflow channels (e.g., cheatgrass, Russian thistle, Indian ricegrass) does not impede the flow of water and, therefore, is not removed. However, woody vegetation in the outflow channel does require periodic removal. Scattered tamarisk plants were cut and treated with herbicide in late September 2008. No weed control activities were conducted in 2009.

Terrace Area and Site Perimeter—The terrace comprises the area north and east of the disposal cell between the cell and the escarpment. The escarpment, more than 300 feet from the eastern edge of the disposal cell, is prone to slumping. Four sets of erosion control markers along the terrace escarpment allow stability to be monitored. Fractures and incipient slumps commonly occur in the Mancos Shale bedrock along the escarpment northwest of erosion control marker ECM–1A. No new erosion was evident in 2009.

The noxious weeds have been treated on the terrace since 2004, but desirable native vegetation was allowed to establish. In 2008, because of the abundance of undesirable vegetation, the terrace was treated with a soil sterilant. Little live vegetation remained at the time of the 2009 inspection. In addition to native vegetation and annual weeds, saltcedar and halogeton were observed on the steep slopes of the escarpment below the terrace, but control of these plants is not recommended because of their inaccessibility and because they stabilize the slope.

16C

Two phytoremediation test plots, referred to as the northern and southern test plots, have been maintained on the northeast side of the terrace since 2006. The purpose of these test plots is to evaluate the effectiveness of using phreatophyte shrubs (four-wing saltbush and black greasewood) to remove contaminated groundwater from the terrace. Studies are ongoing, and results are preliminary.

Outlying Area—A sand and gravel pit operated by NECA is located immediately southeast of the disposal cell. Gravel operations were underway in 2009, and heavy equipment was operating in the pit during the inspection. All gravel operation activities take place well away from the disposal site perimeter, and historically they have had no effect on the integrity of the site. Inspectors will continue to monitor sand and gravel operations to ensure that gravel pit activities do not encroach upon or adversely impact the disposal site and perimeter area.

In 2002, DOE constructed an 11-acre lined evaporation pond (across the public access road) as part of the ongoing groundwater treatment program. A chain-link security fence encloses the area. Although the activities associated with the treatment of contaminated groundwater at this site are not within the scope of the LTSP, the pond is monitored for general condition and security as part of the annual inspections. At the time of the 2009 inspection, the pond liner appeared intact, and the pond was partially full of water.

With the exception of minor damage along the southwestern fence line and a damaged warning sign, the security fence was in good condition. Tumbleweeds and trash that have accumulated in several areas along the fence will be removed prior to the next inspection.

16.3.2 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 follow-up or contingency inspections were required in 2009.

16.3.3 Routine Maintenance and Repairs

A gap in the fence near perimeter sign P5 was filled with rock during the 2009 inspection. No other maintenance or repairs occurred at the site in 2009.

16.3.4 Groundwater Monitoring

The LTSP does not require groundwater monitoring at the Shiprock site. Section 5 of the LTSP concluded that the site is located over an aquifer (the alluvial aquifer) that is not useful as a source of water for drinking or any other beneficial purpose because of its poor quality, limited areal extent, and low yield. Based on these findings, no additional hydrogeologic investigations were planned for the disposal site, and no cell performance monitoring of groundwater was proposed as part of the long-term surveillance program.

16.3.5 Corrective Action

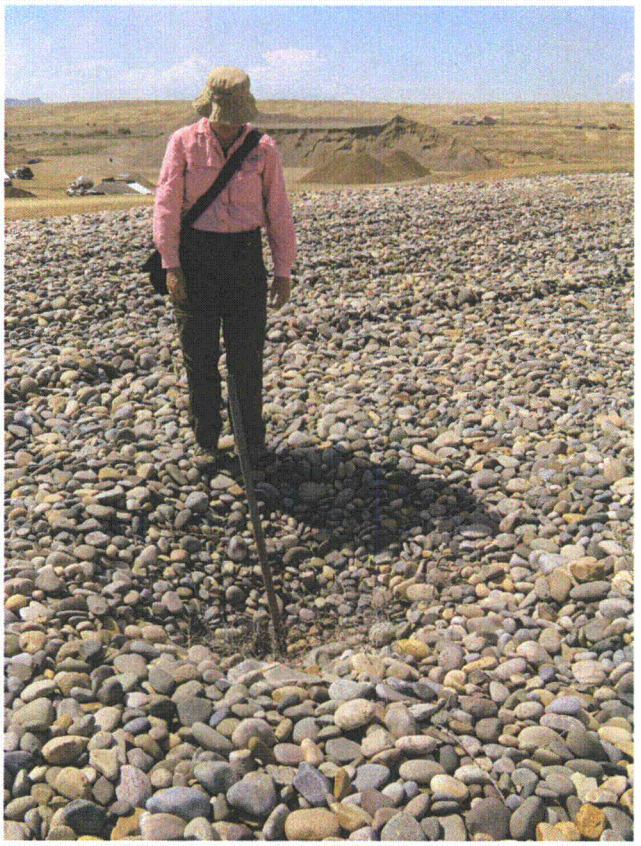
Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192.

No corrective action was required in 2009.

16.3.6 Photographs

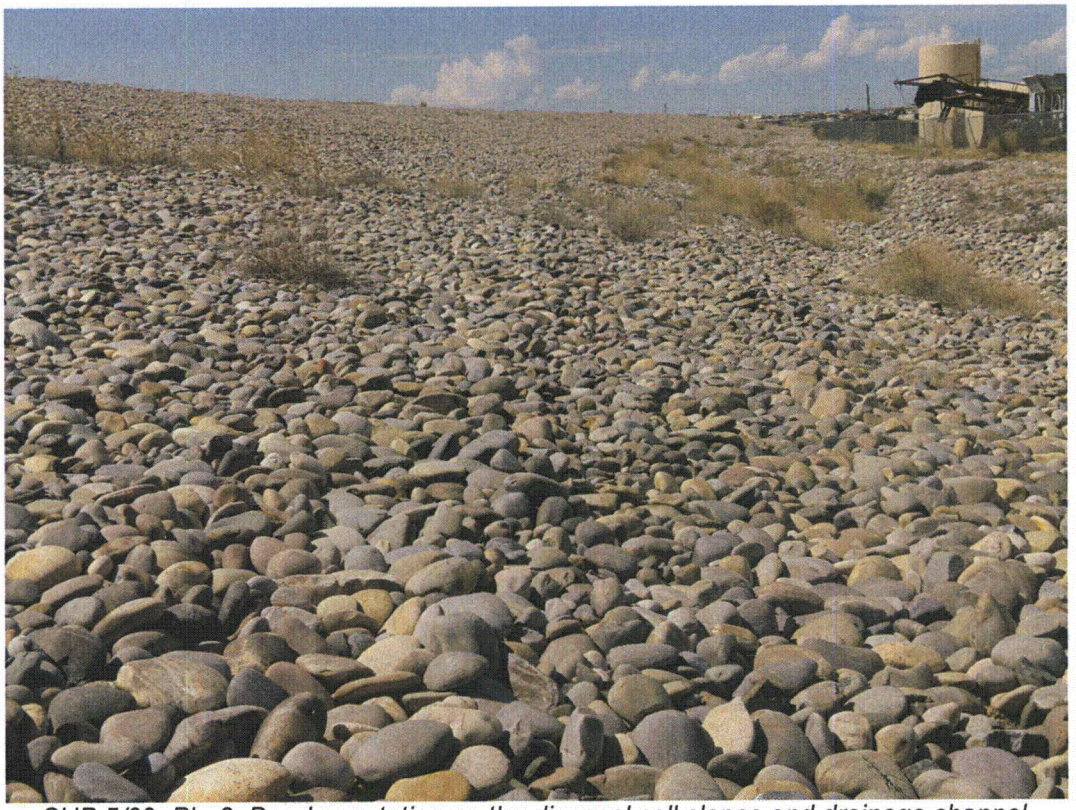
Table 16–2. Photographs Taken at the Shiprock Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	130	Conical depression found on top of the disposal cell.
PL–2	15	Vehicle ruts on the surface of the disposal cell.
PL–3	205	Dead vegetation on the disposal cell slopes and drainage channel.
PL–4	350	Loose erosion fabric on the slope of the hill above the outflow channel.



SHP 5/09. PL–1. Conical depression found on top of the disposal cell.

SHP 5/09. PL–2. Vehicle ruts on the surface of the disposal cell.



SHP 5/09. PL–3. Dead vegetation on the disposal cell slopes and drainage channel.

SHP 5/09. PL–4. Loose erosion fabric on the slope of the hill above the outflow channel.

17.0 Slick Rock, Colorado, Disposal Site

17.1 Compliance Summary

The Slick Rock, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on May 12, 2009. The disposal cell and its associated surface water drainage features remain in good condition and are functioning as designed.

Runoff events during the last several years have noticeably affected the size and stability of erosional features on the site. Large gullies containing deep headcuts that had formed between the retention pond and the county access road had been repaired in 2008, and the culvert at the entrance gate had been repaired as well. Given these repairs the previous year, only minor erosion was evident at the time of the 2009 inspection. For example, rills and gullies are still evident southeast of the disposal cell, but this erosion does not pose a threat to the disposal cell or to site features. However, these areas will continue to be monitored during future inspections. No other maintenance needs or cause for a follow-up or contingency inspection was identified.

17.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Slick Rock Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the Burro Canyon Disposal Cell, Slick Rock, Colorado* (DOE/AL/62350–236, Rev. 0, U.S. Department of Energy [DOE], May 1998) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 17–1 lists these requirements.

Table 17–1. License Requirements for the Slick Rock Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.0 and 6.2	Section 17.3.1
Follow-Up or Contingency Inspections	Section 3.4	Section 17.3.2
Routine Maintenance and Repairs	Section 4.0	Section 17.3.3
Groundwater Monitoring	Sections 2.5 and 2.6	Section 17.3.4
Corrective Action	Section 5.0	Section 17.3.5

Institutional Controls—The 62-acre disposal site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) in 1998. 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 disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing signs along the property boundary, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

17.3 Compliance Review

17.3.1 Annual Inspection and Report

The site, northeast of Slick Rock, Colorado, was inspected on May 12, 2009. Results of the inspection are described below. Figure 17–1 shows features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

17.3.1.1 Specific Site-Surveillance Features

Access Road, Gate, Fence, and Signs—Access to the site is off County Road T11, an improved gravel-and-dirt road maintained by San Miguel County. The road was in good condition at the time of the inspection.

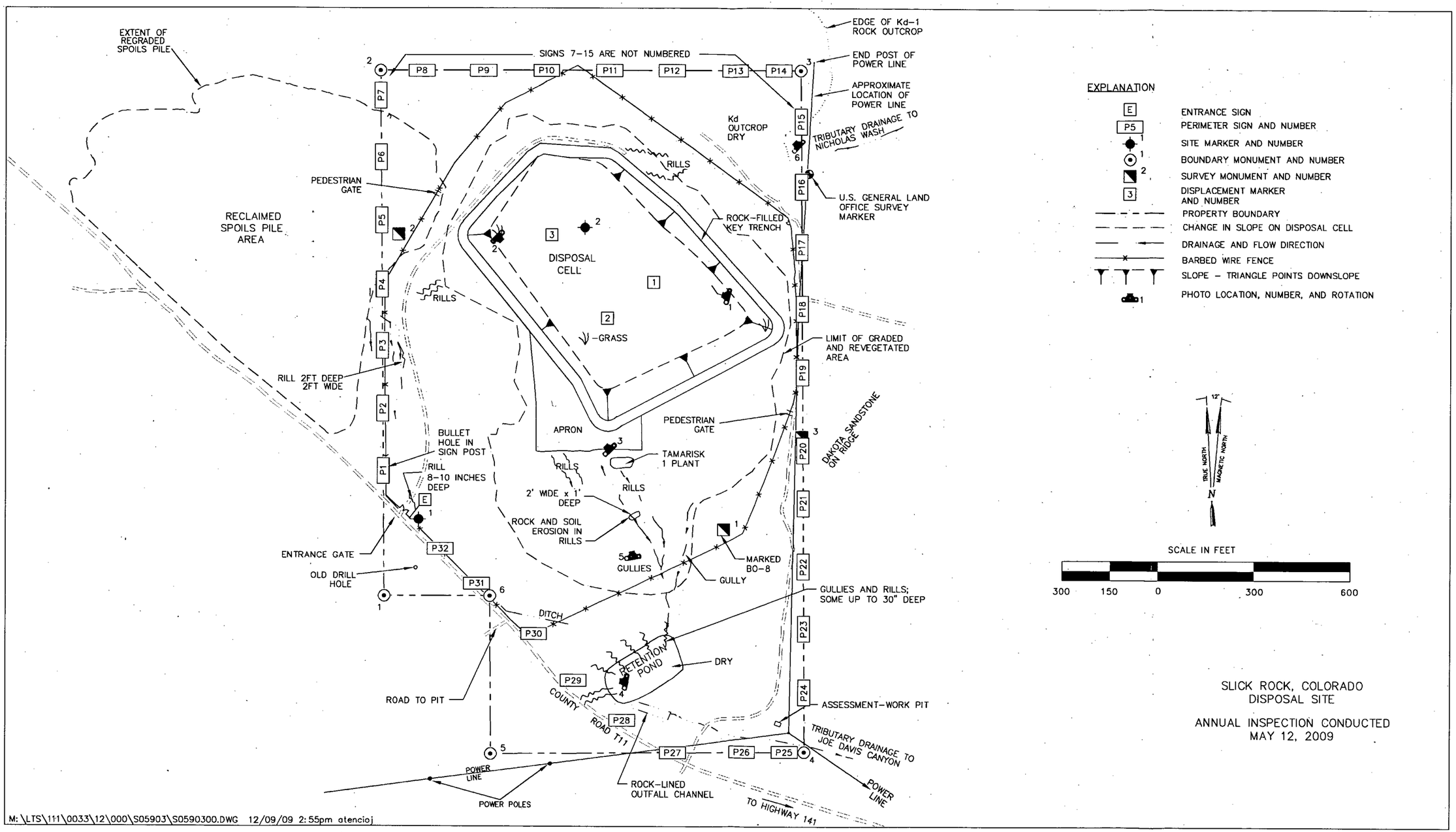
At the entrance gate, a 15-inch-diameter culvert was installed in July 2008 beneath the access road to allow runoff to flow along the borrow ditch. This culvert was installed to replace the previous 8-inch-diameter culvert, which had been continually eroded by storm water runoff. The culvert repair was in good condition at the time of the 2009 inspection.

The entrance to the site is through a barbed-wire gate that is secured with a DOE lock. The stock fence around the site is strung with four strands of wire with spacers. The top and bottom strands are smooth wire, allowing wildlife to pass over or under, and the middle two wire strands are barbed. This stock fence was dismantled and reconfigured in 2007 to enclose the disposal cell, while excluding the adjacent reclaimed spoils pile. Two new 4-foot-wide, steel-tube pedestrian gates were installed at that time. The entrance and pedestrian gates and the stock fence were all in good condition at the time of the 2009 inspection.

The entrance sign, located inside the stock fence just east of the entrance gate, was in good condition. Thirty-two perimeter signs, designated P1 through P32, are spaced at approximately 200-foot intervals around the site. The signs, attached to steel posts set in concrete, are placed 5 feet inside the site boundary. As reported the last several years, the signpost at perimeter sign P1 has a bullet hole, but it remains legible and sturdy. Perimeter signs are numbered with adhesive labels to facilitate future inspections; during the 2009 inspection, the number labels for signs 7 through 15 were missing. All other perimeter signs were in good condition.

Site Markers and Monuments—The two granite site markers, SMK–1 near the entrance gate and SMK–2 on the north-central part of the disposal cell, were in good condition.

Six boundary monuments define the corners of the site boundary, and three survey monuments (SM–1, SM–2, and SM–3) are located along the fence line. All of the boundary and survey monuments were located and were in good condition.



EXPLANATION

- E — ENTRANCE SIGN
- P5 — PERIMETER SIGN AND NUMBER
- SITE MARKER AND NUMBER
- 1 — BOUNDARY MONUMENT AND NUMBER
- 2 — SURVEY MONUMENT AND NUMBER
- 3 — DISPLACEMENT MARKER AND NUMBER
- PROPERTY BOUNDARY
- CHANGE IN SLOPE ON DISPOSAL CELL
- DRAINAGE AND FLOW DIRECTION
- BARBED WIRE FENCE
- SLOPE – TRIANGLE POINTS DOWNSLOPE
- 1 — PHOTO LOCATION, NUMBER, AND ROTATION

SCALE IN FEET

300 150 0 300 600

SLICK ROCK, COLORADO
DISPOSAL SITE

ANNUAL INSPECTION CONDUCTED
MAY 12, 2009

Figure 17–1. 2009 Annual Compliance Drawing for the Slick Rock Disposal Site

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17.3.1.2 Transects

To ensure a thorough and efficient inspection, inspectors divided the site into three areas called "transects": (1) the rock-covered top of the disposal cell including side slopes, the key trench, and the apron; (2) the area between the disposal cell and the site boundary, including the stock pond, re-contoured and reseeded areas, and the stock fence; and (3) the outlying area.

Within each transect, inspectors examined specific site-surveillance features, such as survey and boundary monuments, signs, and site markers. Inspectors examined each transect for evidence of erosion, settling, slumping, or other disturbance that might affect site integrity or the long-term performance of the engineered portions of the site.

Disposal Cell, Side Slopes, Key Trench, and Apron—The disposal cell was completed in 1996. The top of the disposal cell is roughly pentagonal; five side slopes descend from the top of the disposal cell at a maximum grade of 25 percent and are covered with riprap. At the base of the side slopes is a key trench that encircles the disposal cell. The key trench is as much as 5 feet deep and 20 feet wide and filled with riprap. South and downslope from the disposal cell, an apron of riprap extends for 50 to 200 feet beyond the key trench. All side slopes, the key trench, and the apron were in good condition.

Rock covering the disposal cell, key trench, and apron is rounded cobble- and pebble-sized material. No evidence of settling, slumping, or erosion was apparent on any of the rock-covered surfaces of the disposal cell. All rock and rock-covered features were in good condition (PL–1, PL–2, and PL–3).

Area Between the Disposal Cell and the Site Boundary—The area around the disposal cell includes the retention pond and the graded and reseeded areas. Surface drainage from the disposal cell flows south into the retention pond, which is constructed in a channel tributary to Joe Davis Canyon. An outflow channel below the pond is lined with rounded cobblestones for a short distance. Both the pond, which was dry at the time of the inspection, and the outflow channel were in good condition at the time of the inspection.

As noted in the last inspection report, large storm water runoff events have caused erosion in several areas near the retention pond during the past several years. Erosion was significant enough to warrant repair last year: two large gullies containing deep headcuts that had formed southwest and southeast of the retention pond were repaired in July 2008. Some of the gullies 17A previously noted on the northwest side of the retention pond are still as deep as 30 inches (PL–4), but they do not present a hazard to the disposal cell or to any site feature. As such, action is still not warranted. All of the aforementioned erosion areas will continue to be monitored during future site inspections.

As noted during previous inspections, rills have formed downslope of the disposal cell apron between the apron and the retention pond. In 2004, rock and soil were placed in the rills to disrupt runoff flow. Although this area downslope of the apron appears to be stabilizing, some erosion is still occurring. As observed in 2008, sedimentation and soil loss were still evident at some of these rill features in 2009 (PL–5), indicating further erosion from recent storm water runoff events. However, these areas still do not present a hazard to the disposal cell, and no repairs are necessary at this time. These features will be monitored as part of future inspections.

Rills east of perimeter signs P2 and P3, noted in the last several inspection reports, are still apparent. In 2008, the largest rill was approximately 2 feet wide by 2 feet deep, twice as deep as it was at the time of the 2007 inspection. However, no increase in size was noted during the 2009 inspection. These features will continue to be monitored for evidence of continuing erosion requiring repair.

Revegetation Status of Disturbed Areas—Since the last seeding effort in March 1999, vegetation around disturbed areas adjacent to the disposal cell has become well established with desirable species (e.g., wheatgrass and fescue); however, Russian thistle and cheatgrass are also present.

Several noxious weeds—including tamarisk, Russian knapweed, halogeton, and bindweed—have been identified at the disposal site during previous site inspections. Tamarisk, previously identified below the rock apron and around the retention pond, was thought to have been eradicated in 2001. During the last two inspections, tamarisk shoots have been found below the eastern third of the rock apron (only one shoot was identified during the 2009 inspection).

Russian knapweed, halogeton, and bindweed have been sprayed annually since 2005. As was the case the previous 2 years, Russian knapweed was found northwest of the retention pond. A licensed applicator treated this area with herbicide later in the season. Overall, noxious weed control monitoring at the site indicated that good to excellent control of Russian knapweed and fair control of halogeton were achieved.

Outlying Area—During the construction of the disposal cell, material excavated from the site was placed in a 60-foot-high spoils pile on the west side of the site. The U.S. Bureau of Land Management (BLM) granted DOE a right-of-way permit (COC–57851) that encompassed the spoils pile and the former staging area adjacent to the site entrance. This permit was terminated in 2006 when BLM agreed that the permit area had been successfully reclaimed.

The Dakota sandstone unit, which crops out near the northeast corner of the property, was identified in the LTSP as a potential pathway of lateral migration of transient drainage from the disposal cell. In 2007, inspectors noted minor erosion of the surface along the outcrop. However, there was no evidence of moist soil, mineralization, or phreatophyte vegetation that would indicate that transient drainage was occurring along this interface. This was still the case at the time of the last two inspections (in 2008 and 2009) (PL–6).

The natural, undisturbed areas outside the disposal site support grass and scattered piñon and juniper trees; the primary land use is grazing. Steep hillsides north and northeast of the site slope eastward into Nicholas Wash. Areas north and northeast of the site are routinely used for recreational purposes (e.g., hunting, four-wheeling, firewood cutting). No new disturbances in the outlying areas were noted at the time of the inspection.

17.3.2 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 follow-up or contingency inspections were required in 2009.

17.3.3 Routine Maintenance and Repairs

Apart from routine noxious weed control monitoring and herbicide application, no maintenance or repairs were required in 2009.

17.3.4 Groundwater Monitoring

DOE does not monitor groundwater at this site because there is no preexisting contaminant plume at the disposal site and because the uppermost aquifer is of limited use since it is not a current or potential source of drinking water (due to low yield) (40 CFR 192.21 [g]).

17.3.5 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 2009.

17.3.6 Photographs

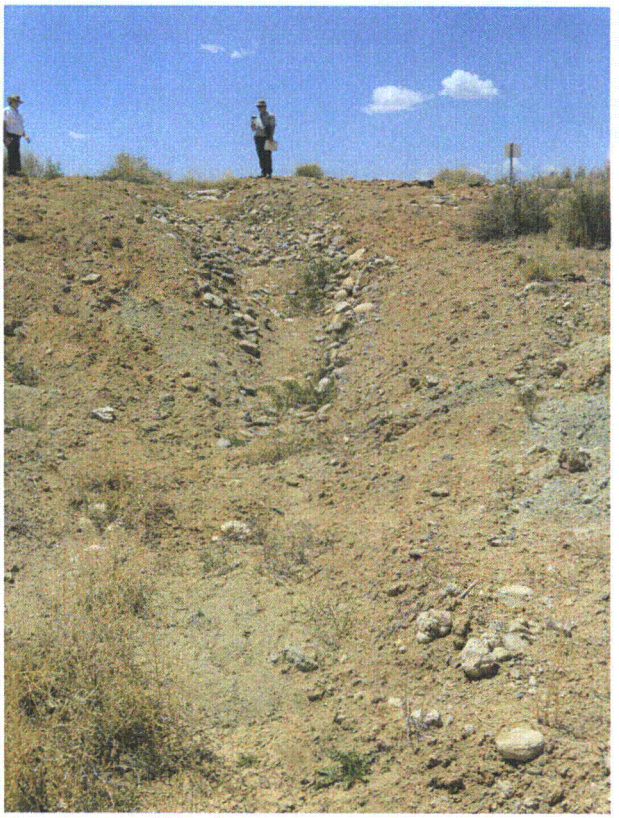
Table 17–2. Photographs Taken at the Slick Rock Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	285	View to northwest across cell top.
PL–2	135	View to southeast from west corner of cell top.
PL–3	315	View to northwest from cell apron.
PL–4	280	Erosion in west corner of retention pond.
PL–5	350	View to north-northwest of erosion southeast of apron.
PL–6	315	Dakota contact showing lack of moisture.

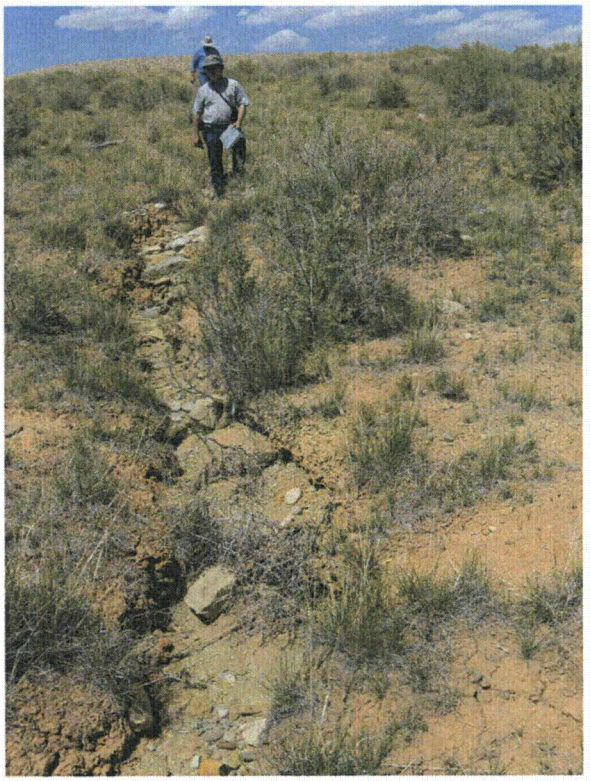
SRD 5/2009. PL–1. View to northwest across cell top.

SRD 5/2009. PL–2. View to southeast from west corner of cell top.

SRD 5/2009. PL–3. View to northwest from cell apron.



SRD 5/2009. PL–4. Erosion in west corner of retention pond.



SRD 5/2009. PL–5. View to north-northwest of erosion southeast of apron.

SRD 5/2009. PL–6. Dakota contact showing lack of moisture.

18.0 Spook, Wyoming, Disposal Site

18.1 Compliance Summary

The Spook, Wyoming, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, inspected on June 10, 2009, was in excellent condition. No evidence of settling or erosion was observed over the encapsulated waste materials. Minor erosion had occurred in the existing rills and gullies due to substantial spring precipitation. Several of the perimeter signs have faded and will be replaced. No other maintenance needs or cause for a follow-up or contingency inspection was identified.

18.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Spook Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the Spook, Wyoming, Disposal Site* (DOE/AL/350215.000, Rev. 0, U.S. Department of Energy [DOE], January 1993) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 18–1 lists these requirements.

Table 18–1. License Requirements for the Spook Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0	Section 18.3.1
Follow-Up or Contingency Inspections	Section 7.0	Section 18.3.2
Routine Maintenance and Repairs	Section 8.0	Section 18.3.3
Corrective Action	Section 9.0	Section 18.3.5

Institutional Controls—The 14-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 1993. 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 disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property and warning/no-trespassing signs along the property boundary. The site is not fenced. Verification of these institutional controls is part of the annual inspection.

Inspectors found no evidence that these institutional controls were ineffective or violated.

18.3 Compliance Review

18.3.1 Annual Inspection and Report

The site, in north-central Converse County, Wyoming, was inspected on June 10, 2009. The results of the inspection are described below. Features and the photograph locations (PLs) mentioned in this report are shown on Figure 18–1. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

18.3.1.1 Specific Site-Surveillance Features

Access Road and Signs—Access to the site, northwest of Douglas, Wyoming, is via Highway 93 to County Road 31 onto the Hornbuckle Ranch road. Site access is maintained through perpetual easements across the Hornbuckle Ranch. The road to the site is graded and hard-packed.

The site is open-range and unfenced. All 10 perimeter signs and one entrance sign were legible. Several perimeter signs have bullet holes. Perimeter sign P7 is slightly bent, and the paint is cracked. The wind has scoured soil from the base of perimeter sign P10. The text on several of the signs has faded (PL–1), and all of the signs are scheduled for replacement in 2010.

Site Markers and Monuments—Site marker SMK–2 and the eight boundary monuments and three survey monuments were in excellent condition. The concrete base of site marker SMK–1 is damaged due to spalling but is stable. Wind has scoured soil from beneath the surface concrete collar around boundary monument BM–6; however, the monument is stable.

Monitoring wells—Groundwater monitoring is not required at this site. DOE abandoned all monitoring wells in October 2000 and closed out the permits.

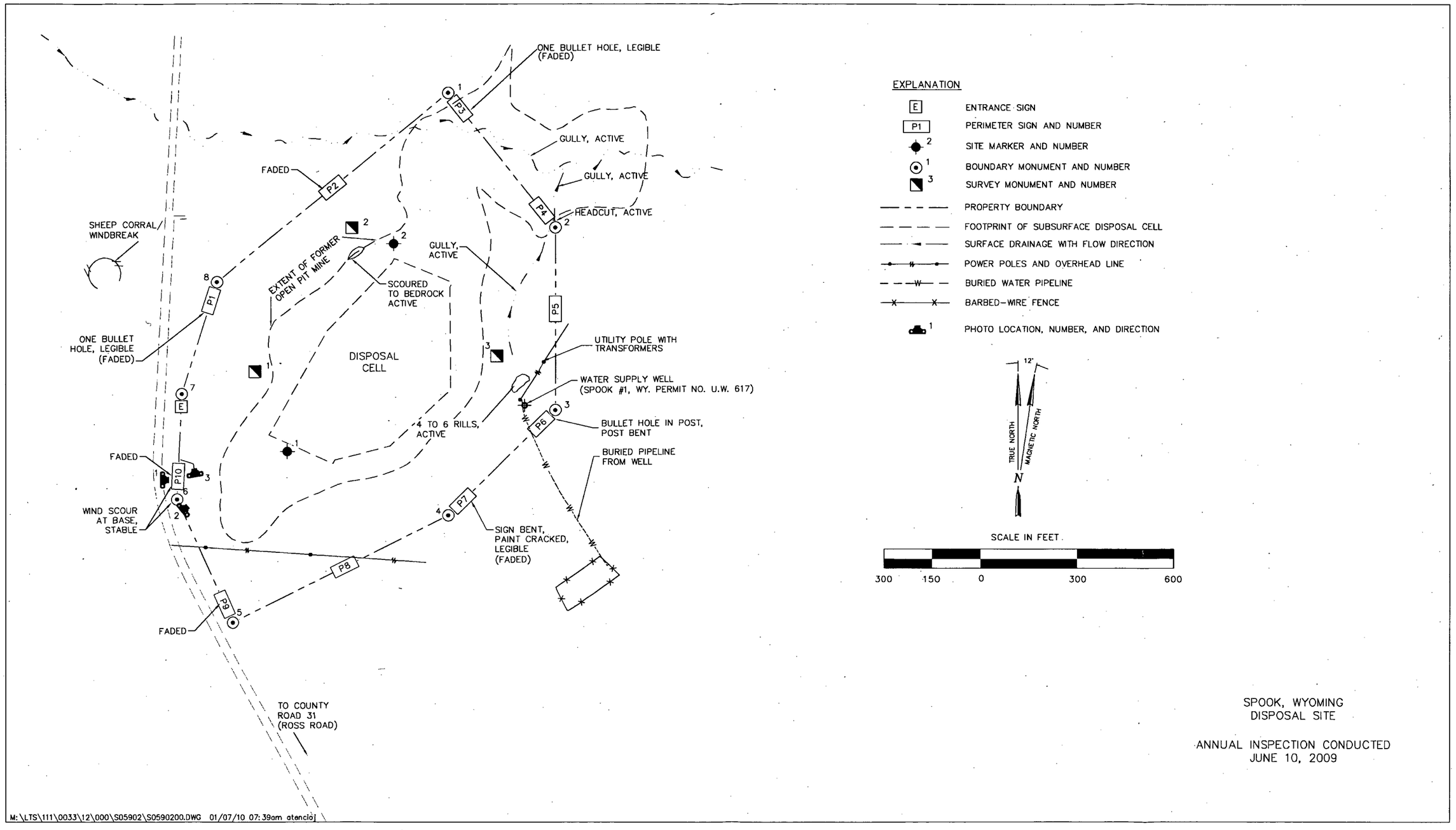
A water supply well remains on the site. The well, Spook #1 (Wyoming Permit No. U.W. 617), was installed in 1961 by the former landowner and predates site mining and milling activities. Well ownership was transferred to DOE when DOE acquired the site. It is completed in a deeper aquifer not affected by regional uranium mineralization and is permitted for 100 gallons per minute. DOE granted use of the well for agricultural and other purposes to Hornbuckle Ranch Limited Partnership through a perpetual access agreement (DE–RO13–02GJ67289). The agreement stipulates that users will hold DOE harmless from all liability associated with the use of the well. A new power pole and electrical panel were installed adjacent to the well in 2007, and a buried pipeline carries water to a storage pond southeast of the site. The pond was dry at the time of the inspection. It appears that the water was used to support drilling operations near the site.

18.3.1.2 Transects

To ensure a thorough and efficient inspection, the site is divided into three transects: (1) the disposal site, (2) the site perimeter, and (3) the outlying area.

Within each transect, the inspectors examined specific site-surveillance features, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes.

Disposal Site—The Spook Disposal Site is unique among Title I sites in that tailings were encapsulated in the bottom of an open pit mine and covered with 40 to 60 feet of clean fill and topsoil. As such, many of the observations and concerns routinely associated with above-grade disposal cells—such as the quality of the riprap, the stability of side slopes, or the presence of deep-rooted plants (biointrusion) above the radon barrier—do not apply to this site.



EXPLANATION

- E — ENTRANCE SIGN
- P1 — PERIMETER SIGN AND NUMBER
- 2 — SITE MARKER AND NUMBER
- 1 — BOUNDARY MONUMENT AND NUMBER
- 3 — SURVEY MONUMENT AND NUMBER
- PROPERTY BOUNDARY
- FOOTPRINT OF SUBSURFACE DISPOSAL CELL
- SURFACE DRAINAGE WITH FLOW DIRECTION
- POWER POLES AND OVERHEAD LINE
- BURIED WATER PIPELINE
- BARBED-WIRE FENCE
- 1 — PHOTO LOCATION, NUMBER, AND DIRECTION

SPOOK, WYOMING
DISPOSAL SITE

ANNUAL INSPECTION CONDUCTED
JUNE 10, 2009

Figure 18–1. 2009 Annual Compliance Drawing for the Spook Disposal Site

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The surface of the 5-acre disposal cell, completed in 1989, was in excellent condition (PL–2). No evidence of settling was observed over the former mine pit. Vegetation across the site, consisting of grasses and forbs, appears healthy and is indistinguishable from that which grows on the surrounding hills and valleys. The same species are present, and the overall health and density of vegetation are similar.

The site is not fenced, and the local landowner controls the grazing of cattle on the DOE property as an extension of his ranching activities. Pronghorn antelope also graze on the site. The range was healthy and has not been overgrazed.

The Pacific Power and Light Company owns a transmission line that crosses the southern end of the site. The company also owns the new utility pole with transformers that provide power to the submersible pump in the water supply well on site.

Several minor rills and gullies are on the site. They appeared to be stable during the 2008 inspection. However, substantial precipitation events prior to the 2009 inspection had caused most of the features to reactivate. The erosion is not harming the function of the cell cover or other site features, and is not a concern at this time.

Site Perimeter—This transect was in excellent condition. If there were no perimeter signs along the boundary, the perimeter of the site would be indistinguishable from the adjacent open range.

Recent precipitation had caused many of the shallow gullies along and adjacent to the property to reactivate. However, the features are minor and do not currently threaten site features' stability.

Outlying Area—The area beyond the site boundary for a distance of about 0.25 mile was examined for erosion, disturbance, change in land use, or other features of possible concern. The access road experiences frequent truck traffic to service and maintain the oil wells in the area (PL–3). Even though several wells are near the site, no evidence of trespassing or vandalism was observed.

18.3.2 Follow-Up or Contingency Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed.

No follow-up or contingency inspections were required in 2009.

18.3.3 Routine Maintenance and Repairs

No maintenance or repairs were required in 2009.

18.3.4 Groundwater Monitoring

Groundwater in the uppermost aquifer at this site is contaminated as a result of widespread, naturally occurring uranium mineralization. The aquifer is of limited use because its yield is marginal and because it cannot be cleaned up by methods reasonably employed in public water

systems. Therefore, in accordance with 40 CFR 192.21 (g), narrative supplemental standards have been applied to the site, and groundwater monitoring is not required.

18.3.5 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 at the site in 2009.

18.3.6 Photographs

Table 18–2. Photographs Taken at the Spook Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	90	Faded perimeter sign P10.
PL–2	50	Northeast view across the site.
PL–3	350	Oil well near the northwest side of the site.

SPK 6/2009. PL–1. Faded perimeter sign P10.

SPK 6/2009. PL–2. Northeast view across the site.

SPK 6/2009. PL–3. Oil well near the northwest side of the site.

19.0 Tuba City, Arizona, Disposal Site

19.1 Compliance Summary

The Tuba City, Arizona, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on April 29, 2009. The disposal cell and all associated surface water diversion and drainage structures were in good condition and functioning as designed. Although sand accumulation has increased in the apron ditch and diversion channel along the northwest side of the disposal cell, it is not adversely affecting the function of these features. Wind erosion has scoured sand and soil from exposed locations, particularly along the west fence and south side of the site. Resulting gaps under the fence will be filled in prior to the next annual inspection.

Results of groundwater monitoring performed in 2009 indicate no significant change in groundwater quality when compared to historical results. However, groundwater quality downgradient of the former millsite is still degraded due to residual historical (processing-related) contamination. No other maintenance needs or cause for a follow-up or contingency inspection was identified.

19.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Tuba City Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the Tuba City, Arizona, Disposal Site* (DOE/AL/62350–182, Rev. 0, U.S. Department of Energy [DOE], October 1996) and in procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). Table 19–1 lists these requirements.

Table 19–1. License Requirements for the Tuba City Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.1	Section 19.3.1
Follow-Up or Contingency Inspections	Section 7.0	Section 19.3.2
Routine Maintenance and Repairs	Section 8.0	Section 19.3.3
Groundwater Monitoring	Section 5.2	Section 19.3.4
Corrective Action	Section 9.0	Section 19.3.5

Institutional Controls—The United States Bureau of Indian Affairs holds the 145-acre disposal site in trust. The Navajo Nation retains title to the land. 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. The U.S. Nuclear Regulatory Commission (NRC) required DOE to enter into Cooperative Agreement DE–FC04–85AL26731 with the Navajo Nation to perform remedial actions at the former processing sites prior to bringing the site under the general license. DOE and the Navajo Nation executed a Custodial Access Agreement (CAA) that conveys to the federal government title to the residual radioactive materials stabilized at the repository site and ensures that DOE has perpetual access to the site.

The site was accepted under NRC general license (10 CFR 40.27) in 1996 for compliance with 40 CFR 192, Subpart A. Institutional controls at the disposal site, as defined by DOE Policy 454.1, consist of federal control of the property, a site perimeter security fence,

warning/no-trespassing signs (called perimeter signs) along the property boundary, and a locked gate at the entrance to the site. Verification of these institutional controls is part of the annual inspection. Inspectors found no evidence that these institutional controls were ineffective or violated.

19.3 Compliance Review

19.3.1 Annual Inspection and Report

The site, located east of Tuba City, Arizona, was inspected on April 29, 2009. Results of the inspection are described below. Figure 19–1 shows the features and photograph locations (PLs) mentioned in this report. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

Many structures and features at the site—including an office building, a water treatment plant, a solar water-heating system, evaporation ponds, a network of extraction and injection wells, and a treated water infiltration system—are associated with the active treatment of contaminated groundwater, which is ongoing. The purpose of the active groundwater remediation is to mitigate contamination resulting from former uranium processing that occurred at the site. These activities are not addressed in the LTSP, however, because they are not related to the long-term disposal and stabilization of encapsulated contaminated materials. As such, associated features are not included in the annual inspection and are only addressed herein as they relate to site integrity or safety concerns.

19.3.1.1 Specific Site-Surveillance Features

Access Road, Fence, Gate, and Signs—The site is accessed directly from U.S. Highway 160. Perpetual access to the site is granted by the CAA. A gate in a fence on the highway right-of-way allows access to the site along a gravel access road; the site entrance gate is at the perimeter security fence. The access gate, road, and entrance gate to the site were in good condition. The gates were open at the time of the inspection because of ongoing groundwater remediation operations at the site. Entrance signs on both gates were in good condition. The two vehicle gates located on the south side of the perimeter fence were locked and in good condition. However, a significant gap found under the vehicle gate in the southeast corner of the site (PL–1) was repaired.

19A The security fence was intact and was generally in good condition. However, excessive wind erosion that occurred during the spring caused scouring of sand and soil along the west fence section, exposing the concrete base of several fence posts and leaving numerous gaps under the fence. These gaps were later repaired.

Perimeter signs are posted in pairs and are all in good condition (all 30 perimeter signs were replaced with new aluminum signs in 2008). Each sign pair, secured to a metal post, consists of a no-trespassing sign, and a schematic sign with a diagram of the disposal cell and the site boundary. Both signs include a radioactive-materials tri-foil symbol.

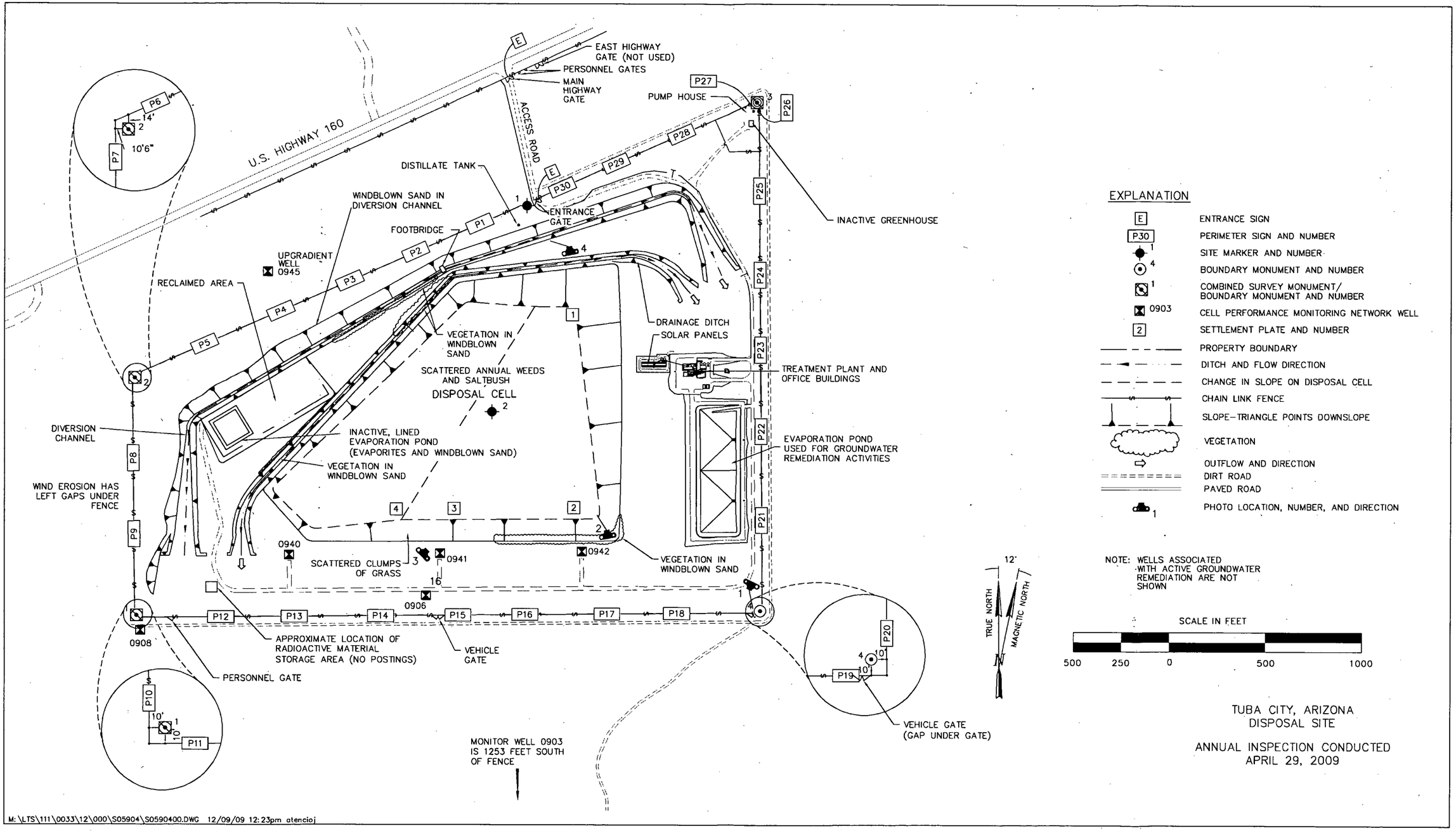

Figure 19–1. 2009 Annual Compliance Drawing for the Tuba City Disposal Site

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Markers and Monuments—The two granite site markers—one just inside and to the right of the entrance gate, and the other on top of the disposal cell—were in good condition. The survey and boundary monuments were also in good condition.

Monitoring wells—Seven wells constitute the cell performance monitoring network (MW–0903, MW–0906, MW–0908, MW–0940, MW–0941, MW–0942, and MW–0945). The six wells inside and immediately adjacent to the disposal site were secure and in good condition. Monitoring well MW–0903, located about 0.25 mile south of the cell, was not inspected, but is maintained by personnel performing the annual sampling and was reported locked and in good condition.

19.3.1.2 Transects

To ensure a thorough and efficient inspection, inspectors divided the site into three areas called "transects": (1) the disposal cell; (2) the area between the disposal cell and the site boundary; and (3) the outlying area. The area inside each transect was inspected by walking a series of traverses.

Within each transect, the inspectors examined specific site-surveillance features, drainage structures, vegetation, and other features. Inspectors also examined the site for evidence of settlement, erosion, or other modifying processes.

Disposal Cell—The disposal cell is covered with riprap to control erosion. At the time of the inspection, the rock cover material was in good condition and showed no signs of deterioration. No evidence of differential settlement or slumping was observed. All visible components of the disposal cell and cover were in good condition (PL–2).

In accordance with the LTSP, deep-rooted vegetation is removed or controlled to prevent potential penetration of the radon barrier. The most recent removal effort occurred in 2004. Since then, periodic application of herbicide has been very effective in controlling deep-rooted vegetation growth on the cell cover. Herbicide was last applied to saltbush shrubs on the disposal cell in April 2008. This treatment appears to have been effective, as these shrubs were dead at the time of the 2009 inspection. However, several new small shrubs were observed growing on the cell; therefore, additional treatment is planned for 2010. Scattered patches of grass and annual weeds also grow on the cell top and side slopes, but these shallow-rooted plants are not a concern.

Sand accretion and vegetation encroachment are still evident at several locations along the south side slope (PL–3). Annual photographs are taken at these locations to document changes in sand accretion and vegetation conditions. Sand accretion has likely increased in the last year, but no significant change in vegetation cover or density was noted.

Area Between the Disposal Cell and the Site Boundary—The apron drainage ditch at the base of the disposal cell and the diversion channel, both located along the north and northwest sides of the cell, are in good condition. As noted during the 2007 and 2008 annual inspections, erosion along the north bank of the diversion channel near the distillate tank has resulted in sediment accumulation in the channel (PL–4). After the 2009 inspection, the erosion rill was removed, and rock was placed in the area to reduce erosion.

19B

Windblown sand deposition continues to be monitored at the site because unstable dunes in outlying areas can contribute to sand accumulation along fence lines, in diversion channels, and in the rock cover of the disposal cell. Successive wind storms during the spring of 2009 have resulted in wind erosion and sand accumulation at various locations on the site. Sand accretion and vegetation encroachment have been checked annually since 2001 in the diversion channel and apron drainage ditch on the west and northwest sides of the cell. A comparison of photographs taken in 2009 with those taken in previous years indicates additional accumulations of sand and vegetation in these areas. However, these accumulations are not adversely affecting the performance of these features at this time.

In 2007, two of the three evaporation ponds located near the northwest side of the disposal cell were removed, and the area was reclaimed. The reclaimed area was reseeded, but it appears that the spring wind storms scoured much of the topsoil from the area, and very few live plants were observed. Revegetation progress in this area will continue to be monitored. The remaining pond is retained as a backup for the main evaporation pond located on the east side of the site.

Outlying Area—The area beyond the site boundary for a distance of about 0.25 mile was examined for erosion, disturbance, change in land use, and other features of possible concern. The only notable change observed during the 2009 inspection was wind erosion of sand dunes on the west side of the site.

19.3.2 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 follow-up or contingency inspections were required in 2009.

19.3.3 Routine Maintenance and Repairs

Several gaps under the perimeter fence were filled in, and an erosion rill along the diversion channel near the distillate tank was repaired. No other maintenance or repairs were required in 2009.

19.3.4 Groundwater Monitoring

In accordance with the LTSP, DOE monitors groundwater to compare current conditions to baseline post-construction (disposal cell) groundwater quality at the site. Groundwater quality
19C beneath and downgradient of the disposal cell has been degraded by contamination from former uranium-processing activities. This preexisting (legacy) processing-site-related groundwater contamination might mask any contamination leaching from the disposal cell. Additionally, transient drainage resulting from the presence of wet tailings and slimes placed within the disposal cell may also occur that would not reflect cell performance. These conditions limit the effectiveness of normal point-of-compliance (POC) groundwater monitoring as a reliable indicator of cell performance (40 CFR 192, Subpart A).

Given the preexisting processing-site-related contamination described above, long-term groundwater monitoring at POC wells in the uppermost aquifer to demonstrate cell performance is not technically feasible at the Tuba City Site. Therefore, groundwater monitoring is performed in accordance with Section 5.2.2 of the LTSP and is defined as *evaluative monitoring*. According to the LTSP, the purpose of this monitoring is to (1) evaluate trends in groundwater quality in the uppermost aquifer, (2) monitor the downgradient extent of contamination in groundwater, and (3) analyze the impacts of transient drainage and surface runoff. Preexisting processing-site-related groundwater contamination at the site is currently under remediation (40 CFR 192, Subpart B).

In accordance with the LTSP, seven compliance wells (Table 19–2) are monitored for four target analytes: molybdenum, nitrate (nitrate plus nitrite as nitrogen), selenium, and uranium. Because of the preexisting groundwater contamination, the LTSP provides provisional upper baseline limits (UBLs) as the main criteria for assessing the results of the evaluative monitoring (Table 19–3). As stated in the LTSP, maximum concentration limits (MCLs) are not appropriate for determining the concentration limits needed to evaluate disposal cell performance.

Table 19–2. Groundwater Monitoring Network at the Tuba City Disposal Site

Monitoring well	Hydrologic Relationship	Monitoring Frequency
MW-0903	Downgradient (Off-site)	Annually
MW-0906	Downgradient	Semiannually
MW-0908	Downgradient	Semiannually
MW-0940[a]	Downgradient	Semiannually
MW-0941	Downgradient	Semiannually
MW-0942	Downgradient	Semiannually
MW-0945	Upgradient (Background)	Annually

[a] MW–0940 has not been sampled since February 2004 due to an insufficient volume of water.

Table 19–3. Provisional Upper Baseline Limits for Groundwater at the Tuba City Disposal Site

Constituent	Provisional UBL (mg/L)[a]
Molybdenum	0.14
Nitrate (as Nitrogen)	311[b]
Selenium	0.05
Uranium	1.171

[a] The LTSP provides provisional UBLs.
[b] 311 mg/L (for nitrate as nitrogen) was calculated based on the 1,379 mg/L UBL for nitrate cited in the LTSP.
mg/L = milligrams per liter
UBL = upper baseline limit

Evaluative groundwater monitoring in 2009 was conducted in February (for those wells sampled semiannually) and in August (for all wells; see Table 19–2). As has been the case since August 2004, it was not possible to obtain a sample from well MW–0940 because of an insufficient volume of water, reflecting the ongoing groundwater remediation pumping being conducted at the site. Until that time, concentrations of nitrate and (in most cases) selenium had been the highest in this well.

Sample results from the 2009 evaluative monitoring indicate that groundwater quality downgradient of the former millsite (in on-site wells MW–0906, MW–0908, MW–0940, MW–0941, and MW–0942) is still degraded with respect to concentrations of the four target analytes in the upgradient well (MW–0945). Figures 19–2 through 19–5 show time-concentration plots for the four analytes, beginning in 1998.

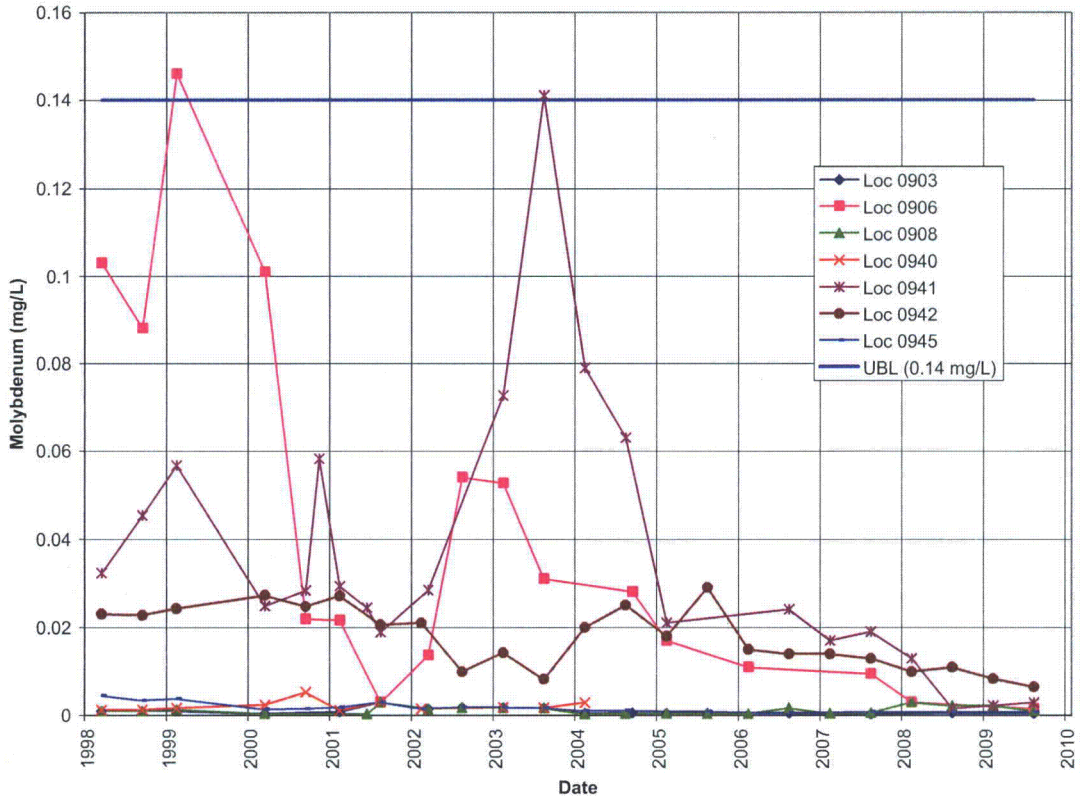


Figure 19–2. Time-Concentration Plots of Molybdenum in Groundwater at the Tuba City Disposal Site

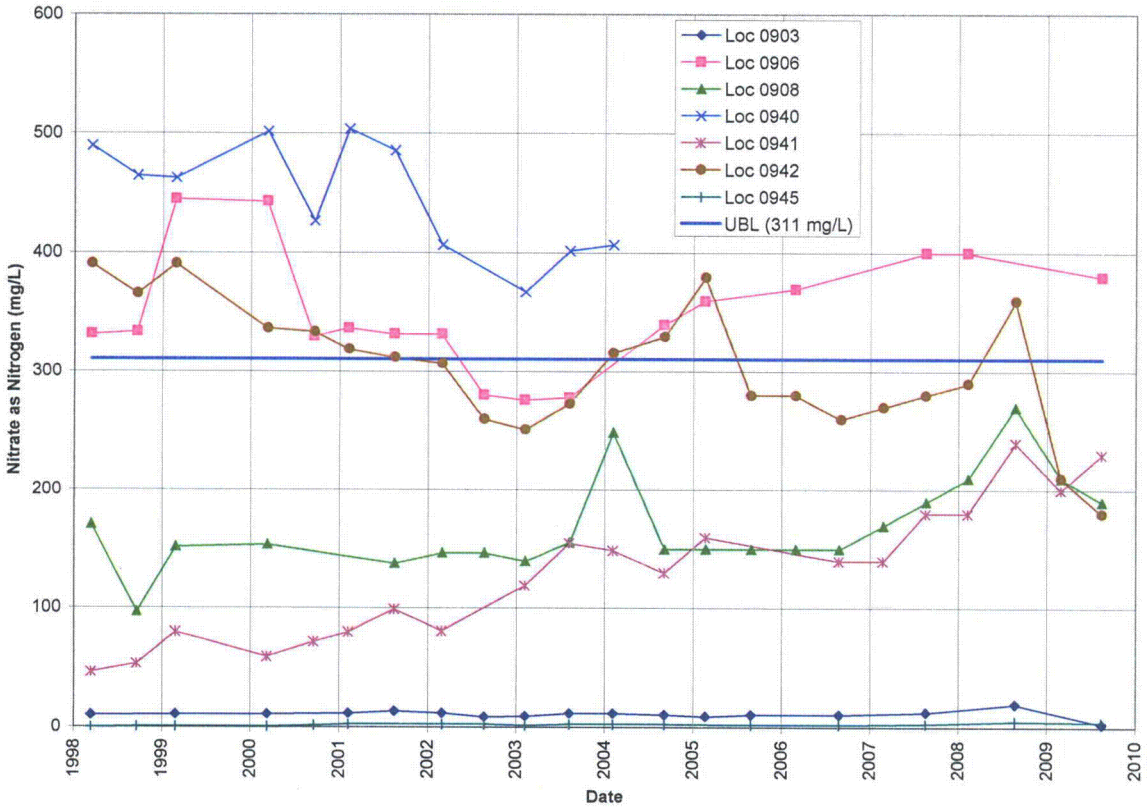


Figure 19–3. Time-Concentration Plots of Nitrate in Groundwater at the Tuba City Disposal Site

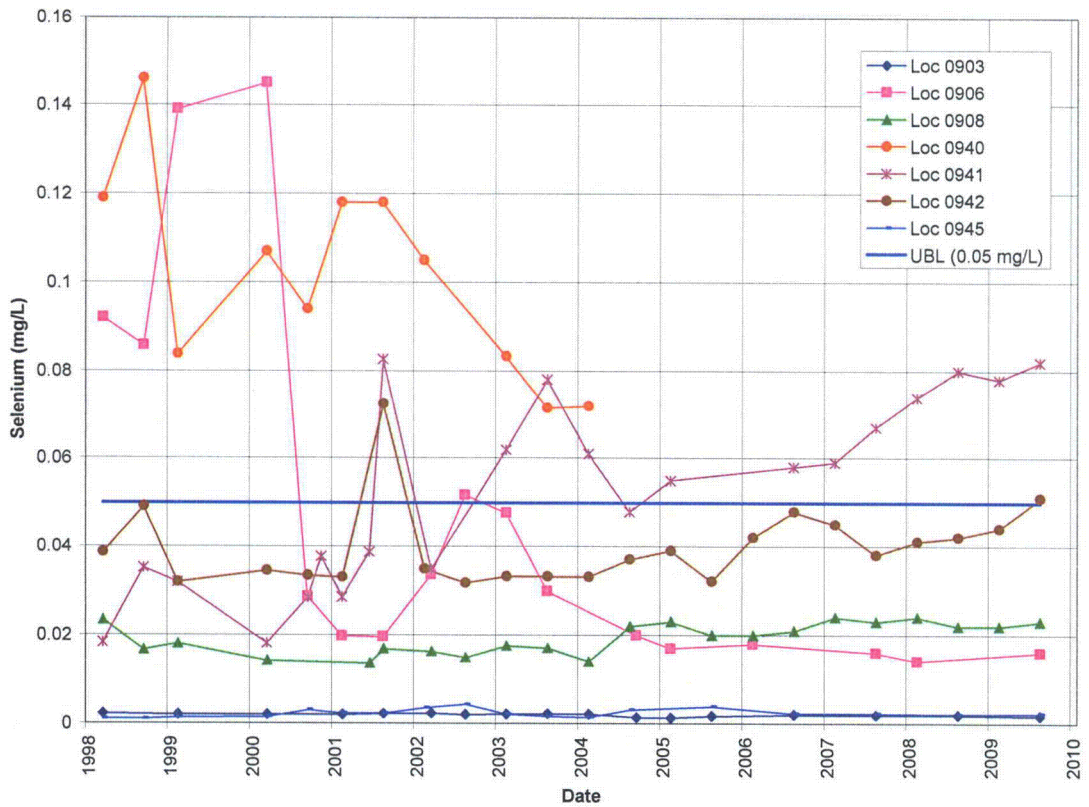


Figure 19–4. Time-Concentration Plots of Selenium in Groundwater at the Tuba City Disposal Site

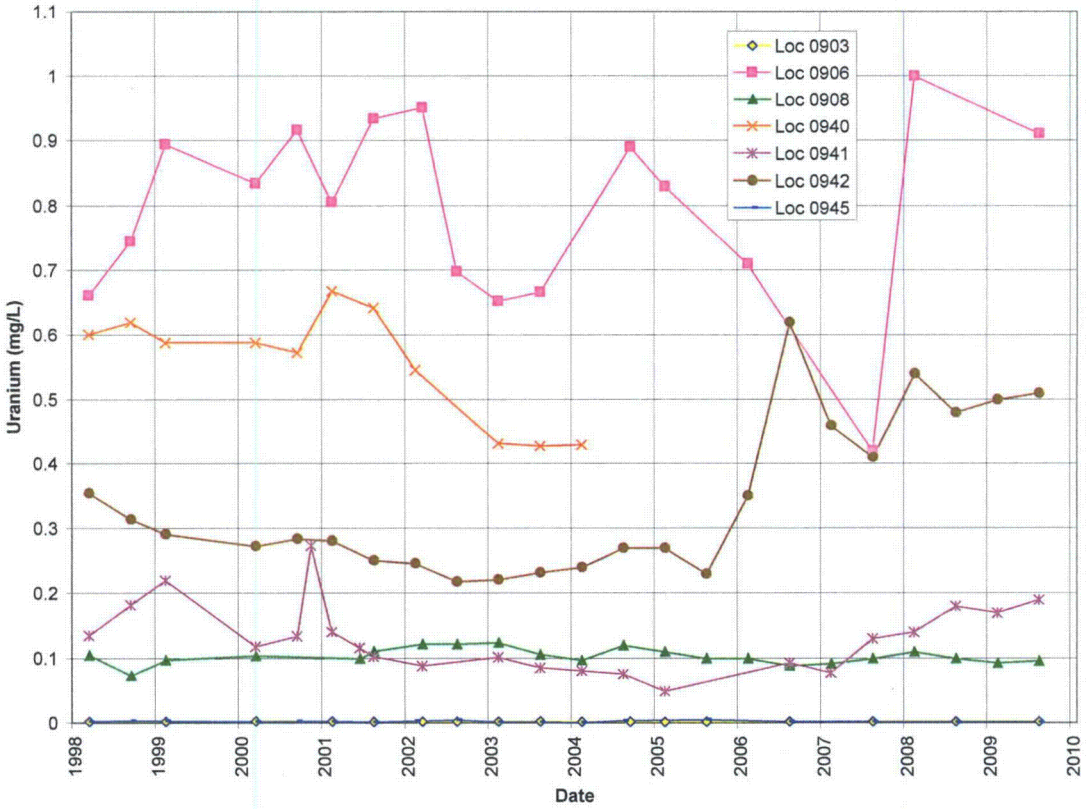


Figure 19–5. Time-Concentration Plots of Uranium in Groundwater at the Tuba City Disposal Site

For all four analytes, concentrations in the off-site downgradient well MW–0903 (approximately 1,250 feet from the site) are comparable with those detected in the upgradient (background) well MW–0945, significantly lower than the on-site cell performance wells, and well below corresponding MCLs and UBLs.

In 2009, molybdenum concentrations in groundwater were below the 0.1 mg/L MCL and the 0.14 mg/L UBL in all wells (Figure 19–2). This has been the case since 2004, when concentrations began a downward trend in wells MW–0906 and MW–0941. Molybdenum concentrations in remaining wells have consistently been below 0.03 mg/L; results for MW–0908 and MW–0940 (last sampled in 2004) are comparable to background (MW–0945). Concentrations in both the off-site downgradient well MW–0903 and the upgradient background well MW–0945 remain at or near the detection limit (0.0001 mg/L).

Since 1998, nitrate concentrations in all on-site downgradient wells—MW–0906, MW–0908, MW–0941, and MW–0942—have exceeded the 10 mg/L MCL by an order of magnitude or more (Figure 19–3). Nitrate concentrations exceeding the 311 mg/L UBL have only been measured in MW–0906 (currently stable at approximately 400 mg/L), MW–0942 (last exceedance in August 2008), and MW-0940 (dry since 2004). Nitrate in wells MW–0908 and MW–0941 has increased since 2003, but concentrations are still below the UBL (both at approximately 200 mg/L in 2009). The nitrate concentration measured in the off-site downgradient well MW–0903 was only 3 mg/L, less than the 10 mg/L MCL and well below the UBL. Concentrations in the upgradient background well MW–0945 remain below the MCL.

As shown in Figure 19–4, selenium concentrations measured in groundwater in 2009 exceeded the 0.01 mg/L MCL in all wells except for the off-site downgradient well MW–0903 and the upgradient background well MW–0945. However, selenium concentrations in most wells are below the 0.05 mg/L UBL. The only exception is MW–0941, where 0.08 mg/L was measured in both samples collected in 2009. Both MW–0941 and MW–0942 exhibit slightly increasing trends in selenium concentrations.

In 2009, uranium concentrations in groundwater exceeded the 0.044 mg/L MCL but remained below the 1.17 mg/L UBL in all on-site downgradient wells (Figure 19–5). Concentrations in the upgradient well MW–0945 and the off-site downgradient well MW–0903 remain below 0.044 mg/L. Although uranium in well MW–0906 was essentially halved (from 0.8 to 0.4 mg/L) between 2005 and 2007, it rebounded to a historical maximum of 1.0 mg/L in 2008 and remained stable in 2009 (0.9 mg/L).

Active groundwater remediation is ongoing at the site. The wells used for the evaluative monitoring of cell performance are a subset of the groundwater remediation monitoring well network. The progress of groundwater remediation is evaluated annually, but remediation has not been active long enough to determine if the disposal cell is performing as designed.

19.3.5 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 2009.

19.3.6 Photographs

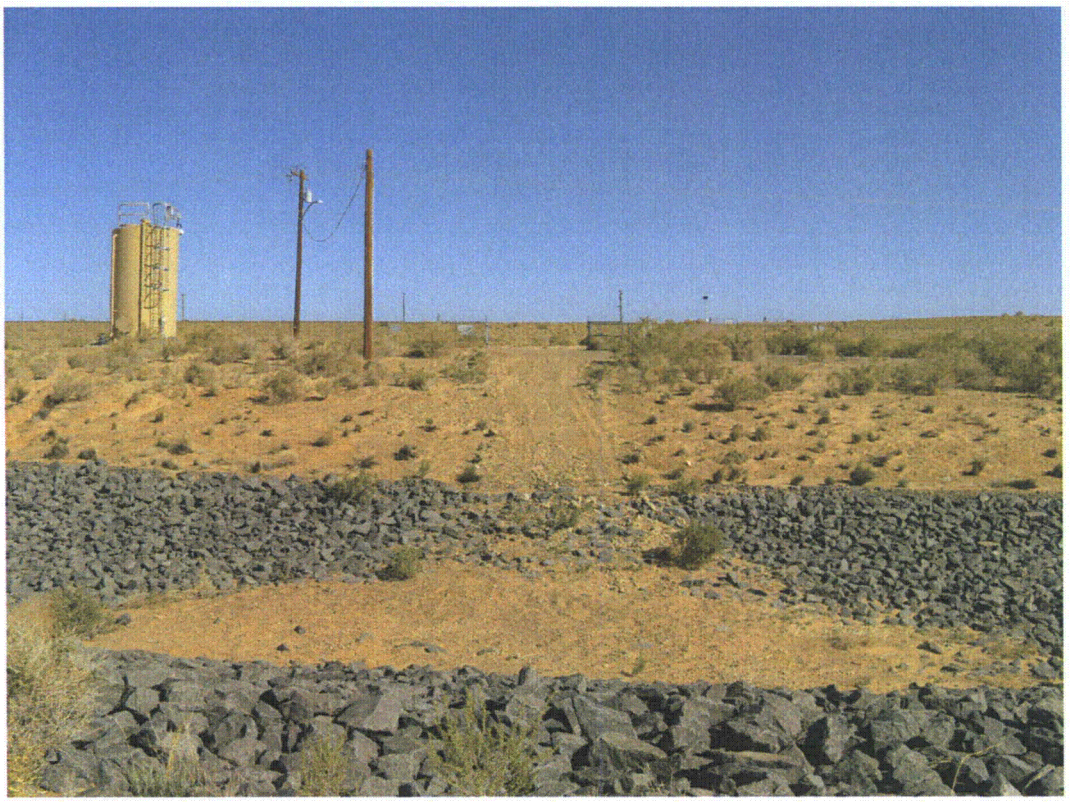
Table 19–4. Photographs Taken at the Tuba City Disposal Site

Photograph Location Number	Azimuth	Description
PL–1	205	Gap under the vehicle gate at the southeast corner of the site.
PL–2	350	View to the north showing the east edge of the disposal cell cover.
PL–3	45	Vegetation encroachment on the south side slope of the disposal cell. Photograph taken from extraction well 1107.
PL–4	350	Erosion deposition into the north diversion channel below the distillate tank.

TUB 4/2009. PL–1. Gap under the vehicle gate at the southeast corner of the site.

TUB 4/2009. PL–2. View to the north showing the east edge of the disposal cell cover.

TUB 4/2009. PL–3. Vegetation encroachment on the south side slope of the disposal cell. Photograph taken from extraction well 1107.



TUB 4/2009. PL–4. Erosion deposition into the north diversion channel below the distillate tank.

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