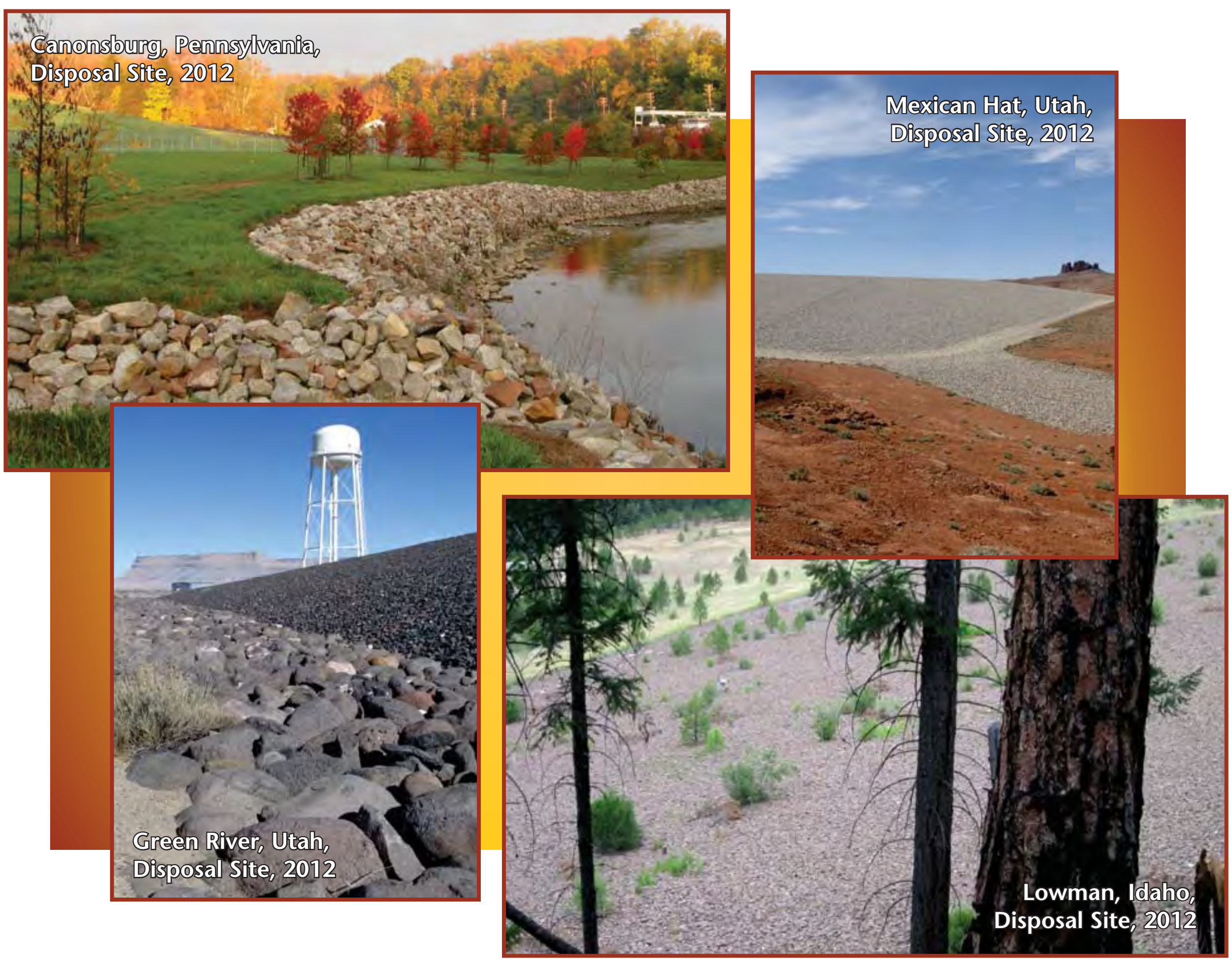
LMS/S09461

U.S. DEPARTMENT OF
ENERGY

Legacy
Management

2012 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title I Disposal Sites

February 2013



Canonsburg, Pennsylvania, Disposal Site, 2012

Mexican Hat, Utah, Disposal Site, 2012

Green River, Utah, Disposal Site, 2012

Lowman, Idaho, Disposal Site, 2012

LMS/S09461

U.S. Department of Energy
Office of Legacy Management

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Abbreviations

ACL	alternate concentration limit
BLM	U.S. Bureau of Land Management
CFR	*Code of Federal Regulations*
D_{50}	mean diameter
DOE	U.S. Department of Energy
EDA	energy dissipation area
EPA	U.S. Environmental Protection Agency
FM	Farm-to-Market Road
GCAP	Groundwater Compliance Action Plan
LM	Office of Legacy Management
LTSP	Long-Term Surveillance Plan
MCL	maximum concentration limit
mg/L	milligrams per liter
NECA	Navajo Engineering and Construction Authority
NMED	New Mexico Environment Department
NRC	U.S. Nuclear Regulatory Commission
PL	photograph location
POC	point-of-compliance
ROW	right of way
UBL	upper baseline limit
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978 (88 USC 7901, *et seq*.)

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Executive Summary

This report, in fulfillment of a license requirement, presents the results of long-term surveillance and maintenance activities conducted by the U.S. Department of Energy (DOE) Office of Legacy Management (LM) in 2012 at 19 uranium mill tailings disposal sites established under Title I of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978.[1] These activities verified that the UMTRCA Title I disposal sites remain in compliance with license requirements.

DOE operates 18 UMTRCA Title I sites under a general license granted by the U.S. Nuclear Regulatory Commission (NRC) in accordance with Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27). As required under the general license, a long-term surveillance plan (LTSP) for each site was prepared by DOE and accepted by NRC. The Grand Junction, Colorado, Disposal Site, one of the 19 Title I sites, will not be included under the general license until the open, operating portion of the cell is closed. The open portion will be closed either when it is filled or in 2023. This site is inspected in accordance with an interim LTSP.

Long-term surveillance and maintenance services for these disposal sites include inspecting and maintaining the sites; monitoring environmental media and institutional controls; conducting any necessary corrective actions; and performing administrative, records, stakeholder relations, and other regulatory stewardship functions.

Annual site inspections and monitoring are conducted in accordance with site-specific LTSPs and procedures established by DOE to comply with license requirements. Each site inspection is performed to verify the integrity of visible features at the site; to identify changes or new conditions that may affect the long-term performance of the site; and to determine the need, if any, for maintenance, follow-up or contingency inspections, or corrective action in accordance with the LTSP. LTSPs and site compliance reports are available on the Internet at http://www.lm.doe.gov/.

All of the sites require some degree of routine monitoring and maintenance, which may include groundwater and surface water monitoring, minor erosion control, vegetation control, fence and gate repairs, sign replacement, and minor trash removal. The following nonroutine activities[2] occurred in 2012:

- Lakeview, Oregon:
  - Rock riprap durability monitoring was integrated into the LTSP gradation monitoring per the request of NRC.
- Rifle, Colorado:
  - DOE continues to remove and evaporate pore water from the disposal cell, a task that began in 2001 in response to exceeding the LTSP-required action level.

[1] Congress directed that the Moab, Utah, Processing Site be remediated under Title I of UMTRCA. This site eventually will become the 20th Title I disposal site.
[2] Nonroutine activities are activities implemented in response to changes in site conditions, regulatory setting, or management structure following a regulatory compliance review.

Results of the annual site inspection, maintenance, and monitoring activities are reported in the site-specific chapters that follow. Actions and issues are summarized in the following table, which includes an index number for each item that can be found in the left margin next to the corresponding text in the respective site chapter.

2012 Summary of UMTRCA Title I Site Actions and Issues

Site	Chapter	Page	Index No.	Actions and Issues
Ambrosia Lake, New Mexico	1	1–6	1A	Groundwater monitoring
Burrell, Pennsylvania	2	2–7 2–7	2A 2B	Maintenance: routes to wells mowed Groundwater monitoring: next scheduled in 2013
Canonsburg, Pennsylvania	3	3–7 3–10	3A 3B	Maintenance: mowing along boundary fence and disposal cell Groundwater monitoring frequency change approved
Durango, Colorado	4	4–8 4–8	4A 4B	Maintenance: repair chip in site marker SMK-1 Groundwater monitoring
Falls City, Texas	5	5–6 5–8 5–8	5A 5B 5C	Riprap movement monitoring Maintenance: fence posts to be straightened Groundwater monitoring
Grand Junction, Colorado	6	6–7 6–7	6A 6B	Maintenance: damaged perimeter sign replaced Groundwater monitoring
Green River, Utah	7	7–6 7–6	7A 7B	Maintenance: missing perimeter sign replaced Groundwater monitoring
Gunnison, Colorado	8	8–7	8A	Groundwater monitoring: next scheduled in 2016
Lakeview, Oregon	9	9–7 9–10	9A 9B	Evaluation: riprap gradation and durability monitoring Groundwater monitoring: next scheduled in 2014
Lowman, Idaho	10			None
Maybell, Colorado	11	11–9	11A	Maintenance: minor fence repair
Mexican Hat, Utah	12	12–7 12–7	12A 12B	Maintenance: missing radiological sign and warning sign to be replaced Seep monitoring
Naturita, Colorado	13	13–6 13–6	13A 13B	Maintenance: minor fence repair Groundwater monitoring: next scheduled in 2014
Rifle, Colorado	14	14–8 14–8 14–8	14A 14B 14C	Maintenance: fence repairs to be performed Maintenance: pump removal Disposal cell pore water monitoring
Salt Lake City, Utah	15	15–6	15A	Riprap degradation monitoring
Shiprock, New Mexico	16	16–7 16–7 16–7	16A 16B 16C	Maintenance: cover open research pits Maintenance: reestablish/unbury boundary monuments Maintenance: replace missing sign
Slick Rock, Colorado	17	17–6	17A	Maintenance: locate and repair or replace survey monument
Spook, Wyoming	18			None
Tuba City, Arizona	19	19–6	19A	Groundwater monitoring

1.0 Annual Inspection of the Ambrosia Lake, New Mexico, UMTRCA Title I Disposal Site

1.1 Compliance Summary

The Ambrosia Lake, New Mexico, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on August 21, 2012. The disposal cell was in excellent condition. No maintenance needs or cause for a follow-up or contingency inspection was identified.

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

1.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Ambrosia Lake, New Mexico, Disposal Site* (DOE/AL/62350–211, Rev. 1, U.S. Department of Energy [DOE], July 1996; 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 1–1 lists these requirements.

Table 1–1. License Requirements for the Ambrosia Lake Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0	Section 1.4
Follow-Up or Contingency Inspections	Sections 6.0 and 7.0	Section 1.5
Maintenance and Repairs	Section 8.0	Section 1.6
Groundwater Monitoring	Section 5.0	Section 1.7.1
Corrective Action	Section 9.0	Section 1.8

1.3 Institutional Controls

The 288-acre 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, and a locked gate at the access road.

1.4 Inspection Results

The site, north of Grants, New Mexico, was inspected on August 21, 2012. R. Johnson and S. Hall of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. D. Barr, the DOE Office of Legacy Management site manager, attended the inspection.

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

1.4.1 Site Surveillance Features

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

1.4.1.1 Entrance Gates, Entrance Signs, and Access Road

Access to the site is along a gravel road that crosses private property and leads to the site for approximately 1 mile from New Mexico State Highway 509. There is a locked gate across this road where it leaves Highway 509 because the road continues to private mining and grazing interests that lie east of the site. Numerous locks are connected in series to allow other users to pass through the gate. The access road continues through the DOE-owned property along the southern boundary of the site. DOE has been granted permanent access to the site. DOE does not maintain the access road.

The entrance sign was in good condition (PL–1).

1.4.1.2 Perimeter Fence and Perimeter Signs

The site is not fenced. Seventy perimeter signs, positioned on the site boundary, also were in good condition. Posts for perimeter signs P1 through P15 include mining-restriction-area warning signs (PL–2).

1.4.1.3 Site Markers

Granite site markers are located near the site entrance (SMK–1) and on top of the disposal cell (SMK–2). Both site markers were in excellent condition (PL–3 and PL–4). No maintenance or deferred maintenance needs were identified for these real property assets.

1.4.1.4 Survey Monuments and Boundary Monuments

Three combined survey and boundary monuments, and five additional boundary monuments, identify the property corners and boundary. All of the monuments were undisturbed and in good condition (PL–5).

1.4.1.5 Monitoring Wells

Monitoring wells 0409, 0675, and 0678 were in good condition (PL–6, PL–7, and PL–8). Gully formation adjacent to monitoring well 0678 appears to be stable, and the well is not threatened.

1.4.1.6 Mine Vent

A mine vent shaft, associated with an abandoned underground mine, is within the site boundary in the northern portion of the site. The vent has a casing, which rises approximately 3 feet above the ground, and a spot-welded cover. The vent was secure at the time of the inspection. Inspectors will continue to monitor the condition of the vent to ensure that the closure remains secure.

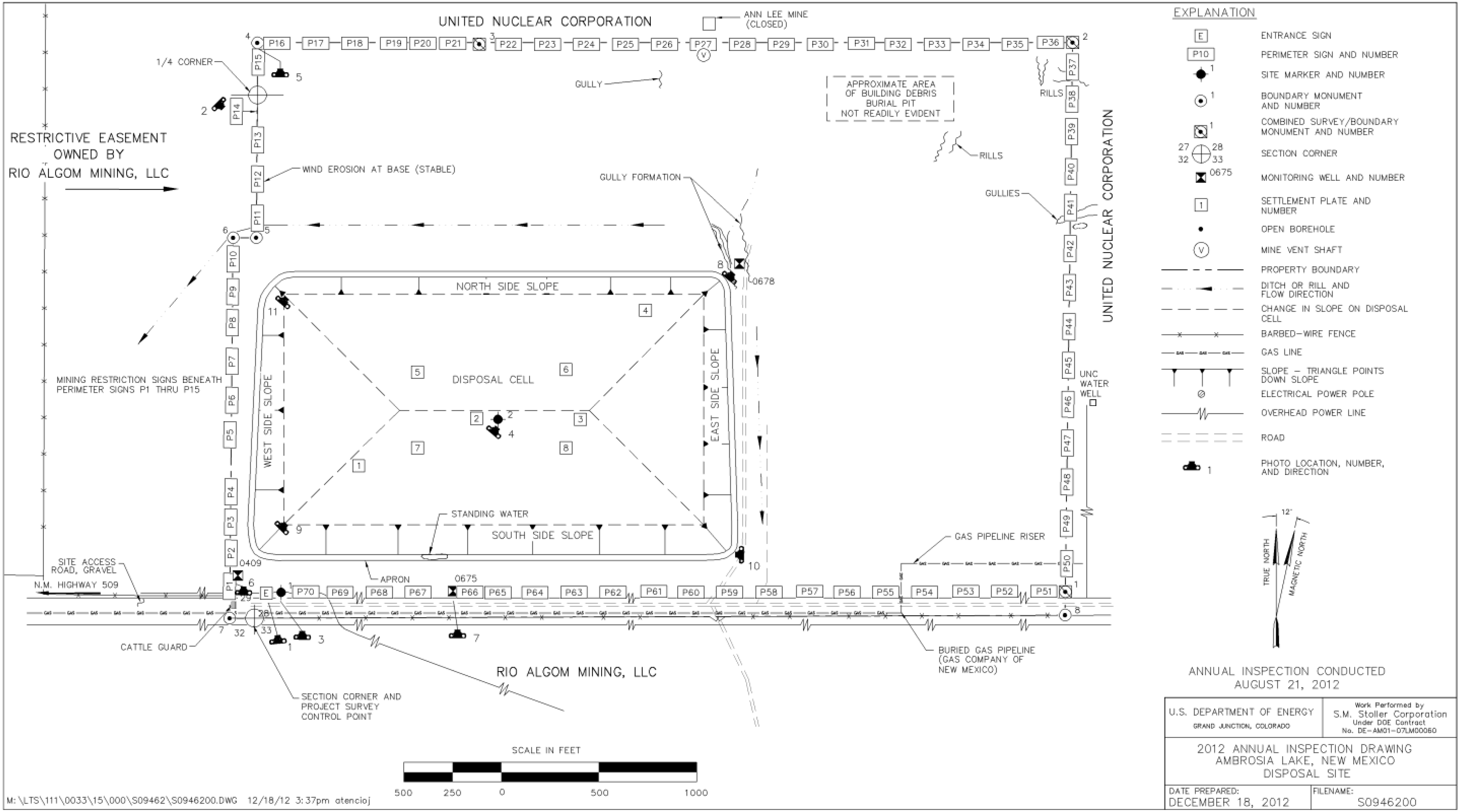

Figure 1–1. 2012 Annual Compliance Drawing for the Ambrosia Lake Disposal Site

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1.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (1) the riprap-covered top of the disposal cell, (2) the riprap-covered side slopes and apron of the cell, (3) the graded and revegetated area between the disposal cell and the site perimeter, and (4) the outlying area.

Within each area, inspectors examined specific site surveillance features, such as monitoring wells, boundary monuments, and signs. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

1.4.2.1 Top of Disposal Cell

The 91-acre disposal cell was completed in 1994. The basalt riprap-covered top slope of the disposal cell was in excellent condition. There was no evidence of cracking, slumping, or erosion (PL–9).

A shallow depression around settlement plate SP–4, near the northeast corner of the disposal cell cover, was first noted during the 1997 inspection and continued to grow in depth and area in subsequent years. The depression was repaired in August 2005. Surveys of the eight settlement plates were conducted in September 2005, September 2006, and September 2007 to monitor for continued settlement at SP–4. The surveys indicated no significant changes at the repaired location. Additional surveys will be conducted only if significant settlement is observed. Visual observations during the 2012 inspection indicate that no apparent settlement has occurred since the depression was repaired.

Scattered annual weeds and perennial grasses and forbs are growing on the disposal cell top slope. In accordance with the LTSP, deep-rooted shrubs are to be removed from the cell cover. None were present at the time of the inspection.

1.4.2.2 Side Slopes and Apron

The basalt riprap-covered side slopes and apron were in excellent condition and showed no evidence of cracking, settling, slumping, or erosion (PL–10). Standing water from recent rainfall events was present in the apron along the south side of the disposal cell. This water likely dissipates both through evaporation and through infiltration into the underlying alluvium.

1.4.2.3 Graded and Revegetated Site Area

In general, site vegetation appeared to be healthy. However, some areas are windswept and have little growth, particularly in an area north of the disposal cell where mill tailings had formerly been stockpiled (PL–11). Revegetation has not progressed sufficiently to sustain grazing.

Rills and gullies within the DOE property north and east of the disposal cell have been monitored for several years. These erosional features, which appear to be stabilizing, do not threaten the disposal cell's performance or integrity. The features are sufficient distances from the disposal cell. Headward erosion is occurring away from the cell, and there is no significant sedimentation.

1.4.2.4 Outlying Area

The area within 0.25 mile of the site boundary was inspected. There were no activities in the immediate vicinity that would impact the site.

1.5 Follow-Up or Contingency Inspections

DOE will conduct follow-up or contingency 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 or in the vicinity of the site are substantially changed.

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

1.6 Maintenance and Repairs

No maintenance needs were identified during the inspection.

1.7 Environmental Monitoring

1.7.1 Groundwater Monitoring

In accordance with the LTSP, groundwater monitoring is not required at this site because (1) the groundwater is heavily contaminated from underground uranium mining and naturally occurring mineralization, and (2) the uppermost aquifer is of limited use due to its low yield. Consequently, NRC concurred in the application of supplemental standards at the site and the exemption of both compliance and performance groundwater monitoring. However, at the request of the New Mexico Environment Department (NMED), DOE conducts groundwater monitoring as a best management practice.

1A Monitoring well 0675 is completed in weathered Mancos Shale just below its contact with the overlying alluvium, and monitoring well 0678 is completed in a sandstone unit (Tres Hermanos B unit) of the Mancos Shale. DOE originally agreed to sample these locations once every third year for 30 years; however, annual sampling was initiated in November 2010 at the request of NMED. Monitoring results are provided to NMED and NRC.

DOE installed a new monitoring well (0409) in May 2011 in support of a regional groundwater investigation being conducted by NMED. The well, located on DOE property adjacent to the southwest corner of the disposal cell, is completed in an alluvium-filled paleochannel. The bottom of the well screen is at the contact between the alluvium and sandstone of the Tres Hermanos C unit of the Mancos Shale. The well is dry, which suggests that groundwater is not leaving the southwest portion of the site via alluvium.

1.8 Corrective Action

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

No corrective action was required in 2012.

1.9 Photographs

Photo Location Number	Azimuth	Photograph Description
PL–1	355	Entrance sign and site marker SMK–1.
PL–2	135	Perimeter sign P14 and mining-restriction sign.
PL–3	0	Site marker SMK–1 near the site entrance.
PL–4	40	Site marker SMK–2 on the disposal cell top slope.
PL–5	0	Boundary monument BM–4.
PL–6	0	Monitoring well 0409.
PL–7	0	Monitoring well 0675.
PL–8	40	Monitoring well 0678.
PL–9	45	View northeast across the disposal cell top slope.
PL–10	270	South side slope and apron of the disposal cell.
PL–11	40	Poorly vegetated area north of the disposal cell (remediated tailings stockpile area).

AMB 8/2012. PL–1. Entrance sign and site marker SMK–1.

AMB 8/2012. PL–2. Perimeter sign P14 and mining-restriction sign.

AMB 8/2012. PL–3. Boundary monument BM–4.

AMB 8/2012. PL–4. Site marker SMK–1 near the site entrance.

AMB 8/2012. PL–5. Site marker SMK–2 on the disposal cell top slope.

AMB 8/2012. PL–6. Monitoring well 0409.

AMB 8/2012. PL–7 Monitoring well 0675.

AMB 8/2012. PL–8. Monitoring well 0678.

AMB 8/2012. PL–9. View northeast across the disposal cell top slope.

AMB 8/2012. PL–10. South side slope and apron of the disposal cell.

AMB 8/2012. PL–11. Poorly vegetated area north of the disposal cell (remediated tailings stockpile area).

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2.0 Annual Inspection of the Burrell, Pennsylvania, UMTRCA Title I Disposal Site

2.1 Compliance Summary

The Burrell, Pennsylvania, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, inspected on October 17, 2012, was in excellent condition. The disposal cell and all associated drainage diversion structures were in good condition and functioning as designed. No maintenance needs or cause for a follow-up or contingency inspection was identified.

Groundwater monitoring is required every 5 years and was last conducted in October 2009. The next sampling event is scheduled for 2013. Monitoring is being coordinated with the Canonsburg, Pennsylvania, UMTRCA Title I Disposal Site (which is also on a 5-year sampling schedule) to improve efficiency and reduce costs. Past monitoring results have indicated that the disposal cell is not releasing any contamination and is performing as designed.

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

2.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the U.S. Department of Energy*, *Burrell Vicinity Property*, *Blairsville, Pennsylvania* (GJO–2002–231–TAR, U.S. Department of Energy [DOE], April 2000; 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 2–1 lists these requirements.

Table 2–1. License Requirements for the Burrell Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.3	Section 2.4
Follow-Up or Contingency Inspections	Section 3.5	Section 2.5
Maintenance and Repairs	Section 3.6	Section 2.6
Groundwater Monitoring	Section 3.7	Section 2.7.1
Corrective Action	Section 3.6.3	Section 2.8

2.3 Institutional Controls

The 72-acre 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 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 site include federal ownership of the property and the following features that are inspected annually: a site marker, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and locked gates at the site entrances.

2.4 Inspection Results

The site, east of Blairsville, Pennsylvania, was inspected on October 17, 2012. M. Miller, K. Broberg, and J. Homer, all with the S.M. Stoller Corporation, the Legacy Management Support contractor, conducted the inspection. C. Carpenter, with the DOE Office of Legacy Management, participated in the inspection.

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

2.4.1 Site Surveillance Features

The locations of site surveillance features are shown in Figure 2–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 2–1 by photograph location (PL) numbers.

2.4.1.1 Entrance Gates, Entrance Signs, and Access Road

Access to the site is off Strangford Road on an access road that lies within a perpetual right-of-way through private property (Tract 201–E). The access road continues across DOE-leased land and crosses the Norfolk Southern railroad tracks to the entrance gate at the east end of the site. Authorized personnel who need access to the railroad tracks and to the several natural-gas wells nearby also use the road. The entrance gate and four personnel gates were in good condition, and gate locks remain serviceable.

2.4.1.2 Perimeter Fence and Perimeter Signs

The chain-link security fence, replaced in 2007, remains in excellent condition, with the exception of a bent rail on the south fence (PL–1). The fence rail was damaged when a tree fell across it in 2011. The tree was safely removed from the fence shortly after being discovered. The top rail of the fence needs to be replaced. A vegetation-free corridor remains established along the fence line (PL–2). Several of the 17 perimeter signs mounted on the security fence have been damaged by bullet holes, but they remain serviceable (PL–3).

2.4.1.3 Site Markers

Site marker SMK–1 was in excellent condition (PL–4).

2.4.1.4 Survey Monuments and Boundary Monuments

The site has 10 monuments (three survey monuments and seven boundary monuments). All three survey monuments (SM–100, SM–101, and SM–102) are located at points on the property that originally afforded a sweeping view of the site during construction. Several years ago, inspectors installed tall pieces of white PVC pipe near SM–100 and SM–101 to make them easier to locate (PL–5).

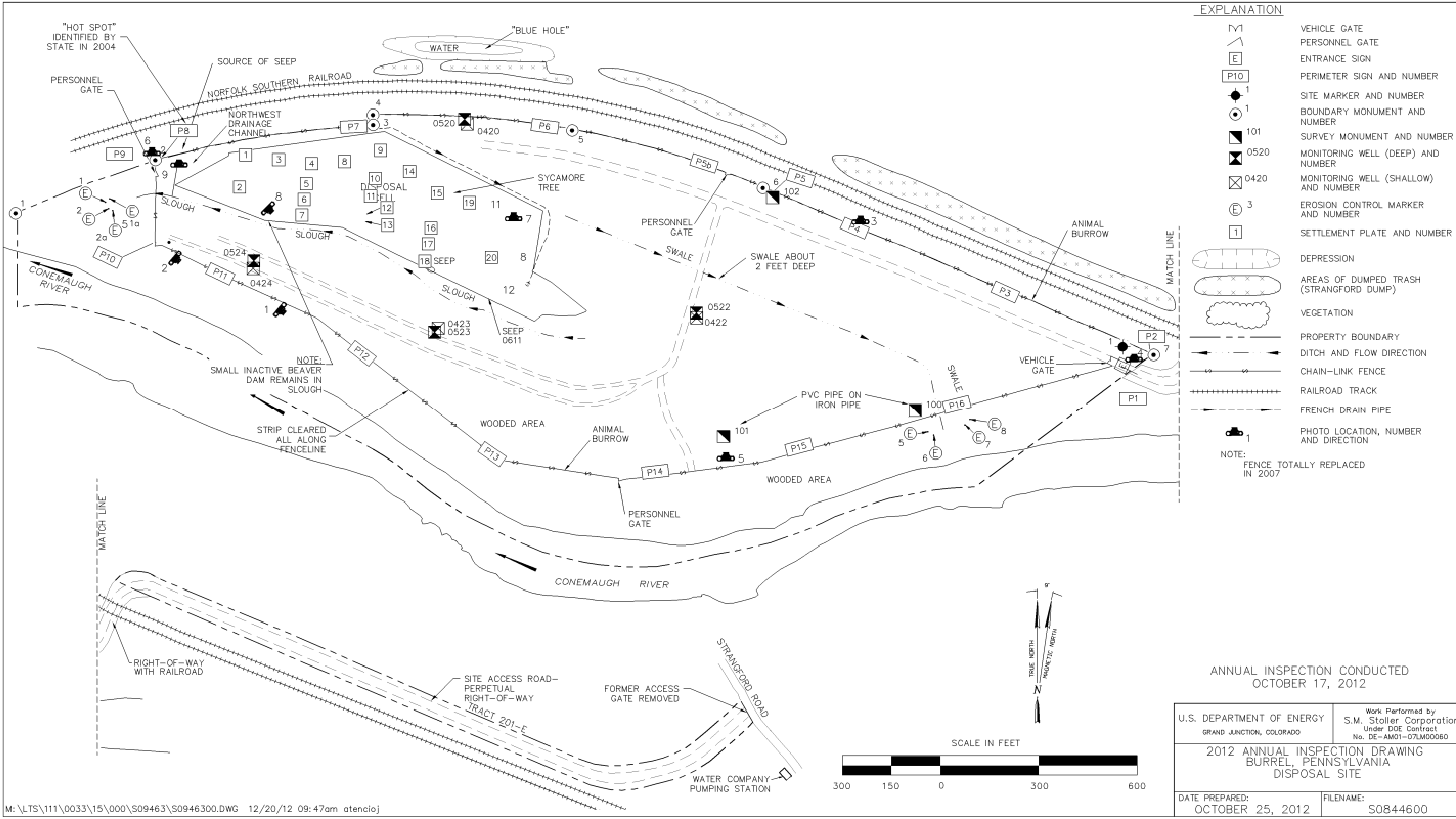

Figure 2–1. 2012 Annual Compliance Drawing for the Burrell Disposal Site

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Survey monuments SM–101 and SM–102 were in good condition. Although the PVC pipe near SM–100 was located, the actual boundary monument plate was not located. Additional efforts will be made during next year's inspection to find the monument plate.

Seven boundary monuments are located along the north perimeter fence. Five of the seven boundary monuments (BM–2, BM–3, BM–4, BM–5, and BM–7) were located during the inspection and observed to be in good condition (PL–6). Vegetation near boundary monument BM–1 was too dense to allow access. It is recommended that the site maintenance contractor be asked to clear a path through the vegetation for the inspection next year. Boundary monument BM–6 could not be located. Extra effort will be made during next year's inspection to find boundary monument BM–6.

2.4.1.5 Erosion Control Markers

All eight erosion control markers were located during the inspection, and in excellent condition. Dense vegetation was cleared from all of the erosion control markers, making them easy to locate.

2.4.1.6 Monitoring Wells

The site has four pairs of monitoring wells. Each pair consists of a shallow (alluvial) completion and a deeper (bedrock) completion. Monitoring wells were not inspected in 2012. The water sampling crew last inspected them in 2009. The monitoring wells will be inspected again when they are sampled in 2013. All wells encountered during the 2012 site inspection were locked and secured.

2.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (1) the disposal cell, (2) the area between the disposal cell and site boundary, (3) the site perimeter, and (4) the outlying area.

Within each area, inspectors examined specific site surveillance features, such as monitoring wells, boundary monuments, and signs. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

2.4.2.1 Disposal Cell

The riprap-covered disposal cell was in excellent condition. There were no indications of cell instability, such as slumping, bulging, or differential settlement. Rock quality was excellent; degradation of the limestone riprap was not evident.

Active control of vegetation on the cell cap has not been required since 2000 (PL–7). Past studies at the site concluded that deep-rooted plant growth on the cell puts the public and the environment at no greater risk of exposure to contaminants within the disposal cell. Vegetation growth on the cell might actually enhance cover performance through evapotranspiration. These studies further concluded that plant growth would not impede the proper functioning of the radon barrier. NRC concurred on the revised LTSP, which no longer requires active control of deep-rooted vegetation on the cell cover. NRC has suggested that DOE reevaluate the effects of vegetation on cover performance in 10 to 20 years to confirm performance parameters and predictions. The timing for this assessment is, therefore, between 2007 and 2017.

No active seeps were found along the south slope of the disposal cell during the site inspection.

2.4.2.2 Area Between the Disposal Cell and Site Boundary

The area surrounding the disposal cell and inside the security fence was cleared during reclamation and is now covered by thick grass and reestablishing hardwood trees. Periodic mowing maintains access to monitoring wells. The area east of the cell remains grassland.

A French drain was installed along the base of the north side slope of the disposal cell in 1998 to prevent water from ponding next to the cell. Inspection findings dating back to 1998 indicate that, before the French drain was installed, rainwater and snowmelt would collect off the north side of the disposal cell. Saturated soil and wetland vegetation (cattails and purple loosestrife) were present. At the same time that wetland vegetation was growing on the north slope of the disposal cell, seeps were occurring on the south slope of the disposal cell. It was thought that the source of water for the seeps could be the ponded water north of the cell. No water has been observed flowing from the seeps on the south slope of the disposal cell since the French drain was installed. In spring 2010, though, a new seep was observed on the south slope (seep 0611). The seep was sampled. No maximum concentration limit exceedances were measured in the sample. Inspectors in 2010 and 2011 observed cattails and purple loosestrife growing between the north slope of the disposal cell and the location of the French drain, which indicates that the area might not be draining efficiently. This area was revisited during the 2012 inspection, and no cattails were present—just purple loosestrife. Inspection of the outlet to the French drain indicates that the drain outlet is clear of obstructions.

A small, inactive beaver dam remains within the slough at the base of the south slope of the disposal cell, and water continues to collect behind it. The water level behind the dam is not high enough to saturate the tailings or impact the integrity of the disposal cell (PL–8). Therefore, DOE has elected not to remove the dam. Instead, DOE will continue to monitor the dam and its possible impacts on the disposal site.

2.4.2.3 Site Perimeter

A known seep along the north security fence, about 60 feet east of perimeter sign P8 and west of the disposal cell, was flowing at the time of the 2012 inspection (PL–9). It appeared to be about the same as observed in 2011. This area will continue to be monitored for seeps to determine if they threaten the disposal cell's integrity. Conceivably, the seeps also could destabilize the nearby railroad embankment. The water for this seep may be coming from other seeps on the bluffs, above and just north of the railroad tracks.

2.4.2.4 Outlying Area

The area beyond the site boundary for a distance of 0.25 mile was visually examined for signs of erosion, development, and other changes that might affect the site. North of the site, a dirt road parallels the railroad tracks and provides access to a long, narrow, wooded area that has been used as an illegal dump over the years. In 2012, no new trash was observed. The dump is not a threat to the disposal site but is an indication of the overall level of activity near the disposal site and may be a predictor of vandalism. For this reason, the area will continue to be monitored. All other areas around the site remained unchanged.

2.5 Follow-Up or Contingency Inspections

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

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

2.6 Maintenance and Repairs

2A The routes to the monitoring wells were mowed.

2.7 Environmental Monitoring

2.7.1 Groundwater Monitoring

In accordance with the LTSP, DOE monitors groundwater at the site as a best management practice to evaluate the disposal cell's performance. The groundwater monitoring network consists of eight wells (in four pairs) that are monitored for four target analytes: lead, molybdenum, selenium, and uranium. The revised LTSP stipulates that monitoring be performed
2B every 5 years. DOE last conducted monitoring in 2009 (presented in the 2010 report). The results indicated that no contamination was being released and that the disposal cell was performing as designed. The next monitoring is scheduled for October 2013. Monitoring at Burrell is being coordinated with monitoring at Canonsburg to improve efficiency and decrease costs. Both sites are now on a 5-year monitoring schedule.

2.8 Corrective Action

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

No corrective action was required in 2012.

2.9 Photographs

Table 2–2. Photographs Taken at the Burrell Disposal Site

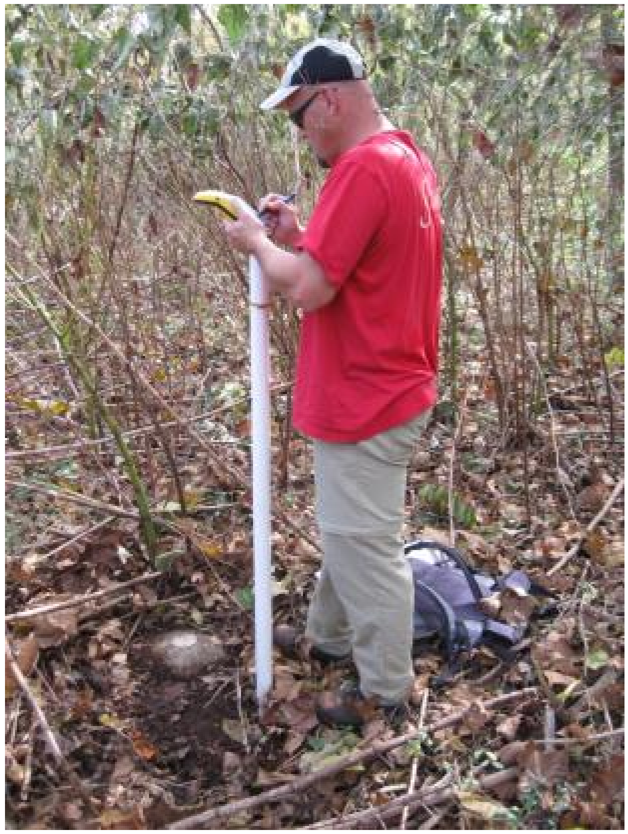
Photograph Location Number	Azimuth	Description
PL–1	130	Fence damage.
PL–2	130	Southwest fence line.
PL–3	NA	Bullet holes in perimeter fence sign P4.
PL–4	NA	Site marker SMK–1.
PL–5	NA	Survey monument SM–101.
PL–6	NA	Boundary monument BM–2.
PL–7	NA	Examining tree at base of disposal cell.
PL–8	135	Small inactive beaver dam.
PL–9	NA	Active seep; north fence.

BUR 10/2012. PL–1. Fence damage.

BUR 10/2012. PL–2. Southwest fence line.

BUR 10/2012. PL–3. Bullet holes in perimeter fence sign P4.

BUR 10/2012. PL–4. Site marker SMK–1.


BUR 10/2012. PL–5. Survey monument SM–101.


BUR 10/2012. PL–6. Boundary monument BM–2.

BUR 10/2012. PL–7. Examining tree at base of disposal cell.

BUR 10/2012. PL–8. Small inactive beaver dam.

BUR 10/2012. PL–9. Active seep; north fence.

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3.0 Annual Inspection of the Canonsburg, Pennsylvania, UMTRCA Title I Disposal Site

3.1 Compliance Summary

The Canonsburg, Pennsylvania, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on October 17, 2012. The disposal cell and all associated surface water diversion and drainage structures were in excellent condition and functioning as designed. No additional maintenance needs or cause for a follow-up or contingency inspection was identified.

An effective vegetative management program that aligns with requirements set forth within the *Long-Term Surveillance Plan for the U.S. Department of Energy Canonsburg Uranium Mill Tailings Disposal Site, Canonsburg, Pennsylvania* (LMS/CAN/S00404-0.0, U.S. Department of Energy [DOE], revised September 2008; LTSP) remains successful (PL–1). In-the-field discussions with site maintenance personnel during the inspections continue to provide lesson-learned opportunities to improve the efficiency and effectiveness of site maintenance activities.

In accordance with the LTSP, a groundwater monitoring assessment was conducted following the collection of samples in fall 2010 to recommend whether to continue, modify, or terminate the groundwater monitoring program. The assessment concluded that the compliance strategy for the site remains effective, and that the low and slowly changing concentrations of uranium in both groundwater and surface water warrant a monitoring change. The assessment recommended that following the collection of samples in 2011, the frequency of monitoring be reduced from annual to once every 5 years. On July 16, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued its concurrence to reduce the sampling from annual to every 5 years. Therefore, no samples were collected in 2012. A 5-year sampling frequency will commence in 2013. Sampling at the site is being coordinated with sampling at the Burrell, Pennsylvania, UMTRCA Title I Disposal Site in order to improve efficiency and lower costs. Sampling was conducted last in October 2011. Monitoring results, which were not available in time to be included in the 2011 compliance report, are provided in this report. Results from 2011 demonstrate continued compliance with established site standards.

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

3.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the 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 3–1 lists these requirements.

Table 3–1. License Requirements for the Canonsburg Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.3	Section 3.4
Follow-Up or Contingency Inspections	Section 3.4	Section 3.5
Maintenance and Repairs	Section 3.5	Section 3.6
Groundwater and Surface Water Monitoring	Section 3.7	Section 3.7.1
Corrective Action	Section 3.6	Section 3.8

3.3 Institutional Controls

The 34.2-acre site is owned by the United States of America and was accepted under the 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. Institutional controls at the site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and locked gates at the site entrances.

Institutional controls also apply to Area C and former Tract 117, which are southeast of Strabane Avenue. Area C (3.1 acres) was sold and transferred in 2006, and former Tract 117 (0.431 acre) was sold and transferred in 2009; the same private party purchased both. DOE and the Commonwealth of Pennsylvania complied with restrictions on parcel transfers stipulated in UMTRCA and the Cooperative Agreement between DOE and the Commonwealth. The deed for Area C and former Tract 117 establishes restrictions to limit excavation in the areas, prohibits the disturbance of the stream bank, maintains access for monitoring, and prevents the areas from being used for residential purposes. Inspectors found no evidence that these institutional controls were ineffective.

The land owner of Area C and former Tract 117 has elevated the land surface of both areas through the placement and grading of clean fill material (PL–2). This does not violate institutional controls. DOE owns two groundwater monitoring wells on Area C and former Tract 117. The land owner has taken excellent steps to provide adequate access to both wells, and to protect the integrity of both wells by grading the fill in a manner that should not result in surface water pooling around the base of the well pads (PL–3).

3.4 Inspection Results

The site, between the communities of Canonsburg and Houston, Pennsylvania, was inspected on October 17, 2012. M. Miller, K. Broberg, and J. Homer, all with the S.M. Stoller Corporation, the DOE Legacy Management Support contractor, conducted the inspection. C. Carpenter, with the DOE Office of Legacy Management, also participated in the inspection.

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

3.4.1 Site Surveillance Features

The locations of site surveillance features are shown in Figure 3–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 3–1 by photograph location (PL) numbers.

3.4.1.1 Entrance Gates, Entrance Signs, and Access Road

Access to the site is directly from Strabane Avenue, a public right-of-way within the Borough of Canonsburg in Washington County, Pennsylvania. All four site gates were in excellent condition. The entrance sign was in good condition.

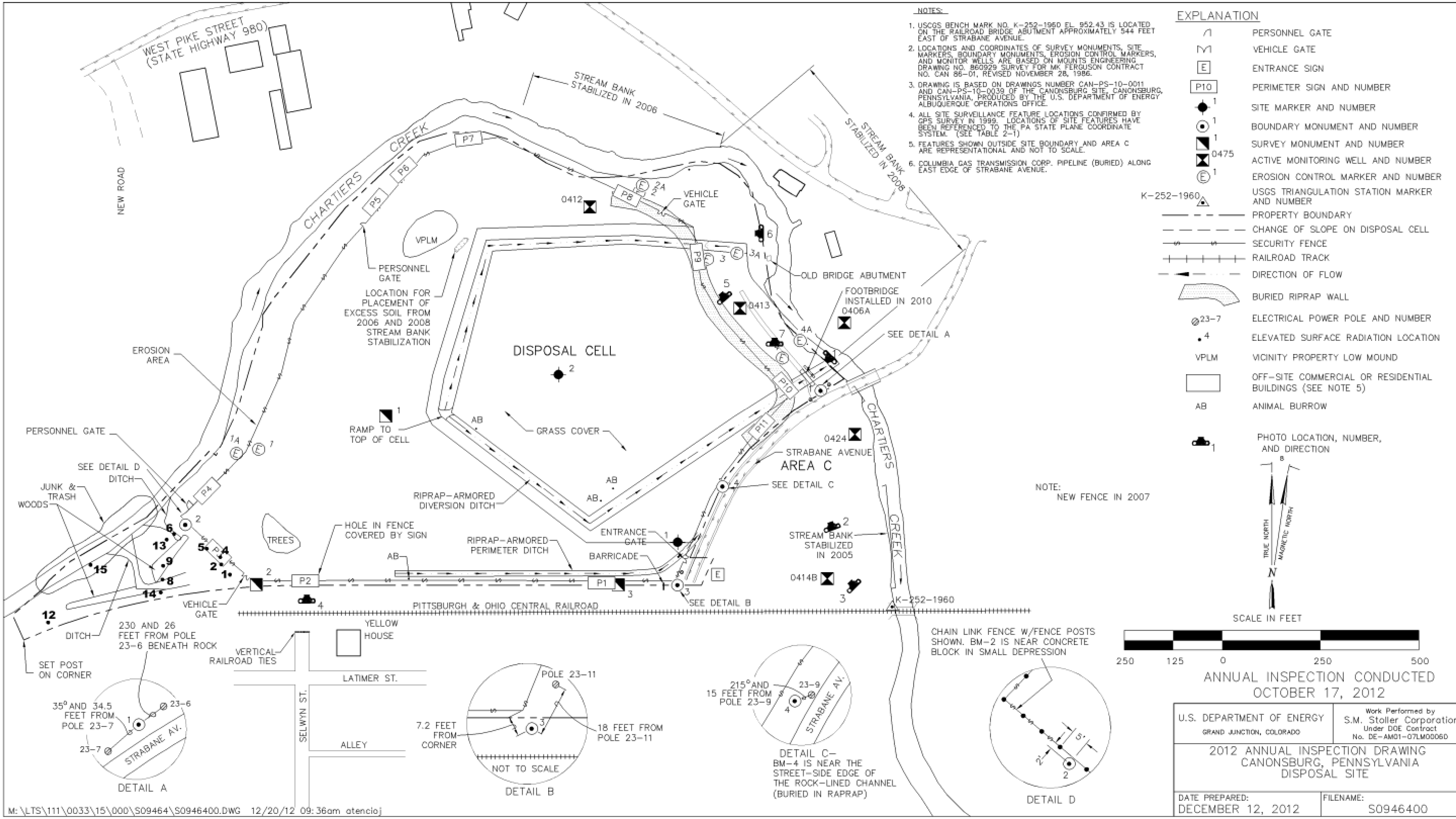

Figure 3–1. 2012 Annual Compliance Drawing for the Canonsburg Disposal Site

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3.4.1.2 Perimeter Fence and Perimeter Signs

The security fence was in excellent condition with the exception of a small hole in the fence at perimeter sign P2. In 2011, for unknown reasons, someone cut perimeter sign P2 from the fence and left a small hole in its place. A new sign was installed to cover the hole in the fence (PL–4). A vegetation-free buffer zone is being maintained around the entire site security fence (PL–5). The 11 perimeter signs were in good condition.

3.4.1.3 Site Markers

The site contains two site markers, SMK–1 near the entrance gate and SMK–2 on top of the disposal cell. Both were in excellent condition.

3.4.1.4 Survey Monuments and Boundary Monuments

There are three survey monuments and four boundary monuments. All monuments are in excellent condition.

3.4.1.5 Erosion Control Markers

The eight erosion control markers were in excellent condition.

3.4.1.6 Monitoring Wells

The site's monitoring well network consists of five wells (0406A, 0412, 0413, 0414B, and 0424). The wells are inspected when they are sampled. All of the monitoring wells were properly locked during the inspection.

3.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into five inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (1) the disposal cell, (2) the diversion channels and perimeter ditch, (3) the other areas on site, (4) the site perimeter, and (5) the outlying area.

Within each area, inspectors examined specific site surveillance features, such as monitoring wells, boundary monuments, and signs. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

3.4.2.1 Disposal Cell

The grass-covered disposal cell surface was in excellent condition. There was no evidence of slumping, settling, erosion, or other modifying processes. The grass was mowed in accordance with the LTSP.

Animal burrows continue to be observed on the cell cover. Because a 36-inch-thick clay layer (radon barrier), an 18-inch-thick rock layer, and a 12-inch-thick topsoil layer overlie the buried tailings at this site, biointrusion into the tailings is unlikely, and such burrows should not pose a risk to the disposal cell's integrity or the public's health. The location, level of activity, and significance of burrows on the cell cover will continue to be monitored.

3.4.2.2 Diversion Channels and Perimeter Ditch

Diversion channels around the disposal cell and the perimeter ditch along the south side of the site are armored with riprap and were in excellent condition (PL–6). No indications of diminished rock durability were noted. Woody vegetation in the diversion ditches continues to be controlled by cutting and spraying.

3.4.2.3 Other Areas on Site

Thick grass covers the area surrounding the disposal cell. The grass extends beyond the security fence to the north and east as far as the bank of Chartiers Creek. The grass inside the site boundary was in excellent condition. It is mowed in accordance with the LTSP. Vegetation management continues to be successfully implemented.

3.4.2.4 Site Perimeter

Chartiers Creek is an active, meandering waterway that abuts the east, north, and west portions of the site. As a result of flooding in past years, particularly in 2004, the creek cut into the bank and resulted in a series of stream bank stabilization efforts. Both the Borough of Canonsburg and DOE funded the work. NRC representatives evaluated the plans and concurred on the work.

In 2001, the Chartiers Creek bank along Area C was reconstructed to stop slumping. In 2004, inspectors found that floodwater eroded the stream bank. Approximately 100 feet of reconstructed stream bank was damaged downstream from the Strabane Avenue Bridge, and 200 feet was damaged upstream from the railroad bridge. Floodwater cut laterally into the bank and scoured behind the riprap and fabric in places. DOE notified NRC, performed a follow-up inspection of the damage, and developed recommendations for creek bank repair along Area C. NRC concurred on the recommendations, and in April 2005, repairs were made (scoured areas along Area C were filled with riprap to restore the creek bank profile). Shrub and forb seed was broadcast to further stabilize the bank with vegetation. In 2006, the area between perimeter signs P7 and P8 was stabilized, and in 2008, the area between perimeter sign P8 and Strabane Avenue Bridge was stabilized. The stabilization work consisted of cutting back the slope of the creek bank and armoring the toe with riprap keyed into bedrock. Geotextile fabric underlies the riprap. Above the riprap, stabilization matting and new plantings of live fascines protect the slope.

In 2009, reseeding and the planting of large saplings (greater than 2 inches in diameter) took place within the area that was regraded in 2008 as part of a stream bank stabilization project. The trees were planted under a third-party DOE Office of Legacy Management grant. Several of the trees planted in 2009 did not survive and were replaced with healthy trees in 2010, which continue to do well (PL–7). The stream bank stabilization project dramatically changed the look of the site. There is a sharp contrast between the riprap-armored south bank of Chartiers Creek (where vegetation growth is managed) and the unarmored north bank (where vegetation growth is not managed).

3.4.2.5 Outlying Area

The predominant land use near the site is residential and commercial. The area outward, for a distance of approximately 0.25 mile, was visually inspected. With the exception of Area C and former Tract 117 (discussed earlier) no new development or changes in land use were observed that would affect the safety or security of the site.

In 2007, DOE conducted a radiological survey on a small portion of the site property that lies outside the perimeter fence southwest of the disposal cell. The survey was conducted to evaluate the potential for releasing this portion of the site for industrial reuse. The survey identified isolated radium-226 contamination in soil that exceeded UMTRCA standards for unrestricted use. DOE retains this portion of the site. Under the current property use, the radiological conditions do not pose unacceptable risk to personnel, and no corrective measures are required. DOE has added monitoring for disturbance of this area to inspection procedures. No disturbances were noted during this year's inspection.

3.5 Follow-Up or Contingency Inspections

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

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

3.6 Maintenance and Repairs

3A In 2012, DOE controlled woody growth within the diversion channels, mowed grass on and adjacent to the disposal cell, and cleared vegetation from the perimeter fence.

3.7 Environmental Monitoring

3.7.1 Groundwater and Surface Water Monitoring

DOE monitors groundwater and surface water at the site to comply with the requirements in the revised LTSP. The revised LTSP combines the objectives of both the original LTSP (issued in 1995) and the *Ground Water Compliance Action Plan and Application for Alternative Concentration Limits for the Canonsburg, Pennsylvania, UMTRA Project Site* (U0035901, DOE, February 2000; GCAP). Monitoring prescribed in the original LTSP was a best management practice because NRC determined that cell performance monitoring to ensure compliance with remedial actions discussed under Subpart A of 40 CFR 192 was not required since the disposal cell's design was adequate to provide long-term protection of human health and the environment. The GCAP required monitoring for a period of no less than 5 years (through 2004) and up to 30 years (through 2029, which is the estimated time for any contamination to naturally attenuate). This monitoring period was established to ensure compliance with Subpart B of 40 CFR 192, which applies to contamination related to legacy uranium-processing sites. The Subpart B protection strategy is no remediation in conjunction with the application of an alternate concentration limit (ACL) for uranium.

The objectives of groundwater monitoring under the revised LTSP are to (1) evaluate downgradient contaminant trends in groundwater in the shallow unconsolidated materials and in surface water, (2) demonstrate that concentrations of uranium at point-of-compliance locations are decreasing as predicted and that the system remains in compliance with the GCAP, and (3) ensure that remedial actions at the site and Area C continue to protect human health, safety, and the environment. The ACL for uranium is 1.0 milligram per liter (mg/L) at point-of-compliance wells (0412, 0413, and 0414B). The U.S. Environmental Protection Agency maximum concentration limit for uranium is 0.044 mg/L (40 CFR 192, Subpart A, Table 1). The uranium limit established for the point of exposure in Chartiers Creek is 0.01 mg/L (surface location 0602).

The monitoring network consists of five wells (0406a, 0412, 0413, 0414B, and 0424) completed in the uppermost aquifer (shallow unconsolidated materials), and one surface water location in Chartiers Creek (0602). Each year, routine field measurements are collected, water levels are measured, and uranium concentrations are determined.

DOE considers the risk associated with uranium in groundwater within the unconsolidated materials and shallow bedrock (defined as the uppermost aquifer for regulatory purposes) beneath the site to be negligible because neither is considered a viable aquifer, from a water-resource perspective, even though the zone is capable of discharging to surface water (Appendix A to 10 CFR 40). Because the materials are not ideal for aquifer formation and because the source of recharge to the shallow units is minimal, sustained yield to a well from these units would be limited. The shallow groundwater is not used as a drinking water source in the area although some domestic water is derived from a few private wells that extend deeper than 100 feet.

Institutional controls, in the form of government ownership of the site, prevent access to the groundwater directly beneath the site. NRC concurred on deleting groundwater use restrictions for Area C in 2003. Most of the residents in the area are connected to a municipal water system, which is supplied by surface water reservoirs upgradient of the site. Chartiers Creek, the discharge point for the shallow groundwater beneath the site, is not a source of potable water. Additionally, uranium concentrations reported from samples collected from the creek are near the detection limit. Therefore, site-related concentrations do not pose an unacceptable risk to human health and the environment.

DOE conducted groundwater monitoring in October 2011, and results were not available in time to be included in the 2011 compliance report. Therefore, the results from 2011 are presented in this report.

Analytical results for groundwater and surface water monitoring are presented below. Time-concentration plots for uranium, from 1995 through 2011, are shown in Figure 3–2 for groundwater and in Figure 3–3 for surface water. The results of the 2011 monitoring demonstrate continued compliance with established site standards.

Uranium concentrations in 2011 were considerably below the established ACL (Figure 3–2). With the exception of monitoring wells 0412 and 0413, uranium concentrations in 2011 also were below the maximum concentration limit.

Only one surface water location (0602) is sampled under the revised LTSP. The uranium concentration of surface water at location 0602 in 2011 remained below the target concentration of 0.01 mg/L (Figure 3–3).

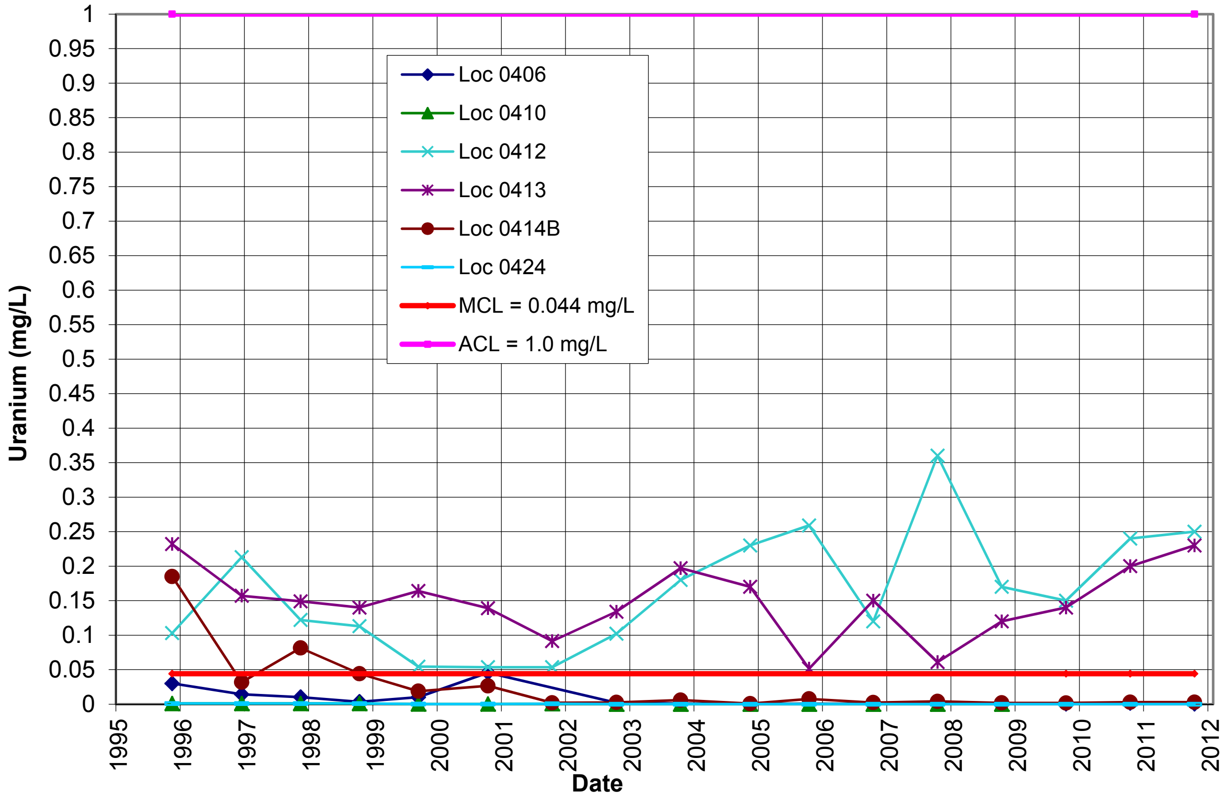

Figure 3–2. Time-Concentration Plot of Uranium in Groundwater at the Canonsburg Disposal Site

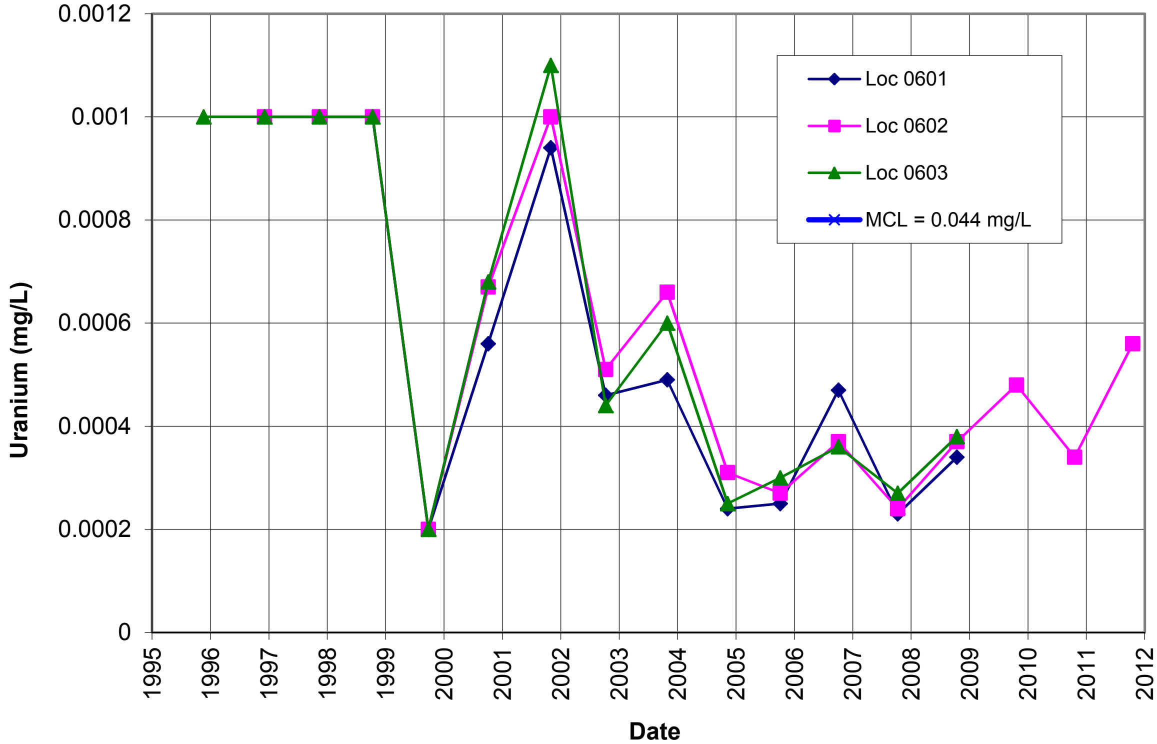

Figure 3–3. Time-Concentration Plot of Uranium in Surface Water at the Canonsburg Disposal Site

In 2011, DOE evaluated the groundwater and surface water monitoring program at the site, as required by the LTSP, to recommend whether to continue, modify, or terminate monitoring efforts. Five additional years of monitoring data (2006 through 2010) were added to the previous data set (1986 through 2005). The assessment concluded that:

- Groundwater and surface water uranium concentrations remain well below site ACLs, resulting in no adverse impact at the point of exposure in Chartiers Creek. Therefore, the compliance strategy continues to be protective of human health and the environment.
- Water levels measured at the site are steady and within the historical range.
- A monitoring change is warranted due to the low and slowly changing concentrations of uranium in both groundwater and surface water.

3B The assessment recommended that following the collection of samples in 2011, the frequency of monitoring at the site be reduced from annual to once every 5 years for cell-performance purposes. NRC approved the sampling change in 2012. Groundwater and surface water sampling is scheduled next for 2013, and will then be conducted every 5 years. Sampling at the site is being coordinated with the Burrell site to improve efficiency and decrease travel costs.

3.8 Corrective Action

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

No corrective action was required in 2012.

3.9 Photographs

Table 3–2. Photographs Taken at the Canonsburg Disposal Site

Photograph Location Number	Azimuth	Photograph Description
PL–1	225	Riprap-armored stream bank.
PL–2	340	Looking northwest across Area C.
PL–3	315	Area around monitoring well 0414B.
PL–4	NA	Fence repair at perimeter sign P2.
PL–5	320	Fence line, northeast of disposal cell.
PL–6	270	Looking west down riprap-armored diversion ditch.
PL–7	NA	Floodplain northeast of disposal cell.

CAN 10/2012. PL–1. Riprap-armored stream bank.

CAN 10/2012. PL–2. Looking northwest across Area C.

CAN 10/2012. PL–3. Area around monitoring well 0414B.

CAN 10/2012. PL–4. Fence repair at perimeter sign P2.

CAN 10/2012. PL–5. Fence line, northeast of disposal cell.

CAN 10/2012. PL–6. Looking west down riprap-armored diversion ditch.

CAN 10/2012. PL–7. Floodplain northeast of disposal cell.

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

4.1 Compliance Summary

The Durango, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, inspected on May 30, 2012, was in excellent condition. Vegetation on top of the disposal cell remains healthy, and the top and side slopes remain relatively free of deep-rooted species.

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

Transient drainage water from the cell in the retention pond is being pumped out and dispersed through drip lines onto the pond side slopes to enhance evaporation. Decommissioning of the retention pond has been delayed, pending an evaluation of uranium concentrations in groundwater from one of the downgradient wells.

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

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

4.2 Inspection Requirements

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

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0	Section 4.4
Follow-Up or Contingency Inspections	Section 7.0	Section 4.5
Maintenance and Repairs	Section 8.0	Section 4.6
Groundwater Monitoring	Section 5.0	Section 4.7.1
Corrective Action	Section 5.0	Section 4.8

4.3 Institutional Controls

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

4.4 Inspection Results

The site, southwest of Durango, Colorado, was inspected on June 10, 2011. M. Kastens and L. Sheader, both of the S.M. Stoller Corporation, the Legacy Management Support contractor for the DOE office in Grand Junction, Colorado, conducted the inspection. J. Dayvault, of the DOE Office of Legacy Management; L. Gersey, of the U.S. Nuclear Regulatory Commission; and S. Woods, of the S.M. Stoller Corporation, participated in the inspection.

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

4.4.1 Site Surveillance Features

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

4.4.1.1 Entrance Gates, Entrance Signs, and Access Road

The entrance gate along County Road 212 and the older, original entrance gate were locked and in good condition.

The entrance sign was present and in good condition.

4.4.1.2 Perimeter Fence and Perimeter Signs

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

Numerous perimeter signs have bullet holes or other markings but remain legible. Perimeter sign P2 has been missing for several years and will not be replaced, as adjacent signs are within sight. In previous years, inspectors noted that the base of perimeter sign P45 was being undercut by erosion; the sign remains stable (PL–1).

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

4.4.1.3 Site Markers

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

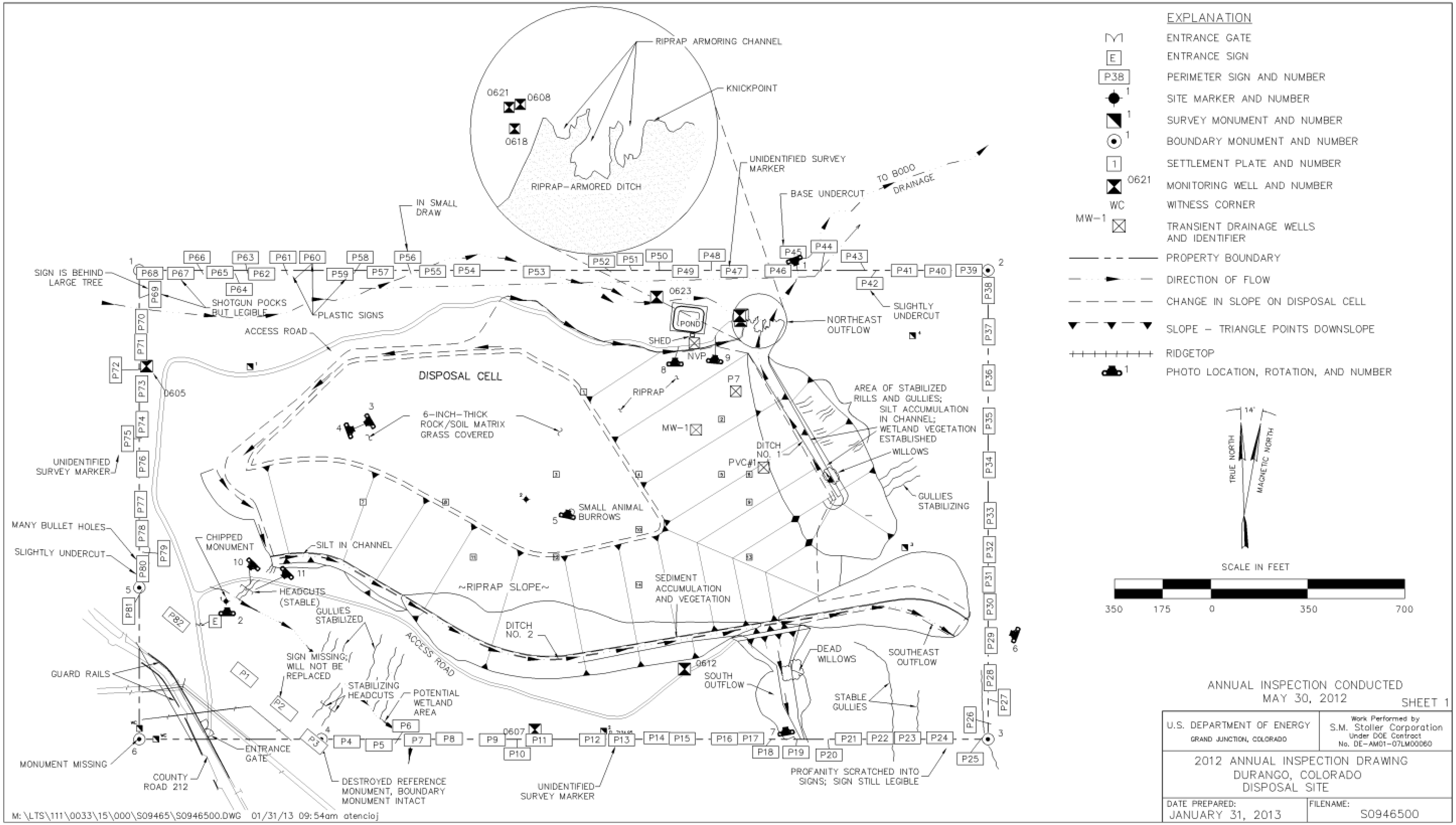

Figure 4–1. 2012 Annual Compliance Drawing for the Durango Disposal Site

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4.4.1.4 Survey and Boundary Monuments

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

4.4.1.5 Monitoring Wells

Monitoring wells specified in the LTSP are locked and in excellent condition. The cap on a drainage system vent well, PVC #1, is cracked but remains functional. The drainage system portal well, NVP, is located inside the equipment shed.

4.4.2 Inspection Areas

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

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

4.4.2.1 Top of Disposal Cell

The top of the disposal cell is in excellent condition. Settling, slumping, and erosion were not observed.

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

The LTSP states, "Woody plants and other unwanted plant species may be eliminated from the cover by selective spraying or mechanical removal. Based on a root-to-shoot ratio of 1.0 to 1, an unwanted plant species must be removed when its shoot height equals or exceeds 3.5 feet (1.1 meters) from the base of the plant." Although the aboveground height of dryland alfalfa (*Medicago sativa*) will never exceed the 3.5-foot criterion listed in the LTSP, it is known to be a deep-rooted plant. Therefore, this species is now being controlled with herbicide on the disposal cell cover. At the time of the 2012 inspection, only a few, small alfalfa plants were identified. Two small, gray rabbitbrush (*Ericameria nauseosa*) shrubs were also discovered on the cell top. The alfalfa and rabbitbrush plants will be treated with herbicide.

Small animal burrows historically have been present in an area southeast of site marker SMK–2. A few burrows were observed during the 2012 inspection (PL–5). These features do not affect the integrity of the cell cover. They appear small in extent and shallow in depth (as surmised by the amount of discarded soil material adjacent to the burrows).

4.4.2.2 Side Slopes of Disposal Cell

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

In the past, woody species (primarily ponderosa pine [*Pinus ponderosa*], narrowleaf cottonwood [*Populus angustifolia*], boxelder [*Acer negundo*], gray rabbitbrush, Siberian elm [*Ulmus pumila*], and tamarisk [*Tamarix ramosissima*]) have become established on the cell's side slopes. Once they reach 3 feet in height, they are removed or treated with herbicide. At the time of the 2012 inspection, no woody species over 3 feet in height were observed.

4.4.2.3 Drainage Ditches

Rock-armored drainage ditches are constructed beneath the toe of the side slope on the northwest, south, and east sides of the disposal cell. These ditches direct runoff into natural drainages that carry storm water away from the disposal site. Erosion and mass wasting occurred in the past on some of the steep slopes above these channels. The eroded sediment was deposited in the rock-armored channel, creating locales favoring plant growth. At places in Ditch No. 1, moist sediments associated with the colluvial deposits support wetland vegetation, including willows (*Salix* sp.). In other places, boxelder trees as tall as 10 and 15 feet grow in the drainage ditches. Inspectors saw no evidence of recent accumulations of sloughed material in the ditches.

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

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

The southeast and south outflows spill into steep, natural channels and are also monitored annually. The channels at these locations are armored by riprap and bedrock. Both outflow channels were stable and in good condition at the time of the 2012 inspection (PL–6, PL–7).

4.4.2.4 Retention Pond Area

The retention pond contains precipitation and transient drainage water from the disposal cell, the latter of which in past years has been collected and treated with zero-valent iron. Because the water level in the disposal cell has dropped, the transient drainage water is no longer being withdrawn and treated although it is pumped to the pond occasionally. The water currently in the pond is being pumped out and then dispersed through drip lines onto the pond side slopes to enhance evaporation. The pond and evaporation system were planned to be decommissioned in 2008, but decommissioning has been delayed until the source of a recent spike in uranium concentrations in a downgradient well can be determined. The tear in the pond liner discovered during the 2011 inspection had been repaired by the time of the 2012 inspection (PL–8).

In October 2010, the permeable reactive barrier treatment system, buried in the area east of the retention pond, was decommissioned and removed. Revegetation of this area is proceeding successfully (PL–9), and sediment-control structures continue to prevent offsite sediment discharges. Inspectors will continue to monitor the integrity of the sediment-control structures until the disturbed area is considered reclaimed.

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

4.4.2.5 Site Boundary

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

Historical rill and gully erosion on the south-facing slope along the southern boundary of the site is stable for the most part. Establishment of vegetation and exposure of resistant bedrock in the gullies are effectively preventing further erosion in most of the gullies. Inspectors noted fresh headcuts in two gullies in the southwest portion of the site in 2006. No noticeable movement in the headcuts has been observed since then, and the gullies appear to be stabilizing with rock and vegetation (PL–10, PL–11). These erosional features do not threaten cell integrity but will continue to be inspected.

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

Erosion rills have been noted on the west-facing hillside east of Ditch No. 1 since construction of the disposal site. Inspectors have considered these rills stable since approximately 2000, as most of them now contain perennial vegetation. The hillside appeared stable at the time of the 2012 inspection.

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

4.4.2.6 Outlying Area

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

4.5 Follow-Up or Contingency Inspections

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

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

4.6 Maintenance and Repairs

4A Site marker SMK–1 has a new chip in it. The chipped area will be covered with a protective coating to reduce the potential for further chipping.

4.7 Environmental Monitoring

4.7.1 Groundwater Monitoring

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

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

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

Groundwater samples are collected annually and analyzed for three indicator parameters: molybdenum, selenium, and uranium. To monitor the increased uranium observed in well 0618, wells 0608, 0618, and 0621 have been increased to monthly sampling as weather permits. The site-specific standards used for the three indicator parameters are the respective maximum observed background concentrations reported in groundwater samples collected from wells completed in the bedrock aquifer as identified in Table 5−4 of the LTSP. These site-specific standards are provided below in Table 4−3. Time-concentration plots for uranium, selenium, and molybdenum monitoring results are included as Figures 4–2, 4–3, and 4–4, respectively.

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

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

mg/L = milligram per liter
Note: Site-specific groundwater standards represent the maximum observed background concentrations reported in samples collected from wells completed in the bedrock aquifer (LTSP, Table 5–4).

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

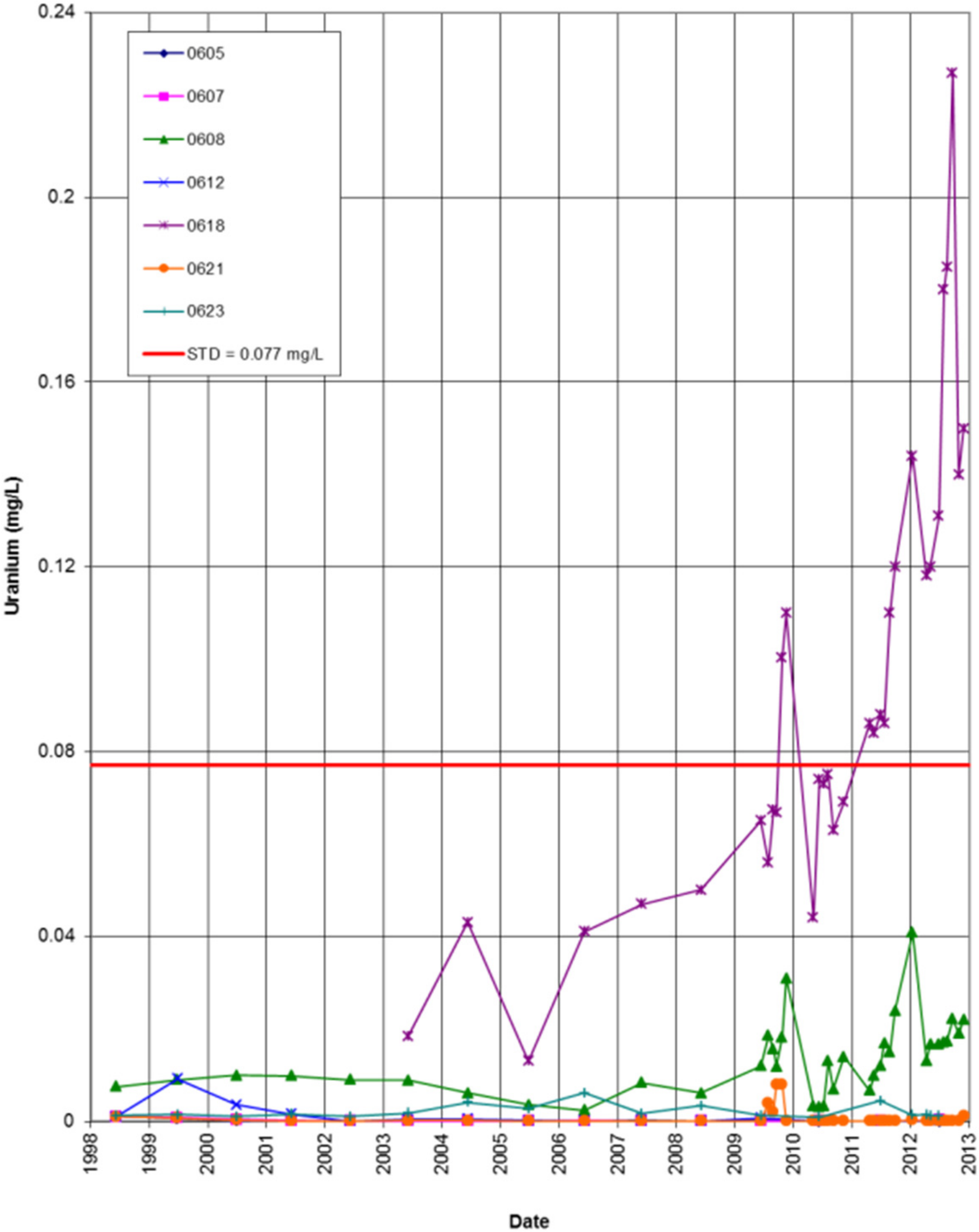

Figure 4–2. Time-Concentration Plot of Uranium in Groundwater at the Durango Disposal Site

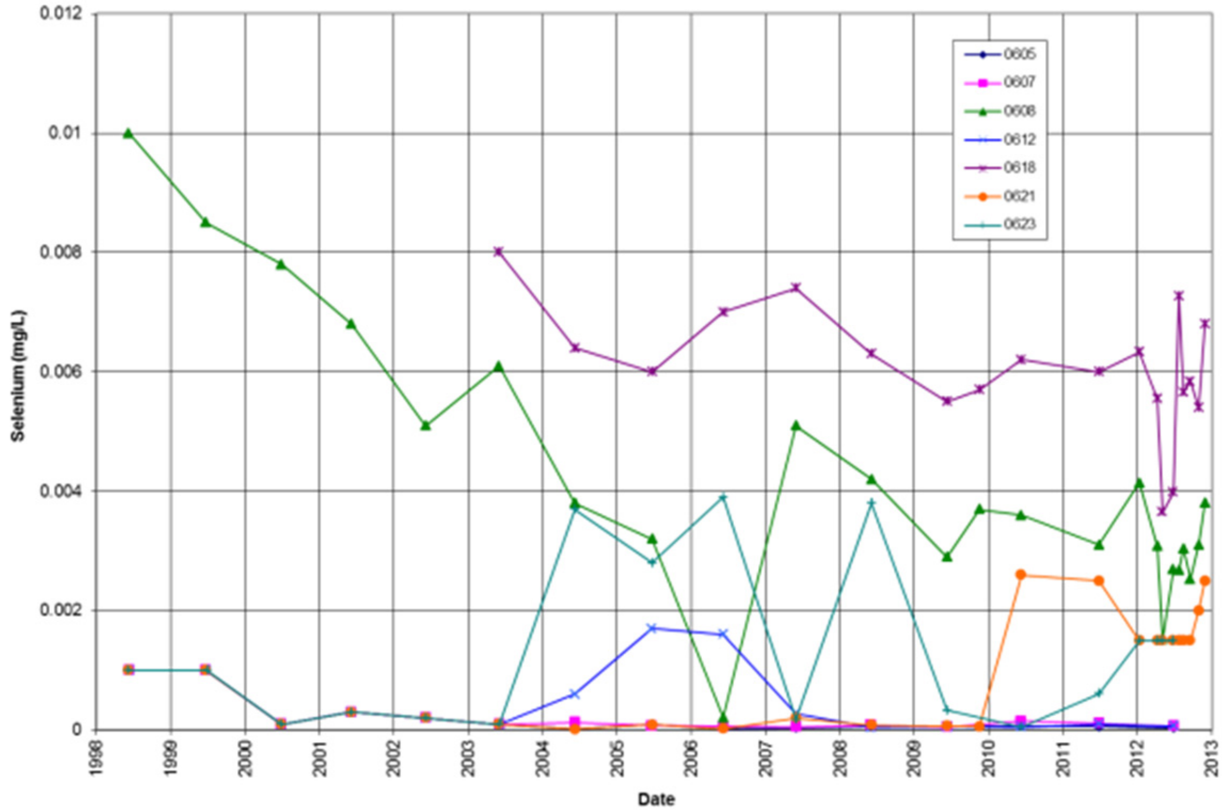

Figure 4–3. Time-Concentration Plot of Selenium in Groundwater at the Durango Disposal Site

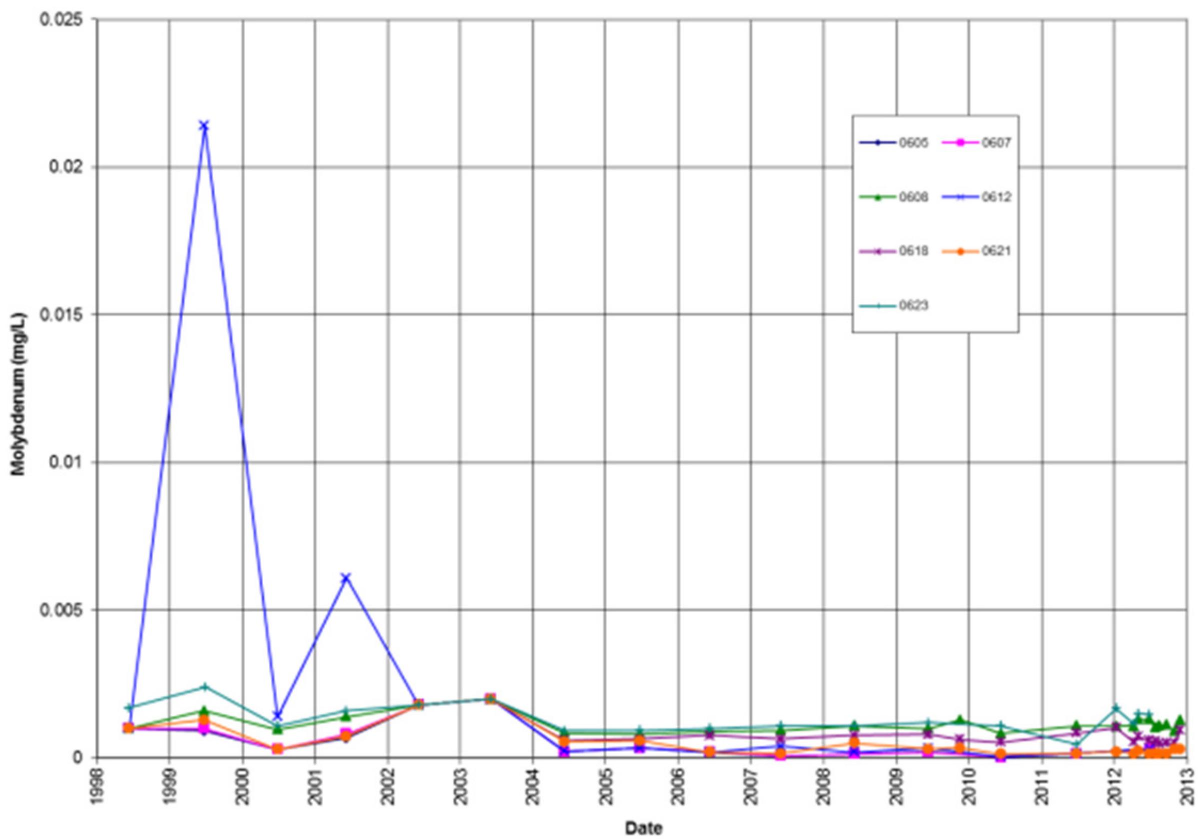

Figure 4–4. Time-Concentration Plot of Molybdenum in Groundwater at the Durango Disposal Site

4.8 Corrective Action

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

No corrective action was required in 2012.

4.9 Photographs

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

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

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

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

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

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

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


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


DUD 5/2012. PL–8. Evaporation pond.

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

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


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

5.0 Annual Inspection of the Falls City, Texas, UMTRCA Title I Disposal Site

5.1 Compliance Summary

The Falls City, Texas, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on January 17, 2012. The disposal cell and all associated surface water diversion and drainage structures were in excellent condition and functioning as designed. No maintenance needs or cause for a follow-up or contingency inspection was identified.

Under normal weather conditions, grass is harvested (cut and bailed) from the site, including from the disposal cell cover, two or three times a year, resulting in a successful beneficial reuse of the site. Due to ongoing drought conditions in Texas, very little hay has been harvested in the last 2 years. In-the-field discussions with vegetation and site management personnel during the annual inspection continue to be used to improve the efficiency and effectiveness of site maintenance activities.

Activity surrounding the site increased this year. County Road 202 (which parallels the northwest perimeter fence) was opened to the public. Opening this road makes the site more susceptible to potential trespass and vandalism. Oil and gas exploration has increased significantly in the area. New underground pipelines have been installed next to the site along County Road 202 and Farm-to-Market Road (FM) 1344. Traffic near the site has also increased as a result of oil and gas industry activity.

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

5.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the U.S. Department of Energy Falls city Uranium Mill tailings Disposal Site Falls City, Texas* (DOE-LM/1602-2008, Rev. 4, U.S. Department of Energy [DOE], March 2008; 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 5–1 lists these requirements.

Table 5-1. License Requirements for the Falls City Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.3	Section 5.4
Follow-Up or Contingency Inspections	Section 3.4	Section 5.5
Maintenance and Repairs	Section 3.5	Section 5.6
Groundwater Monitoring	Section 3.7	Section 5.7.1
Corrective Action	Sections 3.6	Section 5.8

5.3 Institutional Controls

The 231-acre 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 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and locked gates at the site entrances.

5.4 Inspection Results

The site, southwest of Falls City, Texas, was inspected on January 17, 2012. M. Miller, K. Broberg, and D. Traub of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. A. Kleinrath, the DOE Office of Legacy Management (LM) site manager, attended the inspection along with R. Lyssy (a maintenance subcontractor for the site) and K. Tu, L. Line, and M. Pimentel (of the Uranium and Technical Assessments Section, Radioactive Materials Division, Texas Commission on Environmental Quality).

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

5.4.1 Site Surveillance Features

The locations of site surveillance features are shown in Figure 5–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 5–1 by photograph location (PL) numbers.

5.4.1.1 Entrance Gates, Entrance Signs, and Access Road

The main entrance gate (which was replaced in 2006) and the vehicle gate at the north corner of the site were found to be locked and functional (PL–1). The entrance sign located next to the main entrance gate was in good condition.

5.4.1.2 Perimeter Fence and Perimeter Signs

The five-strand barbed-wire perimeter fence, which surrounds the site property boundary, was in good condition.

There are 64 perimeter signs at the site (PL–2). The back of the signs are labeled with the appropriate sign numbers, as designated on the site drawings. All of the perimeter signs were in serviceable condition. All of the signs remain serviceable and do not require corrective action at this time; however, a few minor maintenance items noted during the inspection last year remain. Specifically:

- Perimeter sign P20 was bent, and the post is loose.
- Perimeter signs P56 and P61 contain bullet holes.
- Perimeter signs P1, P2, P3, P4, P63, and P64 are plastic and fading.

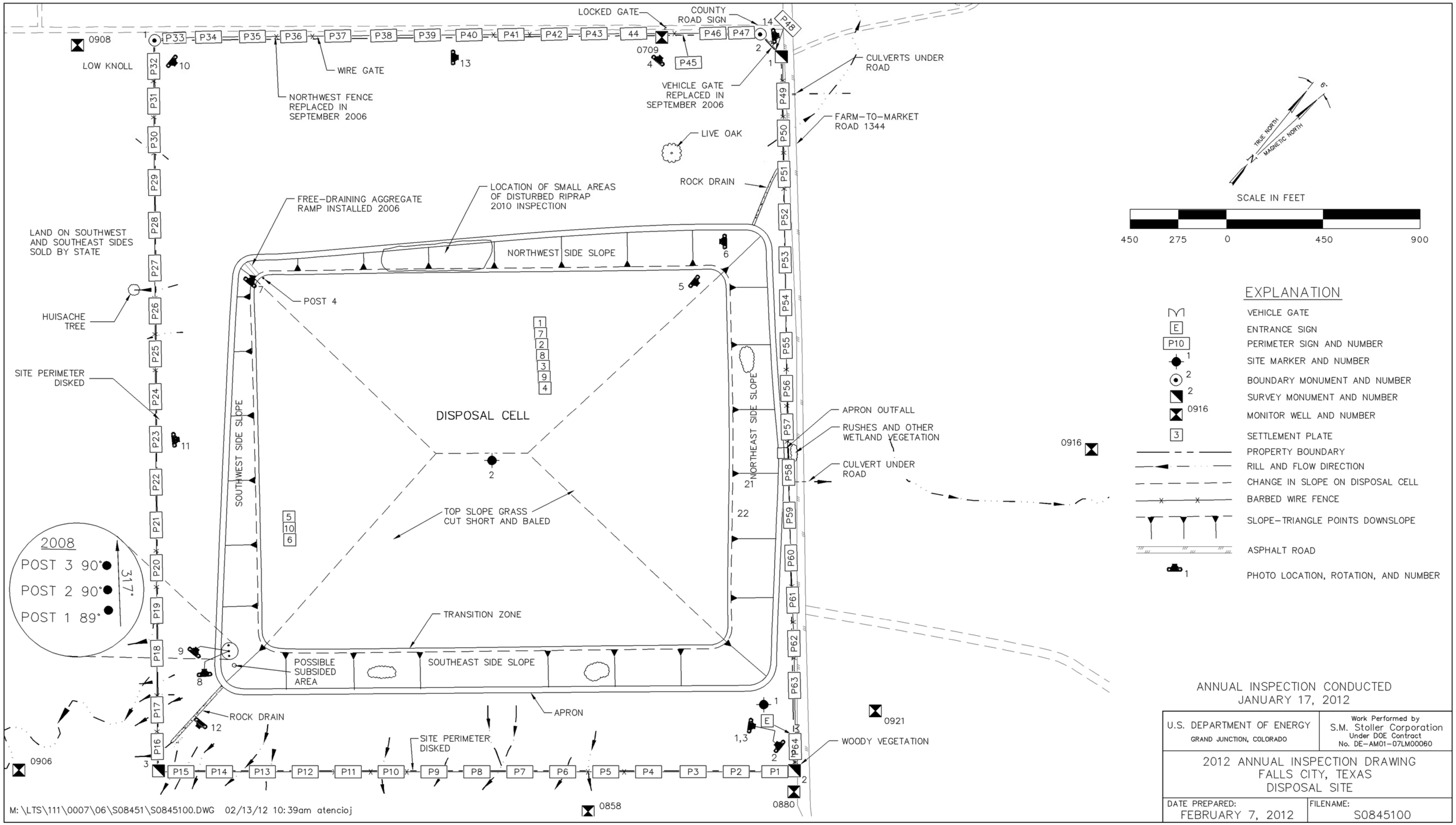

Figure 5–1. 2012 Annual Compliance Drawing for the Falls City Disposal Site

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5.4.1.3 Site Markers

There are two site markers. The marker on top of the disposal cell (SMK–2) was in excellent condition. The marker at the entrance gate (SMK–1) is also in excellent condition, but the corners of the concrete base that the marker sits on have developed cracks (PL–3). The cracks appear to be unchanged from last year. No action is required at this time to address the cracks.

5.4.1.4 Survey Monuments and Boundary Monuments

Three survey monuments and two boundary monuments are situated at the corners of the site. They were undisturbed and in excellent condition.

5.4.1.5 Monitoring Wells

Monitoring wells in the groundwater monitoring network were inspected when they were sampled in April 2011. At that time, all sampled wells were secure and in excellent condition. All monitoring wells observed during the inspection were checked to make sure that they were locked (PL–4).

5.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (1) the top and side slopes of the disposal cell, (2) the site perimeter, and (3) the outlying area.

Within each area, inspectors examined specific site surveillance features, such as monitoring wells, boundary monuments, and signs. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

5.4.3 Top and Side Slopes of the Disposal Cell

The top of the disposal cell is in excellent condition. The cell is covered with well-established coastal Bermuda grass. Kleingrass and other species are interspersed. R. Lyssy (the maintenance subcontractor) typically takes three cuttings of hay each year from the property, which includes the top of the disposal cell. Due to continued drought conditions in Texas, only one cutting was made in 2011, and this was for maintenance purposes, not for harvesting hay.

In past inspections, small desiccation cracks were present in the surface of the soil on the top and upper edges of the disposal cell. Desiccation cracks near the surface of a soil profile are common, especially in clayey or loamy soils when soil conditions are dry. No desiccation cracks were observed during this year's inspection.

Grass on the top slope of the disposal cell was cut short (PL–5). Vegetation was dense, and no sparse or barren areas were noted. No areas of ponded water were observed on top of the disposal cell. No areas of settlement were observed.

The side slopes are covered with riprap and are in excellent condition (PL–6). A couple of riprap disturbances (depressions) were observed on the northwest side slope of the disposal cell during the 2010 inspection. As reported in 2010, the disturbances did not appear to compromise the protectiveness of the riprap side slope. The areas were checked again during the 2011 inspection and this year. No changes were observed in either year.

Evidence of fractured riprap on the side slopes of the disposal cell was not observed during this year's inspection. Previous inspections noted minor amounts of fractured riprap along the side slopes but offered no evidence to suggest that the riprap degradation was pervasive or would diminish erosion resistance. During this year's inspection, photos were taken of riprap at the base of Post 4, near the access ramp on the west corner of the disposal cell (PL–7). Compared to photos taken in earlier years at this location, there is no indication that the riprap is degrading.

In 2007, inspectors noted a possible slight slumping of riprap at the toe of the south corner of the side slope. In 2008, three t-posts were installed in a straight line running at an orientation of 317 degrees (PL–8). Each post was installed at a vertical pitch of 90 degrees. These three posts provide reference points that are used to assess if the area is undergoing movement. Movement
5A of a post out of line with the other two posts, or the change in pitch of an individual post, will indicate possible movement in the area. During the inspection, a small level was used to measure the vertical pitch of each post, and a compass was used to check the orientation of the line of the posts (PL–9). The three posts remain in the same straight line at which they were installed (i.e., 317 degrees). The vertical pitch of each post is within a degree of the installation pitch, which indicates that no movement has occurred (Table 5–2).

Table 5-2. Vertical Pitch of Posts at the Falls City Disposal Site

Post	2008 Inspection	2009 Inspection	2010 Inspection	2011 Inspection	2012 Inspection
1	90 degrees	89 degrees	89 degrees	89 degrees	89 degrees
2	90 degrees	90 degrees	90 degrees	90 degrees	90 degrees
3	89 degrees	90 degrees	89 degrees	89 degrees	90 degrees

An equipment access ramp to the top of the cell is located at the west corner of the side slope (PL–10). The ramp was installed in 2008 and constructed with clean angular riprap of progressively smaller sizes to provide a free-draining and stable driving surface that does not encourage vegetation encroachment. The ramp is in excellent shape, but it will probably need an additional layer of small gravel in the next couple of years.

Vegetation management on the cell and side slopes is excellent (PL–11). Much of the vegetation observed during the inspection on the side slopes was either dead or dormant grass. R. Lyssy has been subcontracted since 2003 to eradicate the perennial plants from the site, including the disposal cell, the riprap apron around the base of the disposal cell, and riprap-lined drainage ditches leading from the disposal cell.

During past inspections, small, scattered trees and bushes (greasewood, upland willow, mesquite, and possibly others) were observed in the riprap on the side slopes of the disposal cell. Greasewood and similar species are of particular concern because they are deep-rooted and could penetrate the radon barrier. DOE expects that control of undesirable vegetation on the side slopes will be ongoing. Such control will include cutting the deep-rooted species at ground level before the woody vegetation gets to be 1 inch in diameter, and applying a systemic herbicide to the stumps. The maintenance subcontractor will be instructed to continue efforts to eradicate woody vegetation on the side slopes.

5.4.3.1 Site Perimeter

A five-strand barbed-wire fence is installed around the disposal site. The fence on the northwest boundary of the site was replaced in 2006. The remainder of the fence was installed when the disposal site was remediated in the mid-1980s. The fence is in good condition. In the west corner of the site (near perimeter sign P33), a 16-foot-long fence panel was replaced with barbed wire in 2010 to provide additional security. Fence posts in the south corner of the site need to be straightened. Cattle have brushed up against them and pushed them over.

The area between the fence and the toe of the disposal cell is covered with well-established grass, primarily Kleingrass with some coastal Bermuda grass. During most years, these areas are cut and baled two or three times. Due to ongoing drought conditions, no hay was harvested this year from the site. One cutting was made for maintenance purposes. When performed on a regular basis, the cutting and baling process is a clean and thorough method of controlling and managing grass at this site and provides a beneficial reuse of the site. Grass is usually left uncut along the fence, along rock drains, and around some of the as-built features such as the site markers.

Evidence for wild hog burrows was observed along the fence line in some areas. The maintenance contractor fills in these burrows as they are located. Other than possibly compromising the integrity of the fence, the burrows are considered to be a minor nuisance at this time.

No water was flowing in the south rock drain during this year’s inspection, but water was ponded at the end of the drain (PL–12). No water was observed in the north rock drain. Vegetation is left uncut at the outlets of the rock drains to assist in dissipating the energy of site runoff during storm events. Baffling the flow of water at the outlets helps to alleviate soil erosion near the outlet areas during large precipitation events. Tall, thick grass at the drain outlets is, therefore, desirable. Vegetation in the apron outfall, located midway along the northeast side slope, is being properly managed.

5.4.3.2 Outlying Area

The area outward from the disposal site for a distance of 0.25 mile was visually inspected, including land that was sold to Alamo Holdings in 2005. A significant increase in oil and gas industry activity was observed during this year’s inspection. A gravel-supply operation is now located just northwest of the site along FM 1344. Truck traffic to and from this facility has increased significantly. During the inspection, heavy truck traffic was observed not only on FM 1344 but also on County Road 202, which runs along the northwest side of the site property (PL–13 and PL–14).

No developments or disturbances that violate deed restrictions at the site were observed. The Alamo Holdings parcel is used for occasional livestock grazing and is reverting to native brush land. A private residence just south of the disposal cell was sold in 2010, and the new owner completed construction of a barn since the inspection last year.

Up until 2011, public access to County Road 202 was restricted by a locked gate. As of the 2011 inspection, the road has been open. Removal of the lock and gate has not led to increased vandalism or trespass of the site.

5.5 Follow-Up or Contingency Inspections

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

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

5.6 Maintenance and Repairs

5B Fence posts in the south corner of the site need to be straightened. Cattle have brushed up against them and pushed them over.

5.7 Environmental Monitoring

5.7.1 Groundwater Monitoring

NRC does not require groundwater monitoring at the site. It is conducted as a best management practice. Groundwater was sampled in April 2012 in accordance with the LTSP. Uranium
5C concentrations at monitoring well 0891 (completed in the Dilworth aquifer) decreased in 2012. The concentration measured at monitoring well 0891 in 2012 was 2.7 milligrams per liter (mg/L), down 0.2 mg/L from the concentration measured in 2011. Water levels measured in 2012 were consistent with past years.

Groundwater monitoring was conducted at the site in April 2012. As prescribed in the revised LTSP, groundwater monitoring at the site as a best management practice has two components:

1) Monitor groundwater to demonstrate the initial performance of the disposal cell (40 CFR 192, Subpart A).
2) Monitor groundwater for plume movement to demonstrate that potential users of groundwater downgradient of the site are not exposed to contamination related to the former processing site (40 CFR 192, Subpart B).

Because narrative supplemental standards apply to the uppermost aquifer at the site, no concentration limits or points of compliance have been established. Groundwater in the uppermost aquifer beneath the site has a U.S. Environmental Protection Agency designation of "limited use" (Class III) because it is not currently or potentially a source of drinking water due to widespread ambient contamination that cannot be cleaned up using methods reasonably employed by public water supply systems. Background groundwater quality varies by orders of magnitude in the area because the uppermost aquifer is in a location where uranium mineralization is naturally redistributed. For these reasons, the NRC general license does not require groundwater monitoring at the site.

Two aquifers of interest underlie the site: the shallow Deweesville/Conquista aquifer and the deeper Dilworth aquifer. Because the two aquifers are hydraulically connected, they constitute the uppermost aquifer for regulatory purposes. The Dilworth aquifer is underlain by the Manning Clay, a 300-foot-thick aquitard that isolates the uppermost aquifer from better-quality groundwater in deeper aquifers. Groundwater samples at the site are collected from both the Deweesville/Conquista aquifer and the underlying Dilworth aquifer.

The disposal cell performance monitoring network consists of five monitoring wells (0709, 0858, 0880, 0906, and 0921) that are completed in the uppermost aquifer and sampled as specified in the revised LTSP. Two additional cell performance monitoring wells (0908 and 0916), also completed in the uppermost aquifer, are designated for water-level measurements only.

The groundwater compliance monitoring network consists of five monitoring wells (0862, 0886, 0891, 0924, and 0963) that are completed in the uppermost aquifer and sampled annually as specified in the revised LTSP. Figure 5–2 shows the monitoring well networks.

The revised LTSP prescribes continued annual monitoring of the current network of wells through 2010 as a best management practice and reduces the analyte list to total uranium and field measurements of temperature, pH, conductivity, turbidity, alkalinity, dissolved oxygen, and oxidation-reduction potential.

The revised LTSP (which incorporates the *Ground Water Compliance Action Plan*, March 1998) identifies low pH levels in groundwater as an indicator of the extent and movement of the legacy groundwater plumes. Changes in the baseline geochemical conditions may also indicate leachate movement from the disposal cell into the uppermost aquifer. Tailings pore fluids were lower in pH than background groundwater was. However, because pH levels and other signature contaminants in tailings pore fluids are essentially indistinguishable from processing-related contamination, it is difficult to determine if contamination comes from the disposal cell or from legacy processing activities.

DOE has determined that pH and uranium concentrations do not co-vary. This is an indication that other factors contribute to uranium distribution in the uppermost aquifer, such as natural redistribution of uranium in this active ore-forming environment. Therefore, increasing uranium levels at a monitoring location without an attendant drop in pH probably does not indicate movement of processing-related contamination. Groundwater chemistry at monitoring locations near the formation subcrop may also be influenced by residence time as a response to precipitation or changes in oxidation state within the formation. If increases in uranium are sporadic and not accompanied by decreases in pH, DOE concludes that the elevated uranium is naturally occurring. Time-concentration plots for pH and uranium from 1996 through April 2011 are included as Figures 5–3 through 5–6.

5.7.1.1 Groundwater Quality Monitoring Results

This report considers groundwater monitoring results through April 2012. In 2012, monitoring wells were sampled for uranium and field parameters. Water levels were also measured.

At the cell performance monitoring wells, pH levels have historically been higher than the pH in tailings pore fluids, with no significant upward or downward trends. In 2012, the pH levels for the cell performance wells remained within the historical range, with the exception of well 0858. The pH measured was 6.07 standard units (s.u.), slightly above the previous high of 6.04 s.u. (Figure 5–3).

At the groundwater compliance monitoring wells, pH levels have historically been higher than the pH in the plumes of groundwater contaminated by processing activities, with no significant upward or downward trends, except that the pH at well 0963 has historically been lower than at the other locations. In 2012, the pH levels for the compliance monitoring wells remained within the historical range (Figure 5–4).

In 2012, the uranium concentration at well 0921 was elevated slightly (1.7 milligrams per liter [mg/L]) compared to 2011 (1.4 mg/L). Overall, in 2012 the uranium concentrations in the cell performance network remained relatively stable, approximately 1.7 mg/L or less, with the exception of well 0880. At well 0880, uranium has varied from a low concentration of 1.38 mg/L in 2008 to a high concentration of 14 mg/L in 2004 (Figure 5–5). Over time, the concentration of uranium in this well has varied. The pH at this location is lower than, and has varied more than, at other locations in the cell performance monitoring network (Figure 5–3). Water levels are also generally falling at well 0880 (see Section 5.7.1.2). These results suggest that the interaction among the disposal cell, the legacy groundwater mound, and processing plumes is still equilibrating. However, monitoring results do not indicate that the disposal cell is contributing to the degradation of the uppermost aquifer. Because the groundwater in the uppermost aquifer is not used as a potable water source near the site, the site remains protective.

The concentration of uranium in groundwater within the compliance monitoring network shows that the uranium concentration trends at monitoring wells 0862, 0886, and 0963 remain stable at low levels (less than 0.2 mg/L) (Figure 5–6). The increasing uranium concentration trend at well 0924 has leveled off and fluctuates between 0.5 and 0.6 mg/L. The uranium concentrations measured at well 0891 in 2009 (1.7 mg/L), 2010 (2.1 mg/L), 2011 (2.9 mg/L), and 2012 (2.7 mg/L) are anomalously high compared to historical measurements at the well, but not for the aquifer.

The uranium concentration at well 0891 in 2012 (2.7 µg/L) is down slightly from the concentration measured in 2011 (2.9 µg/L). The maximum uranium concentration measured at monitoring well 0891 in 2011 (2.9 mg/L) is below the maximum concentration reported for the aquifer, which is also the value used in the risk assessment for the Dilworth groundwater (3.04 mg/L). Site-related contamination poses no risk to the uppermost aquifer at the site because the groundwater from this aquifer is not used for human consumption, as a result of its “limited use” designation. Additionally, a 300-foot-thick aquitard isolates the uppermost aquifer from the better-quality groundwater in deeper aquifers.

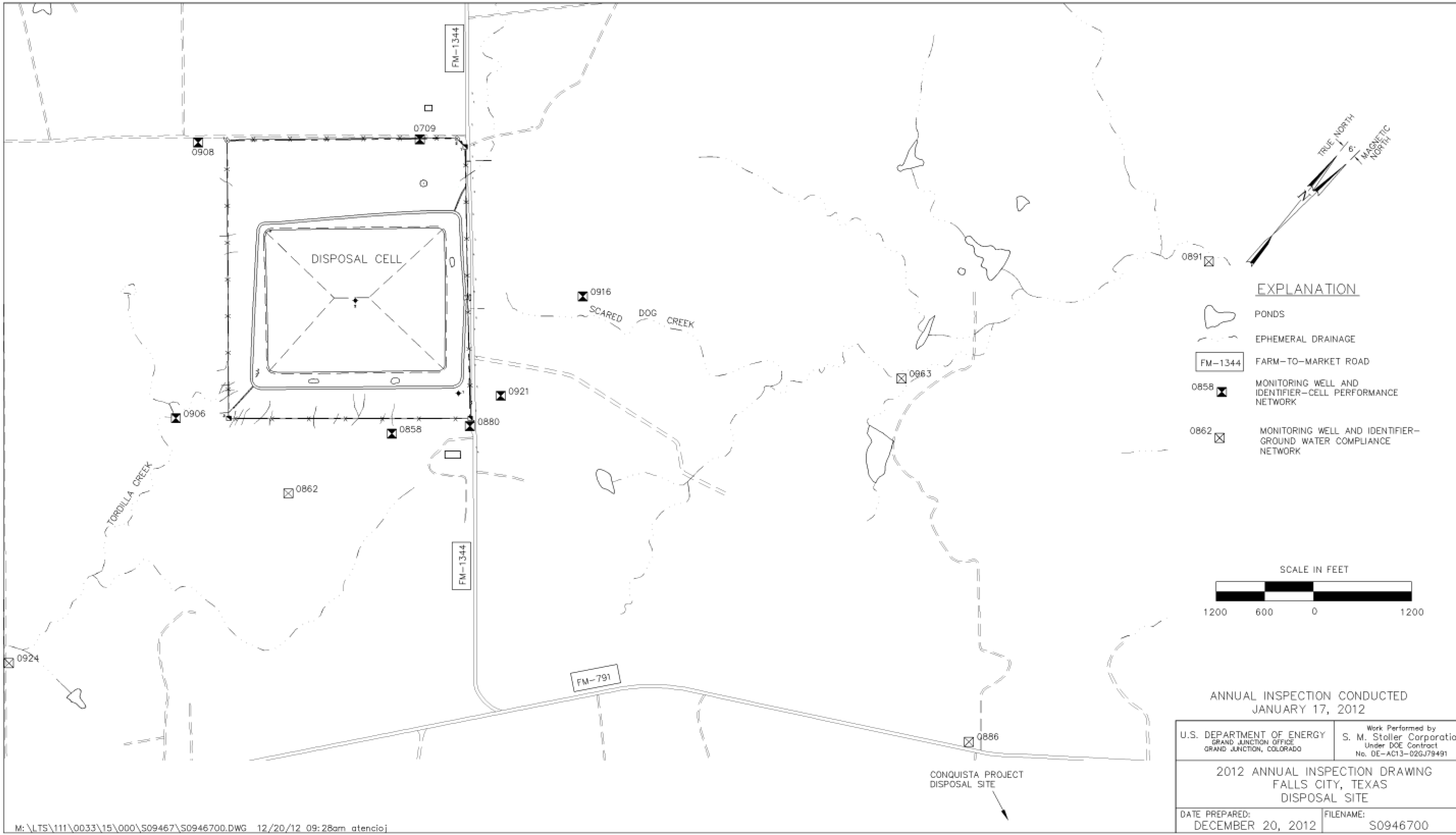

Figure 5–2. Combined Monitoring Well Network at the Falls City Disposal Site

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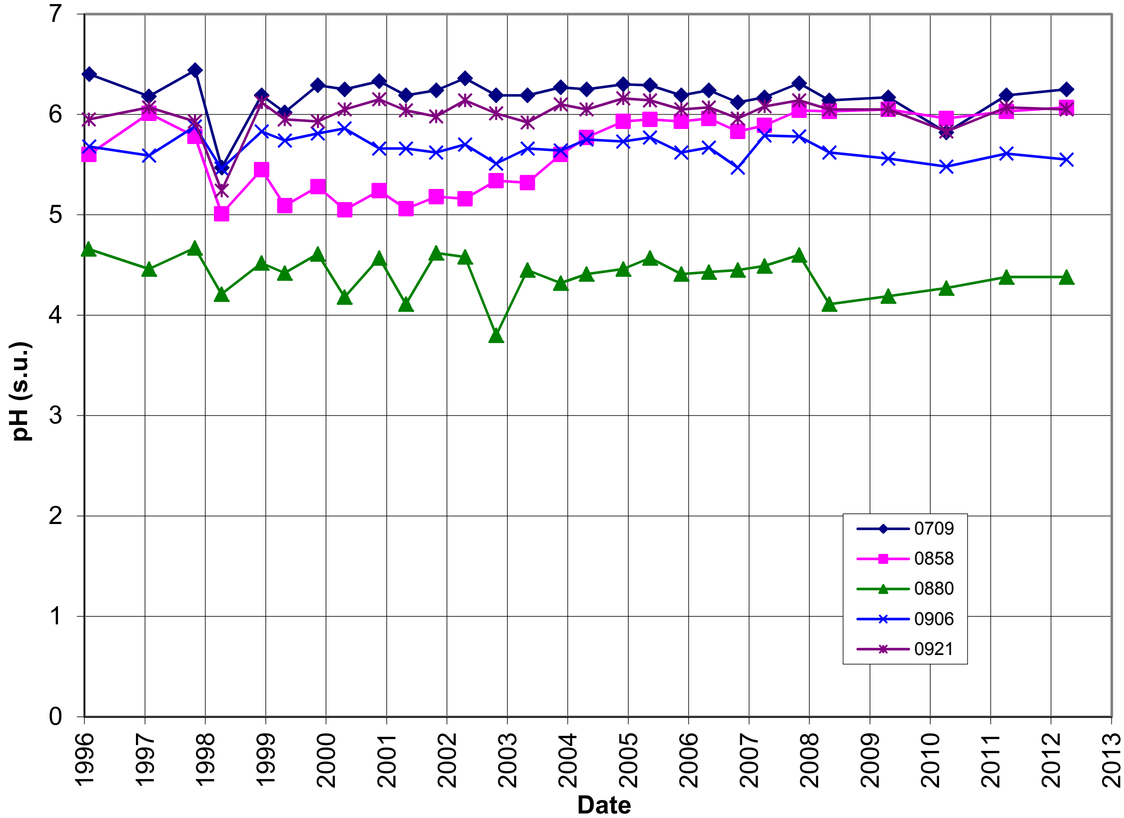

Figure 5–3. pH in Groundwater at Cell Performance Monitoring Locations at the Falls City Disposal Site

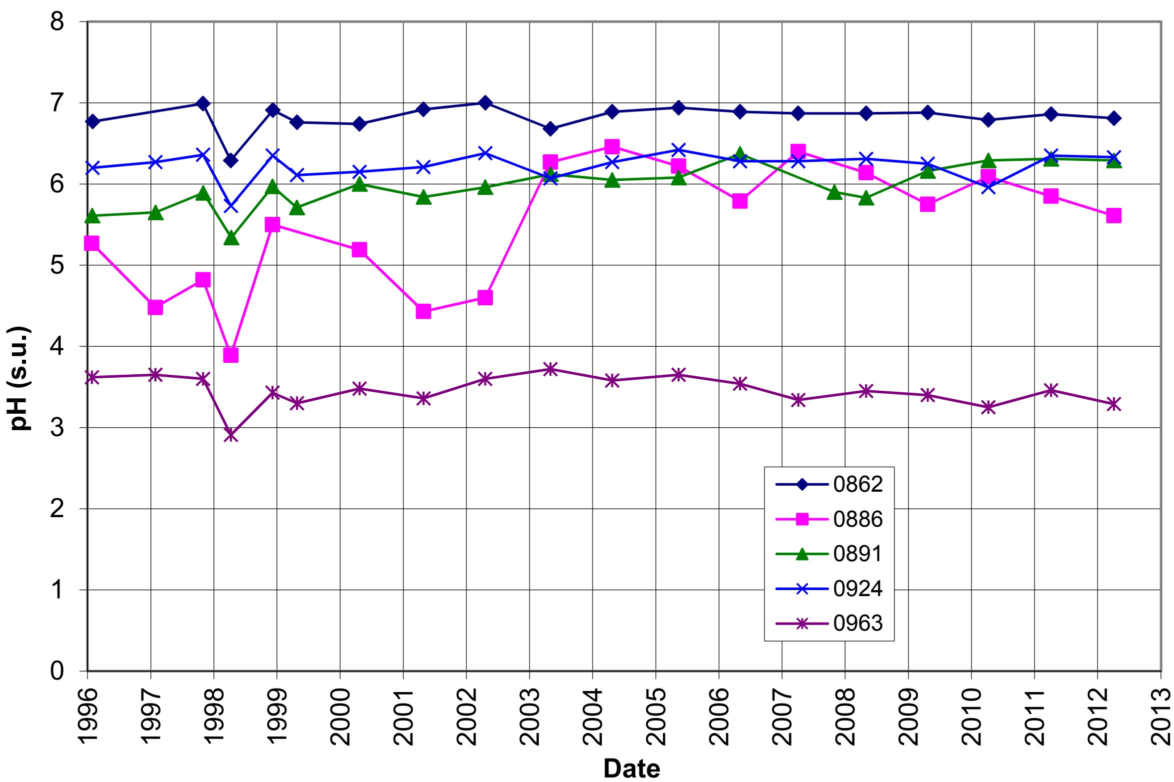

Figure 5–4. pH in Groundwater at Compliance Monitoring Locations at the Falls City Disposal Site

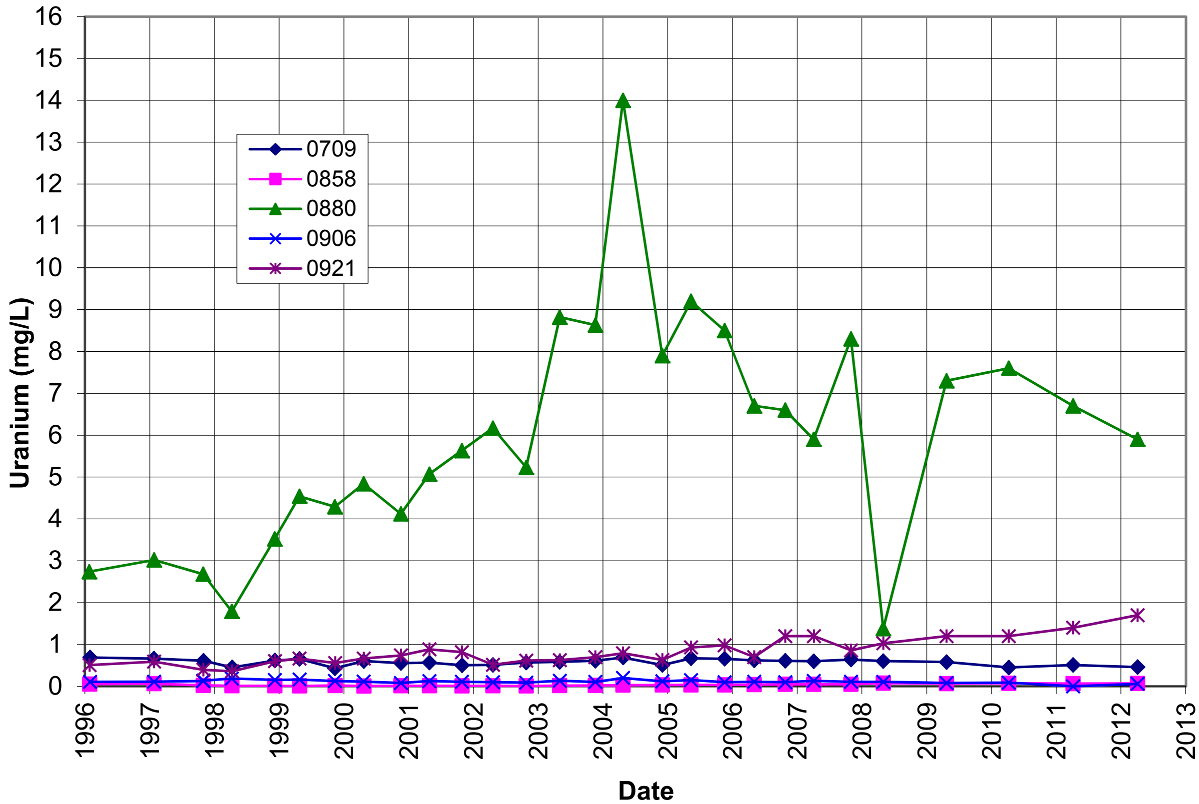

Figure 5–5. Uranium in Groundwater at Cell Performance Monitoring Locations at the Falls City Disposal Site

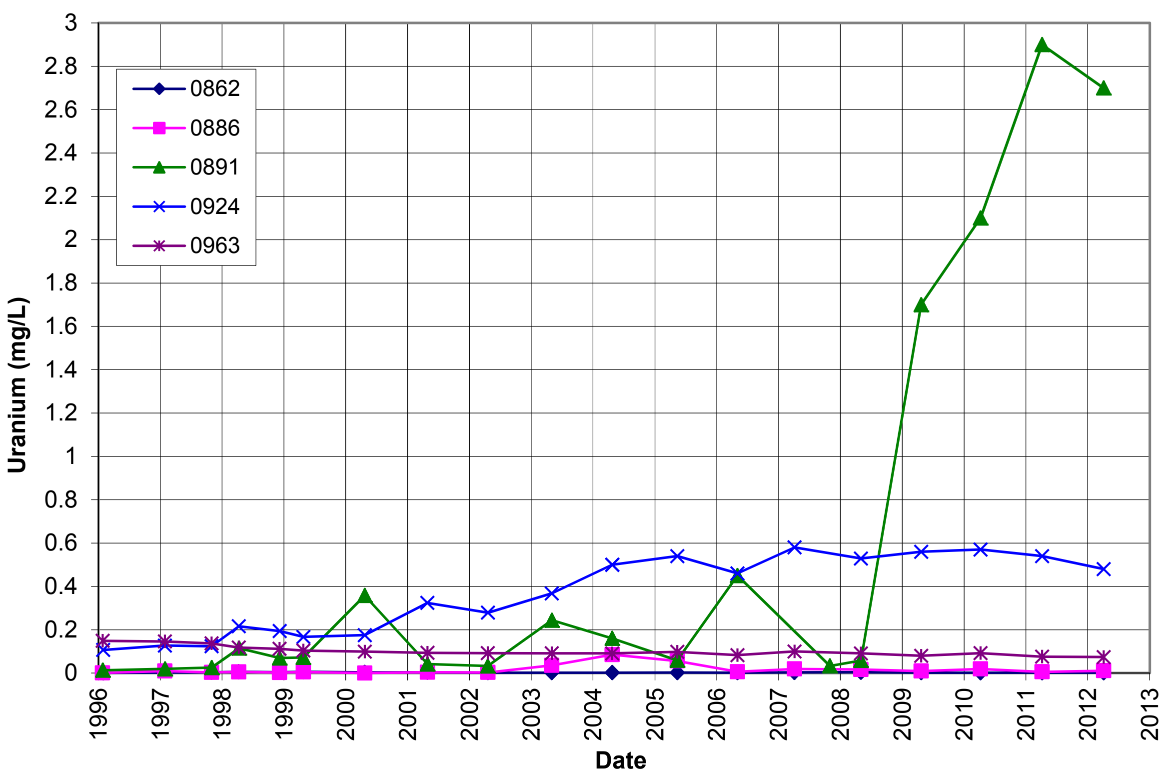

Figure 5–6. Uranium in Groundwater at Compliance Monitoring Locations at the Falls City Disposal Site

5.7.1.2 Groundwater-Level Monitoring Results

Water levels measured in 2012 in the disposal cell performance network are all new measured lows for each well (Figure 5–7). Since 1996, groundwater levels in the disposal cell performance network wells have fallen slightly. The water level in monitoring well 0906 has fluctuated more than the other wells over the years. Monitoring well 0906 is directly downslope of the disposal cell, and the historical fluctuation may be the result of the infiltration of water shed by and conveyed away from the disposal cell, reflecting variations in annual precipitation. Other contributors that may influence local groundwater levels include (1) the dissipation of the processing-site-related groundwater mound beneath the disposal cell, and (2) the dissipation of transient drainage from the disposal cell.

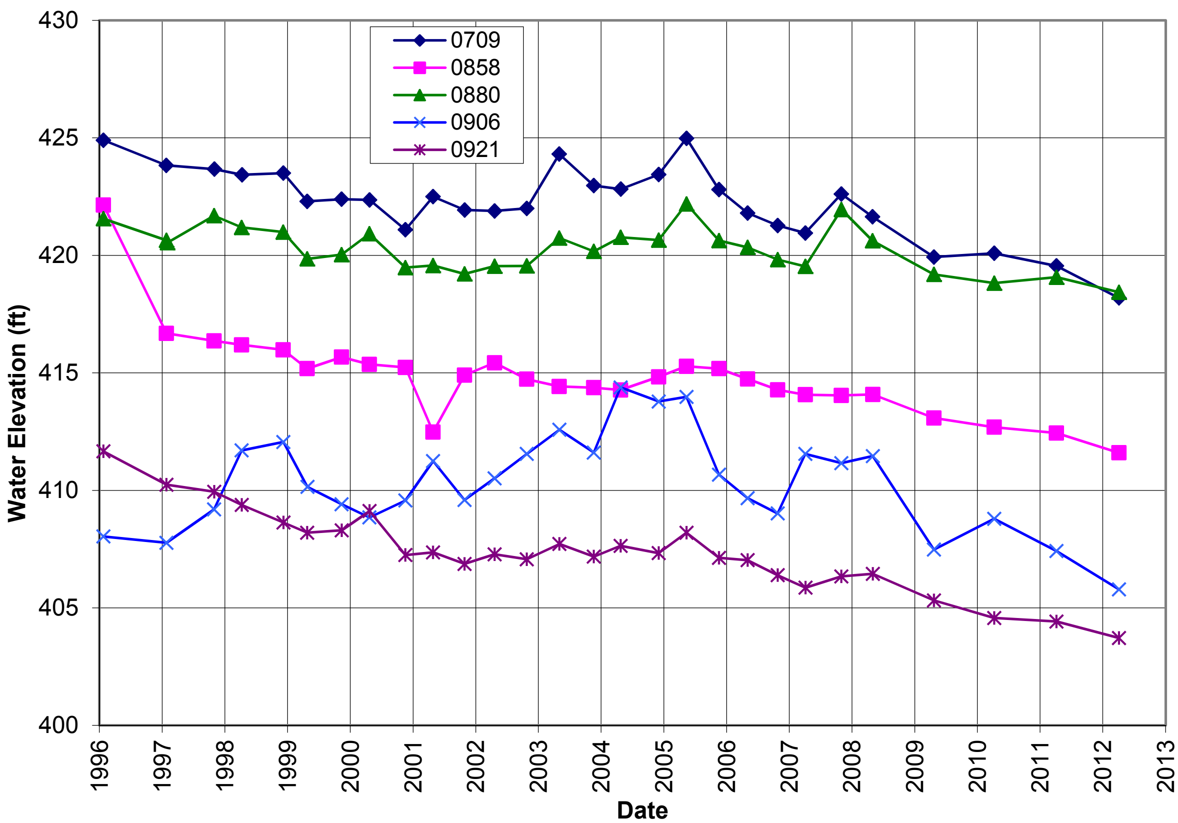

Figure 5–7. Water-Level Measurements at Cell Performance Monitoring Locations at the Falls City Disposal Site

Two cell performance monitoring wells, 0908 and 0916, are not shown in Figure 5–7. These wells, designated for groundwater-level monitoring only, are completed in the unsaturated zone of the Conquista Sandstone and have been dry since 1996.

In contrast, water levels in the groundwater compliance monitoring network wells have all increased slightly between 1996 and 2012 (Figure 5–8).

5.7.1.3 Evaluation of Groundwater Monitoring

Site-related contamination poses no risk to the uppermost aquifer at the site because groundwater from this aquifer is not used for human consumption, as a result of its “limited use” designation. Potable (domestic) water is produced locally from the Carrizo Sandstone that lies 2,000 feet below the surface near the site. Additionally, a 300-foot-thick aquitard isolates the uppermost aquifer from the better-quality groundwater in deeper aquifers.

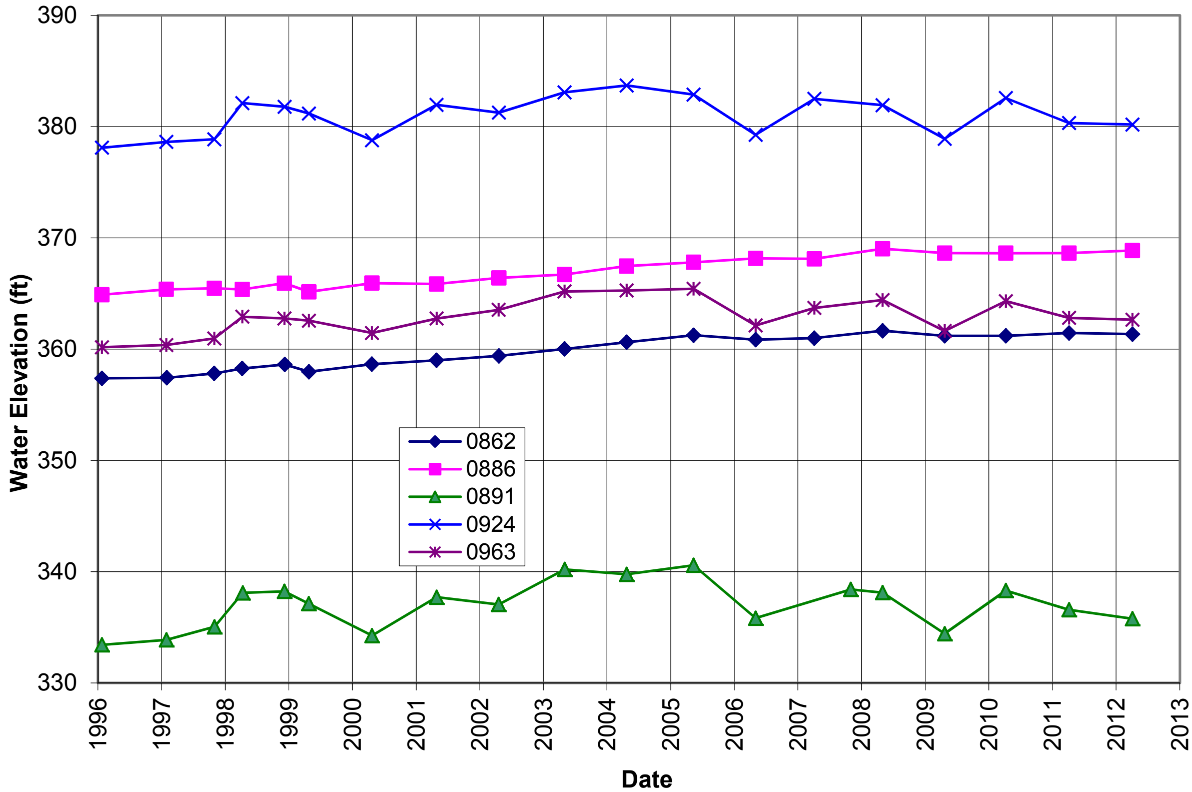

Figure 5–8. Water-Level Measurements at Compliance Monitoring Locations at the Falls City Disposal Site

In 2010, DOE evaluated the groundwater monitoring program at the site, as required every 5 years by the LTSP. Five years of additional groundwater monitoring data (2006 through 2010) at the site were compared to previous data (1996 through 2005). The comparison showed that hazardous constituent concentrations continued to fluctuate in the uppermost aquifer, but the fluctuations in the past 5 years were within the historical range reported for the aquifer in the area of the site. Uranium concentrations at monitoring well 0891 had increased from 2006 through 2010. The concentration of the sample collected in April 2011 was at an all-time high for the well, 2.9 mg/L. The comparison also showed no new unexpected water-level changes.

The 2010 evaluation recommended that after the collection of samples in 2011, groundwater monitoring activities at the site be discontinued. It was proposed that DOE would not plug and abandon the 12 monitoring wells at the site until the nearby Conquista, Texas, Title II Disposal Site is transferred to LM. The transfer is projected to occur in 2017. The Conquista site is just south of, and adjacent to, the Falls City site. Upon the Conquista site's transfer to LM, DOE will assess whether a joint monitoring approach is warranted (either as a one-time event or as periodic monitoring). Once NRC approves the recommended monitoring strategy for the Conquista site, wells no longer deemed necessary to a Conquista monitoring effort would be decommissioned following State of Texas guidelines for plugging and abandoning groundwater monitoring wells.

Recommendations made in the 2010 evaluation continue to undergo NRC review.

5.8 Corrective Action

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

No corrective action was required in 2012.

5.9 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL–1	60	Entrance gate locked.
PL–2	270	Perimeter sign with DOE website posted.
PL–3	60	Site marker SMK–1; note cracks in concrete base.
PL–4	NA	Monitoring well 0709.
PL–5	90	View east from north corner of cell.
PL–6	230	Top of northwest side slope.
PL–7	NA	Riprap near access ramp and post 4.
PL–8	317	Line of t-posts, south corner of cell.
PL–9	NA	Pitch of post 1.
PL–10	90	Access ramp, west corner of cell.
PL–11	45	Southwest side slope.
PL–12	180	Pooled water, south rock drain.
PL–13	50	Traffic on County Road 202, northwest of site.
PL–14	45	Heavy traffic on FM 1344, northeast of site.

FCT 1/2012. PL–1. Entrance gate locked.

FCT 1/2012. PL–2. Perimeter sign with DOE website posted.

FCT 1/2012. PL–3. Site marker SMK–1; note cracks in concrete base.

FCT 1/2012. PL–4. Monitoring well 0709.

FCT 1/2012. PL–5. View east from north corner of cell.

FCT 1/2012. PL–6. Top of northwest side slope.

FCT 1/2012. PL–7. Riprap near access ramp and post 4.

FCT 1/2012. PL–8. Line of t-posts, south corner of cell.

FCT 1/2012. PL–9. Pitch of post 1.

FCT 1/2012. PL–10. Access ramp, west corner of cell.

FCT 1/2012. PL–11. Southwest side slope.

FCT 1/2012. PL–12. Pooled water, south rock drain.

FCT 1/2012. PL–13. Traffic on County Road 202, northwest of site.

FCT 1/2012. PL–14. Heavy traffic on FM 1344, northeast of site.

6.0 Annual Inspection of the Grand Junction, Colorado, UMTRCA Title I Disposal Site

6.1 Compliance Summary

The Grand Junction, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on November 14, 2012. The disposal cell and all associated surface water diversion and drainage structures were in excellent condition and functioning as designed. A portion of the disposal cell remains open to receive additional low-level radioactive materials from various sources. The annual inspection applies only to the closed and completed portion of the disposal cell and surrounding disposal site. A damaged perimeter sign was replaced after the inspection. No maintenance needs or cause for a follow-up or contingency inspection was identified.

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

6.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Interim Long-Term Surveillance Plan for the Cheney Disposal Site Near Grand Junction, Colorado* (DOE/AL/62350–243, Rev. 1, U.S. Department of Energy [DOE], April 1998; 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 6–1 lists these requirements.

Table 6–1. License Requirements for the Grand Junction Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 6.4
Follow-Up or Contingency Inspections	Section 3.4	Section 6.5
Routine Maintenance and Repairs	Sections 2.7.3 and 4.0	Section 6.6
Groundwater Monitoring	Section 2.6	Section 6.7.1
Corrective Action	Section 5.0	Section 6.8

6.3 Institutional Controls

The United States of America owns the 360-acre site. A portion of the disposal cell is projected to remain open until 2023, or until it is filled to its design capacity, to accommodate additional authorized low-level radioactive material expected from approved sources. This material includes unremediated uranium mill tailings from under roads and along water, sewer, and utility lines in Grand Junction; uranium mill tailings from under city streets in Monticello, Utah; and process wastes from the water treatment plant at the Tuba City, Arizona, UMTRCA Title I Disposal Site. The DOE Office of Legacy Management operates the site under the authority of House Rule 2967 Section 2(a)(1)(B). Consequently, the site has not been accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27).

Institutional controls at the site include federal ownership of the property and the following features that are inspected annually: boundary monuments, warning/no-trespassing signs, a site perimeter fence, and locked gates at the site entrances.

6.4 Inspection Results

The site, south of Grand Junction, was inspected on November 14, 2012. R. Johnson, S. Hall, S. Woods, and P. Wetherstein of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, conducted the inspection. R. Bush, the DOE Office of Legacy Management site manager; R. Evans, of NRC; and M. Cosby, of the Colorado Department of Public Health and Environment, attended the inspection.

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

6.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 6–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 6–1 by photograph location (PL) numbers.

6.4.1.1 Entrance Gates, Entrance Signs, and Access Road

Access to the site, located approximately 18 miles southeast of Grand Junction, is from U.S. Highway 50 along a right-of-way grant on federal land administered by the U.S. Bureau of Land Management (BLM). A steel double-swing access gate secured by a chain and DOE lock is located along the highway right-of-way fence. The gate was locked and in good condition.

A two-lane asphalt access road, maintained by DOE, extends approximately 1.7 miles east along DOE's right-of-way to the site entrance gate. The access road was reconstructed in fall 2012 and was in excellent condition (PL–1). The fence along the right-of-way corridor was in good condition.

The site entrance gate is a double-swing chain-link gate. It is secured by a DOE lock, which is keyed the same as the site access gate, and was in good condition.

The entrance sign at the entrance gate was in excellent condition (PL–2).

6.4.1.2 Perimeter Fence and Perimeter Signs

A standard four-strand barbed-wire stock fence surrounds the disposal cell features and operations areas. The fence was in good condition (PL–3).

A total of 29 perimeter signs are placed at regular intervals along the DOE property boundary. The signs are installed on galvanized steel posts set in concrete. One sign had numerous bullet holes and was replaced after the inspection. All of the other signs were in excellent condition.

6.4.1.3 Site Markers

Granite site markers similar to those installed at other UMTRCA sites will not be installed at this site until the disposal cell is closed.

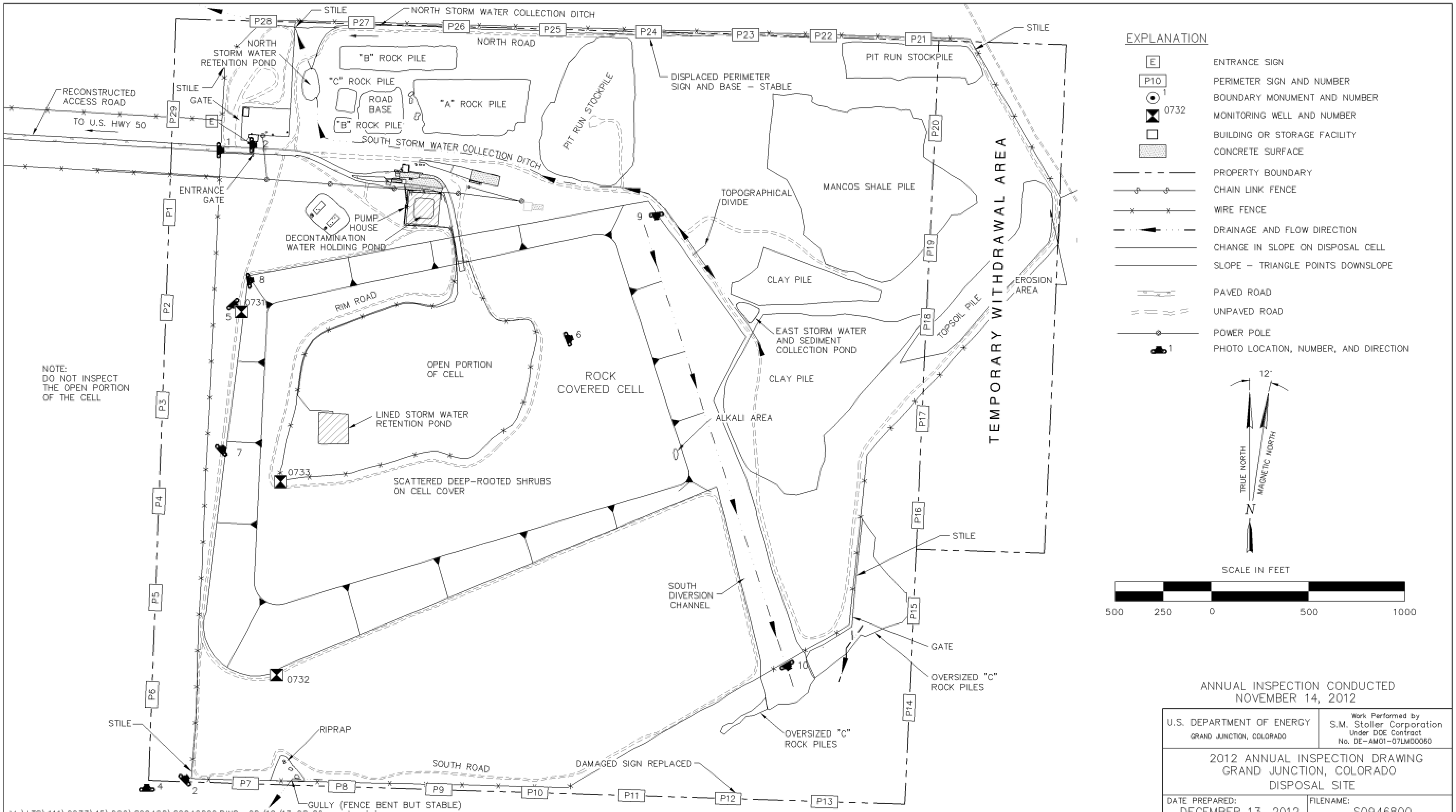

Figure 6-1. 2012 Annual Compliance Drawing for the Grand Junction Disposal Site

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6.4.1.4 Survey Monuments and Boundary Monuments

The site has four permanent boundary monuments, one at each of the four corners. All of the boundary monuments were in excellent condition (PL–4).

6.4.1.5 Monitoring Wells

The groundwater monitoring network consists of three monitoring wells. All three are inside the site boundary. The wells were secure and in excellent condition (PL–5).

6.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into five inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (1) the closed portion of the disposal cell, (2) the diversion structures and drainage channels, (3) the area between the disposal cell and the site boundary, (4) the site perimeter, and (5) the outlying area.

Within each area, inspectors examined specific site surveillance features, such as monitoring wells, boundary monuments, and signs. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

6.4.2.1 Closed Portion of the Disposal Cell

Basalt riprap covers the top and side slopes of the disposal cell. The rock is durable and was in excellent condition. The cover was in excellent condition, with no evidence of settling or erosion (PL–6). Numerous small areas on the cell cover have alkali deposits. These areas tend to have fine windblown and construction-related deposits that absorb precipitation and runoff moisture and subsequently dry out, leaving evaporite minerals. There is no indication that these areas degrade the performance of the disposal cell cover.

The side slopes (PL–7) and riprap-filled apron (PL–8) were in excellent condition. There was no evidence of erosion or slope instability.

Grasses and weeds grow on most of the cell cover, and scattered deep-rooted vegetation (primarily shrubs) was present. The grasses and weeds have shallow root systems and do not degrade cell cover performance. Historically, deep-rooted shrubs have been considered to pose a potential threat to the long-term integrity of the radon barrier and are periodically treated with herbicide. However, recent studies by DOE and the U.S. Environmental Protection Agency (EPA) have indicated that evapotranspiration cover designs perform significantly better than the conventional rock-covered compacted soil layer designs (as used at this site) in terms of limiting permeability and the percolation of moisture into the cells.

6.4.2.2 Diversion Structures and Drainage Channels

The south diversion channel is a large riprap-armored structure that conveys runoff from the disposal cell southeast into a natural drainage that flows away from the site to the southwest. The diversion channel was in excellent condition (PL–9). Some plant growth, including grasses, weeds, and deep-rooted shrubs, exists within the channel. However, the presence of vegetation is not expected to degrade the performance of the channel. The discharge area of the channel is armored with large-diameter basalt riprap and was in excellent condition (PL–10).

Other drainage features at the site include north and south storm water collection ditches, the north storm water retention pond, and a storm water and sediment collection pond on the east side of the south diversion channel. These small drainage features control storm water runoff primarily from the various cover materials stockpiled on the northern and eastern portions of the disposal site property. The north storm water collection ditch also captures storm water run-on from a large catchment area north and east of the disposal site. The ditches and ponds were functioning as designed.

6.4.2.3 Area Between the Disposal Cell and the Site Boundary

There are 12 discrete stockpiles of rock and soil between the disposal cell and the site boundary on the north and east sides of the disposal cell. These materials eventually will be used to cover and close the open cell. Natural vegetation is generally well established and is protecting the stockpiles from significant erosion.

On the south and west sides of the site, between the disposal cell and the site boundary, the ground is relatively flat and covered with native vegetation that consists primarily of perennial grasses and small shrubs. No erosion was observed in the undisturbed areas south and west of the disposal cell.

6.4.2.4 Site Perimeter

The site boundary ranges from a few feet to approximately 900 feet outside the perimeter fence. A perimeter sign had been shot with numerous bullets; otherwise, the site perimeter was in excellent condition.

6.4.2.5 Outlying Area

The area outward from the site for a distance of 0.25 mile was visually inspected. No development or disturbance that could affect the site was observed. Most of the land surrounding the site is rangeland administered by BLM. The land is covered by native grass and shrubs, and it is used primarily for cattle grazing.

Directly east of the site, just beyond the site boundary, there is a 40-acre temporary withdrawal area of federal land administered by BLM. The temporary withdrawal area is not included in the interim LTSP and, therefore, is not formally inspected. DOE uses the temporary withdrawal area to stockpile cover materials for the eventual closure of the open portion of the cell.

6.5 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 or in the vicinity of the site are substantially changed.

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

6.6 Maintenance and Repairs

6A Damaged perimeter sign P12 was replaced after the inspection. No additional maintenance needs were identified during the inspection.

6.7 Environmental Monitoring

6.7.1 Groundwater Monitoring

6B Because narrative supplemental standards apply (40 CFR 192.21 [g]), groundwater in the uppermost aquifer (Dakota Sandstone) beneath the site need not be monitored. The basis for supplemental standards is that the groundwater is designated "limited use" because the content of total dissolved solids exceeds 10,000 milligrams per liter (mg/L) (40 CFR 192.11 [e]). Confined groundwater in the uppermost aquifer lies approximately 750 feet below the existing ground surface and is hydrogeologically isolated from the tailings material by mudstones and shales of the Mancos Shale.

In lieu of monitoring groundwater in the uppermost aquifer, DOE voluntarily monitors groundwater as a best management practice from two monitoring wells completed in (or very near) buried alluvial paleochannels adjacent to the disposal cell (0731 and 0732) and one monitoring well in the disposal cell (0733) (Table 6–2). This best-management-practice monitoring is done to assess the disposal cell's performance and to ensure that seepage (transient drainage) from the disposal cell is not impacting any groundwater in the paleochannels. The paleochannel monitoring wells are along the west (downgradient) edge of the disposal cell and are screened at the interface between the alluvium and shallow Mancos Shale. The third well is in the southwest corner of the open portion of the disposal cell and is used primarily for the measurement of water levels in the deepest part of the disposal cell to demonstrate that the groundwater elevation directly beneath the cell has not risen enough to move laterally into the paleochannels.

Table 6–2. Groundwater Monitoring Network at the Grand Junction Disposal Site

Monitoring Well	Hydrologic Relationship
0731	Paleochannel, downgradient, edge of cell, north side
0732	Paleochannel, downgradient, edge of cell, south side
0733	Disposal cell, deepest location, downgradient, center

6.7.1.1 Groundwater-Level Monitoring

Static water-level measurements are obtained from each well before water quality samples are collected (Figure 6–2). In September 2006, a datalogger was installed in each well to obtain continuous water-level measurements (at a 4-hour interval).

Since 1998, the water level in disposal cell well 0733 has risen approximately 2.9 feet and has remained significantly lower than the water levels in the two paleochannel monitoring wells (0731 and 0732) (Figure 6–2). Water levels within the two paleochannel monitoring wells are approximately equal to 1998 levels. The trends for wells 0731 and 0732 have been slightly decreasing, with level fluctuations that range from 2 to 5 feet. Given these elevations, groundwater at the base of the disposal cell at well 0733 has no potential to migrate to the paleochannels at wells 0731 and 0732.

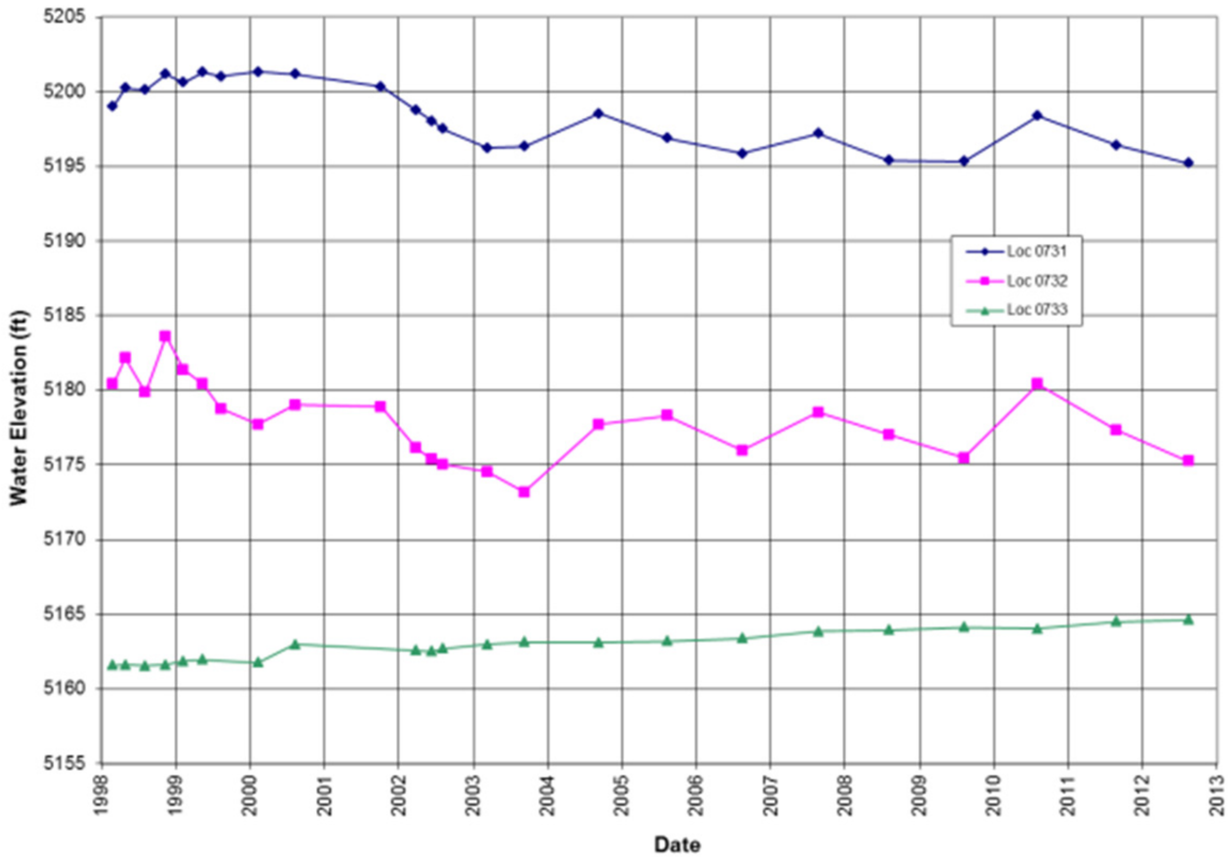

Figure 6-2. Water-Level Measurements at the Grand Junction Disposal Site

6.7.1.2 Groundwater Quality Monitoring

Groundwater samples are analyzed for standard field parameters and the following indicator analytes: molybdenum, nitrate, selenium, sulfate, total dissolved solids, uranium, vanadium, and polychlorinated biphenyls. Key indicator analytes are molybdenum, nitrate, selenium, and uranium. At 40 CFR 192, Subpart A, Table 1, EPA has established maximum concentration limits (MCLs) for these analytes in groundwater (Table 6–3). Time-concentration plots, from 1998 through 2011, for three key indicator analytes—nitrate (as nitrogen), selenium, and uranium—are shown on Figures 6−3 through 6−5.

Table 6–3. Maximum Concentration Limits for Groundwater at the Grand Junction Disposal Site

Constituent	MCL[a] (mg/L)
Molybdenum	0.1
Nitrate (as Nitrogen)	10
Selenium	0.01
Uranium	0.044

[a] EPA MCLs as listed in 40 CFR 192, Subpart A, Table 1.

Nitrate (as nitrogen) concentrations in groundwater continued to exceed the MCL of 10 mg/L in the paleochannel monitoring wells (0731 and 0732) through 2012 (Figure 6–3). Concentrations in well 0731, following an initial steep downward trend, remained below the MCL from 2000 through 2004. In 2005 and continuing through 2011, concentrations steadily increased and remain above the MCL. Concentrations in well 0732, though varied, have consistently remained above the MCL since 1998. Concentrations in well 0733 continued a significant downward trend, dropping below the MCL in 2006, and reaching a low of 3 mg/L in 2012. Historically, the highest concentration of nitrate (96 mg/L) occurred in 1998 from disposal cell well 0733.
In 2012, the concentration of nitrate has increased, and the nitrate levels in both paleochannel monitoring wells are very similar: 42 mg/L in well 0731 and 41 mg/L in well 0732.

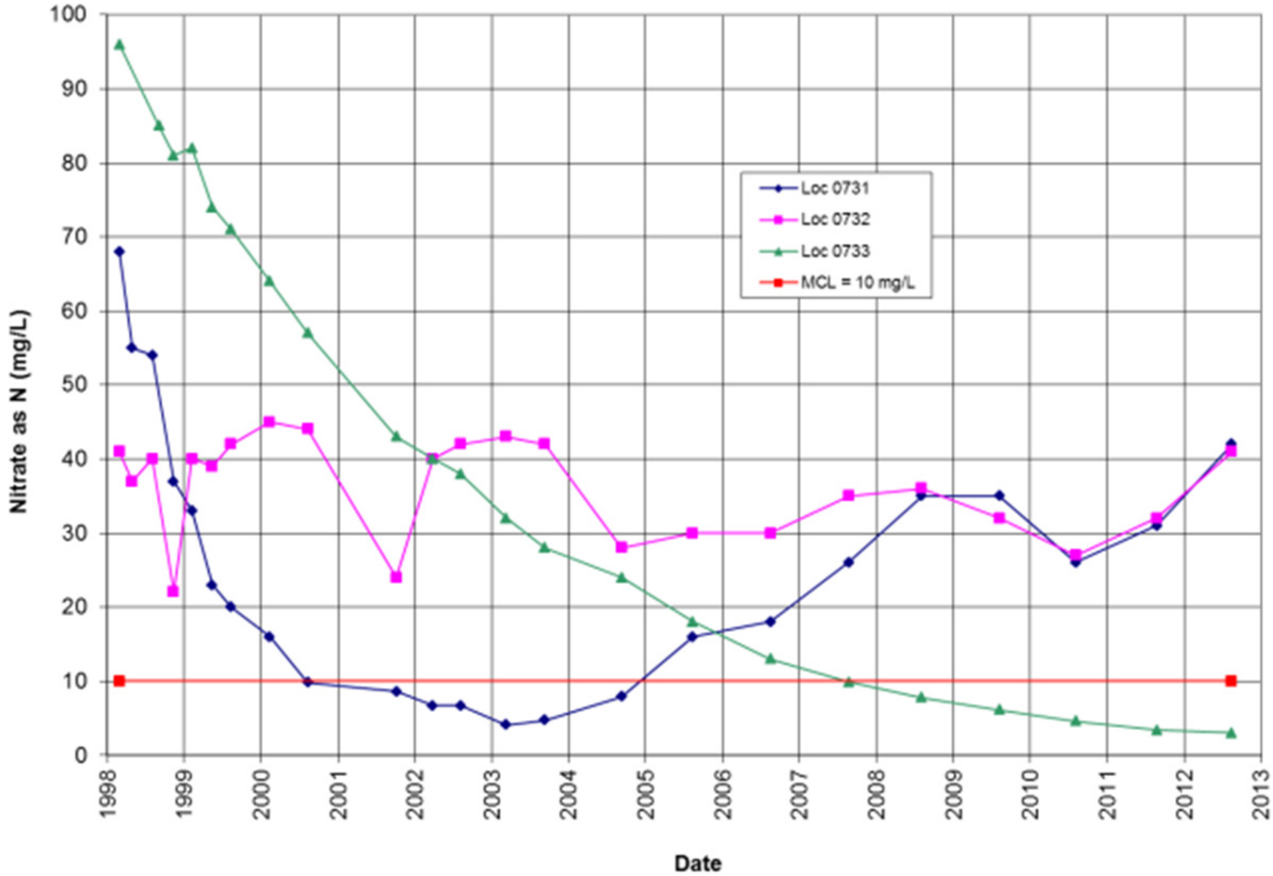

Figure 6–3. Time-Concentration Plots of Nitrate (as Nitrogen) in Groundwater at the Grand Junction Disposal Site

Selenium occurs naturally in the Mancos Shale deposits that underlie the disposal cell, and it may be the cause of the elevated concentrations reported in both paleochannel monitoring wells (0731 and 0732). Selenium concentrations continued to exceed the MCL of 0.01 mg/L in the paleochannel monitoring wells (Figure 6–4). Concentrations in well 0731 displayed a sharp decreasing trend, and the decreasing trend continued until 2003, when a slight upward trend began. Selenium concentrations in well 0731 have increased slightly in 2012. Concentrations in well 0732 continue to display no trend. In well 0733, the selenium concentration of 0.0037 mg/L remained well below the standard, with no trend evident.

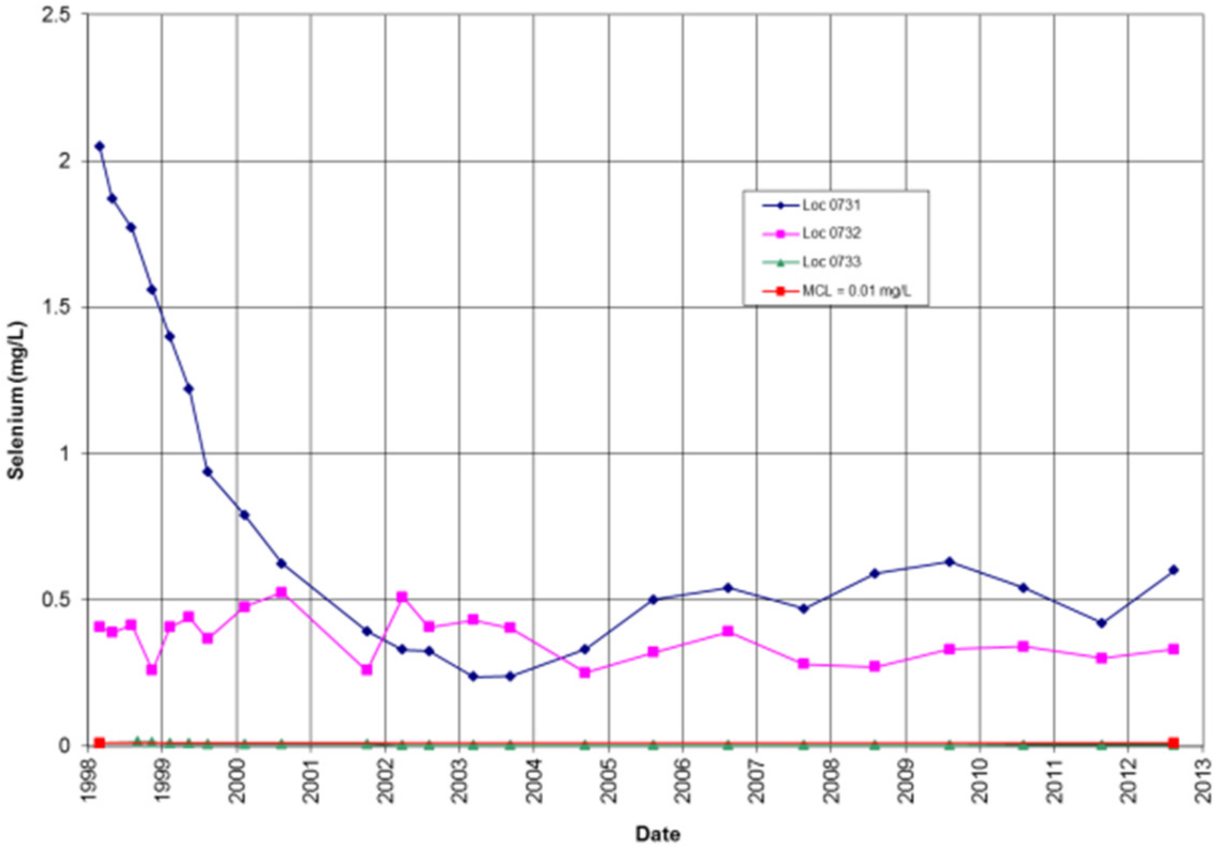

Figure 6–4. Time-Concentration Plots of Selenium in Groundwater at the Grand Junction Disposal Site

Uranium concentrations in groundwater were below the MCL of 0.044 mg/L in paleochannel monitoring wells 0731 and 0732, and were above the MCL in well 0733 (Figure 6–5). Concentrations in well 0731, after an initial increase above the MCL, have been below the MCL since 2003. Concentrations in well 0732 have remained relatively consistent. Concentrations in well 0733 remained relatively consistent through 2003, at which time an upward trend began, which leveled off at 0.11 mg/L for the 2010 and 2011 sampling events and increased slightly to 0.13 mg/L in 2012.

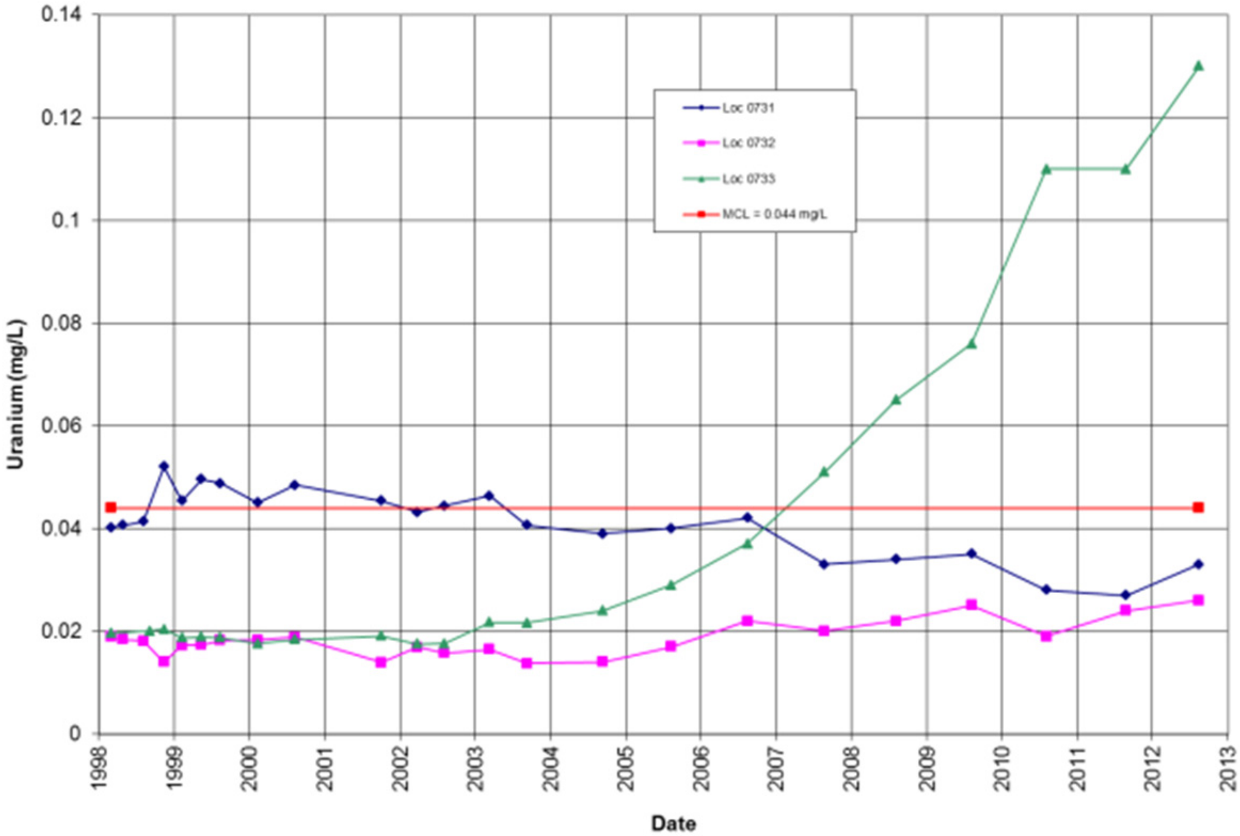

Figure 6–5. Time–Concentration Plots of Uranium in Groundwater at the Grand Junction Disposal Site

6.8 Photographs

Photo Location Number	Azimuth	Photograph Description
PL–1	90	Entrance gate and reconstructed access road.
PL–2	90	Site entrance sign.
PL–3	45	Stile over the perimeter fence in the southwest corner of the site.
PL–4	0	Boundary monument BM–4 at the southwest corner of the site.
PL–5	135	Monitoring well 0731.
PL–6	70	East portion of the disposal cell top slope.
PL–7	45	West side slope of the disposal cell.
PL–8	80	North side slope and apron of the disposal cell.
PL–9	175	Downgradient view of the south diversion channel.
PL–10	150	Riprap-armored discharge area of the south diversion channel.

GRJ 11/2012. PL–1. Entrance gate and reconstructed access road.

GRJ 11/2012. PL–2. Site entrance sign.

GRJ 11/2012. PL–3. Stile over the perimeter fence in the southwest corner of the site.

GRJ 11/2012. PL–4. Boundary monument BM–4 at the southwest corner of the site.

GRJ 11/2012. PL–5. Monitoring well 0731.

GRJ 11/2012. PL–6. East portion of the disposal cell top slope.

GRJ 11/2012. PL–7. West side slope of the disposal cell.

GRJ 11/2012. PL–8. North side slope and apron of the disposal cell.


GRJ 11/2012. PL–9. Downgradient view of the south diversion channel.


GRJ 11/2012. PL–10. Riprap-armored discharge area of the south diversion channel.

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7.0 Annual Inspection of the Green River, Utah, UMTRCA Title I Disposal Site

7.1 Compliance Summary

The Green River, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on March 20, 2012. The disposal cell was in excellent condition. A missing perimeter sign was replaced during the inspection. No additional maintenance needs or cause for a follow-up or contingency inspection was identified.

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

7.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Green River, Utah, Disposal Site* (DOE/AL/62350–89, Rev. 2, U.S. Department of Energy [DOE], July 1998; 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 7–1 lists these requirements.

Table 7–1. License Requirements for the Green River Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0	Section 7.4
Follow-Up or Contingency Inspections	Section 7.0	Section 7.5
Routine Maintenance and Repairs	Section 8.0	Section 7.6
Groundwater Monitoring	Section 5.2	Section 7.7.1
Corrective Action	Section 9.0	Section 7.8

7.3 Institutional Controls

The 25-acre 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and a locked gate at the site entrance.

7.4 Inspection Results

The site, southeast of Green River, Utah, was inspected on March 20, 2012. J. Price and R. Johnson of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. M. Kautsky, the DOE Office of Legacy Management (LM) site manager, attended the inspection.

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

7.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 7–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 7–1 by photograph location (PL) numbers.

7.4.1.1 Entrance Gates, Entrance Signs, and Access Road

The site can be accessed either from the town of Green River or from U.S. Interstate Highway 70 via a paved road. The access route crosses State land and U.S. Army property. Perpetual access has been granted to DOE through right-of-way agreements with both agencies.

Entrance to the site is through a locked steel gate in the access road right-of-way fence; DOE does not own the gate. Past this gate, a dirt access road maintained by DOE leads across State land to the disposal site. The access road divides at the disposal cell security fence, with one branch entering the enclosure and providing access around the base of the disposal cell (PL–1) and the other providing access around the disposal cell security fence. The access road was in good condition, and no maintenance or deferred maintenance needs were identified for this real property asset.

An entrance sign is positioned on the site property boundary where the access road enters the disposal site. The sign was in excellent condition.

7.4.1.2 Perimeter Fence and Perimeter Signs

The disposal cell is enclosed within a chain-link security fence. The chain-link fence is set back between 50 and 250 feet from the site boundary. Two vehicle access gates are installed in this fence at the south and east corners of the fence line. A personnel gate is at the north corner of the fence line. The security fence and gates were in excellent condition (PL–2). Four offsite groundwater monitoring system telemetry towers have chain-link security fence enclosures (each with a locked personnel gate) to inhibit vandalism; the enclosures were in excellent condition.

Seventeen perimeter signs are positioned on steel posts set in concrete along the unfenced site boundary. Perimeter sign P6 was missing and was replaced during the inspection. Perimeter sign P12 has a bullet dent but is legible. The other signs were in excellent condition.

7.4.1.3 Site Markers

Two granite site markers are on the site. Site marker SMK–1 is on the ground inside the southwest security fence line. Its concrete base has several minor cracks, but there is no need for repairs at this time; overall the site marker was in good condition (PL–3). Site marker SMK–2, located on the crest of the disposal cell, was in excellent condition (PL–4).

7.4.1.4 Survey Monuments and Boundary Monuments

Eleven boundary monuments and three survey monuments are along the site perimeter. All of the monuments were in excellent condition.

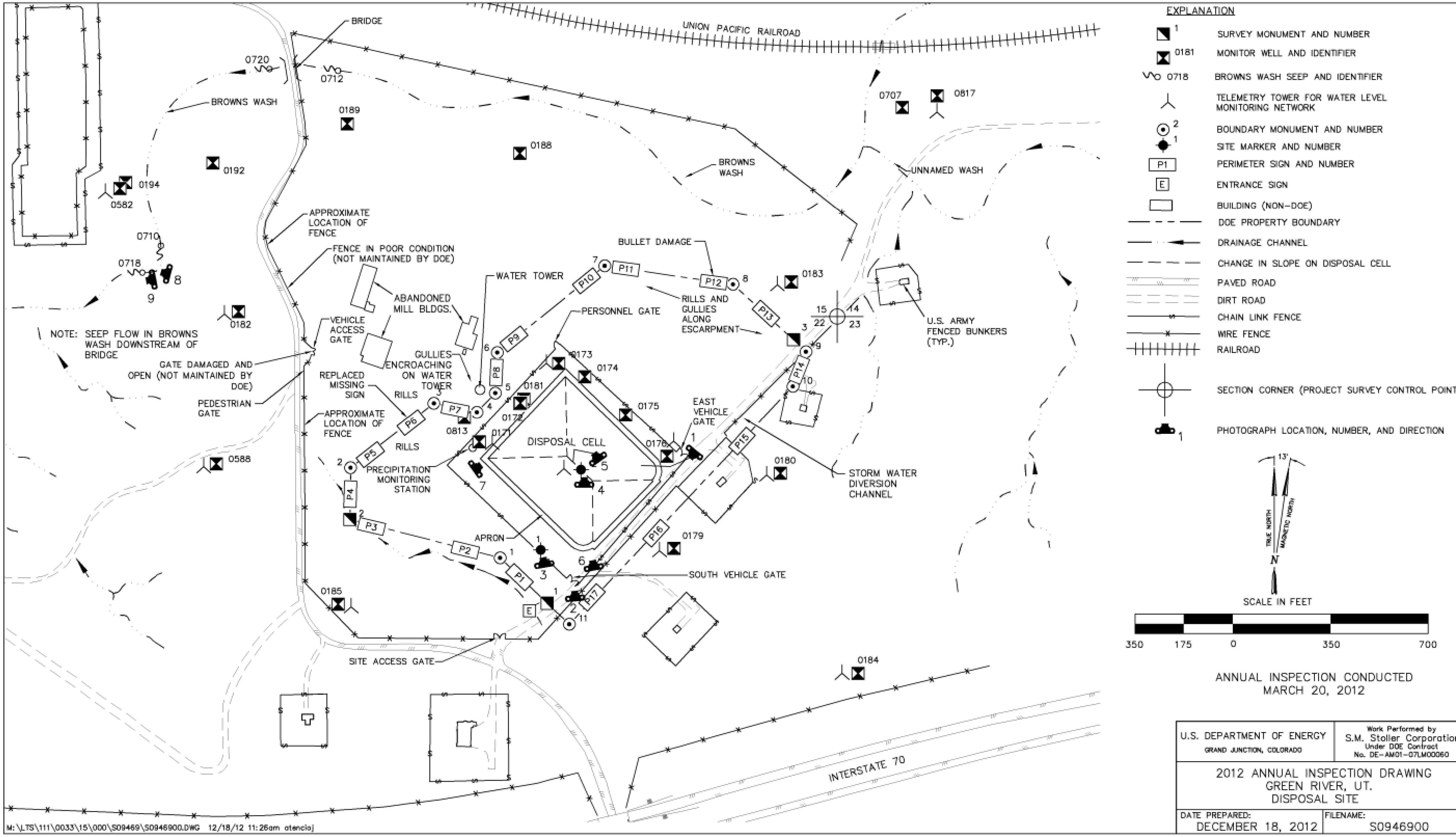

Figure 7–1. 2012 Annual Compliance Drawing for the Green River Disposal Site

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7.4.1.5 Monitoring Wells

Twenty-one groundwater monitoring wells are on or adjacent to the site. A network of 13 telemetry towers has been installed to relay and transmit continuous groundwater-level monitoring data to the LM office in Grand Junction.

The wells were secure at the time of the inspection, and the visible portions of all wells and telemetry system components were in good condition (PL–5).

7.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (1) the disposal cell and adjacent area inside the security fence, (2) the site perimeter between the security fence and the site boundary, and (3) the outlying area.

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

7.4.2.1 Disposal Cell and Adjacent Area Inside the Security Fence

The 6-acre disposal cell was completed in 1989. The slopes of the disposal cell cover are armored with basalt rock. No evidence of any disturbance of the cell surfaces was observed. No vegetation was present on the cell. The quality of the rock is excellent, and the disposal cell cover was in excellent condition (PL–6). A basalt boulder-filled trench, called an apron, surrounds the disposal cell. The apron collects all runoff water from the cell, and the water is reduced by evaporation, evapotranspiration through deep-rooted shrubs that grow along the apron, and infiltration into the underlying bedrock and aquifer through the sides and bottom of the apron. The apron was in excellent condition (PL–7).

The area between the disposal cell and the security fence consists of the cell perimeter road, several monitoring wells and telemetry towers, and open space. This area was in excellent condition.

7.4.2.2 Site Perimeter Between the Security Fence and the Site Boundary

Rills and gullies are present on the west side of the property but do not encroach on disposal cell structures and currently are not affecting any site surveillance features. Rills and gullies are also present along the escarpment northeast of the disposal cell in the area between boundary monument BM–7 and survey monument SM–3. Maximum gully depth in this area is approximately 3 feet. The rill and gully erosion does not encroach on disposal cell structures but could eventually damage perimeter signs and boundary monuments; therefore, the erosion features in this area will continue to be monitored.

Trespassing occurs on the site from several access points through State land. The barbed-wire stock fence on the surrounding State-owned property provides only minimal security; the fence west of the site is in poor condition, and a gate providing access to the former mill buildings and the DOE site is broken off its hinges. The site is also accessible through remote open access points north and east of the property. DOE property will continue to be monitored for adverse public use indicated by trash, tire ruts, and vandalism.

7.4.2.3 Outlying Area

The area extending outward from the site for a distance of 0.25 mile was checked for signs of erosion, development, or other disturbance that might affect site security or integrity. Areas of erosion noted during recent and previous inspections include the natural drainage southwest of the site, and rills and gullies northwest of the water tower. Minor erosion continues but currently does not threaten the integrity of the disposal cell or site surveillance features.

Abandoned buildings and a water tower associated with the former milling activities at the site are northwest and upwind of the DOE property. The buildings are in a severe state of disrepair, and debris (e.g., roofing materials, siding, trash) tends to be blown from the buildings onto the DOE property. Accumulation of materials blown onto DOE property was not significant but will continue to be monitored; debris will be removed as necessary.

Representatives of the U.S. Department of the Army were inspecting Army assets adjacent to and near the site. The Army is planning to disposition land and structures because they are no longer being used or needed.

The conditions of Browns Wash were observed during the inspection. Flow was occurring in the channel between the road bridge and the backwater area near the confluence with the Green River (PL–8). The streambed upstream of the bridge was dry; therefore, the flow downstream of the bridge was from seeps. The backwater area near the mouth of Browns Wash is important because of its potential to be a fish-spawning location (PL–9). The conditions of Browns Wash channel and the backwater area change substantially after each runoff event as sediment is either scoured or deposited along the channel bottom.

7.5 Follow-Up or Contingency Inspections

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

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

7.6 Maintenance and Repairs

7A Missing perimeter sign P6 was replaced during the inspection.

7.7 Environmental Monitoring

7.7.1 Groundwater Monitoring

7B In compliance with 40 CFR 192, Subpart A, and as stipulated in the LTSP, the groundwater monitoring network consists of four point-of-compliance (POC) wells northwest of the disposal cell (0171, 0173, 0181, and 0813). Two additional POC wells (0176 and 0179) have been added to the compliance network. The purpose of the monitoring is to evaluate the performance of the disposal cell. Additionally, wells 0188, 0189, 0192, 0194, and 0707 completed in the contaminated but low-yield Browns Wash alluvium, have been added to the groundwater monitoring network as a best management practice. The *Groundwater Compliance Action Plan* *for the Green River, Utah, Disposal Site* (December 2011; GCAP) adds more best-management-practice wells. These wells (0182, 0184, 0185, and 0588) are completed in the basal unit of the Cedar Mountain Formation.

Monitoring wells 0171, 0173, 0176, 0179, 0183, 0813, and 0817 are currently providing continuous water-level measurements for the contaminated middle sandstone unit, and wells 0182, 0184, 0185, 0582, and 0588 are providing continuous water-level measurements for the uncontaminated basal sandstone unit in the Cedar Mountain Formation. A telemetry system was installed at these wells in January 2007 to send data to the LM office in Grand Junction. Wells 0817 and 0582, completed in the middle sandstone unit and basal sandstone unit, respectively, are capped to prevent artesian flow and to allow continuous measurements of the potentiometric surface through pressure transducers.

Based on the evaluation of several years of analytical data and associated risk, the alternate concentration limits (ACLs) listed in Table 7–2 have been proposed in the GCAP. If NRC accepts the GCAP, these proposed ACLs will apply to all POC wells.

Table 7–2. Proposed Alternate Concentration Limits for Point-of-Compliance Wells at the Green River Disposal Site

Constituent	Standard (mg/L)[a]	Proposed ACL (mg/L)
Arsenic	0.05	5.0
Nitrate + Nitrite as Nitrogen	10	1,000
Selenium	0.05	5.0
Uranium	0.044	4.4

[a] U.S. Environmental Protection Agency maximum concentration limit (40 CFR 192, Table 1).
Key: mg/L = milligrams per liter

Quarterly monitoring of the original four POC wells was conducted from 1998 through June 2007. Risk analyses have determined that there is no unacceptable risk to human health and the environment as a result of site-related contamination in groundwater near the site because the groundwater is not used and because site contaminants do not affect river water quality. Therefore, DOE determined that there was no health or cost benefit associated with continuing quarterly monitoring. Annual monitoring has been implemented instead.

7.7.1.1 Cell Performance Monitoring

Table 7–3 provides the analytical results for the June 2012 sampling event at the proposed POC wells. Time-concentration plots for the four target analytes—arsenic, nitrate, selenium, and uranium—are shown on Figures 7−2 through 7−5.

Table 7–3. 2012 Analytical Results for Point-of-Compliance Wells at the Green River Disposal Site

Monitoring Well	Arsenic (mg/L) ACL = 5.0	Nitrate[a] (mg/L) ACL = 1,000	Selenium (mg/L) ACL = 5.0	Sulfate (mg/L) ACL = None	Uranium (mg/L) ACL = 4.4
	Sample Result	Sample Result	Sample Result	Sample Result	Sample Result
0171	0.0015	51	0.18	4000	0.091
0173	0.0021	120	0.13	6600	0.016
0176	0.00034	64	0.86	3800	0.0026
0179	0.00065	20	0.3	3600	0.17
0181	0.005	5.8	0.0076	5700	0.012
0813	0.1	0.01	0.00073	3800	0.017

[a] Nitrate = nitrate plus nitrite as nitrogen
Key: mg/L = milligrams per liter; ND = not detected (below laboratory detection limit)

Arsenic concentrations in groundwater remain below the U.S. Environmental Protection Agency (EPA) maximum concentration limit (MCL) of 0.05 milligram per liter (mg/L) in all POC wells except well 0813, and remain considerably below the proposed ACL of 5.0 mg/L in all POC wells. In well 0813, levels continue to exceed the MCL, as shown on Figure 7–2, but are substantially below the proposed ACL.

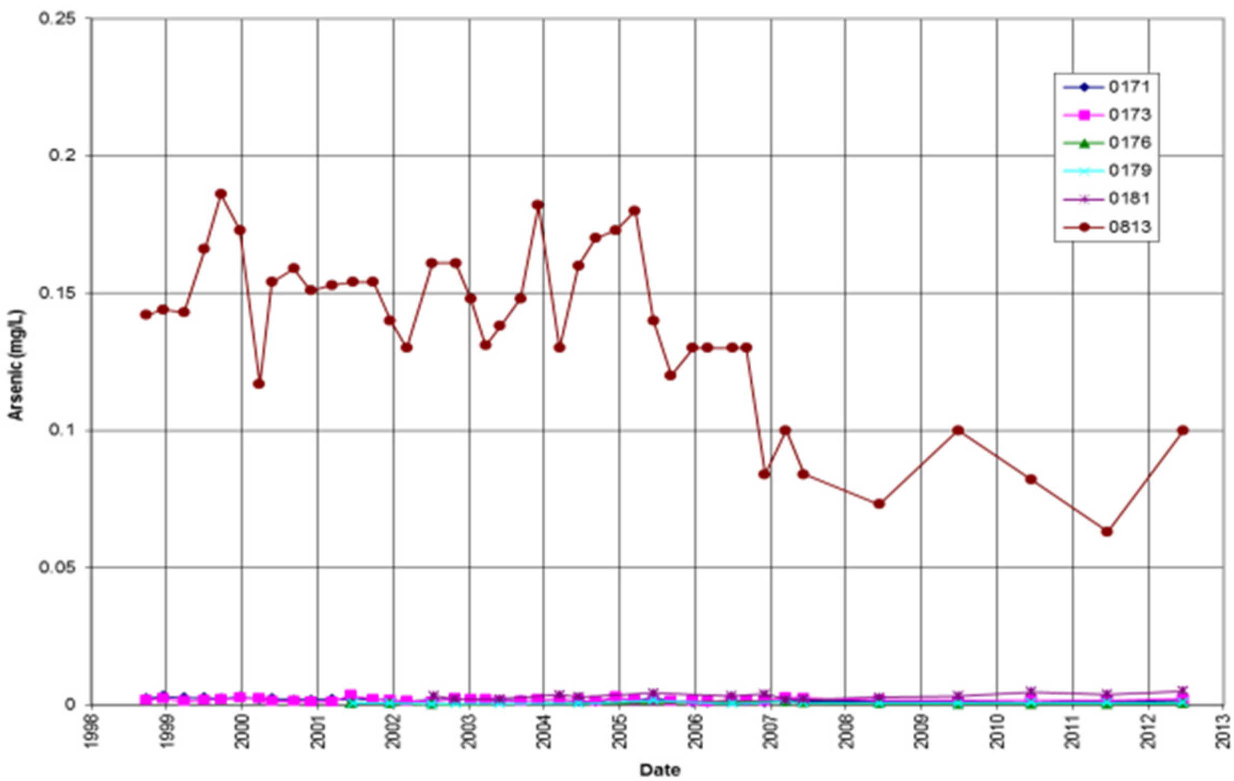

Figure 7–2. Time-Concentration Plots of Arsenic in Groundwater at the Green River Disposal Site

Nitrate concentrations have been measured as nitrate plus nitrite as nitrogen since early 2004 (before then, nitrate was measured as NO_3). Concentrations have continued to exceed the EPA MCL of 10 mg/L in all POC wells except well 0813, but they are considerably below the proposed ACL of 1,000 mg/L in all wells (Figure 7–3). Nitrate concentrations in well 0813 continue to be below the laboratory detection limit. Nitrate concentrations in the other wells are similar to previous measurements, and no trends are apparent.

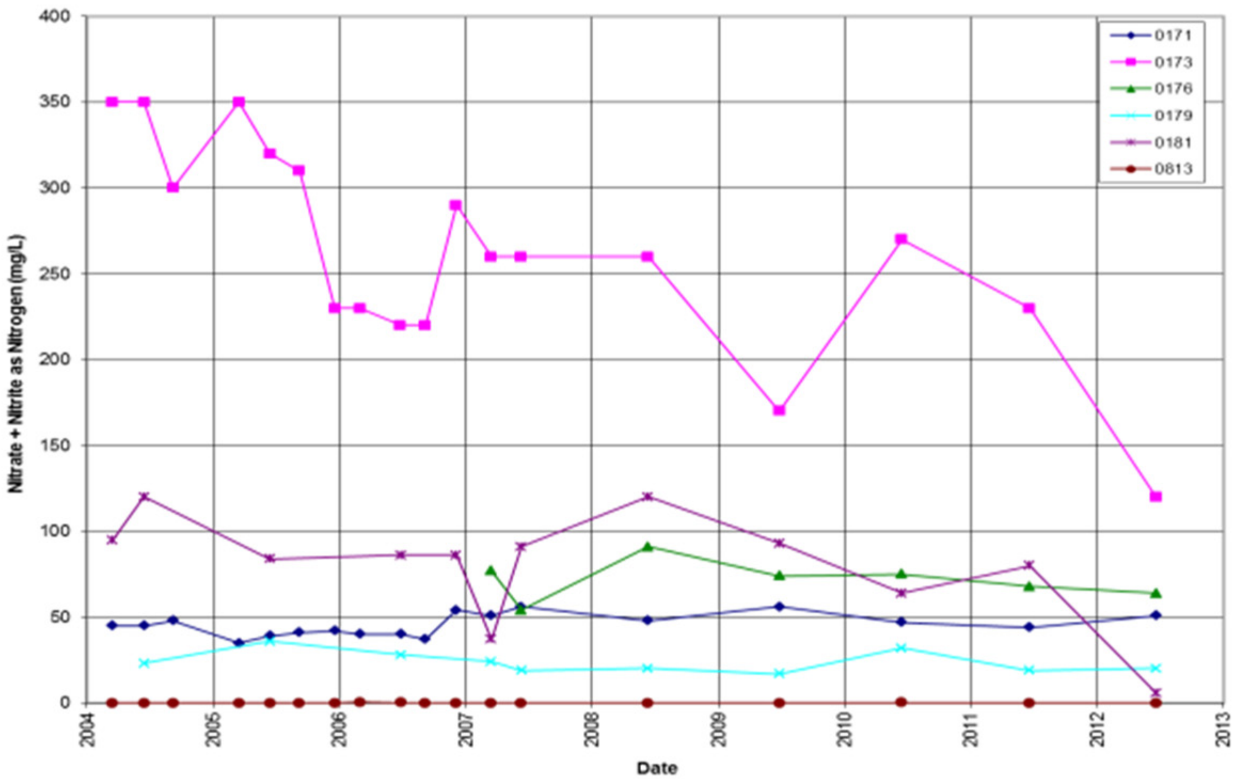

Figure 7–3. Time-Concentration Plots of Nitrate in Groundwater at the Green River Disposal Site

Selenium concentrations in wells 0181 and 0813 remain below the EPA MCL of 0.05 mg/L. Concentrations in the other wells continue to be above the standard but are substantially below the proposed ACL of 5.0 mg/L (Figure 7–4).

Uranium concentrations in groundwater remain below the EPA MCL of 0.044 mg/L in all POC wells except wells 0171 and 0179, and remain considerably below the proposed ACL of 4.4 mg/L in all POC wells. The highest uranium concentrations continue to occur in well 0179 (0.17 mg/L), which is upgradient of the disposal cell. The reason for the elevated concentration of uranium in well 0179 has not been determined, but it may be due to natural causes. At well 0171, concentrations exceed the MCL and indicate an upward trend since 1998 (Figure 7–5). Because uranium is the only constituent of concern that has indicated an upward trend in well 0171, no conclusions regarding the cause of the trend have been reached.

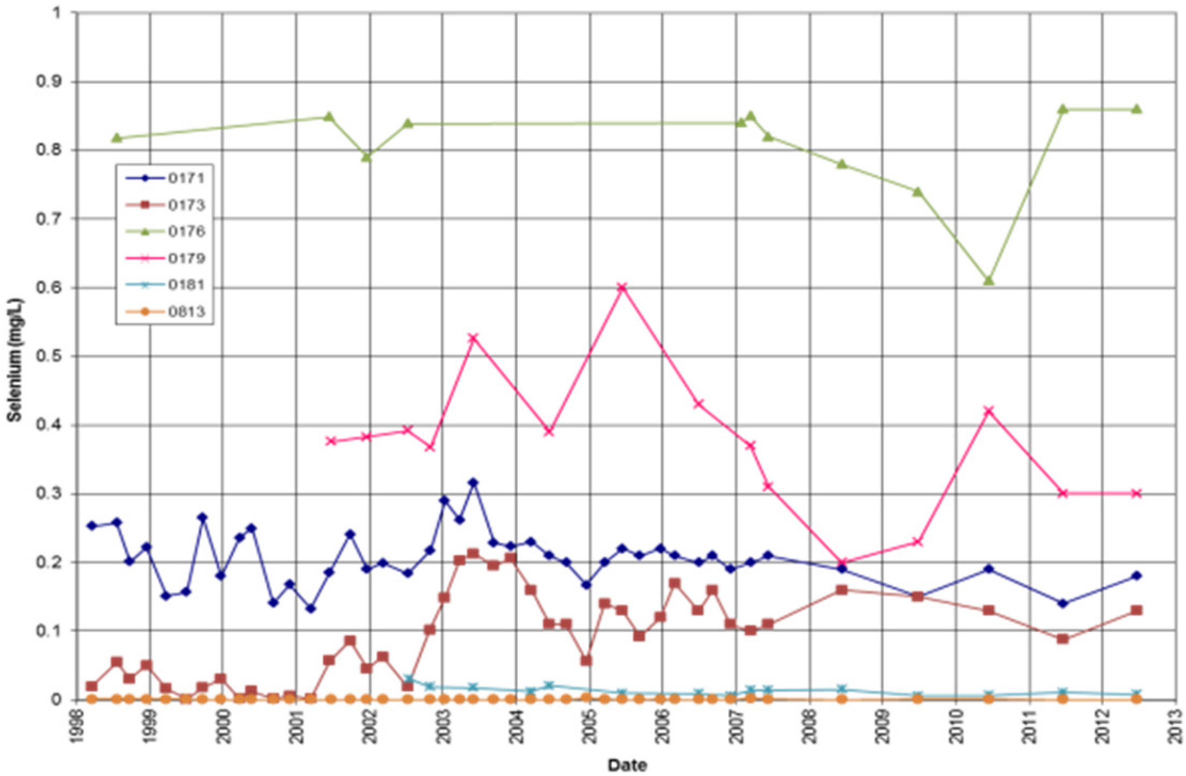

Figure 7–4. Time-Concentration Plot of Selenium in Groundwater at the Green River Disposal Site

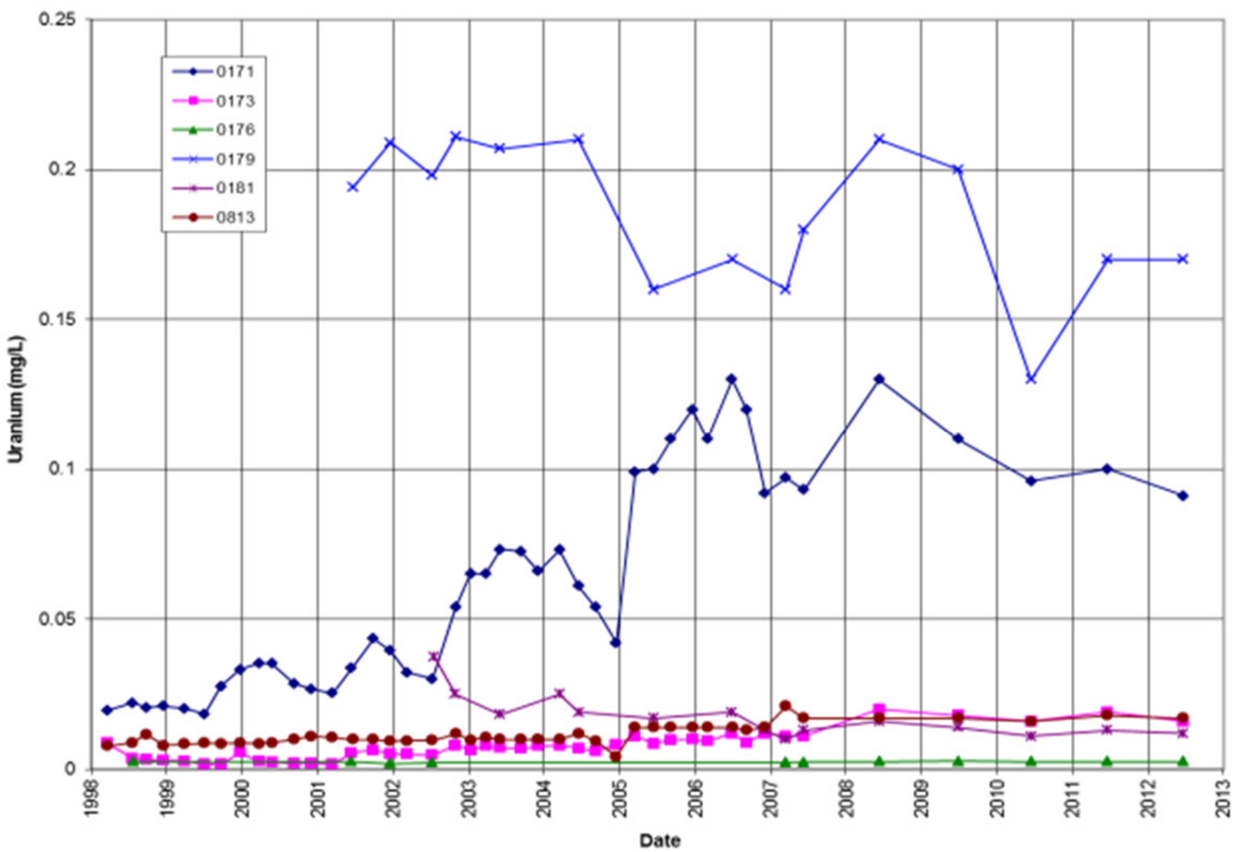

Figure 7–5.Time-Concentration Plot of Uranium in Groundwater at the Green River Disposal Site

7.7.1.2 Groundwater-Level Monitoring

Groundwater levels in several monitoring wells adjacent to the disposal cell have been measured manually since 1991, and continuously with down-hole dataloggers since 1999. Thirteen wells currently have dataloggers, and a telemetry system was installed in 2007 to transmit the continuous water-level monitoring data to the LM office in Grand Junction. The purpose of continuous monitoring is to evaluate the hydraulic gradient and flow directions in the two Cedar Mountain Formation aquifers near the disposal cell.

Water-level hydrographs of the POC wells, completed in the middle sandstone aquifer, indicate that the groundwater elevation decreased approximately 3 feet overall from 1998 through 2004, and then increased approximately 8 feet between 2004 and 2007. Water levels have decreased approximately 2 to 3 feet since 2007, although slight increases occurred in 2010 and 2011 (Figure 7–6).

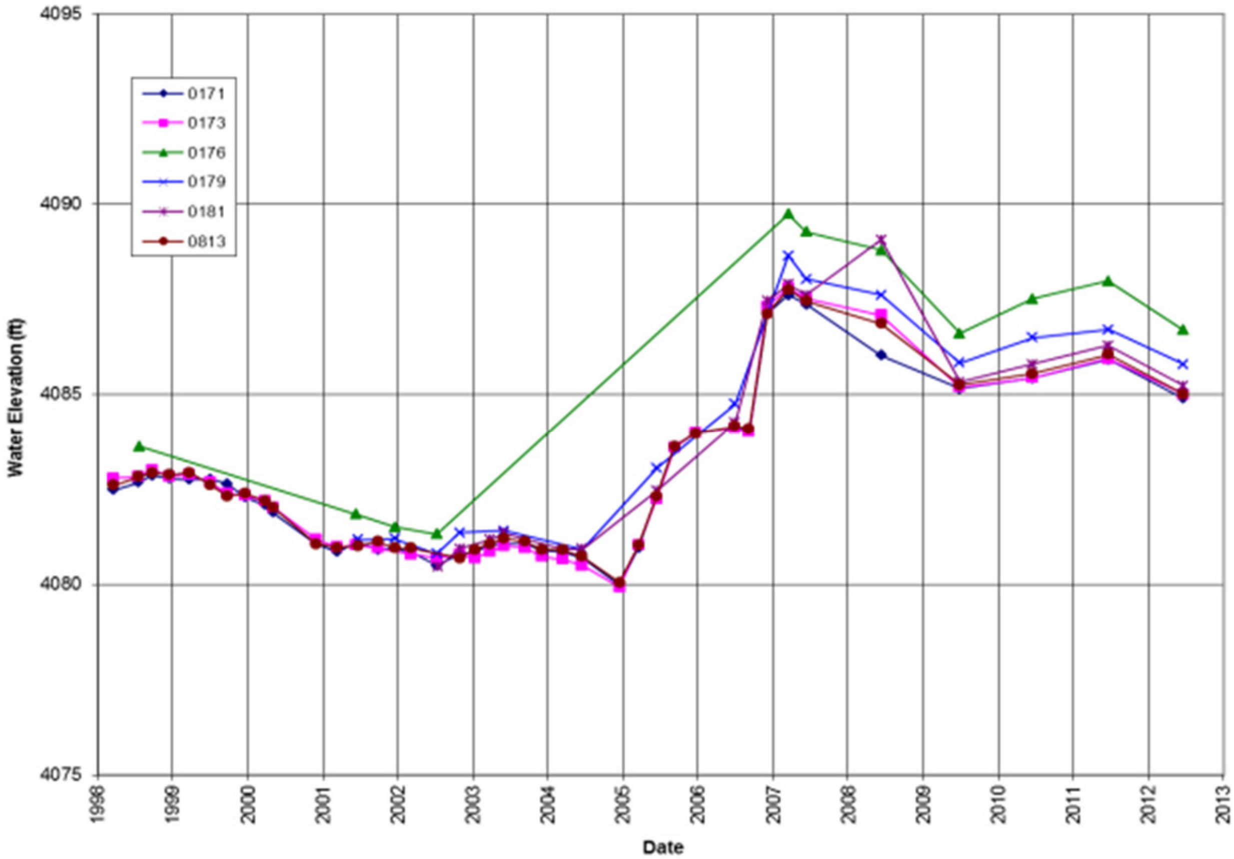

Figure 7–6. Groundwater Elevations at the Green River Disposal Site

The monitoring well locations in the two Cedar Mountain aquifers are not ideal (i.e., no nested well pairs in the upper and lower aquifers) to define both the groundwater flow directions and the hydraulic gradient between the aquifers. However, groundwater elevation data derived from the existing well network are adequate to determine that flow direction in the upper aquifer is toward the west-northwest, while flow direction in the lower aquifer is toward the southwest. The data also suggest that there is a neutral gradient between the two aquifers, therefore neither inducing nor retarding contaminant migration from the contaminated upper aquifer to the uncontaminated lower aquifer.

7.7.1.3 Browns Wash Alluvium Well Monitoring

Analytical results for the June 2012 sampling event at the wells completed in the Browns Wash alluvium are provided in Table 7–4. Because of the proposed application of supplemental standards, ACLs do not apply to the alluvium groundwater. Contaminants are expected to eventually be flushed out of the alluvium as the groundwater migrates toward the Green River alluvium and the Green River.

Table 7–4. 2012 Analytical Results for the Browns Wash Alluvium Wells at the Green River Disposal Site

Monitoring Well	Arsenic (mg/L)	Nitrate[a] (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Uranium (mg/L)
0188	0.00026	6.3	0.024	6100	0.068
0189	0.00057	34	0.065	6800	0.33
0192	0.00031	80	0.11	6300	0.54
0194	0.0027	220	0.022	24,000	4.9
0707	0.00033	2.8	0.092	7500	0.026

[a] Nitrate = nitrate plus nitrite as nitrogen

Concentrations of arsenic, nitrate, and uranium have been steady in wells 0188 and 0192 but variable in wells 0189 and 0194. The highest arsenic, nitrate, and uranium concentrations were in well 0194. The highest and most variable selenium concentrations have been occurring in well 0192. Generally, the groundwater quality degrades from east (upgradient) to west (downgradient). This condition may indicate that the contaminated alluvium groundwater is gradually moving downgradient.

7.7.1.4 Cedar Mountain Formation Basal Unit Well Monitoring

Analytical results for the June 2012 sampling event at the wells completed in the basal unit of the Cedar Mountain Formation are provided in Table 7–5.

Table 7–5. 2012 Analytical Results for the Basal Unit of the Cedar Mountain Formation Wells at the Green River Disposal Site

Monitoring Well	Arsenic (mg/L)	Nitrate[a] (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Uranium (mg/L)
0182	0.0034	0.023	0.000065	580	0.0011
0184	0.002	0.1	0.00032	650	0.0029
0185	0.0012	0.1	0.000032	450	0.00088
0588	0.011	0.01	0.000049	620	0.00015

[a] Nitrate = nitrate plus nitrite as nitrogen
Key: ND = not detected (below laboratory detection limit)

Beginning in 2011, these wells were added to the list of wells that are sampled annually. Data from this sampling will be used to assess any downward migration of contaminants from the middle sandstone to the basal sandstone. Because sulfate is relatively unaffected by natural attenuation, it should be a good indicator of contaminant transport and therefore has been added to the analyte list.

7.7.2 Surface Water Monitoring

According to the site conceptual model, the ultimate point of exposure for groundwater in the middle sandstone unit is the Green River, while exposure to Browns Wash alluvium water is the Green River and Browns Wash backwater. Risk analyses have determined, however, that there are no unacceptable risks to potential receptors (human or ecological) at these locations. As a best management practice, DOE monitors the surface water at these two locations to verify that any contaminated groundwater would not harm ecological receptors in Browns Wash and the Green River. Table 7–5 provides proposed surface water standards in accordance with Utah Rule R317–2, Table 2.14.2.

Table 7–6. Proposed Surface Water Standards for the Browns Wash and Green River Sampling Locations

Constituent	Surface Water Standard (mg/L)
Ammonia as nitrogen	About 0.5 to 1.0 (pH- and temperature-dependent)
Arsenic	0.150 (4-day)
Nitrate + nitrite as nitrogen	4
Selenium	0.0046 (4-day)
Uranium	No standard

A location in the Green River immediately downstream of the mouth of Browns Wash (0846) and a location in the backwater area of Browns Wash (0847) are sampled annually. Historical upgradient Green River sample location 0801 was added in 2012. Analytical results for the June 2012 sampling event are provided in Table 7–7. To date, no surface water sample results have exceeded the standards, and there is no indication that site contamination has degraded the surface water quality at these locations.

Table 7–7. 2012 Analytical Results for the Surface Water Locations at the Green River Disposal Site

Location	Ammonia as Nitrogen (mg/L)	Arsenic (mg/L)	Nitrate[a] (mg/L)	Selenium (mg/L)	Uranium (mg/L)
0846 (Green River)	ND	0.0017	ND	0.00077	0.0024
0847 (Backwater)	ND	0.0014	ND	0.00086	0.0073
0801 (Upgadient Green River)	ND	0.0014	ND	0.00074	0.0024

[a] Nitrate = nitrate plus nitrite as nitrogen
Key: ND = not detected (below laboratory detection limit)

7.8 Corrective Action

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

No corrective action was required in 2012.

7.9 Photographs

Photo Location Number	Azimuth	Photograph Description
PL–1	220	Disposal cell perimeter road along the southeast side of the cell.
PL–2	355	Vehicle entrance gate at the south corner of the disposal cell security fence.
PL–3	350	Site marker SMK–1.
PL–4	0	Site marker SMK–2.
PL–5	325	Telemetry relay station at the disposal cell crest.
PL–6	350	South corner of the disposal cell.
PL–7	55	West corner and apron of the disposal cell.
PL–8	285	Area of seep 0718 in Browns Wash.
PL–9	260	Downgradient view of Browns Wash toward Green River backwater area.

GRN 3/2012. PL–1. Disposal cell perimeter road along the southeast side of the cell.

GRN 3/2012. PL–2. Vehicle entrance gate at the south corner of the disposal cell security fence.

GRN 3/2012. PL–3. Site marker SMK–1.

GRN 3/2012. PL–4. Site marker SMK–2.

GRN 3/2012. PL–5. Telemetry relay station at the disposal cell crest.

GRN 3/2012. PL–6. South corner of the disposal cell.

GRN 3/2012. PL–7. West corner and apron of the disposal cell.

GRN 3/2012. PL–8. Area of seep 0718 in Browns Wash.

GRN 3/2012. PL–9. Downgradient view of Browns Wash toward Green River backwater area.

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8.0 Annual Inspection of the Gunnison, Colorado, UMTRCA Title I Disposal Site

8.1 Compliance Summary

The Gunnison, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on June 4, 2012. The disposal cell and all associated surface water diversion and drainage structures were in excellent condition and functioning as designed. Six riprap test areas on the cell apron and diversion ditches were visually inspected and photographed; no apparent rock degradation was noted when compared to previous photos. Two damaged perimeter signs were replaced. No other maintenance needs or cause for a follow-up or contingency inspection was identified.

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

8.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Gunnison, Colorado, Disposal Site* (DOE/AL/62350−222, Rev. 2, U.S. Department of Energy [DOE], April 1997; 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 8–1. License Requirements for the Gunnison Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 8.4
Follow-Up or Contingency Inspections	Section 3.5	Section 8.5
Routine Maintenance and Repairs	Section 5.0	Section 8.6
Groundwater Monitoring	Section 4.1	Section 8.7.1
Corrective Action	Section 6.0	Section 8.8

8.3 Institutional Controls

The 92-acre 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and a locked gate at the site entrance.

8.4 Inspection Results

The site, southeast of Gunnison, Colorado, was inspected on June 4, 2012. S. Campbell and R. Johnson of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. D. Steckley, the DOE Office of Legacy Management site manager, and W. Naugle, of the Colorado Department of Public Health and Environment, attended the inspection.

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

8.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 8–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 8–1 by photograph location (PL) numbers.

8.4.1.1 Site Access, Entrance Gate, and Entrance Sign

Access to the site is off Gunnison County Road 42 onto U.S. Bureau of Land Management Road 3068 to the site entrance gate. The road to the site is an all-weather gravel road maintained by the U.S. Bureau of Land Management and was in good condition.

The entrance gate is a simple barbed-wire gate in the stock fence that surrounds the site. The entrance gate, located along the south portion of the perimeter fence, was secured by a padlock and chain to the adjoining post and was in good condition.

An entrance sign is bolted to a perimeter fence post next to the entrance gate. The sign was in excellent condition.

8.4.1.2 Fence and Perimeter Signs

A three-strand, barbed-wire fence delineates the site; most of it is set along the property boundary. The fence was in good condition (PL–1). Two locked barbed-wire gates—one on the north fence line and the other on the east fence line—provide monitoring-well access. The gates were locked and in good condition.

Forty-five perimeter signs are bolted to the perimeter fence posts. Perimeter signs P1 and P3 were damaged and were replaced with new signs. Perimeter signs P6 and P38 have bullet holes but were legible. The other signs were in good condition.

8.4.1.3 Site Markers

The site has two granite site markers. Site markers SMK–1 (just inside the entrance gate; PL–2) and SMK–2 (on top of the disposal cell) were in excellent condition.

8.4.1.4 Survey Monuments and Boundary Monuments

The three combined survey/boundary monuments (SM–1/BM–1, SM–2/BM–2, and SM–3/BM–3) and eight additional boundary monuments (BM–4 through BM–11) were in excellent condition.

8.4.1.5 Monitoring Wells

Sixteen wells constitute the groundwater monitoring network for the site. The wells were secure and in excellent condition (PL–3).

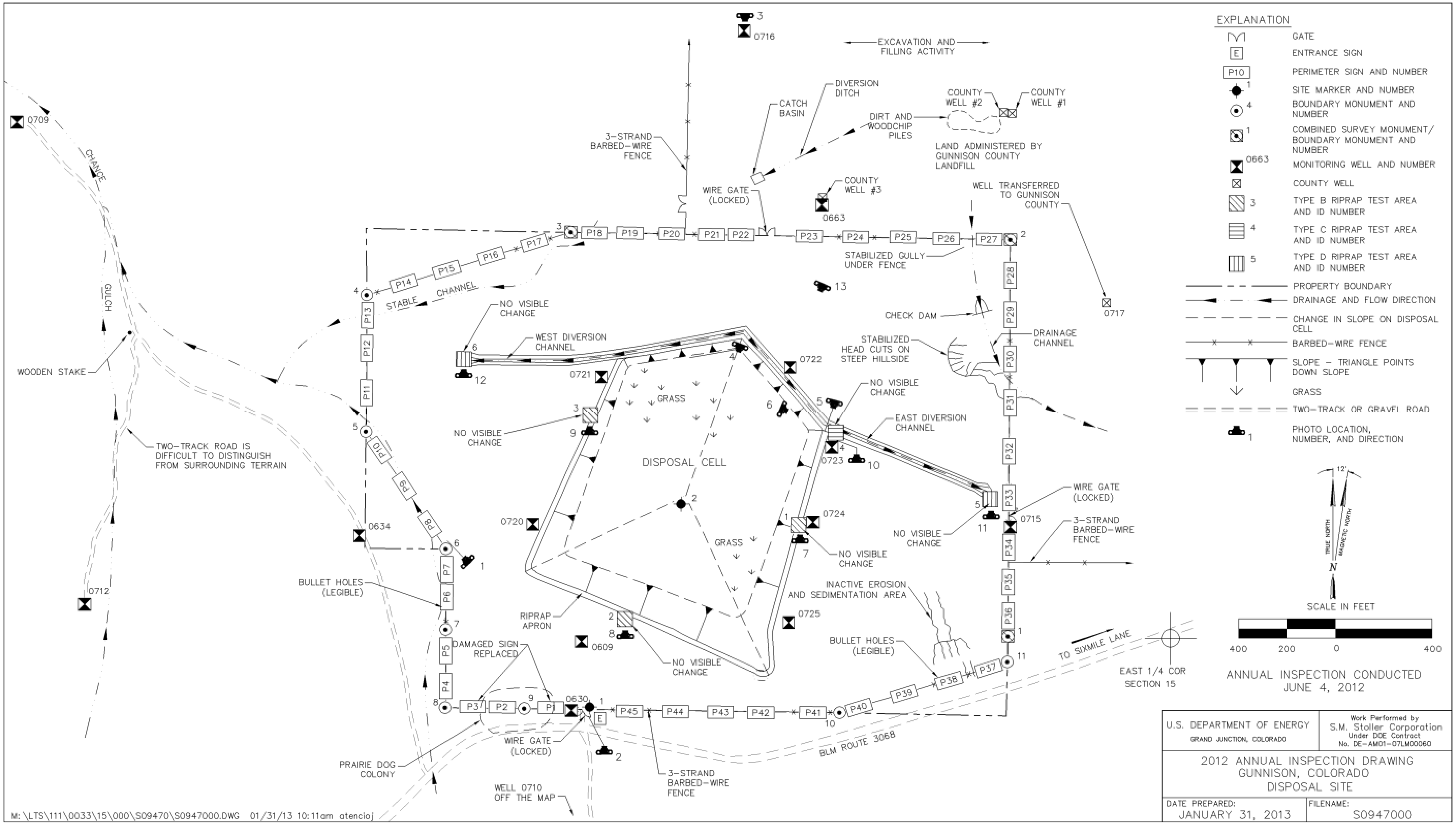

Figure 8–1. 2012 Annual Compliance Drawing for the Gunnison Disposal Site

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8.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (1) the top of the disposal cell; (2) the disposal cell side slopes, apron, and diversion channels; (3) the area between the disposal cell and the site boundary; and (4) the outlying area.

Within each area, the inspectors examined specific site-surveillance features, drainage structures, vegetation, and other features. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

8.4.2.1 Top of the Disposal Cell

The rock-covered top of the disposal cell was in excellent condition (PL–4). There was no evidence of erosion, settling, slumping, or rock degradation. Several isolated patches of grass are randomly distributed over the disposal cell cover; however, these shallow-rooted plants are not a cause for concern.

8.4.2.2 Disposal Cell Side Slopes, Apron, and Diversion Channels

The riprap-covered side slopes, apron, and diversion channels were in good condition (PL–5 and PL–6). No evidence of slumping, settling, rock degradation, or encroachment of vegetation was observed.

The condition of the riprap in six monitoring test areas was visually inspected and photographed. The test areas, each roughly 1 square meter in area, are in critical flow path locations in the apron and diversion channels. The corners of each monitoring plot are marked with orange paint. The riprap in all of the test areas was in excellent condition. When the rocks were compared to the photos taken of them in 2007, there was no evidence that individual rocks had split or otherwise been degraded (PL–7 through PL–12). As outlined in the LTSP, annual photographing and comparing of these test areas was performed through 2002; after that, the LTSP requires the test areas to be photographed every 5 years (through 2017). The next and final set of photos will be taken in 2017.

Precipitation runoff from the cell occasionally ponds in a low-lying area along the southeast corner of the cell. The riparian-type vegetation that has become established in this area indicates that the area retains moisture much of the time. Water collection in this area does not pose a problem because the cell is designed to drain to the southeast, and any water that ponds there is below the elevation of the encapsulated tailings material. This location was dry at the time of the inspection.

8.4.2.3 Area Between the Disposal Cell and the Site Boundary

There are reclaimed and undisturbed areas between the disposal cell and the site perimeter. Both types of areas were in good condition (PL–13). No erosion concerns were observed. In general, reclaimed areas have good vegetation coverage, consisting mostly of grass. As expected, shrubs and forbs are much less abundant and less diverse in reclaimed areas than they are in undisturbed areas.

8.4.2.4 Outlying Area

Gunnison County owns the land that adjoins the site boundary to the north and east, and uses the land for a municipal landfill. Landfill operations have encroached to within approximately 400 feet of the northeast corner of the DOE property boundary. Although landfill activities do not appear to threaten the site, future inspections will continue to monitor the level of activity occurring near the DOE property boundaries and site surveillance features (e.g., fences, monitoring wells).

8.5 Follow-Up or Contingency Inspections

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

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

8.6 Maintenance and Repairs

Two damaged perimeter signs were replaced during the inspection. No other maintenance items were identified.

8.7 Environmental Monitoring

8.7.1.1 Groundwater Monitoring

DOE monitors groundwater at the site to demonstrate compliance with U.S. Environmental Protection Agency groundwater protection standards in 40 CFR 192.03 and to demonstrate that the disposal cell is performing as designed. The monitoring network consists of 16 wells, including six point-of-compliance (POC) wells to monitor cell performance, two wells to monitor background groundwater quality, and eight wells for water-level measurements.

In accordance with the LTSP, groundwater was sampled and water levels were measured annually from 1998 through 2001. Following the 2001 sampling event, the monitoring frequency changed to once every 5 years. The most recent sampling event was in 2011.

The indicator analyte for cell performance at the site is uranium. This analyte was selected on the basis of its presence in tailings pore fluid, its relatively high mobility in groundwater, and its low concentration in upgradient (background) groundwater. The target concentration for uranium is 0.013 milligram per liter (mg/L). The basis for this value is the maximum observed concentration of uranium in background samples determined prior to long-term surveillance and maintenance. The UMTRCA maximum concentration limit that the U.S. Environmental Protection Agency established for uranium is 0.044 mg/L.

Table 8–2. Active Monitoring Wells at the Gunnison Disposal Site

Point-of-Compliance and Background Wells	Water-Level Wells
0720 (point-of-compliance)	0630
0721 (point-of-compliance)	0634
0722 (point-of-compliance)	0663
0723 (point-of-compliance)	0709
0724 (point-of-compliance)	0710
0725 (point-of-compliance)	0712
0609 (background)	0714
0716 (background)	0715

Groundwater at the site was sampled in May 2011. The concentrations of uranium in samples collected at background wells 0609 and 0716 were 0.0038 mg/L and 0.0022 mg/L, respectively. The concentrations of uranium in samples collected from POC wells ranged between 0.001 mg/L and 0.005 mg/L, which is consistent with historical results. Uranium results from the POC wells were an order of magnitude below the action level of 0.013 mg/L, indicating that the disposal
8A cell continues to perform as an efficient containment system. The groundwater will be sampled again in 2016.

8.8 Corrective Action

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

No corrective action was required in 2012.

8.9 Photographs

Photo Location Number	Azimuth	Photograph Description
PL–1	315	Perimeter fence along the west side of the site.
PL–2	0	Site marker SMK–1 at the site entrance.
PL–3	180	Monitoring well 0716 north of the disposal site.
PL–4	200	View southwest across the top of the disposal cell.
PL–5	196	East side slope and riprap apron of the disposal cell.
PL–6	115	Northeast corner of the disposal cell and the east diversion channel.
PL–7	0	Riprap Test Area No. 1 (Type B riprap) on the cell’s east apron (June 4, 2012).
PL–7A	0	Riprap Test Area No. 1 (Type B riprap) on the cell’s east apron (May 21, 2007).
PL–8	0	Riprap Test Area No. 2 (Type B riprap) on the cell’s south apron (June 4, 2012).
PL–8A	0	Riprap Test Area No. 2 (Type B riprap) on the cell’s south apron (May 21, 2007).
PL–9	0	Riprap Test Area No. 3 (Type B riprap) on the cell’s northwest apron (June 4, 2012).
PL–9A	0	Riprap Test Area No. 3 (Type B riprap) on the cell’s northwest apron (May 21, 2007).
PL–10	0	Riprap Test Area No. 4 (Type C riprap) in the east diversion channel (June 4, 2012).
PL–10A	0	Riprap Test Area No. 4 (Type C riprap) in the east diversion channel (May 21, 2007).
PL–11	0	Riprap Test Area No. 5 (Type D riprap) at the east diversion channel outlet (June 4, 2012).
PL–11A	0	Riprap Test Area No. 5 (Type D riprap) at the east diversion channel outlet (May 21, 2007).
PL–12	0	Riprap Test Area No. 6 (Type D riprap) at the west diversion channel outlet (June 4, 2012).
PL–12A	0	Riprap Test Area No. 6 (Type D riprap) at the west diversion channel outlet (May 21, 2007).
PL–13	205	Reclaimed and undisturbed areas north of the disposal cell.

GUD 6/2012. PL–1. Perimeter fence along the west side of the site.

GUD 6/2012. PL–2. Site marker SMK–1 at the site entrance.

GUD 6/2012. PL–3. Monitoring well 0716 north of the disposal site.

GUD 6/2012. PL–4. View southwest across the top of the disposal cell.

GUD 6/2012. PL–5. East side slope and riprap apron of the disposal cell.

GUD 6/2012. PL–6. Northeast corner of the disposal cell and the east diversion channel.

GUD 6/2012. PL–7. Riprap Test Area No. 1 (Type B riprap) on the cell's east apron (June 4, 2012).

GUN 5/2007. PL–7A. Riprap Test Area No. 1 (Type B riprap) on the cell's east apron (May 21, 2007).

GUD 6/2012. PL–8. Riprap Test Area No. 2 (Type B riprap) on the cell's south apron (June 4, 2012).

GUN 5/2007. PL–8A. Riprap Test Area No. 2 (Type B riprap) on the cell's south apron (May 21, 2007).

GUD 6/2012. PL–9. Riprap Test Area No. 3 (Type B riprap) on the cell's northwest apron (June 4, 2012).

GUN 5/2007. PL–9A. Riprap Test Area No. 3 (Type B riprap) on the cell's northwest apron (May 21, 2007).

GUD 6/2012. PL–10. Riprap Test Area No. 4 (Type C riprap) in the east diversion channel (June 4, 2012).

GUN 5/2007. PL–10A. Riprap Test Area No. 4 (Type C riprap) in the east diversion channel (May 21, 2007).

GUD 6/2012. PL–11. Riprap Test Area No. 5 (Type D riprap) at the east diversion channel outlet (June 4, 2012).

GUN 5/2007. PL–11A. Riprap Test Area No. 5 (Type D riprap) at the east diversion channel outlet (May 21, 2007).


GUD 6/2012. PL–12. Riprap Test Area No. 6 (Type D riprap) at the west diversion channel outlet (June 4, 2012).


GUN 5/2007. PL–12A. Riprap Test Area No. 6 (Type D riprap) at the west diversion channel outlet (May 21, 2007).

GUD 6/2012. PL–13. Reclaimed and undisturbed areas north of the disposal cell.

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9.0 Annual Inspection of the Lakeview, Oregon, UMTRCA Title I Disposal Site

9.1 Compliance Summary

The Lakeview, Oregon, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected August 29 and 30, 2012. Other than some ongoing concern with erosion control rock riprap degradation, the disposal cell was in good condition. A section of the site fence had been damaged since May 2012. The damage was apparently caused by a tractor operated on the adjacent property. The barbed wire was mended during the inspection to prevent cattle from entering the site. No additional maintenance needs or cause for a follow-up or contingency inspection was identified.

The U.S. Department of Energy (DOE) has been evaluating the riprap to ensure continued long-term protection of the cell from erosion during a severe precipitation event. The degradation of the rock riprap, observed at the site since the mid-1990s, has been monitored as part of the annual inspections to determine the mean diameter (D_{50}) value of the riprap on the west side slope. The D_{50} value obtained by the annual gradation monitoring measures the number of rocks retained per sieve size. The D_{50} value measured during the 2012 gradation monitoring is 2.74 inches, which falls within the original D_{50} design size range of 2.7 to 3.9 inches for the Type B side slope riprap, as specified in the *Long-Term Surveillance Plan for the Collins Ranch Disposal Site, Lakeview, Oregon* (DOE/AL/62350-19F, Rev. 3, DOE, August 1994; LTSP). The 2012 D_{50} value is 0.25 inch larger than the value of 2.49 inches measured during the gradation monitoring in 2011.

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

9.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the 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). 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 9.4
Follow-Up or Contingency Inspections	Section 7.0	Section 9.5
Routine Maintenance and Repairs	Section 8.0	Section 9.6
Groundwater Monitoring	Section 5.3	Section 9.7.1
Corrective Action	Section 9.0	Section 9.8

9.3 Institutional Controls

The 40-acre 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 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and locked gates at the site entrances.

9.4 Inspection Results

The site, northwest of Lakeview, Oregon, was inspected on August 29 and 30, 2012. A. Houska, C. Goodknight, and K. Turley of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. J. Dayvault, the DOE Office of Legacy Management site manager, and D. Engstrom, of the Oregon Department of Energy, attended the inspection.

The purposes of the inspection were to confirm the integrity of visible features at the site, to identify changes in conditions that may affect site integrity, and to determine the need, if any, for maintenance or additional inspections and monitoring. Rock gradation monitoring of the erosion control rock riprap on the west side slope is also conducted as part of the inspection at the site.

9.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 9–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 9-1 by photograph location (PL) numbers.

9.4.1.1 Entrance Gates, Entrance Signs, and Access Road

Access to the site is gained by traveling a gravel road that heads west off County Road 2-16B. DOE was granted a perpetual easement on the approximately 1.2-mile access road between the county road and the DOE property boundary. A locked gate across the access road on the adjacent privately owned land limits access to the site. The private gate had been relocated on the access road farther to the east from its original location before the 2011 annual inspection. The site access road is a gravel-surfaced road in good condition.

The site gate and the pedestrian gate were locked and in good condition. The site's entrance sign was in good condition and clearly visible. No recent indication of vandalism was observed at the site during the inspection.

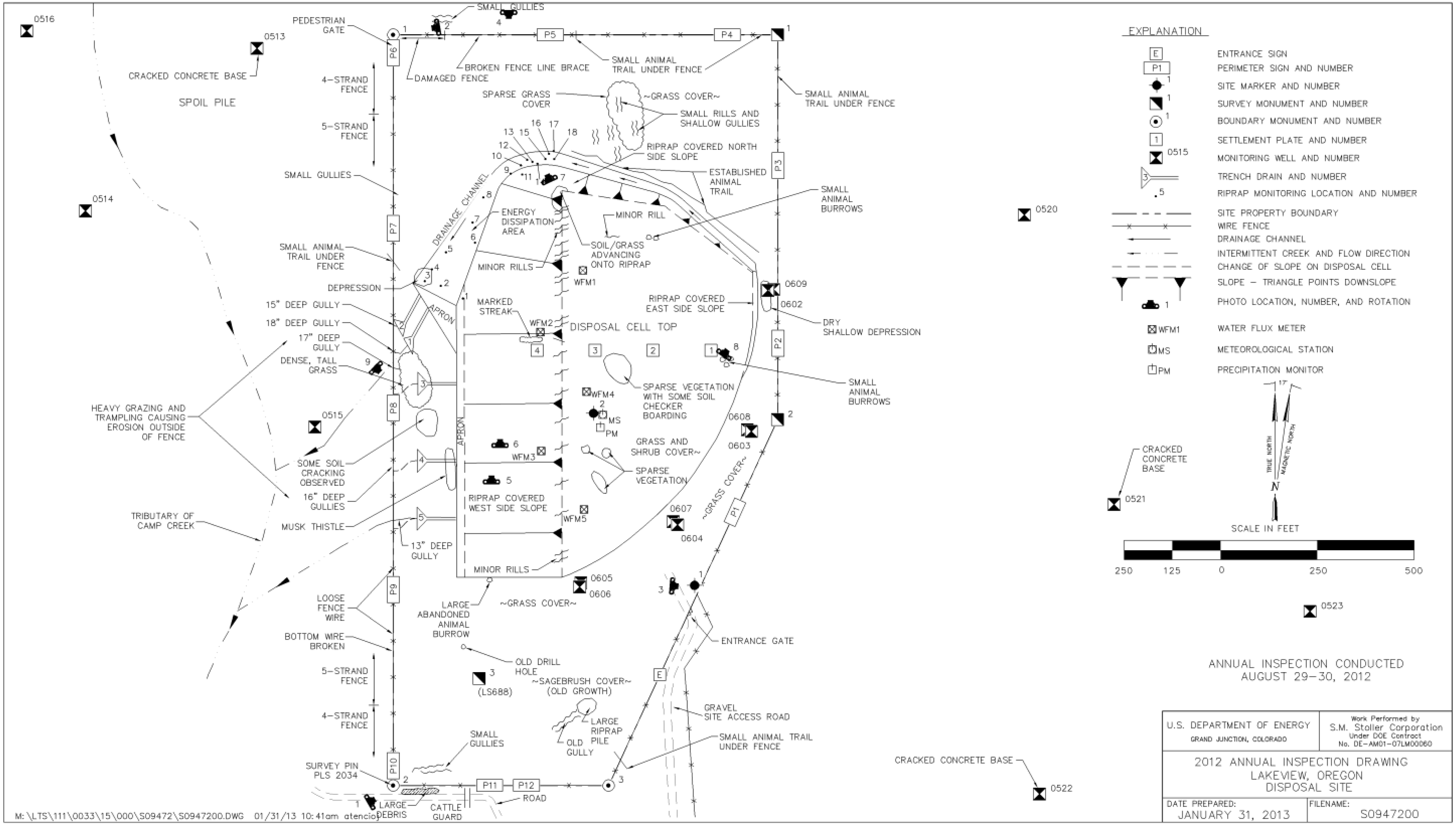

Figure 9–1. 2012 Annual Compliance Drawing for the Lakeview Disposal Site

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9.4.1.2 Perimeter Fence and Perimeter Signs

The 12 perimeter signs were in good condition and clearly visible from outside the site.

The site boundary fence is generally in good condition, but some loose and broken wire strands were noted. Tightening and maintenance of the fence will be needed within the next few years, as will some removal of vegetation near, and involved in, the fence line (PL–1). A section of the north fence, approximately 100 feet long, was damaged, apparently by a tractor operated on the adjacent private property. The location of the damaged fence is noted on the site drawing, and the damage is shown in PL–2. The barbed-wire fence was mended during the inspection to prevent cattle from entering the site, and the landowner was requested to repair the fence.

9.4.1.3 Site Markers

The two site markers—SMK–1, located near the site entrance, and SMK–2, on top of the disposal cell—are in good condition (PL–3).

9.4.1.4 Survey Monuments and Boundary Monuments

The three survey monuments and three boundary monuments are in good condition.

9.4.1.5 Monitoring Wells

The groundwater monitoring network comprises eight onsite point-of-compliance wells (four monitoring well pairs: 0602/0609, 0603/0608, 0604/0607, and 0605/0606) located east and south of the cell and one upgradient compliance well (0515) located offsite to the west of the disposal site. All nine wells were inspected and found locked, labeled, and in good condition.

Seven additional DOE-owned monitoring wells (0513, 0514, 0516, 0520, 0521, 0522, and 0523) exist on privately owned property near the site but are not part of the groundwater compliance monitoring network. These wells were also inspected and found locked, labeled, and in fair to good condition. Of the five offsite wells with concrete surface pads, the pads on wells 0513, 0521, and 0522 are cracked and broken and had some soil undercutting from water and wind erosion.

9.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection: (1) the top of the disposal cell; (2) the side slopes of the disposal cell and adjacent drainage channel, aprons, and trench drains; and (3) the site perimeter and the outlying area. A good overview of the site layout is provided in PL–4.

Within each area, the inspectors examined specific site surveillance features, drainage structures, vegetation, and other features. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site’s integrity, protectiveness, or long-term performance.

9.4.2.1 Top of Disposal Cell

At the time of cell construction, the entire cell top slope was covered in 12 inches of Type A riprap, and 4 inches of soil was 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. 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 movement of precipitation through the riprap, bedding, and compacted soil (radon barrier) layers. Grasses and forbs (rabbitbrush, sagebrush, and bitterbrush plants) growing on the top of the disposal cell have gradually increased over the years, and areas of deeper-rooted wheatgrasses have spread. Some sparsely vegetated areas still remain on the top of the disposal cell.

Riprap was observed through the soil on the top slope in numerous small areas during the inspection. The areas ranged in size from approximately 4 inches to 1.5 feet. These areas are intermittently located across the top slope and are likely caused by the infilling of the soil into the riprap-void spaces below. No structural or cell performance concerns are associated with the riprap becoming visible on the top slope.

The beginning development of soil checkerboard erosion patterns were observed sporadically in some of the more sparsely vegetated areas on the top slope for the first time during last year's inspection. No changes were noted during this year's inspection. This minor erosion pattern could indicate that water on the top slope is attempting to channelize, or it could be associated with the soil settling into the riprap voids beneath the soil. No structural or cell performance concerns are associated with this condition because the riprap rock cover is continuous beneath the top-slope soil cover, the slope crests, and the side slopes. However, future inspections will monitor this condition.

The contact boundary between the cell top and side slopes was inspected and generally appears stable and uniform except at the northernmost corner of the side slopes, where some soil has been transported off of the top slope, allowing for some grass to establish at the top of the side slopes. Approximately 25 minor erosion rills have been observed in the top-slope soil cover along the west contact in the past. These rills appeared more dispersed and less defined during this inspection. The extent of rilling on the west side slope will continue to be monitored during future annual inspections. No structural or cell performance concerns are associated with the minor encroachment of the grass onto the side slope or the presence of the minor rills because the riprap rock cover is continuous beneath the top-slope soil cover, the slope crests, and the side slopes.

No evidence of active animal burrowing on the top slope or evidence of cell settlement, displacement, or slumping was observed during the inspection.

9.4.2.2 Disposal Cell Side Slopes and Adjacent Drainage Channel, Apron, and Trench Drains

The deterioration of the basalt rock riprap at the site is likely due to physical weathering and chemical processes. The crumbling rocks on the surface appear to have increased in the mid-1990s, and rock monitoring continues to be performed. No evidence of cell settlement, displacement, or slumping was observed.

Addendums to the LTSP commit DOE to annually determining the D_{50} value of the west side slope rock riprap through gradation monitoring to ensure that the riprap is large enough to protect the disposal cell from a major precipitation event. This gradation monitoring method measures the number of rocks retained per sieve size. In 2012, the gradation monitoring was performed for the 16th consecutive year, as shown in PL–5 and PL–6. With the U.S. Nuclear Regulatory Commission's consent, an additional sieve size (1 inch) has been included in the monitoring since 2009. Sampling locations are randomly selected before each monitoring event.
9A Particle size distribution by count data was collected at 20 random locations, and approximately 25 rocks were sampled at each location. An evaluation of the rock size measurement data indicates that the west side slope riprap D_{50} is 2.74 inches with a 95 percent confidence interval between 2.52 and 2.96 inches. The 2012 D_{50} value is 0.25 inch larger than the value of 2.49 inches measured during the 2011 gradation monitoring. A graph that shows the results of the gradation monitoring since 1997 is provided as Figure 9–2. As shown on the graph, the downward curve of D_{50} values appears to have somewhat leveled off over the past 10 years. Earlier results appear to indicate a gradual overall decrease in the cover rock D_{50} size.

The annual photographic monitoring of the 18 photograph points for long-term rock monitoring was conducted in the energy dissipation area (EDA). Some of the photo-monitoring points are shown in PL–7. 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 rock type used in the EDA and drainage channel areas is much more homogeneous than the varied rock types used on the side slopes, and appeared in good condition.

Water previously observed at times in the large depression in the EDA at the lower end of the drainage channel was absent. Water is potentially a concern because inundation may accelerate deterioration of the large riprap by the freeze-thaw process, although the rocks used in the EDA are apparently not as susceptible to freeze-thaw as other rock types present on the cell.

Minor amounts of grass have encroached on the riprap on the side slopes, on the upper (eastern) part of the drainage channel, on the EDA at the lower end of the drainage channel, and on the western apron area. The relatively sparse plant growth in the drainage channel will not affect the function of the channel and is not considered a problem. A few small bushes were observed this year in the upgradient portion of the drainage channel, but their presence would not obstruct water flow. This is routinely evaluated at each inspection. Should the potential for flow obstruction become a concern in the future, maintenance activities would be performed. An area of dense, long grass exists near trench drains 1 and 3, which suggests wetter conditions and would be periodically expected in this area due to the runoff control features' normal fluctuations. No ponded water was observed. Some sporadic areas of soil cracking were observed in the soils in the areas west of the trench drains, but the grasses covering this area are dense and provide erosion protection.

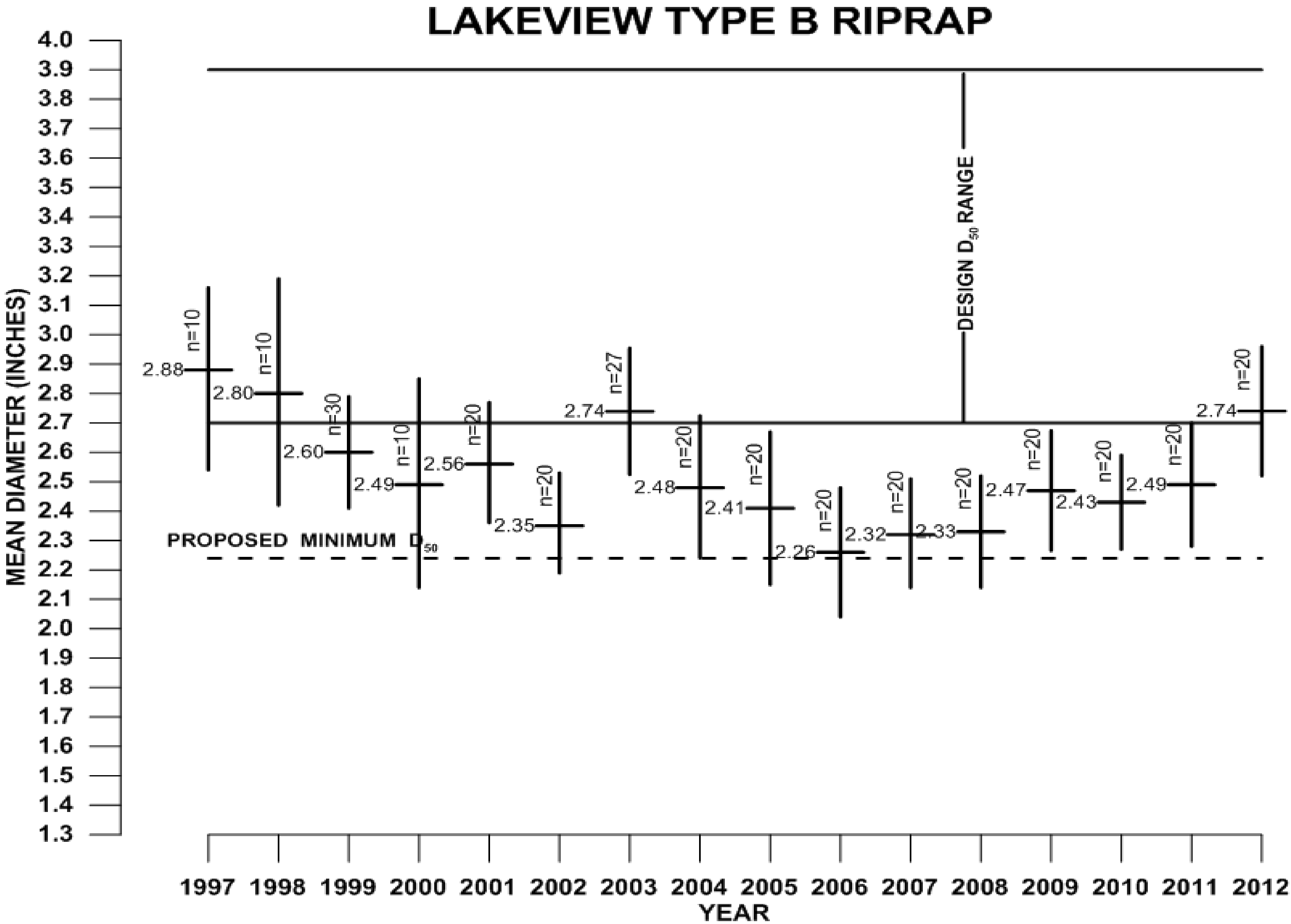

Figure 9–2. Riprap Gradation Monitoring

A slight topographical depression (approximately 60 feet by 20 feet) is located upgradient of the drainage channel near monitoring wells 0602 and 0609. The area was dry, but evidence indicates that surface water from precipitation has temporarily ponded in this area in the past. The maximum depth of the area is approximately 6 inches. This area is shown in PL–8. The depression has been noted in past inspection reports and does not appear significant, nor does it affect the functioning of the cell. No maintenance is recommended at this time.

9.4.2.3 Site Perimeter and Outlying Area

This area includes the seeded grass area extending from the disposal cell to the site boundary, the site fence, and the area within 0.25 mile surrounding the site.

Gullies that formed in seeded areas extending west of trench drains 1 through 5 were filled with rock in 2000. Although the rock has generally arrested the headcutting that was proceeding from the Byers property onto the DOE property, some minor headcutting is still evident although it did not appear to be recent. Several small gullies have formed in heavily grazed areas downslope of the fence line onto the Byers property and were identified during previous inspections. No indication of recent erosion was observed. Although no repairs are warranted at this time, the area will likely need minor maintenance in the next few years (PL–9).

Small gullies were identified in past years along the southern side of the site inside the fence. These gullies are located downhill of an inclined road that intersects the fence line near a cattle guard and probably represent overflow along the road during rain events. This area has not shown evidence of recent erosion. No maintenance is required in this area.

Several small rills and shallow gullies were observed onsite in the area north of the cell where grass reestablishment has been limited. No maintenance is required in this area, but the area will be monitored during future inspections.

Although the site boundary fence is generally in good condition, some loose wire strands were noted along the southwest and southeast fence line, and some fence brace posts were not in their brackets in several places along the site fence. Tightening of the fence will be needed within the next few years. Additionally, vegetation growth has become dense along the southern and southeastern fence line and sporadically in areas along the east and north fence line, and is becoming intertwined in the fence. This condition should be monitored to determine whether pruning or removal of vegetation is needed to ensure the structural integrity of the fence.

No notable changes were observed in the areas adjacent to the site except the continued work at the new gate to the site access road.

9.5 Follow-Up or Contingency Inspections

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

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

9.6 Maintenance and Repairs

No maintenance needs were identified during the inspection.

9.7 Environmental Monitoring

9.7.1 Groundwater Monitoring

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. No groundwater monitoring was performed in 2012. The most recent sampling event was performed in 2009. Constituents analyzed every 5 years include arsenic, cadmium, and uranium. Maximum concentration limits, established by the U.S. Environmental Protection Agency, in Table 1 to Subpart A of 40 CFR 192, are 0.05 milligram per liter (mg/L) for arsenic, 0.01 mg/L for cadmium, and 0.044 mg/L for uranium. Concentrations of these constituents were well below their respective limits in 2009. They also were consistent with sampling results from 2004 and remained within the historical range. Based on the monitoring results to date, there is no indication of any
9B degradation of groundwater in the vicinity of the site. The next cell performance groundwater monitoring is scheduled for 2014.

9.8 Corrective Action

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

No corrective action was required in 2012.

9.9 Photographs

Photograph Location Number	Azimuth	Description
PL–1	60	Vegetation involved in site fence at southwest corner of site.
PL–2	260	View to southwest of damaged north perimeter fence.
PL–3	95	Site Marker SMK–1 near entrance gate.
PL–4	180	View of site from north fence. View to south.
PL–5	NA	Using grid to mark rocks for monitoring on west side slope.
PL–6	NA	State of Oregon and DOE representatives watching rock monitoring on west side slope.
PL–7	335	EDA photo-monitoring locations 12, 13, and 14.
PL–8	35	Monitoring well pair 0602 and 0609.
PL–9	135	Soil erosion from channeling at west fence.

LKV 8/2012. PL–1. Vegetation involved in site fence at southwest corner of site.

LKV 8/2012. PL–2. View to southwest of damaged north perimeter fence.

LKV 8/2012. PL–3. Site Marker SMK–1 near entrance gate.

LKV 8/2012. PL–4. View of site from north fence. View to south.

LKV 8/2012. PL–5. Using grid to mark rocks for monitoring on west side slope.

LKV 8/2012. PL–6. State of Oregon and DOE representatives watching rock monitoring on west side slope.

LKV 8/2012. PL–7. EDA photo-monitoring locations 12, 13, and 14.


LKV 8/2012. PL–8. Monitoring well pair 0602 and 0609.

LKV 8/2012. PL–9. Soil erosion from channeling at west fence.

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10.0 Annual Inspection of the Lowman, Idaho, UMTRCA Title I Disposal Site

10.1 Compliance Summary

The Lowman, Idaho, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on July 16, 2012. The disposal cell was in excellent condition. Erosion was noted on adjacent State property north of the site and reported to the two State representatives who attended the inspection. Steep areas to the north and west of the disposal cell remain stable and vegetated. No maintenance needs or cause for a follow-up or contingency inspection was identified.

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

10.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the U.S. Department of Energy Lowman, Idaho, (UMTRCA Title I) Disposal Site* (DOE–LM/GJ771–2005, Rev. 2, U.S. Department of Energy [DOE], January 2005; LTSP) and 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 10.4
Follow-Up or Contingency Inspections	Section 3.4	Section 10.5
Routine Maintenance and Repairs	Section 3.5	Section 10.6
Corrective Action	Section 3.6	Section 10.8

10.3 Institutional Controls

The 18-acre 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, and a locked gate at the site entrance.

10.4 Inspection Results

The site, approximately ½ mile northeast of Lowman, Idaho, was inspected on July 16, 2012. D. Traub and M. Kastens of the S.M. Stoller Corporation, the Legacy Management Support contractor for the DOE office in Grand Junction, Colorado, conducted the inspection. M. Kautsky, the DOE Office of Legacy Management site manager, also attended the inspection.

C. Cody and D. Nygard, both of the Idaho Department of Environmental Quality, were onsite during the inspection. P. Rekow, a Boise County weed control specialist, was onsite to discuss noxious weed issues.

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

10.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 10−1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 10−1 by photograph location (PL) numbers.

10.4.1.1 Entrance Gates, Entrance Signs, and Access Road

The site is at the end of a hard-packed gravel road about 650 feet north of Idaho State Highway 21. The road is in excellent condition. A locked gate (PL–1) spans the road about 150 feet from the State highway and is in excellent condition.

The entrance sign near site marker SMK–1 has bullet holes (PL–2).

10.4.1.2 Perimeter Fence and Perimeter Signs

A total of 18 perimeter signs delineate the perimeter of the site. The perimeter signs are attached to steel posts along the site boundary. Bullet holes previously have been identified in perimeter signs P2, P3, and P15. Bullet indentations have been identified on perimeter sign P13. These signs remain legible and do not need to be replaced.

Ponderosa pine saplings are encroaching on perimeter sign P1 and making it less visible. Several years ago, trees near the sign were cut to enhance visibility.

10.4.1.3 Site Markers

Two site markers are present at the site. The first, SMK–1, is just inside the site’s southwest boundary (PL–2). The second, SMK–2, is on top of the disposal cell. Both markers are in excellent condition.

10.4.1.4 Survey Monuments and Boundary Monuments

Seven monuments define the site boundary. Three are combined survey and boundary monuments (SM–1/BM–1, SM–2/BM–2, and SM–4/BM–4) and four are boundary monuments (BM–3, BM–5, BM–6, and BM–7). Steel t-posts are installed next to the survey and boundary monuments, with the exception of BM–3, which is immediately adjacent to perimeter sign P9 (PL–3), to allow inspectors to locate the monuments more easily in the field. All are in excellent condition.

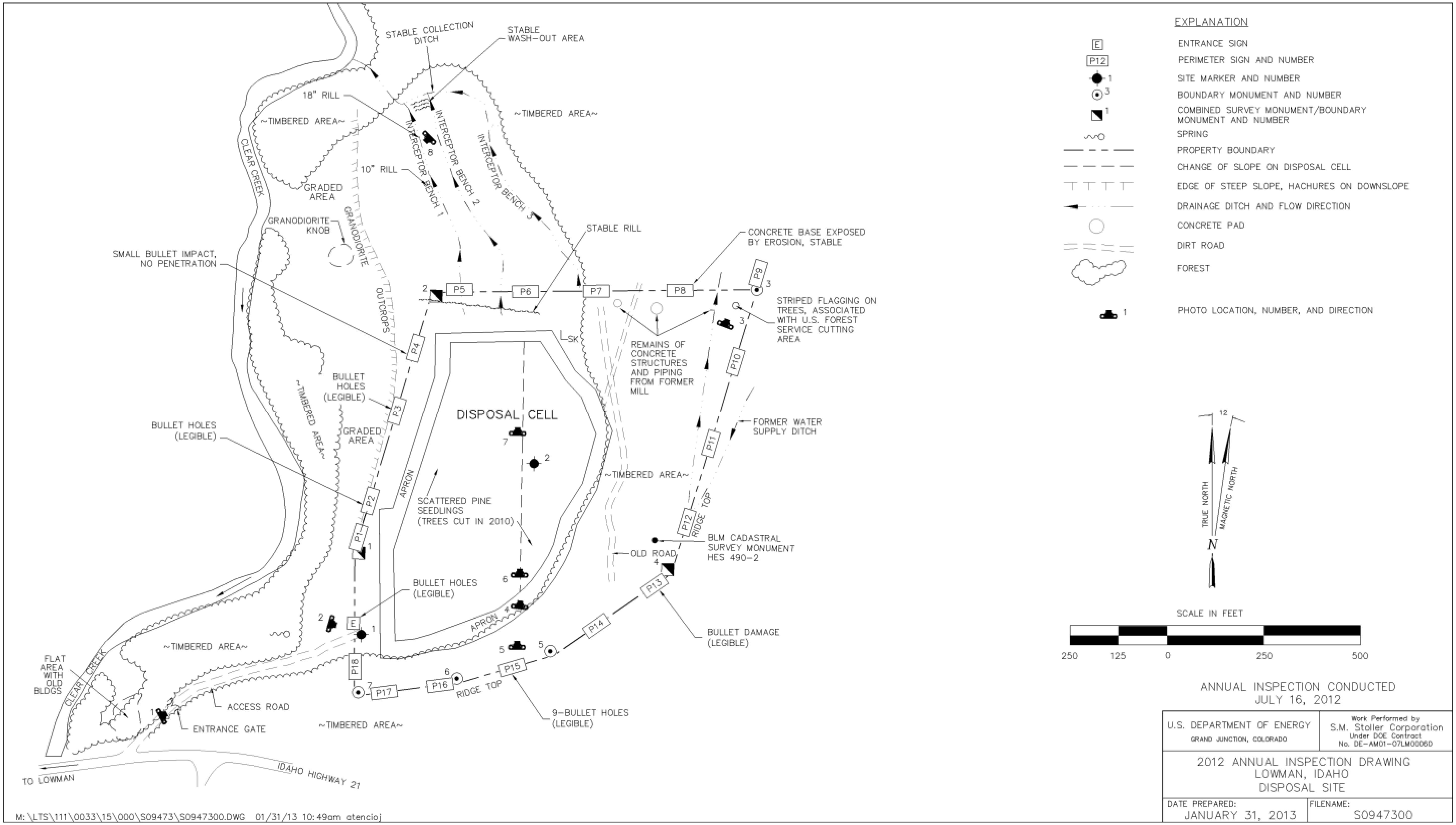

Figure 10–1. 2012 Annual Compliance Drawing for the Lowman Disposal Site

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10.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (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.

Within each area, the inspectors examined specific site surveillance features, drainage structures, vegetation, and other features. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

10.4.2.1 Top and Side Slopes of the Disposal Cell

The disposal cell was completed in 1991. Basalt riprap armors the top (PL–4 and PL–5) and west-facing side slope of the disposal cell. An apron of larger riprap surrounds the disposal cell on all sides. The riprap is in excellent condition. No evidence of instability, such as subsidence, slumping, or cracking, was observed on any of the cell surfaces.

Vegetation encroachment—by species such as ponderosa pine, redosier dogwood, Lewis' mockorange, elderberry species, willow species (PL–6), maple species, Douglas-fir (PL–7), spreading dogbane, fireweed, and woodland strawberry—continues on the top and side slopes of the disposal cell. Encroachment is a natural process operating at this location and will be allowed to continue in accordance with the LTSP.

10.4.2.2 Area Between the Disposal Cell and the Site Boundary

The steep slopes east and south of the site are stable and vegetated with well-established ponderosa pine and grasses. The slopes and area west of the site, which were highly disturbed during site remediation, are currently stable and becoming more vegetated. Due to recent, intensive noxious weed control activities, much of the area to the west of the cell is barren or contains annual weedy species.

10.4.2.3 Outlying Area

An area within 0.25 mile around the site was 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 and campsites are located.

The areas east and south of the site are managed by the U.S. Forest Service and remain relatively unchanged from previous inspections.

During the 2012 inspection, the Idaho Department of Environmental Quality pointed out to inspectors the erosion of drainage channels on State land north of the cell (PL–8).

10.5 Follow-Up or Contingency Inspections

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

No follow-up or contingency inspections were required in 2012.

10.6 Maintenance and Repairs

No maintenance needs were identified in 2012.

10.7 Environmental Monitoring

10.7.1 Groundwater monitoring

Groundwater monitoring is no longer required at the site according to the revised LTSP. All seven wells were decommissioned in August 2006 in accordance with State of Idaho groundwater protection requirements.

10.8 Corrective Action

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

No corrective action was required in 2012.

10.9 Photographs

Photograph Location Number	Azimuth	Description
PL–1	60	Entrance gate.
PL–2	105	Site marker SMK–1.
PL–3	20	Boundary monument BM–3 with U.S. Forest Service benchmark in red area at top center.
PL–4	5	View across disposal cell top.
PL–5	0	View north across cell.
PL–6	NA	Willow (*Salix* sp.) on disposal cell top.
PL–7	NA	Likely Douglas-fir (*Pseudotsuga menziesii*) on disposal cell top.
PL–8	225	Gully forming on State land north of site.

LOW 7/2012. PL–1. Entrance gate.

LOW 7/2012. PL–2. Site marker SMK–1.

LOW 7/2012. PL–3. Boundary monument BM–3 with U.S. Forest Service benchmark in red area at top center.

LOW 7/2012. PL–4. View across disposal cell top.

LOW 7/2012. PL–5. View north across cell.

LOW 7/2012. PL–6. Willow (*Salix* sp.) on disposal cell top.

LOW 7/2012. PL–7. Likely Douglas-fir (*Pseudotsuga menziesii*) on disposal cell top.

LOW 7/2012. PL–8. Gully forming on State land north of site.

11.0 Annual Inspection Report of the Maybell, Colorado, UMTRCA Title I Disposal Site

11.1 Compliance Summary

The Maybell, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on August 2, 2012. The disposal cell and all associated diversion and drainage structures were in good condition and functioning as designed. No significant change was noted to the erosion that has occurred directly downgradient of the outlets to Swale No. 1 and Diversion Channel No. 1; the riprap continues to be protective. No deep-rooted plants were found growing on the disposal cell during this year's inspection. Two additional lode mining claim locator stakes (a precursor to a possible claim) were found onsite. Perimeter signs P5 and P6 have bullet holes but remain legible. Perimeter sign P1 is missing and will be replaced. A broken top strand in the perimeter fence found at two locations will be repaired. The nine boundary monuments determined to have been placed incorrectly north and northwest of the site will be removed, and three new monuments will be installed along the correct property boundary that coincides with the perimeter fence line in this portion of the site.

During the inspection, no activity that raises concern over the integrity of the site was noted in the surrounding area. No maintenance needs or cause for a follow-up or contingency inspection was identified.

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

11.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Maybell, Colorado (UMTRCA Title I) Disposal Site, Moffat County, Colorado* (DOE−LM/1605–2008, U.S. Department of Energy [DOE], Rev. 4, April 2008; 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). The inspection was conducted in accordance with the LTSP. 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 3.3	Section 11.4
Follow-Up or Contingency Inspections	Section 3.5	Section 11.5
Routine Maintenance and Repairs	Section 3.6	Section 11.6
Groundwater Conditions	Section 2.5	Section 11.7.1
Corrective Action	Section 3.6	Section 11.8

11.3 Institutional Controls

The 251-acre 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and a locked gate at the site entrance.

11.4 Inspection Results

The site, northeast of Maybell, Colorado, was inspected on August 2, 2012. S.C. Hall and R.K. Johnson, both of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. J. Nguyen, the DOE site manager; M. Cosby, of the Colorado Department of Public Health and Environment; and A. Houska, of the S.M. Stoller Corporation, attended the inspection.

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

11.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 11–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 11–1 by photograph location (PL) numbers.

11.4.1.1 Entrance Gates, Entrance Signs, and Access Road

Access to the site is via County Road 53, which runs north off U.S. Highway 40 approximately 8 miles east of Maybell. The road is graveled, hard packed, and in good condition. County Road 53 ends at an unlocked gate near the northeast corner of the site (approximately 3 miles from U.S. Highway 40). From that point, the road continues west as a dirt two-track road, directly north of the site. This road continues through a second unlocked gate and past an abandoned open pit mine, known as the Rob Pit, to the Maybell West UMTRCA Title II disposal site.

Because the access road to the site is a County road, maintenance up to that point is performed by Moffat County. From that point to the Maybell West site, DOE is responsible for road maintenance under a U.S. Bureau of Land Management (BLM) right-of-way (ROW) permit. No road maintenance was determined necessary.

Two gates are located in the perimeter fence along the north boundary of the site. One is considered the site entrance gate and located adjacent to the site marker and entrance sign (PL–1). The second gate is located directly west of perimeter sign P3 in the northwest corner of the property. Both gates are standard tubular metal stock gates and were locked and in good condition.

The entrance sign, located near the entrance gate and mounted on a t-post in the fence line, had a couple of bullet holes but remains legible.

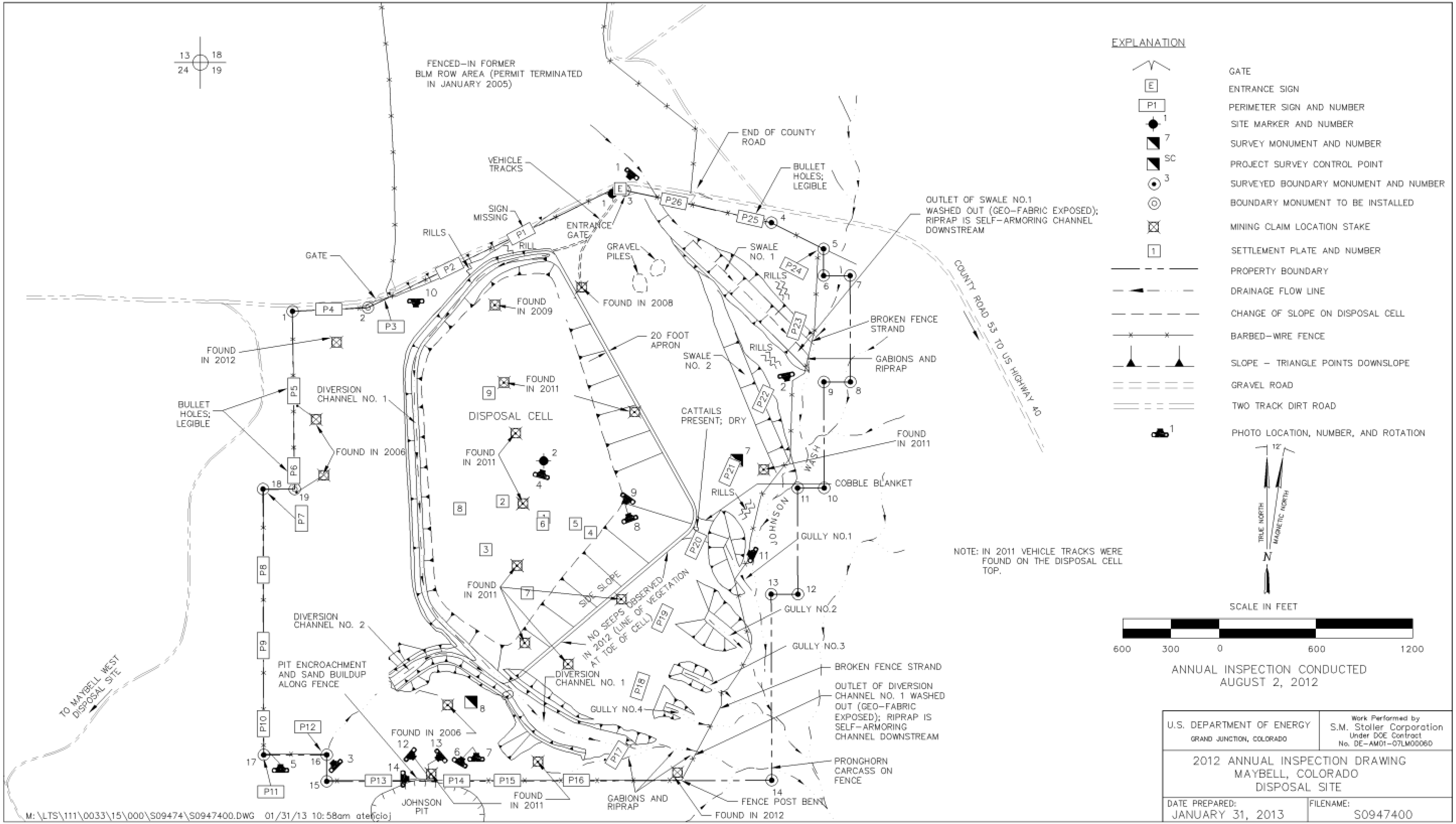

Figure 11–1. 2012 Annual Compliance Drawing for the Maybell Disposal Site

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11.4.1.2 Perimeter Fence and Perimeter Signs

A standard four-strand barbed-wire stock fence surrounds the disposal cell and drainage structures. The site is located in wintering grounds frequented by big game animals (primarily pronghorn, deer, and elk) and is also surrounded by open range land used to graze cattle. As a result, minor damage to the perimeter fence occurs periodically. Maintenance of the perimeter fence was performed in 2009 and 2011; several breaks, loose wires, and a bent post were repaired, and the fence was extended where it crosses Gullies No. 1, 2, 3, and 4 to keep cattle from accessing the site. These modifications appear to have prevented cattle from accessing the site. With the exception of broken top strands at two locations, the fence was in good condition (PL–2).

A total of 26 perimeter signs are located at the site. On the north, west, and south sides of the site, perimeter signs are mounted on t-posts in the perimeter fence. On the east side of the site, perimeter signs are mounted on steel posts set in concrete and are located inside the property boundary approximately midway between the disposal cell and the perimeter fence. Several of the perimeter signs along the dirt road north and west of the site have bullet holes but remain legible. Perimeter sign P1 along the dirt road is missing and needs to be replaced. The remaining signs were in good condition (PL–3).

11.4.1.3 Site Markers

Two standard granite site markers are located onsite. Site marker SMK–1 is located near the entrance gate, and SMK–2 is located on top of the disposal cell. Both were in good condition. In 2003 and 2004, sealant was applied to repair cracks in the concrete base of site marker SMK–2; the repairs remain effective in slowing the deterioration (PL–4).

11.4.1.4 Survey and Boundary Monuments

Two survey monuments are located onsite. Survey monument SM–7 is on the bench above Johnson Wash just north of perimeter sign P21, and survey monument SM–8 is south of the disposal cell on the bench above Diversion Channel No. 2. Both survey monuments were in good condition.

Originally, four boundary monuments were used to define the property. Because these four monuments did not adequately represent the site property boundary, 19 additional monuments were installed in September 2002 to better define the boundary. In 2008, during a real property assessment, an error was discovered in the property boundary along the north and northwest portion of the site. It was determined that the property boundary, as it was depicted following the 2002 land survey, did not match the legal description included in the BLM permanent withdrawal for the site. The correct property boundary along the north and northwest portion of the site was determined to follow the perimeter fence line. As a result, the site base map was corrected, and the LTSP was revised and submitted to NRC for acceptance. Because of this error, nine boundary monuments need to be removed north and northwest of the site, and three new monuments need to be installed along the correct property line. All boundary monuments checked were observed to be in good condition (PL–5).

11.4.1.5 Settlement Plates

Nine settlement plates were installed on the disposal cell top during construction to detect any significant settlement resulting from slimes (i.e., fine-grained wet tailings) that were placed in the south-central part of the cell. The former mill slimes were compacted before the radon barrier was complete, but the potential for additional consolidation and possible stress to the radon/infiltration barrier still existed.

From 2000 through 2004, in accordance with the LTSP, DOE conducted annual land surveys of the settlement plates and presented the results in the annual compliance report to NRC. The annual land surveys verified that no significant settlement had occurred on the disposal cell top. Therefore, having met the 5-year post-construction settlement survey requirement stipulated in the LTSP, DOE discontinued the annual land surveys of the settlement plates. Surveying of the settlement plates will resume if visual observations of the disposal cell made during the annual inspections were to indicate a cause for concern.

11.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection: (1) the disposal cell, (2) other areas inside the site boundary, and (3) the site perimeter and outlying areas.

Within each area, inspectors examined specific site surveillance features, such as monuments, markers, fences, and signs. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site’s integrity, protectiveness, or long-term performance.

11.4.2.1 Disposal Cell

The disposal cell covers approximately 66-acres of the approximately 250-acre disposal site property (PL–6 and PL–7). The roughly pentagonal disposal cell measures about 1,600 feet (ft) by 2,400 ft and is located in the center of the site. The above-grade disposal cell rises to a height of approximately 30 ft and is capped with an approximate 7-ft-thick multiple-component cover. 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 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 (PL–8 and PL–9). In 2008, two slight depressions were thought to have been noted on the disposal cell top between Settlement Plates No. 6 and 7; these depressions could not be identified in subsequent inspections, including during the 2012 inspection. At the time, these areas were thought to be a result of inconsistencies in grade that occurred during cell construction and not from settlement of the underlying materials. Continued visual monitoring of this area will be performed during inspections to determine if any settlement of the disposal cell is actually occurring.

The vehicle tracks noted on top of the disposal cell in 2011 were still evident and are believed to be from recent activity, rather than a remnant of cell construction. The source of these vehicle tracks could not be determined, but the imprint made from the tracks on the riprap is minor, and no damage to the cell occurred. The tracks do not present any cause for concern with regard to future cell performance.

Minor accumulations of various shallow-rooted plants were observed on the disposal cell top and side slopes. No deep-rooted plants were found growing on the disposal cell in 2012 (growth of deep-rooted plants on the disposal cell is controlled in accordance with the LTSP).

The LTSP advises inspectors to look for seeps on the east and southeast side slopes of the disposal cell because slimes were encapsulated in this portion of the cell. In 2012, no seeps were observed at the toe of the disposal cell in this area. However, cattails continue to be observed growing at this location, indicating the presence of moisture that is likely the result of repeated surface runoff from the cell rather than from seepage from the cell; standing water has been observed in this area during past inspections. In 2003, a sample of the evaporites from this location was collected for laboratory analysis, and no constituents attributable to the cell contents were reported to be present. Observation of this area will continue.

11.4.2.2 Other Areas Inside the Site Boundary

The final surface conditions at the site are a combination of rock armoring, and contouring to achieve the necessary surface water drainage control and erosion protection to satisfy design longevity requirements. Revegetated surfaces at the site have been planted with a mix of native and adaptive grasses to provide soil stability. Vegetation diversity and density remains adequate in graded and disturbed areas between the disposal cell and the site boundary. Abundant signs of wildlife are present onsite and in the surrounding area.

The rock-armored diversion channels, swales, and gullies were in good condition (PL–10 and PL–11). Erosion directly downgradient of the outlets to Diversion Channel No. 1 and Swale No. 1 that has exposed the underlying geo-fabric had not changed significantly. Riprap placed within the outlets continues to provide protection against headcutting as designed. This erosion presents no threat to the integrity of the disposal cell but will continue to be monitored. Minor rills noted adjacent to Swale No. 1 and Gully No. 1 continue to stabilize due to self-armoring and increased vegetation growth. There was no evidence of any significant new erosion or sediment moving offsite into Johnson Wash. 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 effective.

In 2006, lode mining claim locator stakes were first discovered onsite inside the perimeter fence. Additional locator stakes were found onsite in the years following, including several on top of the disposal cell in 2011. Two more were found onsite in 2012. Upon contact, BLM confirmed these to be locator stakes and not actual claim stakes, and indicated they were a precursor to a possible claim being filed and that increased uranium exploration is occurring in the area. The "Notice of Location" form on one of the stakes indicated Oregon Energy LLC as the locator. BLM said Western Fuels Incorporated had also placed some of the stakes. If claims were to be filed, they would be considered nuisance claims, as protections pursuant to the NRC general license for the disposal site appear to preclude any surface or subsurface activity that would jeopardize the disposal cell and its associated drainage control structures. Research would be needed to determine if valid subsurface mineral rights that predate BLM's site withdrawal exist.

Additional research would be needed to determine whether the subsurface mineral rights were included with the two private parcels of land on the west and south sides of the site that were purchased in fee simple by the State of Colorado and transferred to DOE. The status of subsurface mineral ownership and confirmation of the apparent regulatory protections has not been obtained.

11.4.2.3 Site Perimeter and Outlying Area

The area outside the site boundary for 0.25 mile was visually inspected. There was no evidence of development, change in land use, or other activities that might affect the long-term performance or stability of the site. As previously discussed, the recent mining claim locator stakes found at the site, if pursued, would be considered nuisance claims and would not threaten the disposal structures because of the regulatory protections afforded by the NRC general license.

Directly south of the site is a former open pit uranium mine referred to as the Johnson Pit (PL–12 and PL–13). Over time, slumping of the pit wall resulted in the pit encroaching approximately 5 ft onto what is now DOE property. This encroachment presents no threat to the integrity of the disposal cell and occurred before the reclamation and transfer of the site to DOE for long-term surveillance and maintenance. Continued observation will be performed to ensure that any additional sloughing of the pit wall does not damage the perimeter fence that runs along the south property line. This encroachment is visually monitored annually and periodically photographed to determine if the pit wall is slumping further. In 2012, there was no evidence of any additional encroachment of the pit onto the site (PL–14).

In September 2004, DOE received written concurrence from BLM that the ROW reservation directly north of the site had revegetated successfully and that the permit for the reclaimed reservation area has been relinquished. At the request of a local rancher (who holds a BLM grazing permit for the area surrounding the site), the fenced-in former ROW area is being used occasionally for livestock management. In 2012, it was observed that vegetation in the former ROW area continued to be well established, and there was no evidence of overgrazing.

11.5 Follow-Up or Contingency Inspections

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

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

11.6 Maintenance and Repairs

11A A broken top strand of barbed wire was found at two locations in the perimeter fence on the east side of the site. The fence remains functional. This minor fence repair will be performed sometime in the future.

11.7 Environmental Monitoring

11.7.1 Groundwater Monitoring

Groundwater at this site is contaminated as a result of widespread, naturally occurring uranium mineralization and mining activities not related to onsite 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, in accordance with 40 CFR 192.21 (g), have been applied to groundwater at the site. Therefore, groundwater quality monitoring is not required at the site.

Groundwater-level monitoring was conducted in accordance with the LTSP from November 1995 through March 2004 to determine if 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 on 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 for acceptance.

11.8 Corrective Action

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

No corrective action was required in 2012.

11.9 Photographs

Photo Location Number	Azimuth	Photograph Description
PL–1	220	Site entrance gate; disposal cell in background.
PL–2	170	East perimeter fence line.
PL–3	315	Perimeter Sign No. 12 in the southwest corner of the site.
PL–4	15	Site marker SMK–2 on the disposal cell top.
PL–5	NA	Boundary Monument No. 17 in the southwest corner of the site.
PL–6	30	Southeast portion of the disposal cell.
PL–7	0	West portion of the disposal cell and Diversion Channel No. 1.
PL–8	340	Northeast edge of the disposal cell top.
PL–9	215	Southeast side slope of the disposal cell.
PL–10	180	Diversion Channel No. 1 between the disposal cell and the rock-covered slope west of cell.
PL–11	295	Rock-armored Gully No. 1.
PL–12	130	Eastern portion of the Johnson Pit directly south of the site.
PL–13	230	Western portion of the Johnson Pit directly south of the site.
PL–14	90	Encroachment of the Johnson Pit along the south perimeter fence.


MAY 4/2012. PL–1. Site entrance gate; disposal cell in background.


MAY 4/2012. PL–2. East perimeter fence line.

MAY 4/2012. PL–3. Perimeter Sign No. 12 in the southwest corner of the site.

MAY 4/2012. PL–4. Site marker SMK–2 on the disposal cell top.

MAY 4/2012. PL–5. Boundary Monument No. 17 in the southwest corner of the site.

MAY 4/2012. PL–6. Southeast portion of the disposal cell.


MAY 4/2012. PL–7. West portion of the disposal cell and Diversion Channel No. 1.


MAY 4/2012. PL–8. Northeast edge of the disposal cell top.

MAY 4/2012. PL–9. Southeast side slope of the disposal cell.

MAY 4/2012. PL–10. Diversion Channel No. 1 between the disposal cell and the rock-covered slope west of cell.

MAY 4/2012. PL–11. Rock-armored Gully No. 1.

MAY 4/2012. PL–12. Eastern portion of the Johnson Pit directly south of the site.

MAY 4/2012. PL–13. Western portion of the Johnson Pit directly south of the site.

MAY 4/2012. PL–14. Encroachment of the Johnson Pit along the south perimeter fence.

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12.0 Annual Inspection of the Mexican Hat, Utah, UMTRCA Title I 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 3, 2012. The disposal cell was in excellent condition. The U.S. Department of Energy (DOE) site lead and three inspectors from the U.S. Nuclear Regulatory Commission (NRC) were part of the annual inspection. The cell condition was unchanged from the previous year. Minor fence repair was performed near the beginning of the north diversion channel. A slight rockslide near perimeter sign P22 loosened fence strands, and a radiation protection sign was missing from perimeter sign P31; these repairs are the only future maintenance required. Vandalism continues, as indicated by new bullet holes in perimeter signs. No additional maintenance needs or cause for a follow-up or contingency inspection was identified.

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

12.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Mexican Hat, Utah, Disposal Site* (DOE/AL/62350–207, Rev. 2, DOE, June 1997; 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 12–1. License Requirements for the Mexican Hat Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.3 and 3.4	Section 12.4
Follow-Up or Contingency Inspections	Section 3.5	Section 12.5
Routine Maintenance and Repairs	Section 3.6	Section 12.6
Groundwater Monitoring	Section 3.7	Section 12.7.1
Corrective Action	Section 3.6	Section 12.8

The inspection was also performed 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*, March 2006; resolution document). Annual assessment of six designated seeps was conducted during the inspection. Qualitative descriptions of the seeps included photographic documentation for yearly comparisons. In accordance with the resolution document, no sampling and analysis was performed since no significant increase of seepage or changes were observed.

12.3 Institutional Controls

The United States of America holds the 119-acre disposal site in trust for the Bureau of Indian Affairs; the Navajo Nation retains title to the land. DOE and the Navajo Nation executed a Custodial Access Agreement 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 a Cooperative Agreement (DE–FC04–

85AL26731) with the Navajo Nation, and the required it before bringing the site under the general license. The purpose of the Cooperative Agreement was to perform remedial actions at the former processing sites. 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 site include federal custody of the disposal cell and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and a locked gate at the site entrance.

12.4 Inspection Results

The site, south of Mexican Hat, Utah, was inspected on April 3, 2012. J. Gillespie and R. Johnson of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. R. Bush, the DOE Office of Legacy Management site manager, attended the inspection, as did NRC inspectors R.J. Evans, D.B. Spitzberg, and L.M. Gersey.

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

12.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 12–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 12–1 by photograph location (PL) numbers.

12.4.1.1 Site Access, Entrance Gate, Access Road, and Entrance Sign

The site is accessed via a short unmarked dirt road off U.S. Highway 163 that ends at a graded parking area. Erosion continues to occur along the dirt road, but the site continues to be accessible.

The entrance sign located at the gate is in excellent condition.

12.4.1.2 Fence and Perimeter Signs

A barbed-wire perimeter fence is located between the disposal cell features and the site boundary. Other than erosion of soil down to rock at a couple of locations near the south and southwest diversion channel, the perimeter fence is in excellent condition. Periodically, the fence is damaged by livestock or erosion and requires repair. Erosion has increased the spacing between the lowest strand and the ground surface between perimeter signs P37 and P40. An additional strand of non-barbed (wildlife-friendly) wire was added in 2010 and was observed to be in good condition. Erosion continues to migrate up to the end of the west diversion channel at perimeter signs P42 and P43 but is not a concern at this time.

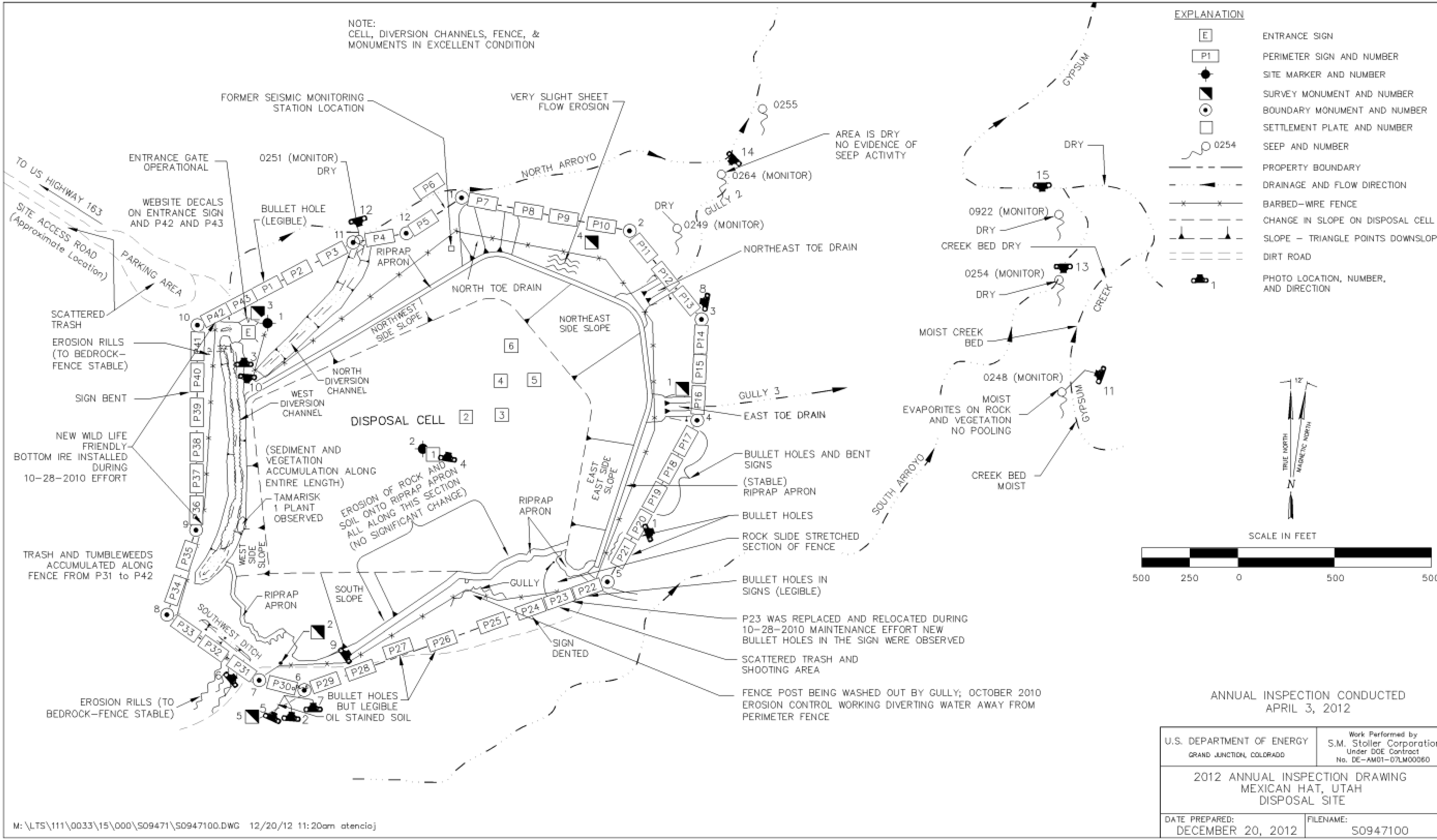

Figure 12–1. 2012 Annual Compliance Drawing for the Mexican Hat Disposal Site

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There are 43 perimeter sign locations, and each location has a pair of signs: an upper property ownership sign and a lower radioactive materials disposal site (warning sign). The remaining perimeter signs were present and legible, although several are damaged by bullet holes or have been bent because wildlife rubbed against them. The area of perimeter signs P20 through P24 continually receives bullet damage, as evidenced at perimeter sign P20 (PL–1). Perimeter sign P31 is missing the lower radioactive warning portion of the sign (PL–2). Several signs on the south boundary have new bullet holes, including perimeter sign P23, which was replaced and relocated inside the perimeter fence in October 2010.

12.4.1.3 Site Markers

Two granite site markers are on the site. Site marker SMK–1 is on the ground inside the southwest security fence line. Its concrete base has several minor cracks, but there is no need for repairs at this time; overall the site marker was in good condition (PL–3). Site marker SMK–2, located at crest of the disposal cell, was in excellent condition (PL–4).

12.4.1.4 Survey Monuments and Boundary Monuments

The four survey monuments and 12 boundary monuments were inspected. All survey and boundary monuments were in good condition.

12.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (1) the riprap-covered disposal cell top; (2) the riprap-covered side slopes, toe drains, aprons, and diversion channels; (3) the area between the cell and the site boundary (perimeter signs and fencing); and (4) the outlying area (drainages and observation of seeps).

Within each area, 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 area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

12.4.3 Disposal Cell and Adjacent Area Inside the Security Fence

The top of the disposal cell is in excellent condition (PL–5, PL–6, and PL–7). 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 to be growing on top of the disposal cell.

The disposal cell side slopes, toe drains, aprons, and diversion channels were in excellent condition and functioning as designed (PL–8).

The sloughing of red country rock and soil along the south apron (PL–9) has not increased during the past year. 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.

Areas offsite and upgradient continue to erode and transport sediment onto the site and into the west diversion channel (PL–10). 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, one tamarisk plant was observed on the site during the inspection in the west diversion channel outside of the cap. Its growth will be monitored and potentially removed during the next scheduled maintenance effort. Tamarisk will continue to be controlled on the site.

12.4.4 Site Perimeter Between the Security Fence 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 storm water 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, the areas on DOE property along the perimeter fence between perimeter signs P31 and P42, and the southern portion of the site between perimeter signs P22 and P27. Periodic trash removal may be required to maintain the integrity of the perimeter fence and to keep trash from entering the fenced area.

Tumbleweeds as well as trash continue to accumulate along the west and southwest sections of the perimeter fence, primarily between perimeter signs P31 and P42. However, this accumulation does 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 tracks. Vandalism has increased, as indicated by new bullet holes in several perimeter signs. This is expected to be an ongoing problem at the site.

12.4.5 Outlying Area

The area surrounding the site was visually inspected for signs of erosion, development, or other disturbance that might affect site integrity or security. As discussed above, trash continues to accumulate primarily in areas immediately adjacent to the site property boundary. No other changes were observed.

12.5 Follow-Up or Contingency Inspections

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

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

12.6 Maintenance and Repairs

12A A missing radiological warning sign (P31) and some minor fence repair near perimeter sign P22 will be required in the future. A warning sign should also be placed at seep 0254.

12.7 Environmental Monitoring

12.7.1 Groundwater Monitoring

12B Visible inspection of the monitored seeps is performed in accordance with the approved recommendations presented in the seep monitoring evaluation report (in the resolution document). Six designated seeps are assessed annually to determine if conditions have changed significantly to warrant sampling.

In accordance with approved recommendations presented in the seep monitoring evaluation report (in the resolution document), annual visual assessments of seep flows were conducted at six designated seep locations. No significant increases in water flow or conditions at the seeps were noted; therefore, no additional sampling and analysis or evaluation is justified at this time. 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, the result of transient drainage from the wet tailings placed within the disposal cell. Warning signs that stipulate to not drink the water remain posted at the seep locations. Seep flows were nonexistent during the 2012 inspection since very little rainfall had occurred so far that year.

All seeps observed during the site inspection are listed in the LTSP, except seep 0264, which replaced seep 0249 in 1995 because of insufficient flow for sampling. Historically, minimal flow is observed only at seep 0248; however, this year the area was only moist, and no pooling or dripping water was observed. The remaining seeps were all dry, with no indication of recent moisture. Some evaporates were observed, but the soil beneath was dry. Gypsum Creek sediments were moist, and there was limited exposed flowing water in the drainage. Table 12–1 provides observations and qualitative descriptions of seep flows, along with a reference to photographic documentation.

Table 12–1. Observations and Descriptions of Seeps at the Mexican Hat Disposal Site

Seep Location Number	Drainage	Photo Numbers	Observations and Descriptions of Seep Flow (Qualitative)
0248	Gypsum Creek	PL–11	Moist adjacent rock face; soils moist but no flow or pooling in the immediate area.
0251	North Arroyo	PL–12	Dry; no evidence of seep soil present but no observed flow. Minimal vegetation—primarily tamarisk (very little other riparian vegetation).
0254	South Arroyo	PL–13	Dry; no flow, or moist soil present where standing pool of water usually exists from recent rain events. Very little riparian vegetation besides tamarisk. Location is not posted.
0264	North Arroyo	PL–14	Dry; no flow.
0922	South Arroyo	PL–15	Dry; no change from previous year's inspection.

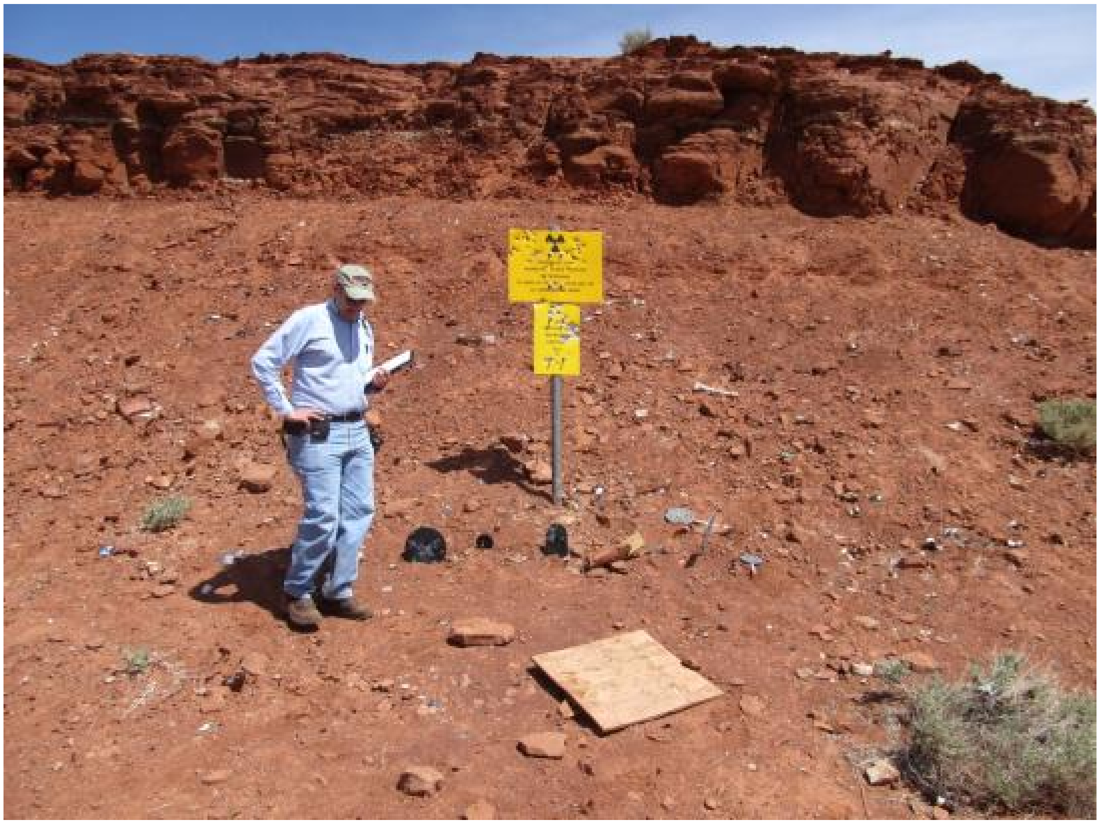
12.8 Corrective Action

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

No corrective action was required in 2012.

12.9 Photographs

Photo Location Number	Azimuth	Photograph Description
PL–1	70	Photo of perimeter sign P20 with bullet damage.
PL–2	5	Missing radiation warning sign at perimeter sign P31.
PL–3	0	Site Marker 1 (SMK–1).
PL–4	10	Site Marker 2 (SMK–2).
PL–5	25	Central portion of the disposal cell.
PL–6	50	Southeast portion of the disposal cell.
PL–7	North	West portion of the disposal cell and the west diversion channel.
PL–8	280	West view of northeast and east slope.
PL–9	55	Southeast edge of the disposal cell.
PL–10	185	West edge of the disposal cell and the west diversion channel.
PL–11	290	Seep 0248 close up of bank (no pooling).
PL–12	165	Seep 0251 in the North Arroyo (dry).
PL–13	180	Seep 0254.
PL–14	225	Seep 0264 in the North Arroyo (dry).
PL–15	180	Seep 0922.



HAT 4/2012. PL–1. Photo of perimeter sign P20 with bullet damage.

HAT 4/2012. PL–2. Missing radiation warning sign at perimeter sign P31.

HAT 4/2012. PL–3. Site Marker 1 (SMK–1).

HAT 4/2012. PL–4. Site Marker 2 (SMK–2).

HAT 4/2012. PL–5. Central portion of the disposal cell.

HAT 4/2012. PL–6. Southeast portion of the disposal cell.

HAT 4/2012. PL–7. West portion of the disposal cell and the west diversion channel.

HAT 4/2012. PL–8. West view of northeast and east slope.

HAT 4/2012. PL–9. Southeast edge of the disposal cell.

HAT 4/2012. PL–10. West edge of the disposal cell and the west diversion channel.

HAT 4/2012. PL–11. Seep 0248 close up of bank (no pooling).

HAT 4/2012. PL–12. Seep 0251 in the North Arroyo (dry).

HAT 4/2012. PL–13. Seep 0254.

HAT 4/2012. PL–14. Seep 0264 in the North Arroyo (dry).

HAT 4/2012. PL–15. Seep 0922.

13.0 Annual Inspection of the Naturita, Colorado, UMTRCA Title I Disposal Site

13.1 Compliance Summary

The Naturita, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, inspected on May 15, 2012, is in excellent condition. The only new maintenance needs identified during the inspection were loose and broken fence wires at two locations on the perimeter fence. The wires will be repaired before the next annual inspection. No additional maintenance needs or cause for a follow-up or contingency inspection was identified.

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

13.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the 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; 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 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 13.4
Follow-Up or Contingency Inspections	Section 3.4	Section 13.5
Routine Maintenance and Repairs	Section 4.0	Section 13.6
Groundwater Monitoring	Section 2.6.2	Section 13.7.1
Corrective Action	Section 5.0	Section 13.8

13.3 Institutional Controls

The 26.65-acre 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 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and locked gates at the site entrances.

13.4 Inspection Results

The site, approximately 1 mile west-southwest of the former community of Uravan, Colorado, was inspected on May 15, 2012. D. Traub and L. Sheader of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. M. Kautsky, the DOE site manager for Naturita, and M. Cosby of the Colorado Department of Public Health and Environment accompanied the inspectors.

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

13.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 13–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 13–1 by photograph location (PL) numbers.

13.4.1.1 Entrance Gates, Entrance Signs, and Access Road

Access to the site is gained by traveling west off State Highway 141 south of Uravan up Hieroglyphic Canyon along Montrose County Road EE22. Road EE22 borders the site on the east.

The entrance gate consists of a locked pair of tubular metal gates that hang on galvanized steel gateposts. Two other metal gates allow access to monitoring wells adjacent to the west side of the cell. The gates are in good condition. The disposal cell access road along the northwest side of the site descends through the shale and sandstone units of the Salt Wash Member, Morrison Formation (PL–1).

The entrance sign is in good condition.

13.4.1.2 Perimeter Fence and Perimeter Signs

Perimeter signs, mounted on steel posts, are set approximately 5 feet inside the perimeter fence. One perimeter sign (P2) has had three bullet holes for the past several years but remains legible. The other 24 perimeter signs are in good condition.

A barbed-wire stock fence encloses the site. The fence is in good condition except for sections with broken and loose strands north of perimeter sign P1 and broken strands near sign P21 (PL–2). Fence wire strands will be repaired or tightened before the next annual inspection. Cattle grazing should be of little concern because forage within the site or in the immediate area is minimal.

As a safety precaution, pedestrian stiles were installed at three locations around the perimeter of the site near boundary monuments BM–15 and BM–16, and one was installed near perimeter sign 19 (as noted on the site map). These allow inspectors safer access without having to climb over or through barbed-wire fences.

13.4.1.3 Site Markers

Two granite site markers identify the site. Site marker SMK–1 is set just inside and left of the entrance gate; site marker SMK–2 (PL–3) is located on the disposal cell in the south-central portion of the top slope. Both markers were undisturbed and in good condition; however, SMK-1 has a minor chip off the northeast corner of the concrete pad on which it is placed.

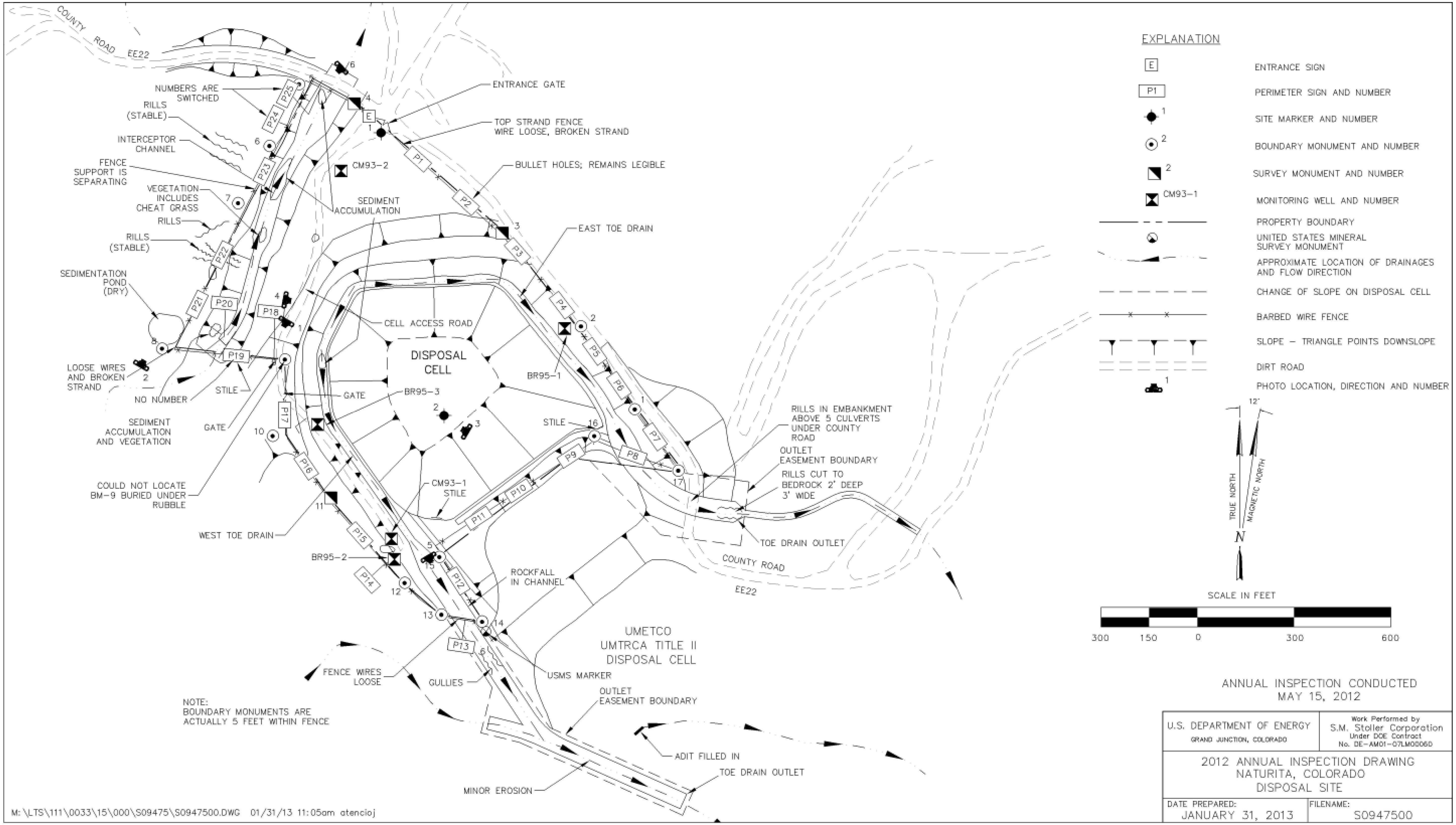


Figure 13–1. 2012 Annual Compliance Drawing for the Naturita Disposal Site

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13.4.1.4 Survey Monuments and Boundary Monuments

Boundary monuments BM–1 through BM–17 (BM–7/PL–7) mark the property corners. Survey monuments SM–3, SM–4, and SM–11 represent boundary monuments BM–3, BM–4, and BM–11. Both survey and boundary monuments are located with the same precision and serve the same purpose of marking the site's boundaries. Survey monuments were installed early during site construction for survey control; boundary monuments were installed after completion of construction. Boundary monument BM–9 was covered by loose rock at the time of the inspection. It will be uncovered and verified before the next inspection. Other than BM–9, the boundary monuments and the survey monuments are undisturbed and in good condition.

13.4.1.5 Monitoring Wells

Monitoring wells BR95–1, BR95–2, and BR95–3 were completed at the contact of the Salt Wash and 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.

13.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (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 area, inspectors examined specific site surveillance features, such as monitoring wells, boundary monuments, and signs. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

13.4.2.1 Disposal Cell, Toe Drains and Toe Drain Outlets, and Interceptor Channel

Rock covers the 2-acre top of the disposal cell and the approximate 8 acres of side slopes. The rock is rounded, with larger rock on the side slopes than on the top. The rock-covered surfaces are in excellent condition (PL–4) and show no signs of disturbance except on the southwest side of the top surface. This is an area that had a standpipe removed several years ago, and the slightly irregular surface is the result of this activity. No other degradation or vegetation was evident on the cell.

Two riprap-filled 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 (PL–5). Some sediment has accumulated in the upper end of the west toe drain, allowing scattered plants to grow. Farther down this drain, beyond the lined portion, water is beginning to erode softer bedrock. A knickpoint has formed at the intersection of shale and overlying sandstone units within the Salt Wash Member of the Morrison Formation. This occurrence is not a threat to the performance of the cell. A boulder rolled off the slope from County Road EE22 along the eastern side of the site into the drain near perimeter sign P4, but it is not a threat to cell performance. This area will be watched in future inspections for additional rock movement. During the 2012 inspection, there was still just one boulder in the drain.

A riprap-armored interceptor channel, upgradient and northwest of the disposal cell, diverts storm water and snowmelt run-on to the northeast under County Road EE22. Some erosion has occurred outside the property uphill from perimeter sign P23 and between perimeter signs P22 and P23, resulting in deposition of sediment in the channel (PL–6). The channel is in excellent condition, however, and the current sediment accumulation and associated vegetation do not impair the function of the channel.

13.4.2.2 Outlying Area

The site boundary and the area within 0.25 mile of the site boundary have been highly disturbed by mining, quarrying, reclamation, and road building. As noted last year, the most significant disturbance in an outlying area is the Umetco reclamation of a large borrow area northwest of the site. Sediment could erode off this disturbed region if heavy rains occur, and the area will probably be a source of new, possibly noxious, weed growth. During the 2010 inspection, the majority of the noxious weeds noted were immediately adjacent to the northwest boundary. Inspectors at the site will monitor this area with interest for the next few years. Umetco (DOW Chemical) has completed most Uravan Title II remedial action activity and is preparing for the transfer of the site to the Office of Legacy Management.

13.5 Follow-Up or Contingency Inspections

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

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

13.6 Maintenance and Repairs

13A Fence strands are broken and loose near perimeter signs P1 and P21. Personnel will repair the strands when they are next in the area.

13.7 Environmental Monitoring

13.7.1 Groundwater Monitoring

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
13B disposal cell; the last sampling event was in July 2012. 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 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; concentrations of all indicator analytes were at or near detection limits and, thus, well below the respective MCLs.

13.7.1.1 Groundwater Monitoring Results

Results of the 2012 sampling event are consistent with those reported in previous years (1997, 1998, 2000, 2002, 2004, 2006, 2008, and 2010). Although the concentrations of uranium in wells BR95–1 and BR95–2 exceed the MCL of 0.044 milligram per liter (mg/L) (0.12 mg/L and 0.057 mg/L, respectively), comparable concentrations of uranium have been detected in samples collected from these wells since the beginning of the monitoring period and have not changed appreciably (see Figure 13–2 below). Concentrations of uranium in this range are not unexpected at the contact between the Salt Wash Member and the Summerville Formation because uranium mineralization is present in the Salt Wash. An indication of the intrinsic mineralization of this groundwater is the high level of uranium in seep water approximately 0.5 mile north-northwest of the disposal cell—2.0 mg/L in October 2000 and 2.59 mg/L in April 2001 (Umetco results for Seep 1). This seep is cross gradient from the disposal cell and represents natural discharge from the Salt Wash/Summerville contact. Therefore, the concentrations of uranium reported from wells BR95–1 and BR95–2 are considered to be naturally occurring (background) and not site-related.

Concentrations of arsenic and molybdenum are still one to two orders of magnitude below corresponding MCLs, consistent with historical measurements. In 2012, concentrations of arsenic in groundwater in the three shallower monitor wells BR95−1 (0.00038 mg/L), BR95−2 (0.00042 mg/L), and BR95−3 (0.00091 mg/L) are well below the MCL of 0.05 mg/L. The concentrations of molybdenum in 2012—BR95−1 (0.0051 mg/L), BR95−2 (0.0022 mg/L), and BR95−3 (0.012 mg/L)—are less than the MCL of 0.1 mg/L.

13.7.1.2 Groundwater Monitoring Evaluation

In previous annual compliance reports, 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 that consists 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 site could be terminated.

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

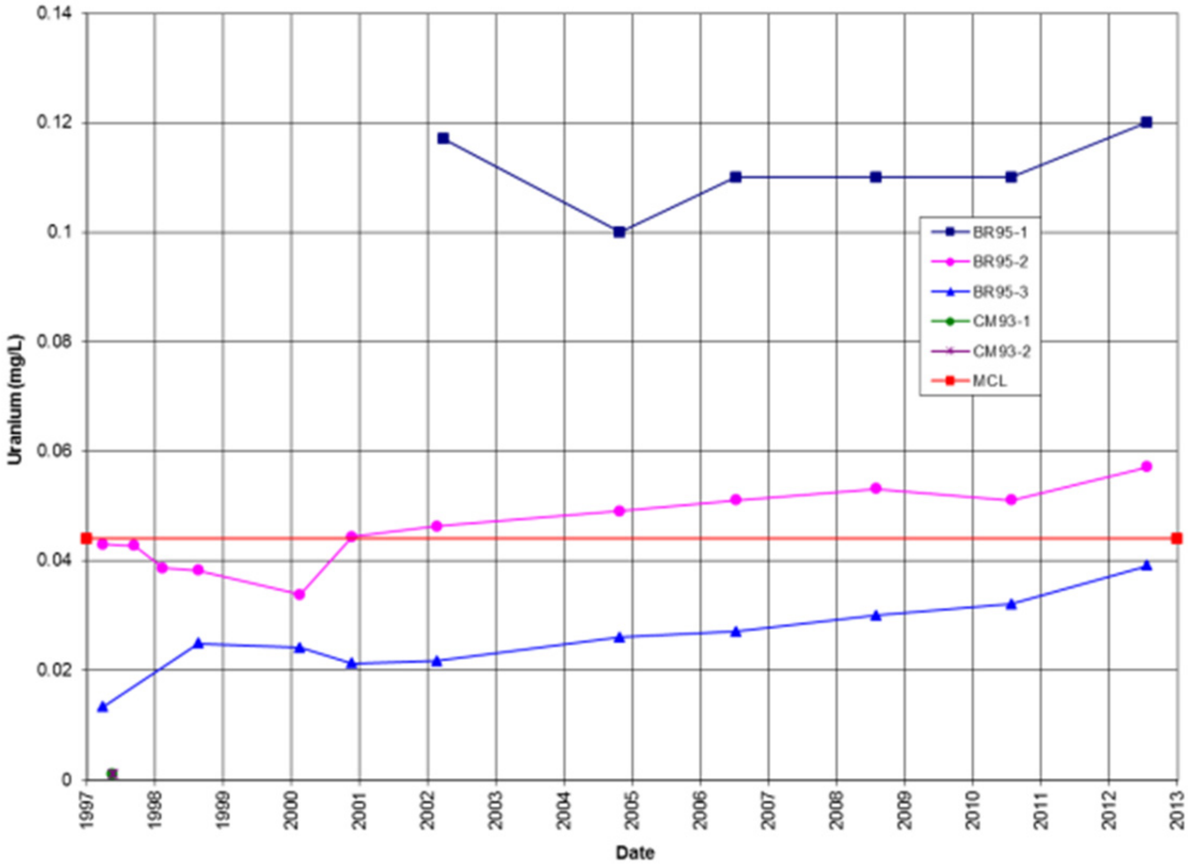

Figure 13–2. Time-Concentration Plots of Uranium in Groundwater at the Naturita Disposal Site

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 site. DOE will continue to monitor groundwater every 2 years to evaluate cell performance.

13.8 Corrective Action

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

No corrective action was required in 2012.

13.9 Photographs

Photo Location Number	Azimuth	Description
PL–1	210	Access road west of cell.
PL–2	210	Broken fence strands near perimeter sign P21.
PL–3	120	Monument on top of cell.
PL–4	270	Top of cell from west.
PL–5	150	Toe drain outlet channel.
PL–6	225	View southwest from county road of interceptor channel area.

NAD 5/2012. PL–1. Access road west of cell.

NAD 5/2012. PL–2. Broken fence strands near perimeter sign P21.

NAD 5/2012. PL–3. Monument on top of cell.

NAD 5/2012. PL–4. Top of cell from west.

NAD 5/2012. PL–5. Toe drain outlet channel.

NAD 5/2012. PL–6. View southwest from county road of interceptor channel area.

14.0 Annual Inspection for the Rifle, Colorado, UMTRCA Title I Disposal Site

14.1 Compliance Summary

The Rifle, Colorado, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on June 27, 2012. The disposal cell and all associated surface water diversion and drainage structures were in good condition and functioning as designed. River-derived rock covering the disposal cell and toe ditch is in excellent condition although isolated cobbles and boulders show incipient weathering. Minor erosional rills observed in previous years show no new erosion. They do not immediately threaten the cell and will be monitored during future inspections. Vegetation on the cell is minimal, consisting of small patches of weeds, mostly prickly lettuce (*Lactuca serriola*), and two small piñon pine (*Pinus edulis*) saplings are growing on the side slope of the cell. A single tamarisk shrub (*Tamarix ramosissima*) was noted in the rock-covered drainage along the southeast side of the site and will be removed at some time in the future. Vegetation around the disposal site is closely grazed, and much of it is brown. This is due to a shortage of moisture this year and heavy grazing by cattle.

Pore water continues to be removed from the disposal cell to maintain the water level below the action level (6,016 feet). This water is 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. The two old pumps in MW–03 were replaced with a new pump in 2012. The barbed-wire perimeter fence that limits access to the site was damaged at the time of the inspection. The BLM grazing permittee for this area will be identified. No additional maintenance needs or cause for a follow-up or contingency inspection was identified.

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

14.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Estes Gulch Disposal Site near Rifle, Colorado* (DOE/AL/62350–235, Rev. 1, U.S. Department of Energy [DOE], November 1997; 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 14–1 lists these requirements.

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

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.0	Section 14.4
Follow-Up or Contingency Inspections	Section 3.4	Section 14.5
Routine Maintenance and Repairs	Section 4.0	Section 14.6
Groundwater Monitoring	Section 2.6 and Appendix	Section 14.7.1
Corrective Action	Section 5.0	Section 14.8

14.3 Institutional Controls

The 205-acre site is owned by the United States of America and was accepted under U.S. Nuclear Regulatory Commission 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and locked gates at the site entrances.

14.4 Inspection Results

The site, located 5 miles north of Rifle, Colorado, was inspected on June 27, 2012. R. Dayvault and L. Sheader of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. R. Bush, the DOE Office of Legacy Management site manager, M. Cosby, Colorado Department of Public Health and Environment, and M. Begay, a DOE intern, attended the inspection.

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

14.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 14–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 14–1 by photograph location (PL) numbers.

14.4.1.1 Entrance Gates, Entrance Signs, and Access Road

The site is accessed by driving northwest of Rifle 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, which limits access to the site proper. The access road, entrance gates, and entrance sign were in good condition.

14.4.1.2 Perimeter Fence and Perimeter Signs

The barbed-wire perimeter fence that limits access to the site was damaged at the time of the inspection. The fence extends to the edge of steep-sided arroyos that bound the site on the east and west and act as a deterrent for easy access to the site. The barbed-wire personnel gate at the southeast corner of the site was open, a section of perimeter fence had been cut and folded back between perimeter signs P0 and P1 , and some bent fence posts and broken or loose wires were found in many places along the fence. Cattle had heavily grazed inside the site boundary and around the perimeter of the cell. A comparison between vegetation inside the fence enclosing the evaporation pond (where no grazing had been done) and outside the fence shows the extent of grazing (PL–1). Other signs of deer and elk grazing in the revegetated areas adjacent to and inside the disposal cell site boundary were identified. Such grazing has occurred historically.

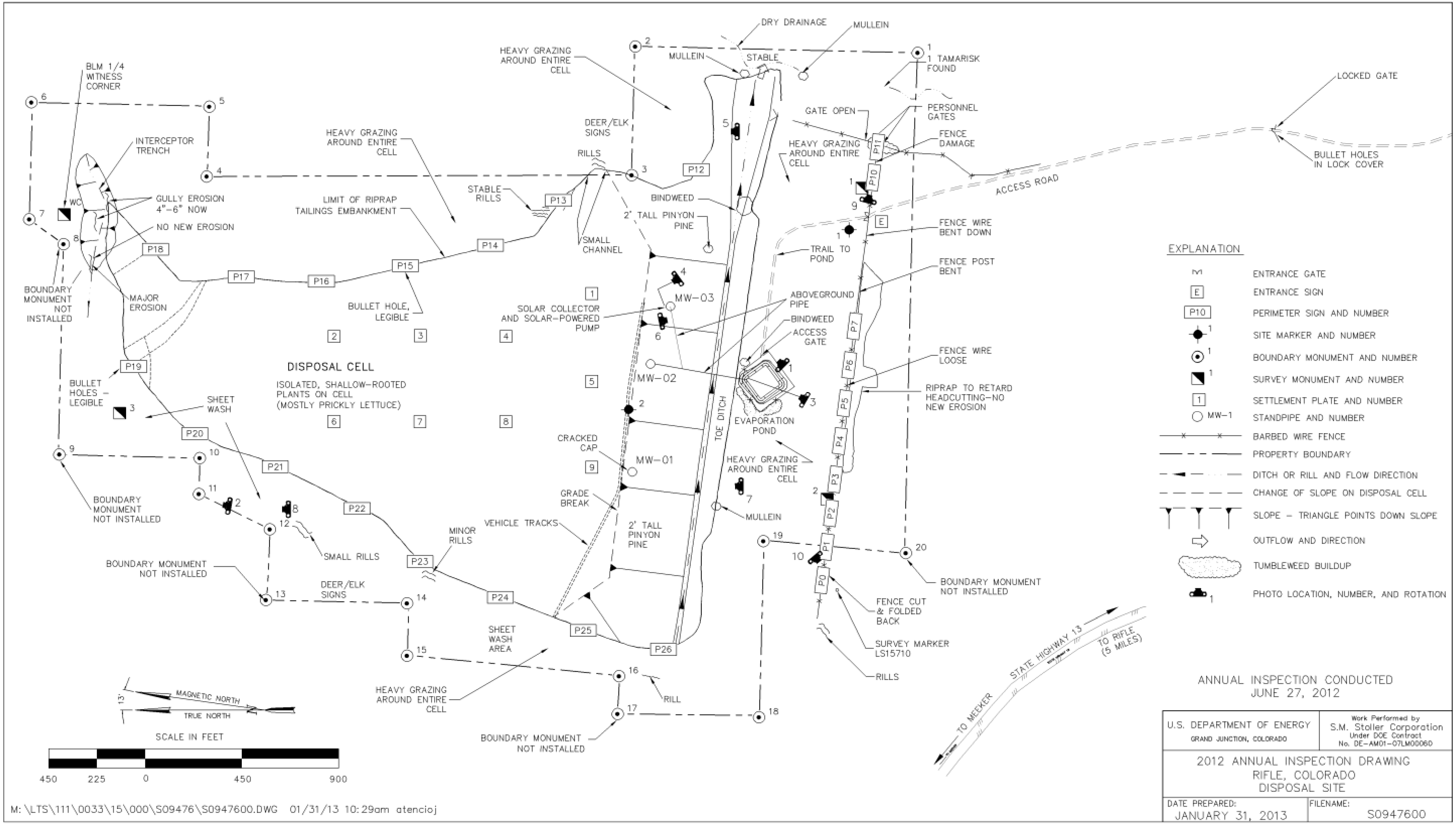

Figure 14-1. 2012 Annual Compliance Drawing for the Rifle Disposal Site

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All perimeter signs are legible although a few have bullet holes; they will continue to be monitored for signs of further vandalism. Two personnel gates, located at the southeast corner of the inner fence, were open but partly blocked by tumbleweeds even though they were removed the previous fall. Tumbleweed buildup against fences is a constant problem and will continue to be monitored.

14.4.1.3 Site Markers

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 in good condition.

14.4.1.4 Survey Monuments and Boundary Monuments

There are three survey monuments and 15 boundary monuments at the 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 the 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 (PL–2).

14.4.1.5 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) powered by solar panels were installed in MW–02 and MW–03 to measure water-level fluctuations. Standpipe MW–03 is equipped with a solar-powered pump so that water may be removed and discharged to a lined evaporation pond directly south of the cell (PL–2). Water was flowing into the evaporation pond as shown in PL–3. The small-diameter, plastic, surficial water line from MW–03 to the pond was in good condition, as were the two solar panels that power the pump.

14.4.1.6 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–4). 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. A meteorological station was also installed alongside the pond several years ago and is functioning normally. This year, the water level was low in the pond due to enhanced evaporation from unusually high temperatures and the abundance of sunny days. The lined pond, surrounding security fence, and locked gate were in excellent condition.

14.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into four inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (1) the top of the disposal cell and interceptor trench, (2) the toe ditch and toe ditch outlet, (3) onsite reclaimed areas, and (4) the outlying area.

Within each area, inspectors examined specific site surveillance features, drainage structures, vegetation, and other features. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

14.4.2.1 Disposal Cell and Interceptor Trench

Rock armor, derived from river cobbles and boulders, covering the 71-acre disposal cell generally remains in excellent condition overall. An example of the cobbles with a local inhabitant is shown in PL–5. No evidence of subsidence, differential settling, or slumping was found. Surveys conducted to detect any movement of the cover rock in three dimensions was discontinued in 2011 after 5 years of surveys revealed no issues.

During the 2010 inspection, it was noted that a few cobbles or boulders showed signs of frost action and had begun to crack. Degradation of a few cobbles and boulders was also noted during the 2011 and 2012 inspections and will continue to be monitored. This is not considered a major concern because most of the rock on the cell consists of very tough igneous and metamorphic river cobbles and boulders that should last for the expected life of the cell. However, if increased rock degradation becomes apparent, one or more study plots will be established.

As observed in 2011, only small, isolated patches of annual weeds or annual grasses were found on the cell top, and these were mostly brown; no deep-rooted plants or noxious weeds were observed in these areas.

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 lower section of the interceptor trench were undertaken later that year. In November 2005, rocks were moved into the eroded channel (directly above the drop-off into a major drainage), and the erosion was stabilized. No new erosion was observed during this inspection for any part of the diversion trench.

14.4.2.2 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 offsite to the east. As observed during previous inspections, small shrubs and trees and minor weeds are still growing around the perimeter of the rock-covered cell. For example, two small piñon trees are growing on the lower part of the cell near the toe drain ditch but are not large enough to be of concern. Minor rabbitbrush, bindweed, and mullein were found in areas around the perimeter of the toe ditch and outlet. This vegetation will be monitored and controlled as necessary in the future.

Tumbleweeds have often collected in the southeastern end of the toe ditch. Because tumbleweeds were removed from this area in November 2010, little accumulation was evident during the 2012 inspection. This area will continue to be monitored next year to determine the need for removal.

Minor erosion, anticipated in the design, is still evident in the channel at the outlet below the toe ditch. 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). Comparisons with a photograph taken during the 2003 inspection indicate that no new erosion has occurred during the past several years. This was still the case in 2012, and no new erosion was found. Several tamarisk were observed downstream of the toe drain during the 2012 inspection. A single tamarisk was noted in the rock-covered portion of the drainage this year and will be removed at some time in the future.

14.4.2.3 Onsite 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 is composed primarily of desirable grasses and shrubs.

During the past several years, inspectors had found no evidence of cattle or sheep grazing within the site boundaries, only evidence of deer and elk grazing. This changed dramatically in 2012. This year, vegetation has been heavily grazed. On average, grasses have been grazed down to only 1 or 2 inches sitewide. Photo PL–6 shows the general barren nature of the reclaimed area south of the disposal cell. Photos PL–7 and PL–8 show the degree of vegetation damage by cattle, including browsing of rabbitbrush and cactus. Fence damage is associated with the cattle grazing. Photo PL–9 shows damage to the barbed-wire fence, and photo PL–10 shows a barbed-wire fence that was cut and folded back. It is unclear if this action was to allow cattle onto or off of the site.

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 very little in 2012. This area will continue to be monitored.

Rills noted during previous inspections in the vicinity of perimeter sign P13 were still stable in 2012. 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 foot wide and less than 1 foot deep, exposing some of the gravel bedding material. A comparison with photographs taken the last several years 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.

During the 2010 inspection, a new rill was noted along the southwest side of the property, extending from about perimeter sign P1 and then down a hill. This feature is not currently affecting the integrity of the cell, and no new erosion was evident in 2012. This area will continue to be examined during future inspections.

14.4.2.4 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, although the area was heavily grazed.

All BLM Right-of-Way Reservation permit areas, including the 16-acre parcel south of the disposal cell, were returned to BLM in 2012. DOE had been obligated to revegetate these areas that were originally withdrawn from BLM during construction of the disposal cell. No further actions by DOE are required for these areas.

14.5 Follow-Up or Contingency Inspections

DOE will conduct follow-up or contingency 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 or in the vicinity of the site are substantially changed.

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

14.6 Maintenance and Repairs

14A Fence repairs will be performed before the next inspection. The BLM grazing permittee for this area will be identified. Discussions will be conducted with this party to determine if a grazing agreement should be established.

14B As discussed in Section 14.7.2, two old pumps were removed from MW-03, and a new pump was installed.

14.7 Environmental Monitoring

14.7.1 Groundwater 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 feet of low-permeability siltstones, shales, and sandstones. The nine monitoring wells that had been at the site were decommissioned in 2002.

14.7.2 Disposal Cell Pore-Water-Level Monitoring

14C In accordance with the LTSP, DOE continues to monitor pore water levels from transient drainage in the disposal cell at standpipes MW−02 and MW−03, installed at the downgradient end of the cell on the south side slope. An action level elevation of 6,016 feet was established in the LTSP for pumping the pore water from the cell to a lined evaporation pond. 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 feet.

Pumping from standpipes MW–02 and MW–03 was initiated when water levels reached an action level of 6,016 feet 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. Although pumping at MW–02 was discontinued at that time, 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 feet to near the bottom of the well so that it could pump for longer periods and produce more water. The pump from MW–02 was removed and installed in MW–03 in August 2008.

Pumps were turned on in May 2012 but did not actuate. The two old pumps in MW-03 were removed, and a new submersible pump was installed. It has been operating normally since being started. At the time of the 2012 inspection, MW–03 was pumping at about 2 to 3 gallons per minute, which is generally consistent with active pumping rates recorded the last several years (see PL–3).

Datalogger information for the 2012 reporting period indicates that pore water levels in both standpipes were consistently below the 6,016-foot action level (Figure 14–2). As observed historically, levels were highest during late fall and winter, when pumping is discontinued (in 2012, maximum water levels in MW–02 and MW–03 were 6,014.4 feet and 6,015.0 feet, respectively). Water levels then declined to between 6,013 feet and 6,014 feet in the summer during pumping. For the 2012 pumping season, pumping started on May 30, 2012, and ceased on October 2, 2012. According to the LTSP requirement, pumping will continue until the water levels in the standpipes stabilize at an elevation of 6,014 feet or lower.

14.8 Corrective Action

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

The LTSP establishes that corrective action will be taken if the water level in the disposal cell reaches 6,016 feet in elevation. In 2001, when the action level of 6,016 feet 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 will continue.

No additional corrective action was required in 2012.

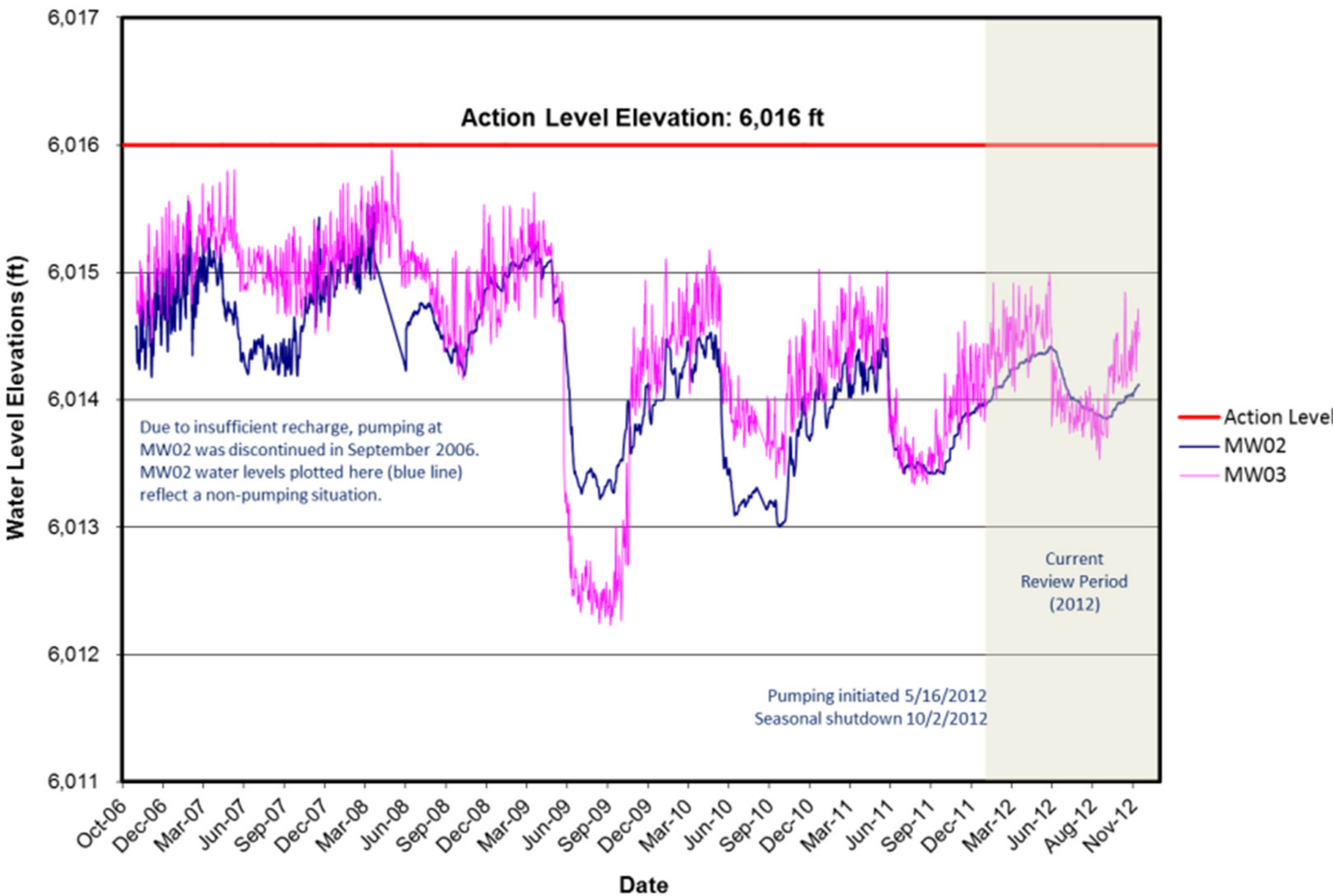
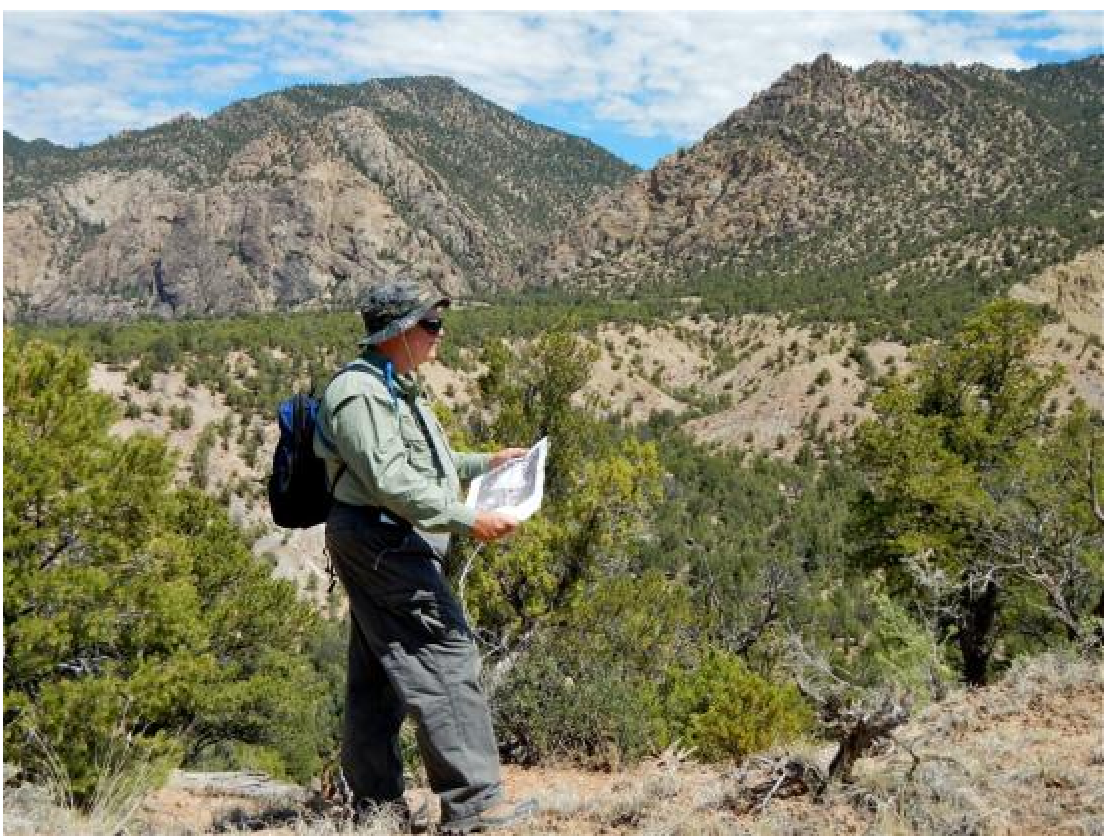


Figure 14-2.Disposal Cell Pore Water Levels in Standpipes MW–02 and MW−03 at the Rifle Disposal Site

14.9 Photographs

Photograph Location Number	Azimuth	Description
Pl–1	45	Contrast of cattle grazing inside and outside evaporation pond fence.
PL–2	10	Inspecting west side of cell area; looking for site boundary monument.
PL–3	30	Water entering evaporation pond.
PL–4	325	Inspecting MW-03 flow meter inside cooler. Solar panel in foreground, evaporation pond in background.
PL–5	NA	Collared lizard on riprap at bottom of cell.
PL–6	170	Looking south from MW-03 at toe of cell and sparse vegetation inside site boundary. Inspectors on left.
PL–7	NA	Rabbitbrush browsed by cattle.
PL–8	NA	Small spiny star cactus browsed by cattle.
PL–9	105	Section of damaged perimeter fence near perimeter sign P10.
PL–10	230	Fence cut and folded back near perimeter sign P1.

RFL 6/2012. PL–1. Contrast of cattle grazing inside and outside evaporation pond fence.



RFL 6/2012. PL–2. Inspecting west side of cell area; looking for site boundary monument.

RFL 6/2012. PL–3. Water entering evaporation pond.

RFL 6/2012. PL–4. Inspecting MW–03 flow meter inside cooler. Solar panel in foreground, evaporation pond in background.

RFL 6/2012. PL–5. Collared lizard on riprap at bottom of cell.

RFL 6/2012. PL–6. Looking south from MW–03 at toe of cell and sparse vegetation inside site boundary. Inspectors on left.

RFL 6/2012. PL–7. Rabbitbrush browsed by cattle.

RFL 6/2012. PL–8. Small spiny star cactus browsed by cattle.

RFL 6/2012. PL–9. Section of damaged perimeter fence near perimeter sign P10.

RFL 6/2012. PL–10. Fence cut and folded back near perimeter sign P1.

15.0 Annual Inspection of the Salt Lake City, Utah, UMTRCA Title I Disposal Site

15.1 Compliance Summary

The Salt Lake City, Utah, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, inspected on May 9, 2012, is in good condition. During the 2010 annual inspection, 8 square-meter monitoring stations were constructed for the purpose of monitoring the small percentage of rock cover that is degrading. Observations of the rock quality monitoring stations performed during this inspection indicated very little change from the previous year. No change was observed in the three slight depressions found on the disposal cell top; visual monitoring for settlement will continue. No waste debris or indication of windblown or spillover contamination from EnergySolutions' adjacent radioactive waste disposal operations was noted. Radiological survey measurements performed during the 2012 inspection indicated that no windblown contamination was present. Corner boundary markers remain in good condition and protected with PVC pipe by EnergySolutions. EnergySolutions removed greasewood (*Sacrobatus vermiculatus*) adjacent to the southern drainage in 2011 as well as any windblown debris from inside the disposal cell boundary. Other minor maintenance issues, such as the removal of greasewood from around site marker SMK–1 and tumbleweeds from the inside perimeter, were also performed as requested in 2011. No maintenance needs or cause for a follow-up or contingency inspection was identified.

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

15.2 Inspection Requirements

The inspection was conducted in accordance with the *Long-Term Surveillance Plan for the South Clive Disposal Site, Clive, Utah* (DOE/AL/62350–228, Rev. 2, U.S. Department of Energy [DOE], September 1997; LTSP) and procedures established by DOE to comply with requirements of Title 10 *Code of Federal Regulations* Part 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 15.4
Follow-Up or Contingency Inspections	Section 3.4	Section 15.5
Routine Maintenance and Repairs	Section 5.0	Section 15.6
Groundwater Monitoring	Section 4.0	Section 15.7.1
Corrective Action	Section 6.0	Section 15.8

15.3 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 site include federal ownership of the property and the following features that are inspected annually: site markers, boundary monuments, warning/no-trespassing signs, a site perimeter fence, and locked gates at the site entrances.

15.4 Inspection Results

The site, 85 miles west of Salt Lake City, Utah, was inspected on May 9, 2012. J. Gillespie and K. Turley of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. J. Nguyen, the DOE Office of Legacy Management site manager, and R. Topham and C. Bishop, of the Utah Department of Environmental Quality, attended. EnergySolutions provided an escort, B. Kirkwood, accompanied by the chief engineer, D. Booth, and the compliance/permitting manager, S. McCandless.

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

15.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 15–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 15–1 by photograph location (PL) numbers.

15.4.1.1 Entrance Gates, Entrance Signs, and Access Road

Access to the 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 that ensures DOE, and its representatives, continued access across EnergySolutions' property to the site. All personnel entering the EnergySolutions facility must sign in at the security building near the northwest corner of the site.

Because EnergySolutions' radioactive waste disposal activities surround the site, posted radiological control areas have to be crossed in order to access the site. Inspectors and other site visitors are, therefore, required by EnergySolutions to receive a radiological hazard awareness briefing, sign in on a Radiological Work Permit, and be issued a dosimeter before entering the site. Typically, the escort provided by EnergySolutions is also a health physics technician. Following the inspection, personnel and equipment are scanned upon leaving the radiological control area. Prior to leaving the EnergySolutions facility, inspectors and other visitors are again monitored for any radiological surface contamination with a personnel contamination monitor. Hardhats, safety glasses, and leather work boots are also required on EnergySolutions' property.

Access to the DOE disposal cell is via a route across EnergySolutions' property to the southwest corner of the site (site access was rerouted from the northwest corner in 2002 to accommodate EnergySolutions' waste disposal activities). Four locked gates provide access to the DOE disposal cell; one in the southwest corner of the chain-link perimeter fence that EnergySolutions maintains around the entire DOE property and three in the interior security fence DOE maintains around the disposal cell (two in the northwest corner and one in the southwest corner). The EnergySolutions escort admits inspectors through their perimeter gate in the southwest corner. DOE provides EnergySolutions access to the entire disposal site to perform, as needed, periodic maintenance activities through a signed access agreement and license. EnergySolutions is to notify DOE anytime access to the site is needed.

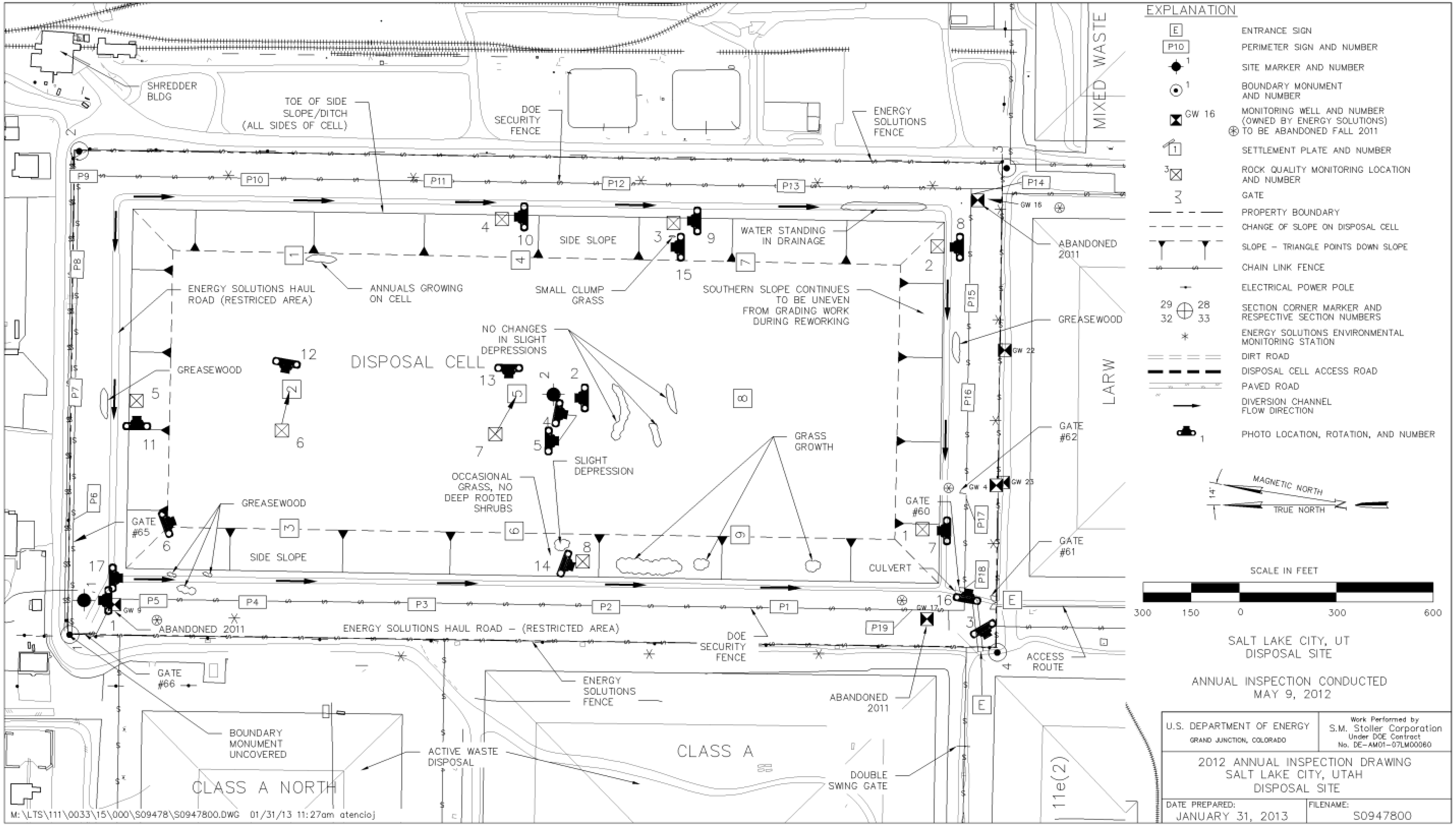


Figure 15–1. 2012 Annual Compliance Drawing for the Salt Lake City Disposal Site

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15.4.1.2 Perimeter Fence and Perimeter Signs

The exterior EnergySolutions fence was in good condition.

The DOE interior fence, site entrance sign, and all perimeter warning signs were present and in good condition. Decal number designations (1 through 18) have been placed on the outward-facing side of all perimeter signs to correspond with the numbered designations on the site map.

15.4.1.3 Site Markers

Both of the granite site markers were in excellent condition (PL–1 and PL–2). Site marker SMK–1 is etched from windblown sand and dirt, but it is legible. EnergySolutions had removed vegetation to clear the area surrounding SMK–1.

15.4.1.4 Survey Monuments and Boundary Monuments

All four boundary monuments were observed to be in good condition. The EnergySolutions protective casings at all four of the locations (PL–3) appeared to be working well for protection from surrounding earth moving activities.

15.4.1.5 Monitoring Wells

Supplemental standards based on limited use (40 CFR 192.21[g]) were applied to the groundwater in the uppermost aquifer underlying the site. The groundwater under the site was determined to be of limited use because of excessive total dissolved solids concentrations (greater than 10,000 parts per million) that naturally occur in the uppermost aquifer. Consequently, in accordance with the LTSP, no groundwater monitoring is required at the site.

Four groundwater monitoring wells that belong to EnergySolutions are located on DOE property. All four wells were properly abandoned in 2011. Abandonment reports are on file at the Utah Department of Environmental Quality and with the Office of Legacy Management.

15.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection: (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.

Within each area, the inspectors examined specific site surveillance features, drainage structures, vegetation, rock quality monitoring plots, and other features. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site’s integrity, protectiveness, or long-term performance.

15.4.2.1 Disposal Cell, Diversion Channels, and Outflow Channel

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 (PL–4) 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 (PL–5). 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 have been observed during previous inspections along the slopes of the cell, and they appear to have been created by the heavy equipment tracks during installation of the riprap (PL–6). These depressions continue to be monitored to ensure settlement is not occurring.

15A A minor portion of the riprap, approximately 1 percent (the percentage determined using eight square-meter grids installed during the 2010 inspection), showed signs of weathering (PL–7 through PL–14). The rock type was consistent, and the weathering effects were all similar. The material weathering does not pose a problem at this time, due to the estimated low percentage observed, but the eight square-meter grids have been permanently located as illustrated on the figure and will continue to be monitored during future inspections.

No deep-rooted plants were found growing on the top or side slopes of the cell. However, vegetation was observed on the cell (PL–15), in areas where finer-grain material is filling voids, but does not pose a threat at this time.

Nine settlement plates are located on the cell top; several were inspected and found to be in good condition. Surveying of the settlement plates was conducted for several years following cell construction, but it is no longer required.

The inspectors examined the area between the toe of the disposal cell and the security fence. No evidence of slumping, settling, or significant vegetation encroachment was seen.

The perimeter road was in good condition. All surface water diversion channels were operating and in good condition during the 2012 inspection. Some standing water from recent precipitation was ponded in channels on the east and south sides (PL–16).

Minor plant encroachment has occurred within the diversion channels, with a few scattered greasewood plants observed growing along the top edge of these channels (PL–17). This vegetation does not interfere with the performance of the channels, but its size has increased since the last inspection. EnergySolutions has removed the larger vegetation.

15.4.2.2 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 site. The most obvious waste disposal activities are occurring directly west of the site, where a Class A (low-level radioactive waste) disposal cell is being capped. On the northeast and east sides of the site, incoming wastes are unloaded from railcars and transferred to haul trucks; decontamination facilities are also present. Directly to the south is a completed low-level radioactive waste disposal cell, 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 directly to the north-northwest. A shredding facility, rotary dump, and railroad spur delivery loop are located to the northwest.

All areas surrounding DOE's property are restricted due to radiological hazards resulting from these waste disposal activities conducted by EnergySolutions. However, EnergySolutions ensures perpetual access to the site. Personnel radiological protection procedures are enforced as previously discussed.

15.4.2.3 Cursory Scanning for Spillover and Windblown Radioactive Surface Contamination

Radiological surveys for spillover and windblown radioactive contamination are generally performed onsite every other year during the inspection due to concerns regarding the ongoing radioactive waste disposal activities being conducted by EnergySolutions adjacent to the site. Survey measurements include taking dose rate measurements at random locations across the site, and the collection of smears are subsequently analyzed for removable alpha/beta contamination. In addition, EnergySolutions maintains several surface soil radiological monitoring and sampling stations, and performs routine scanning onsite, just inside the DOE property boundary.

A radiological survey was performed in 2010 as part of the inspection by an EnergySolutions Rad Tech and again during the 2012 inspection. Results of both surveys are included as part of this 2012 annual inspection report, as an attachment. All radiological survey measurements were below the DOE *Radcon Manual* limits. A prior radiological survey in 2007 also resulted in measurements below DOE *Radcon Manual* limits, which indicates that spillover and windblown radiological contamination does not currently appear to be an issue onsite. EnergySolutions performs periodic walkthroughs of the site to remove any windblown debris. No radiological waste items were found on the site in 2012.

15.5 Follow-Up or Contingency Inspections

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

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

15.6 Maintenance and Repairs

No maintenance needs were identified during the inspection.

15.7 Environmental Monitoring

15.7.1 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 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.

15.8 Corrective Action

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

No corrective action was required in 2012.

15.9 Photographs

Photo Location Number	Azimuth	Description
PL–1	0	Site marker SMK–1's pitted surface.
PL–2	0	Site marker SMK–2.
PL–3	240	Boundary corner number 4.
PL–4	190	View of western slope of cell.
PL–5	180	View across the top of cell.
PL–6	160	View southeast across top of the cell.
PL–7	0	Rock Degradation Plot No. 1.
PL–8	0	Rock Degradation Plot No. 2.
PL–9	0	Rock Degradation Plot No. 3 (eastern slope).
PL–10	0	Rock Degradation Plot No. 4.
PL–11	90	Rock Degradation Plot No. 5.
PL–12	280	Rock Degradation Plot No. 6.
PL–13	270	Rock Degradation Plot No. 7.
PL–14	200	Rock Degradation Plot No. 8.
PL–15	0	Clump of grass in finer-grain materials.
PL–16	100	Standing water in drain south side of perimeter road.
PL–17	180	View along drainage west of perimeter road with greasewood.

SLD 5/2012. PL–1. Site marker SMK–1's pitted surface.

SLD 5/2012. PL–2. Site marker SMK–2.

SLD 5/2012. PL–3. Boundary corner number 4.

SLD 5/2012. PL–4. View of western slope of cell.

SLD 5/2012. PL–5. View across the top of cell.

SLD 5/2012. PL–6. View southeast across top of the cell.

SLD 5/2012. PL–7. Rock Degradation Plot No. 1.

SLD 5/2012. PL–8. Rock Degradation Plot No. 2.

SLD 5/2012. PL–9. Rock Degradation Plot No. 3 (eastern slope).

SLD 5/2012. PL–10. Rock Degradation Plot No. 4.

SLD 5/2012. PL–11. Rock Degradation Plot No. 5.

SLD 5/2012. PL–12. Rock Degradation Plot No. 6.

SLD 5/2012. PL–13. Rock Degradation Plot No. 7.

SLD 5/2012. PL–14. Rock Degradation Plot No. 8.

SLD 5/2012. PL–15. Clump of grass in finer-grain materials.

SLD 5/2012. PL–16. Standing water in drain south side of perimeter road.


SLD 5/2012. PL–17. View along drainage west of perimeter road with greasewood.

COPY

ENERGYSOLUTIONS

Radiological Survey Form

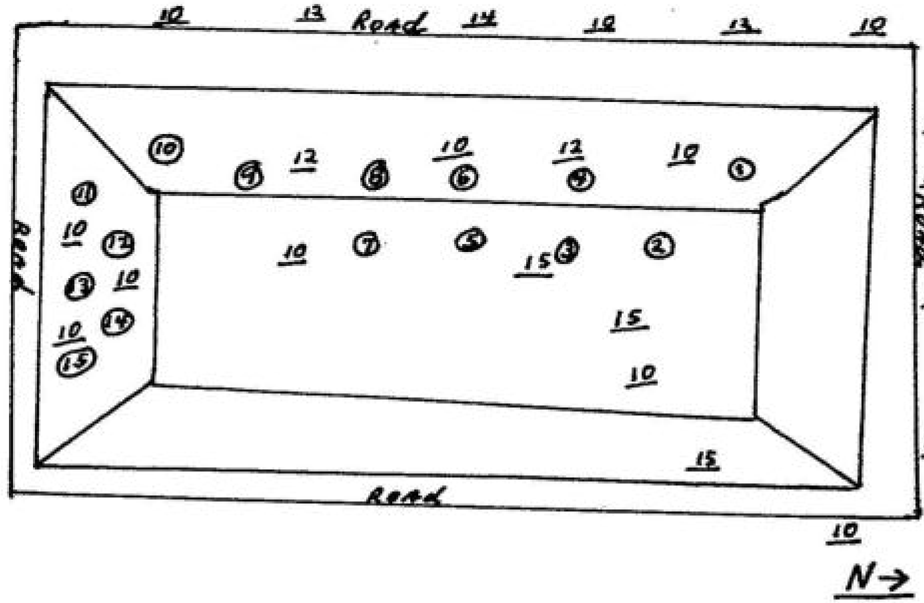
CL-RS-PR-112 F1
Rev. 0

Survey Information

Date: 5-12-10
Survey number: ~~N/A~~
Bates number: N/A
Location: VITRO CELL
Item: N/A
Reason: INSPECTION

Instrument Information

Model	Serial Number	Cal Due	Background alpha	Background beta	MDA alpha	MDA beta
3030	222777	9-19-10	0.0	50.4	7.7	87.5
3030	222790	10-14-10	0.0	37.8	7.7	81.2
BICRON	1957	7-28-10	N/A			N/A
N/A						



	Location	dpm/100cm² alpha	dpm/100cm² beta
1	GROUND ROCK	5	0
2		0	31
3		0	0
4		0	19
5		0	0
6		2	6
7		0	0
8		2	31
9		2	0
10		0	19
11		5	0
12		0	0
13		5	15
14		0	19
15	GROUND ROCK	0	0
16	N/A		
17			
18			
19			
20			
21			
22			
23			
24			
25			

(#) Denotes: Swipe location. (#) Denotes: Direct survey location. # Denotes: General Area dose rate.

All dose rate are in urem/hr unless otherwise noted

Remarks: DOSE RATE IN uREM/hr

Surveyed by (Print): LEO G. BLANCO JR Sign: Leo G Blanco Jr Date: 5-12-10
Surveyed by (Print): N/A Sign: N/A Date: N/A
Reviewed by (Print): S Long Sign: S Long Date: 5-12-10

Page ___ of ___

FY2012

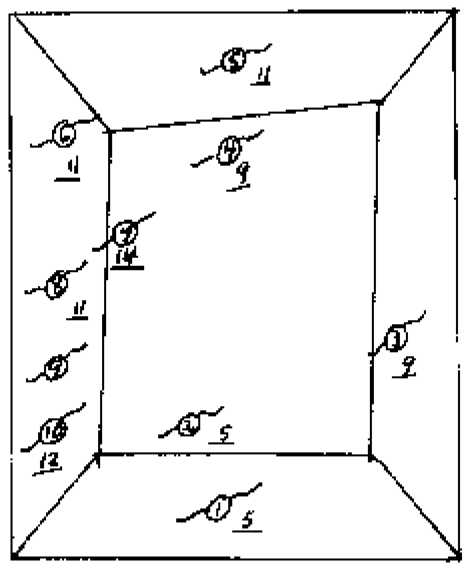
ENERGYSOLUTIONS

Radiological Survey Form

CL-RS-PR-112 F1
Rev. 0

Survey Information		Instrument Information						
					Background		MDA	
		Model	Serial Number	Cal Due 5-9-12	alpha	beta	alpha	beta
Date:	5-9-12	2360	202414	~~4-12-13~~ 7-17-12	1.0	229.2	110	1100
Survey number:	412-828	Beckon	1525	6-14-12	N/A			N/A
Rates number:	N/A	N/A						
Location:	Vito Cell							
Item:	Ground							
Reason:	Inspection							

N ↑



	Location	dpm/100cm² alpha	dpm/100cm² beta
1	Ground	0	81
2	Ground	13	204
3		16	196
4		15	143
5		6	220
6		33	206
7		43	336
8		33	291
9		6	171
10	Ground	30	195
11	N/A		
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Remarks: Highest contact dose rate: 0.014 mrem/hr. All swipes are Large area swipes (10") swipe divide by (3) due to Large area swipe

Surveyed by (Print): Leo LeBlanc Sign: Leo LeBlanc Date: 5-9-12

Surveyed by (Print): N/A Sign: N/A Date: N/A

Reviewed by (Print): S Long Sign: [signature] Date: 5/9/12

Page 1 of 1

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16.0 Annual Inspection of the Shiprock, New Mexico, UMTRCA Title I 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, 2012. The disposal cell and all associated surface water diversion and drainage structures remained in good condition and were functioning as designed. Minor maintenance activities (e.g., fence repairs and debris removal) are required.

No settling, slumping, erosion, animal intrusion, riprap deterioration, or other disturbance was evident on the top and side slopes of the cell. Five open research pits, several small depressions caused by subsided historical piezocone pits, and vehicle ruts were present on the cell top. No significant changes were observed since the 2011 inspection. The research pits were covered after the inspection, and the other depressions will continue to be monitored. Several small woody shrubs were growing on the northwest side slope of the cell. Diversion channels and the outflow channel were in good condition. Vegetation appeared sparse and is not expected to obstruct drainage flow. No new erosion was evident along the terrace escarpment. No significant changes in land use associated with outlying areas were identified. The offsite portion of the outflow channel remained functional and in good condition.

All three of the site's entrance gates remained intact. All perimeter signs were present, legible, and in good condition. One pictorial entrance sign was missing from the northwest gate. Sediment had accumulated under the southwest gate. The perimeter fence, although damaged in places, was intact and functional. Inspectors placed rocks in all significant gaps that formed under the perimeter fence. Boundary monuments BM–2 through BM– 6 were not found during the annual inspection; a survey team found and reestablished the missing boundary monuments after the inspection. One erosion control marker was previously damaged by a vehicle but remained functional.

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

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

16.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Shiprock Disposal Site, Shiprock, New Mexico* (DOE/AL/62350–60F, Rev. 1, U.S. Department of Energy [DOE], September 1994; 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 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 16.4
Follow-Up or Contingency Inspections	Section 7.0	Section 16.5
Routine Maintenance and Repairs	Section 8.0	Section 16.6
Groundwater Monitoring	Section 5.0	Section 16.7.1
Corrective Action	Section 9.0	Section 16.8

16.3 Institutional Controls

The 105-acre disposal site is held in trust by the U.S. Bureau of Indian Affairs. The Navajo Nation retains title to and ownership of the land. The site was accepted under U.S. Nuclear Regulatory Commission general license (10 CFR 40.27) in 1996. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, is responsible for the custody and long-term care of the site. Institutional controls at the site include federal custody of the disposal cell and its engineered features, and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and locked gates at the site entrances.

16.4 Inspection Results

The site, located approximately 28 miles west of Farmington, New Mexico, was inspected on May 29, 2012. L. Sheader and M. Kastens of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. L. Gersey of U.S. Nuclear Regulatory Commission Region 4 observed inspection activities. D. Steckley, the DOE Office of Legacy Management site manager, and L. Benally, of the Navajo Abandoned Mine Lands/Uranium Mill Tailings Remedial Action Department, participated in the inspection. Also in attendance were C. Gauthier and S. Woods of the S.M. Stoller Corporation.

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

16.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 16–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on Figure 16–1 by photograph location (PL) numbers.

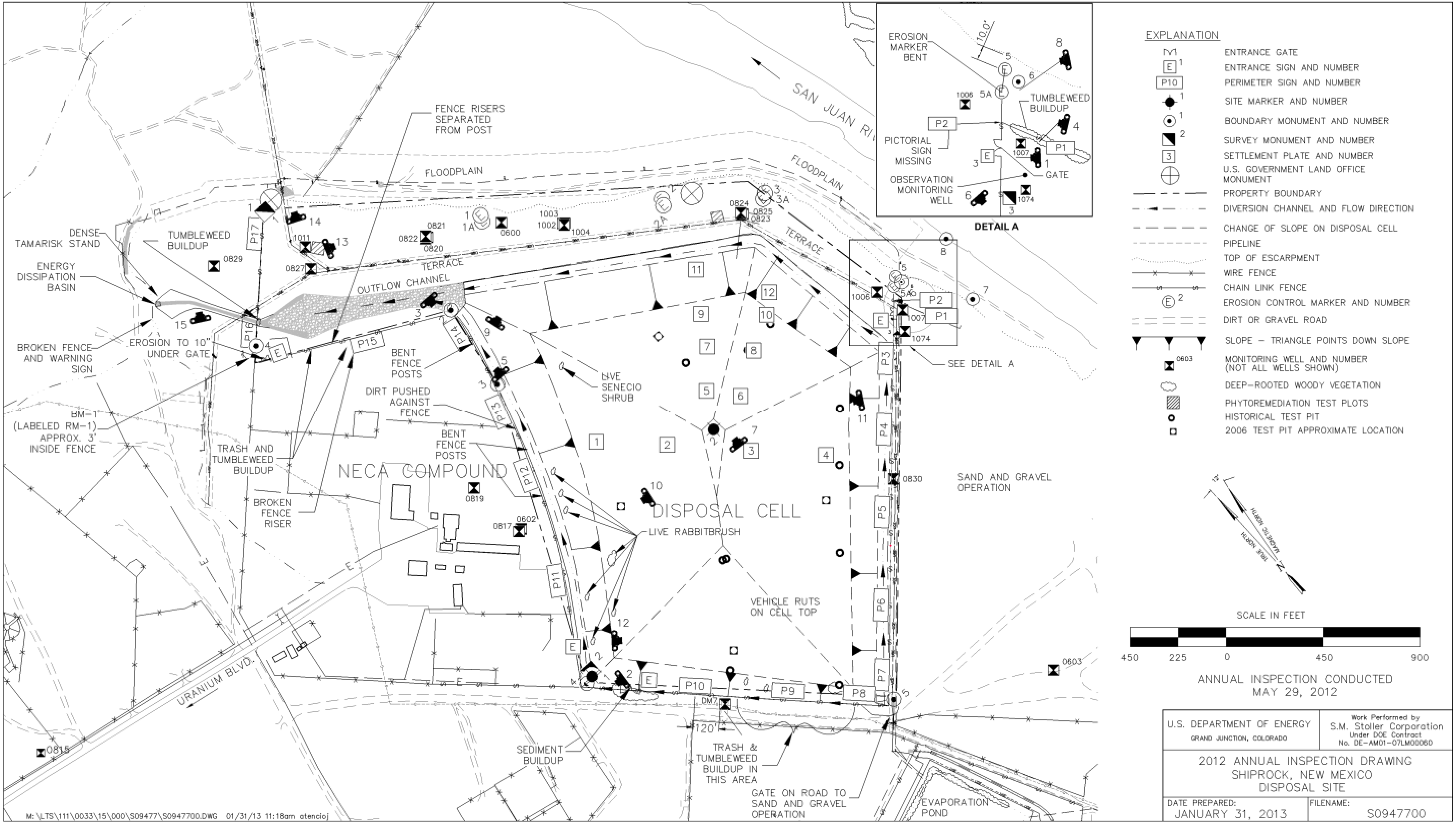

Figure 16–1. 2012 Annual Compliance Drawing for the Shiprock Disposal Site

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16.4.1.1 Entrance Gates, Entrance Signs, and Access Roads

Three gates allow entrance to the site: the east gate (the current main entrance gate near the terrace escarpment), the northwest gate (an auxiliary access gate), and the southwest gate (the former entrance gate). Near each gate, entrance signs are placed in pairs—one text and one pictorial (PL–1). The pictorial sign was missing from the northwest gate. The remaining entrance signs were in good condition; on the signs, contact information for DOE and the Navajo Abandoned Mine Lands/Uranium Mill Tailings Remedial Action Department was correct. The east and northwest gates were intact and functional. Sediment accumulated along the bottom of the southwest gate (PL–2). Access to the main entrance gate is gained by traveling through a gravel pit operated by the Navajo Engineering and Construction Authority (NECA). All access roads were in good condition.

16.4.1.2 Perimeter Fence and Perimeter Signs

As observed in previous years, the perimeter fence was intact and functional but damaged in a number of areas. Damaged fence sections reported in previous years include bent posts and bent fence fabric between perimeter signs P11 and P12, dirt mounded against the fence near P13, bent posts near P14, a broken fence riser near P15, and fence risers separated from posts between P15 and P16. New damage consists of a section of bent fence near P13; damage resulted from a large culvert placed in the adjoining NECA yard (PL–5). Damaged areas will continue to be monitored.

Trash and tumbleweeds have accumulated in many places along the perimeter fence (PL–3 and PL–4), including a section of fence across the outflow channel. These accumulations potentially represent a fire hazard and increase the possibility of damage to the fence, particularly during high winds. To improve the safety and appearance of the site the tumble weeds and trash have been removed.

There were small gaps beneath the fence, most formed by animals and wind erosion, along the site perimeter. In 2012, inspectors placed rocks in all significant gaps (PL–6).

Seventeen pairs of signs designated P1 through P17, each pair consisting of one pictorial sign and one sign with text, are located on the fence around the perimeter of the site. All perimeter signs were in good condition and showed no evidence of vandalism.

16.4.1.3 Site Markers

Site marker SMK–1, located just inside the southwest gate, and site marker SMK–2, located on top of the disposal cell (PL–7), were both in good condition. Minor cracks in the concrete base of SMK–1 were sealed in May 2003 and have not changed.

16.4.1.4 Survey Monuments and Boundary Monuments

In 2012, all three survey monuments (SM–1, SM–2, and SM–3) were located and in good condition. Although survey monument SM–2 was not observed during the 2011 annual inspection, it was verified in 2012.

Eight boundary monuments were originally installed at the site. Inspection of monument BM–7 was discontinued in 1999 because it is located on the steep embankment below the terrace in an area which cannot be accessed safely. BM–8 was located in 2012. It was intact and will be included in future inspections. BM–1 through BM–6 could not be located during the 2012 annual inspection. In January 2013, a survey team located monuments BM–2 through BM–6, which had been buried by sand. These monuments were unburied, flagged and staked with fence posts to locate them during future inspections. Additionally, the survey crew re-established boundary monument BM–1.

16.4.1.5 Erosion Control Markers

The four pairs of erosion control markers along the edge of the terrace escarpment were in good condition except for the marker near the east entrance gate. This marker was previously damaged by a vehicle (PL–8), but it is still functional and does not require repair at this time.

16.4.1.6 Monitoring Wells

Wells along the terrace and at offsite locations are associated with groundwater restoration and are not included in the annual inspection because the LTSP does not require groundwater monitoring for cell performance. Sampling teams inspect and maintain wells during regularly scheduled water sampling events. All of the wells encountered during the inspection were locked and in good condition.

16.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection: (1) the disposal cell, including the riprap-covered top and side slopes, diversion channels at the base of the cell, and the outflow channel; (2) the terrace area north and northeast of the disposal cell; and (3) the outlying area.

Within each area, inspectors examined specific site surveillance features, drainage structures, vegetation, and other features. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site’s integrity, protectiveness, or long-term performance.

16.4.2.1 Disposal Cell, Diversion Channels, and Outflow Channel

The riprap-covered top and side slopes of the cell were in good condition. No evidence of settling, slumping, erosion, animal intrusion, riprap deterioration, or other disturbance was found (PL–9). Five open research pits, described in previous annual inspection reports, were present on the cell top (PL–10). These research pits, installed in 2005 were filled in after the 2012 inspection. In 2002, Piezocones installed on the cell cover were removed and the associated pits filled in. Since that time, several of these pits have subsided slightly, forming conical depressions in the cover (PL–11). The surface of the cell was also covered with vehicle ruts (PL–12), many of which were formed in 2008 during herbicide treatment. The condition of the depressions and vehicle ruts is monitored annually and had not changed significantly since the 2011 inspection.

These features will continue to be monitored and photographed to document any changes. Inspectors noted the location and species of plants in accordance with the LTSP.

Diversion channels around the base of the disposal cell were in good condition and contained little vegetation. Small quantities of non-woody plants were growing in the outflow channel, and woody vegetation was growing on the banks of the channel; neither was expected to obstruct flow. However, tumbleweeds and trash have accumulated along the perimeter fence where it crosses the outflow channel and could potentially obstruct flow (Section 16.4.1.2).

16.4.2.2 Terrace Area

The terrace area is located north and northeast of the disposal cell along the top of a steep escarpment. Very little vegetation grows on the terrace (PL–13). The escarpment, approximately 300 feet from the eastern edge of the disposal cell, is prone to slumping. Fractures and incipient slumps can occur in the Mancos Shale bedrock along the escarpment northwest of erosion control marker 1A. No new erosion was evident in 2012 (PL–14).

16.4.2.3 Outlying Area

A NECA gravel pit is located immediately southeast of the disposal cell. No significant changes in land use associated with the gravel pit or with other outlying areas near the disposal cell were identified. Inspectors will continue to monitor sand and gravel operations to ensure that gravel pit activities do not encroach on or adversely impact the disposal site and perimeter fence.

The offsite portion of the outflow channel was functional and in good condition (PL–15).

16.5 Follow-Up or Contingency Inspections

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

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

16.6 Maintenance and Repair

The following maintenance items, identified during the 2012 inspection, have been addressed:

1. Remove sediment and debris from under the southwest entrance gate.
2. Remove accumulated tumbleweed and trash from along the disposal site's perimeter fence, the outflow channel, and the fence surrounding the evaporation pond.
3. **16A** Cover five research pits in the disposal cell cover installed in 2005.
4. **16B** Reestablish boundary monument BM–1, unbury boundary monuments BM–2 through BM–6, and install reference posts at all boundary monument locations.

The following items will be addressed before the 2013 inspection:

1. **16C** Replace the pictorial sign missing from the northwest entrance gate.

16.7 Environmental Monitoring

16.7.1 Groundwater Monitoring

In accordance with the LTSP, cell performance monitoring of groundwater is not required at the site. Onsite wells are associated with separate groundwater restoration activities and are not included in the annual inspection.

16.8 Corrective Action

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

No corrective action was required in 2012.

16.9 Photographs

Photograph Location Number	Azimuth	Description
PL–1	310	New entrance sign at east gate.
PL–2	275	Sediment buildup along southwest gate.
PL–3	180	Trash and tumbleweed buildup in fence corner by perimeter sign P14.
PL–4	325	Tumbleweed buildup near the east gate.
PL–5	360	Bent fence (still intact) from large culvert in NECA yard near perimeter sign P13.
PL–6	180	Placing rocks in hole under perimeter fence.
PL–7	5	Site marker SMK–2.
PL–8	300	Erosion control marker damaged but functional.
PL–9	75	Side slope of disposal cell, view east.
PL–10	280	Open test pit on western portion of cell.
PL–11	300	Historical test pit on eastern edge of cell.
PL–12	130	Vehicle tracks visible on disposal cell cover, southwest portion of cell.
PL–13	110	View of terrace from the northern phytoremediation test plot.
PL–14	25	Repaired section of escarpment, view from near survey monument SM–1.
PL–15	30	Erosion control fabric along outflow channel.

*The azimuth is not given because the photo was taken at close range.

SHP 5/2012. PL–1. New entrance sign at east gate.

SHP 5/2011. PL–2. Sediment buildup along southwest gate.

SHP 5/2012. PL–3. Trash and tumbleweed buildup in fence corner by perimeter sign P14.

SHP 5/2012. PL–4. Tumbleweed buildup near the east gate.

SHP 5/2012. PL–5. Bent fence (still intact) from large culvert in NECA yard near perimeter sign P13.

SHP 5/2012. PL–6. Placing rocks in hole under perimeter fence.

SHP 5/2012. PL–7. Site marker SMK–2.

SHP 5/2012. PL–8. Erosion control marker damaged but functional.


SHP 5/2012. PL–9. Side slope of disposal cell, view east.


SHP 5/2012. PL–10. Open test pit on western portion of cell.

SHP 5/2012. PL–11. Historical test pit on eastern edge of cell.

SHP 5/2012. PL–12. Vehicle tracks visible on disposal cell cover, southwest portion of cell.

SHP 5/2012. PL–13. View of terrace from the northern phytoremediation test plot.

SHP 5/2012. PL–14. Section of escarpment near survey monument SM–1.

SHP 5/2012. PL–15. Erosion control fabric along outflow channel.

17.0 Annual Inspection of the Slick Rock, Colorado, UMTRCA Title I 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 15, 2012, and was in good condition. The rock-covered top and side slopes of the disposal cell are in excellent condition. The site access road, entrance gate, fence, and site markers were in good to excellent condition; however, survey monument 2, northwest of the disposal cell, could not be located. During the 2011 inspection, most of the boundary monuments and survey monuments were not inspected due to inclement weather. There is a possibility the monument was missing before last year's inspection. The site was revisited with a GPS unit in July to determine the location of the missing monument. There are several minor erosional features on the site that have not increased in size since the last inspection, and there are active rills in areas west and south of the cell that continue to develop. Preexisting rills and gullies were inspected near perimeter signs P2, P3, and P5. Other rills occur southeast of the disposal cell and north of the retention pond. However, due to their locations, none of these erosional features pose a hazard to the disposal cell or are cause for concern. They will continue to be monitored. No maintenance needs or cause for a follow-up or contingency inspection was identified.

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

17.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Burro Canyon Disposal Cell, Slick Rock, Colorado* (DOE/AL/62350–236, Rev. 0, U.S. Department of Energy [DOE], May 1998; 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 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 17.4
Follow-Up or Contingency Inspections	Section 3.4	Section 17.5
Routine Maintenance and Repairs	Section 4.0	Section 17.6
Groundwater Monitoring	Sections 2.5 and 2.6	Section 17.7.1
Corrective Action	Section 5.0	Section 17.8

17.3 Institutional Controls

The 62-acre 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 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and a locked gate at the site entrance.

17.4 Inspection Results

The site, northeast of Slick Rock, Colorado, was inspected on May 15, 2012. D. Traub and L. Sheader of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, performed the inspection. J. Nguyen, the DOE Office of Legacy Management site manager, and M. Cosby of the Colorado Department of Public Health and Environment accompanied the inspectors.

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

17.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 17−1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on the Figure 17−1 by photograph location (PL) numbers.

17.4.1.1 Entrance Gates, Entrance Signs, and Access Road

Site access is by an improved gravel and dirt road maintained by San Miguel County. The road is in good condition. Soil erosion under the fence along the county road continues to be monitored (PL–1).

The entrance to the site is through a barbed-wire gate that is secured with a DOE lock. The gate is in good condition.

17.4.1.2 Perimeter Fence and Perimeter Signs

The stock fence around the site is strung with four strands of wire with spacers. The top and bottom strands are smooth wire to allow wildlife to pass over and under, and the middle two strands are barbed wire. The stock fence is in good condition. There are several places around the perimeter where the top strand of the fence has been slightly stretched down by deer or elk.

Thirty-two perimeter signs, designated P1 through P32, are spaced at approximately 200-foot intervals around the site (PL–2). The signs, attached to steel posts set in concrete, are 5 feet inside the site boundary. Perimeter sign P30 was missing in July 2011 and was replaced in October 2011 using theft-resistant fasteners. All other signs are in good condition.

17.4.1.3 Site Markers

The two granite site markers, SMK–1 near the entrance gate and SMK–2 (PL–3) on the north-central part of the disposal cell, are in excellent condition. Erosion near SMK–1 is being monitored and may require remedial work if heavy rainfalls occur and erosion of the surrounding soil continues.

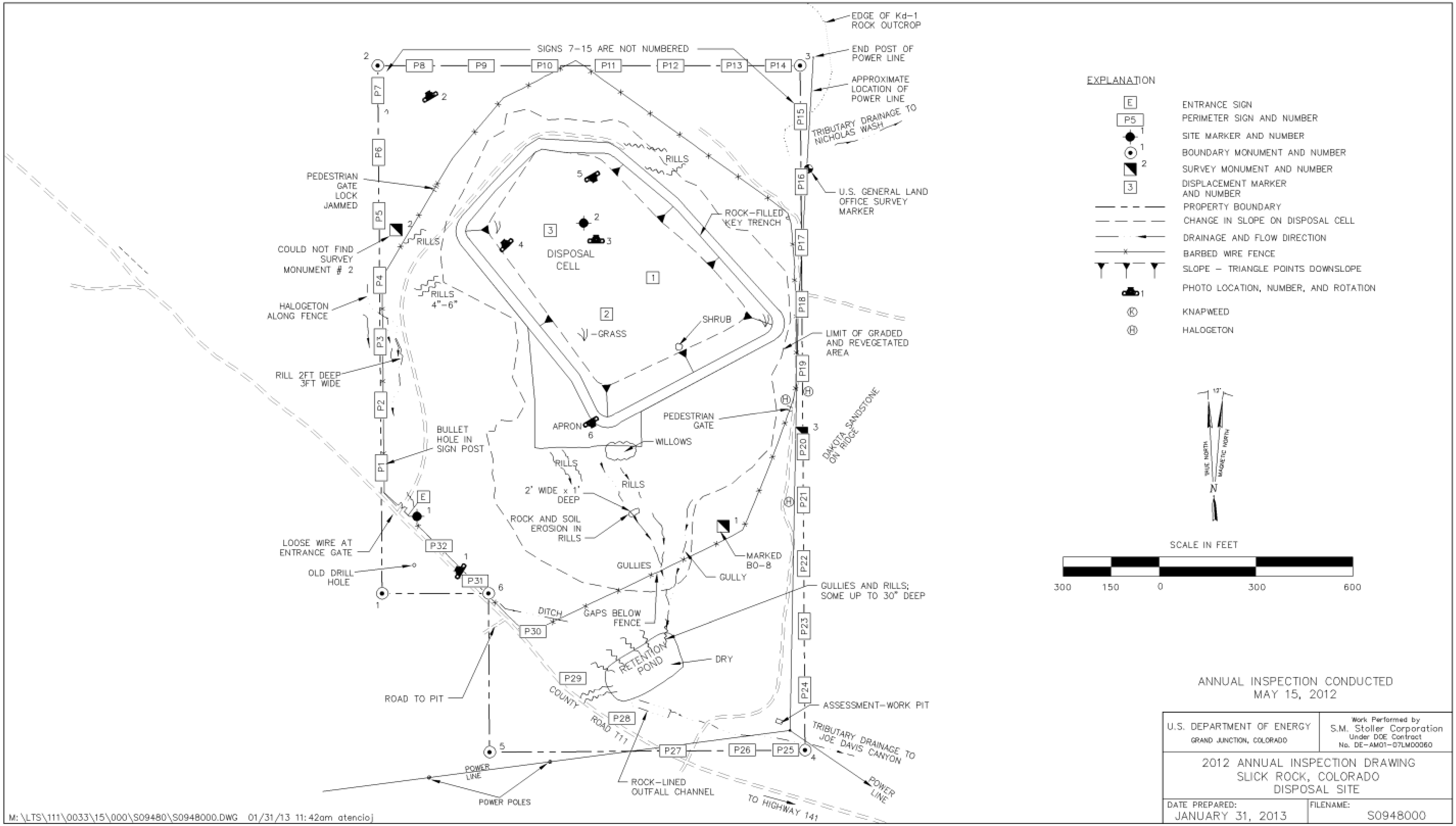

Figure 17–1. 2012 Annual Compliance Drawing for the Slick Rock Disposal Site

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17.4.1.4 Survey Monuments and Boundary Monuments

Six boundary monuments define the corners of the site boundary. Survey monument 2 could not be located despite a rigorous search. No ground disturbances or tire tracks were observed nearby. The locations of all boundary and survey monuments will be loaded into a GPS unit, which will be used to verify the location of the monuments. The remaining boundary and survey monuments were in excellent condition.

17.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (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 retention pond and the stock fence; and (3) the outlying area.

Within each area, the inspectors examined specific site surveillance features, drainage structures, vegetation, and other features. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

17.4.2.1 Disposal Cell, Diversion Channels, and Outflow Channel

Rock covering the disposal cell, key trench, and apron is rounded cobble- and pebble-sized material. The rock is in excellent condition (PL–4 and PL–5). No evidence of settling, slumping, or erosion was seen on any of the rock-covered surfaces of the disposal cell. No phreatophytes or other deep-rooted plant species were observed on the surface of the cell.

The top of the disposal cell is roughly pentagonal. Five side slopes descend from the disposal cell top 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 of the disposal cell, an apron of riprap extends for 50 to 200 feet beyond the key trench (PL–6). All side slopes, the key trench, and the apron are in excellent condition.

17.4.2.2 Area Between the Disposal Cell and the Site Property Boundary

The area around the disposal cell includes the retention pond. 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. The pond, which was dry at the time of the inspection, and outflow channel are in good condition. Some of the gullies on the northwest side of the retention pond are as deep as 30 inches, but they do not present a hazard to the disposal cell or to any site features, so action is not warranted at this time. These erosional features will continue to be monitored during future inspections.

As noted during previous inspections, rills have formed downslope of the disposal cell apron, between the apron and retention pond. Some of these rill features contained evidence of recent runoff events, such as sedimentation and soil loss; however, they do not present a hazard to the disposal cell. These features will be monitored during future inspections to determine if additional actions are warranted.

Inspectors have also monitored the size of rills east of perimeter signs P2 and P3 over the last several years. In 2008 the largest rill was noted to be approximately 2 feet wide by 2 feet deep, twice as deep as what was noted in 2007. No increase in size was noted during this inspection. This rill does not appear to have increased in size appreciably over the last year.

17.4.2.3 Outlying Area

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 also are routinely used for recreational purposes (e.g., hunting, four-wheeling, firewood cutting). No disturbances or evidence of land use changes in the outlying areas were noted. During the 2012 inspection, several mining claim stakes were noted adjacent to the boundary on the northwest corner of the site.

17.5 Follow-Up or Contingency Inspections

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

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

17.6 Maintenance and Repairs

17A Survey monument 2 could not be located during the 2012 inspection. A GPS unit was programmed with the survey monument location and the monument was located on July 30th. The monument had been buried under approximately 4 inches of soil.

No additional maintenance needs were identified during the inspection.

17.7 Environmental Monitoring

17.7.1 Groundwater Monitoring

There are no monitoring wells at the site, and no groundwater monitoring is required.

17.8 Corrective Action

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

No corrective action was required in 2012.

17.9 Photographs

Photo Location Number	Azimuth	Description
PL–1	315	PL–1. View toward northwest along county road; fence line erosion.
PL–2	330	PL–2. Typical perimeter sign along west boundary of site.
PL–3	NA	PL–3. Site marker 2 on top of disposal cell.
PL–4	315	PL–4. Southeast face of cell, across apron.
PL–5	150	PL–5. Top of cell from northwest to southeast.
PL–6	150	PL–6. Willows growing at base of apron.

SRK 5/2012. PL–1. View toward northwest along county road; fence line erosion.

SRK 5/2012. PL–2. Typical perimeter sign along west boundary of site.

SRK 5/2012. PL–3. Site marker 2 on top of disposal cell.

SRK 5/2012. PL–4. Southeast face of cell, across apron.

SRK 5/2012. PL–5. Top of cell from northwest to southeast.

SRK 5/2012. PL–6. Willows growing at base of apron.

18.0 Annual Inspection of the Spook, Wyoming, UMTRCA Title I Disposal Site

18.1 Compliance Summary

The Spook, Wyoming, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, inspected on June 26, 2012, was in excellent condition. No maintenance needs or cause for a follow-up or contingency inspection was identified.

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

18.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Spook, Wyoming, Disposal Site* (DOE/AL/350215.000, Rev. 0, U.S. Department of Energy [DOE], January 1993; 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 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 18.4
Follow-Up or Contingency Inspections	Section 7.0	Section 18.5
Routine Maintenance and Repairs	Section 8.0	Section 18.6
Corrective Action	Section 9.0	Section 18.7.1

18.3 Institutional Controls

The 14-acre 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 include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, and warning/no-trespassing signs.

18.4 Inspection Results

The site, in north-central Converse County, Wyoming, was inspected on June 26, 2012. C. Gauthier and R. Johnson of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. T. Plessinger, the DOE Office of Legacy Management site manager, attended the inspection.

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

18.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 18–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and in Figure 18-1 by photograph location (PL) numbers.

18.4.1.1 Entrance Gates, Entrance Signs, and Access Road

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 road was in good condition, and the site was accessible. The entrance sign was in good condition.

18.4.1.2 Perimeter Fence and Perimeter Signs

The site is unfenced and defined by 10 perimeter signs. Perimeter sign P10 is damaged from wind. The signs were made in two layers, and the top layer has peeled away from the base. The sign is still legible (PL–1).

18.4.1.3 Site Markers

Site marker SMK–2 was in excellent condition. The concrete base of site marker SMK–1 is damaged due to spalling but is stable; no changes were observed from the previous year (PL–2).

18.4.1.4 Survey Monuments and Boundary Monuments

The eight boundary monuments and three survey monuments are in excellent condition. The locations of the boundary monuments were confirmed by GPS (PL–3).

GPS coordinates confirmed that the boundary monuments and perimeter signs are located outside of the DOE property boundary. The adjacent landowner has been notified that the monuments and signs are on his property. This is not of concern to him, and the monuments and signs will remain where they are.

18.4.1.5 Monitoring Wells

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

18.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection: (1) the disposal cell, (2) the site perimeter, and (3) the outlying area.

Within each area, the inspectors examined specific site surveillance features, vegetation, and other features. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site’s integrity, protectiveness, or long-term performance.

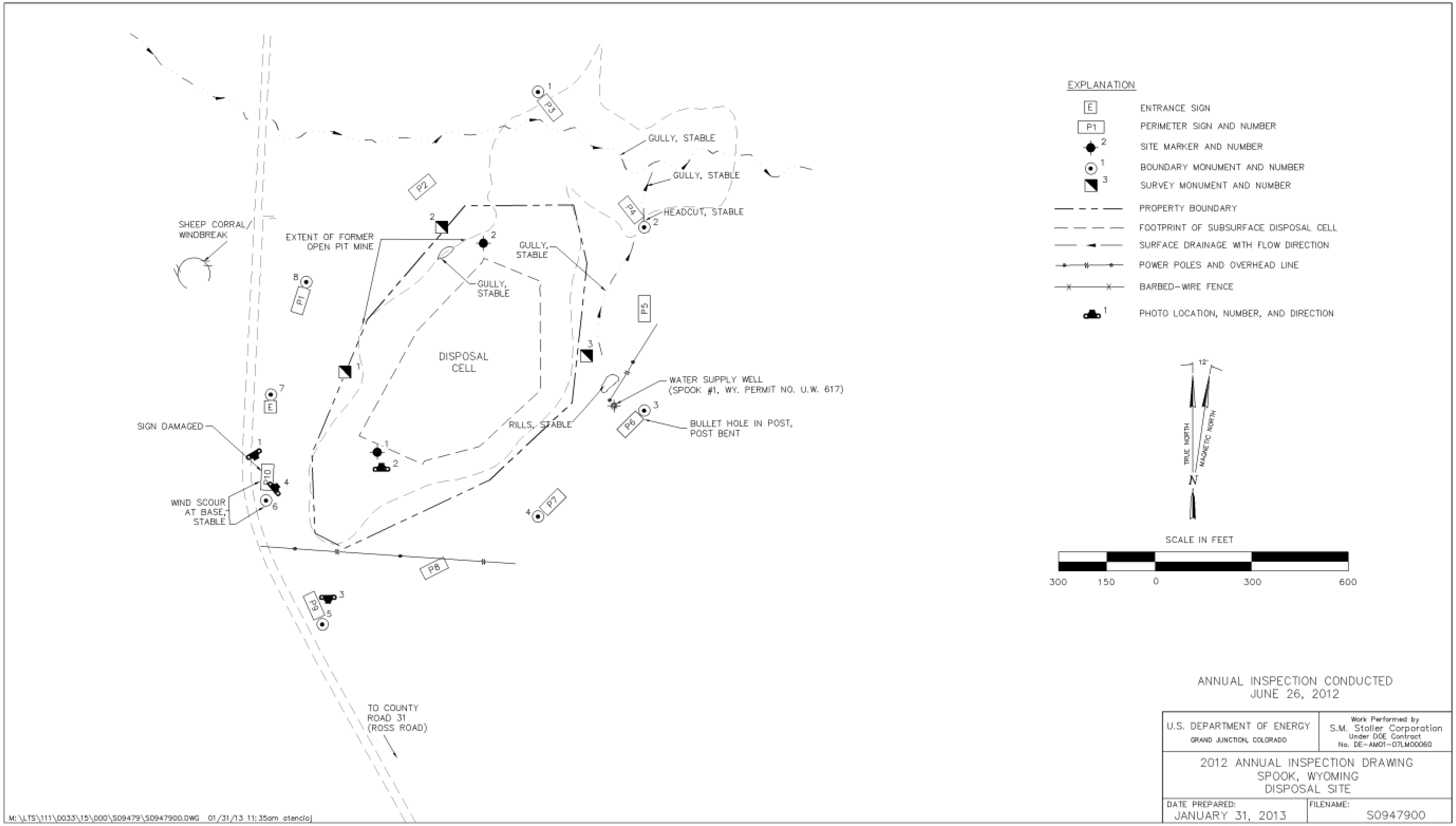

Figure 18–1. 2012 Annual Compliance Drawing for the Spook Disposal Site

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18.4.2.1 Disposal Cell

The 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. The surface of the 5-acre disposal cell, completed in 1989, was in excellent condition. No evidence of settling was observed over the former mine pit. Vegetation across the cell, 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 (PL–4).

18.4.2.2 Site Perimeter

This area was in excellent condition. The perimeter of the site is indistinguishable from the adjacent open range.

18.4.2.3 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. Even though oil field activity has greatly increased near the site, no evidence of trespassing or vandalism was observed.

Several minor rills and gullies are near the site. They appeared to be stable during the inspection. The erosion is not harming the function of the cell cover or other site features, and it is not a concern at this time.

18.5 Follow-Up or Contingency Inspections

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

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

18.6 Maintenance and Repairs

No maintenance needs were identified during the inspection.

18.7 Environmental Monitoring

18.7.1 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.

18.8 Corrective Action

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

No corrective action was required in 2012.

18.9 Photographs

Photograph Location	Azimuth	Description
PL–1	150	Perimeter sign P10 damaged by wind.
PL–2	0	Site marker SMK–1.
PL–3	180	Collecting GPS coordinates at boundary monument BM–5.
PL–4	50	Northeast view across the disposal cell.

SPK 6/2012. PL–1. Perimeter sign P10 damaged by wind.

SPK 6/2012. PL–2. Site marker SMK–1.

SPK 6/2012. PL–3. Collecting GPS coordinates at boundary monument BM–5.

SPK 6/2012. PL–4. Northeast view across the disposal cell.

19.0 Annual Inspection of the Tuba City, Arizona, UMTRCA Title I 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 4, 2012. The disposal cell and all associated surface water diversion and drainage structures were in excellent condition and functioning as designed. No maintenance needs or cause for a follow-up or contingency inspection was identified.

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

19.2 Inspection Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the Tuba City, Arizona, Disposal Site* (DOE/AL/62350−182, Rev. 0, U.S. Department of Energy [DOE], October 1996; 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 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 6.0	Section 19.4
Follow-Up or Contingency Inspections	Section 7.0	Section 19.5
Routine Maintenance and Repairs	Section 8.0	Section 19.6
Groundwater Monitoring	Section 5.2	Section 19.7.1
Corrective Action	Section 9.0	Section 19.8

19.3 Institutional Controls

The U.S. 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 before bringing the site under the general license. DOE and the Navajo Nation executed a Custodial Access Agreement 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 site include federal ownership of the property and the following features that are inspected annually: site markers, survey and boundary monuments, warning/no-trespassing signs, a site perimeter fence, and locked gates at the site entrances.

19.4 Inspection Results

The site, located east of Tuba City, Arizona, was inspected on April 4, 2012. R. Johnson and J. Gillespie of the S.M. Stoller Corporation, the Legacy Management Support contractor at the DOE office in Grand Junction, Colorado, conducted the inspection. R. Bush, the DOE Office of Legacy Management site manager; L. Benally of the Navajo Abandoned Mine Lands/Uranium Mill Tailings Remedial Action Department; N. Honie of the Hopi Nation; and NRC representatives B. Spitzberg, L. Gersey, and R. Evans attended the inspection.

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

19.4.1 Site Surveillance Features

The locations of site surveillance features are shown in Figure 19–1. Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on the attached drawing by photograph location (PL) numbers.

Many structures and features at the site—including an office building, a water treatment plant, a solar water-heating system, a solar photovoltaic system, evaporation ponds, an extensive network of extraction and monitoring 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.

19.4.1.1 Entrance Gates, Entrance Signs, and Access Road

The site is accessed directly from U.S. Highway 160. Perpetual access to the site is granted by the Custodial Access Agreement. 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 (PL–1). The entrance signs posted on both gates were in good condition.

19.4.1.2 Perimeter Fence and Perimeter Signs

The security fence around the site perimeter was in good condition (PL–2).

Perimeter signs are posted in pairs at regular intervals around the site perimeter. Each sign pair, secured to a metal post, consists of a "No Trespassing" sign with a radioactive materials trefoil symbol and a schematic sign with a diagram of the disposal cell (also identified by the radioactive materials trefoil symbol) and the site boundary (PL–3). All of the signs were in good condition.

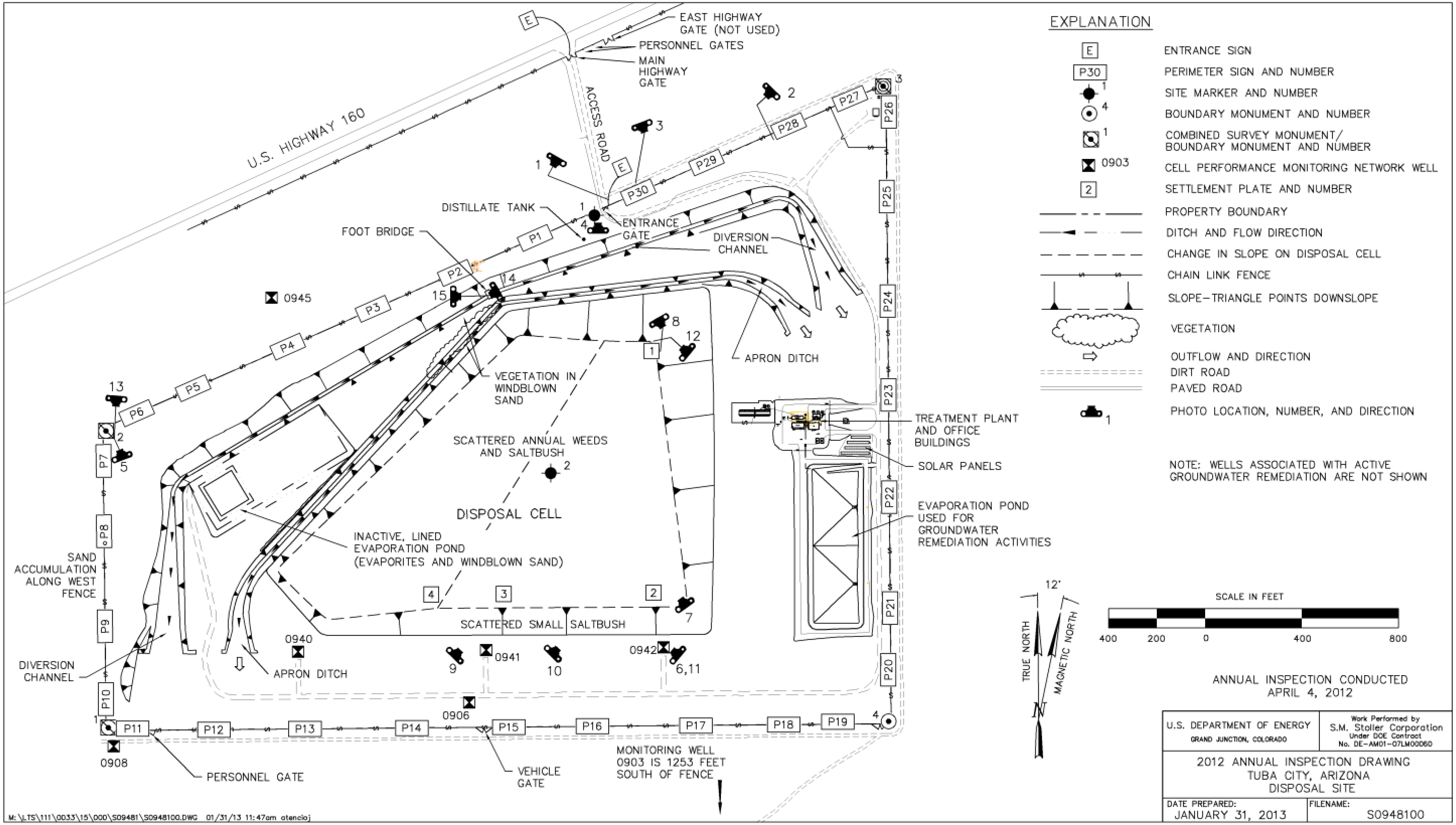

Figure 19–1. 2012 Annual Compliance Drawing for the Tuba City Disposal Site

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19.4.1.3 Site Markers

The two granite site markers, one just inside and to the right of the entrance gate (PL–4) and the other on top of the disposal cell, were in good condition.

19.4.1.4 Survey Monuments and Boundary Monuments

The survey and boundary monuments that were observed were in good condition (PL–5). Boundary monument BM–3, at the northeast corner of the site, was buried by windblown sand.

19.4.1.5 Monitoring Wells

Seven wells constitute the cell performance monitoring network: 0903, 0906, 0908, 0940, 0941, 0942, and 0945. Five wells inside and immediately adjacent to the site were in good condition and locked. The vault cover for well 0942 was open for well maintenance at the time of the inspection (PL–6). Monitoring well 0903, located about 0.25 mile south of the disposal cell, was not inspected.

19.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection: (1) the disposal cell, (2) the area between the disposal cell and the site boundary, and (3) the outlying area.

Within each area, the inspectors examined specific site surveillance features, drainage structures, vegetation, and other features. Inspectors examined each area for evidence of erosion, settling, slumping, or other disturbances that might affect the site's integrity, protectiveness, or long-term performance.

19.4.2.1 Disposal Cell

The disposal cell is covered with riprap to control erosion. The rock cover material was in excellent condition and showed no signs of deterioration. No evidence of differential settlement or slumping was observed, and all visible components of the disposal cell and cover were in excellent condition (PL–7 and PL–8).

In accordance with the LTSP, deep-rooted vegetation, primarily saltbush, is removed or controlled to prevent potential penetration of the radon barrier. Periodic application of herbicide has been very effective in controlling deep-rooted vegetation growth on the cell cover. Only a few small shrubs were noted during the 2012 inspection. Scattered patches of grass and annual weeds also grow on the cell top and side slopes; however, these shallow-rooted plants are not a concern. Windblown sand continues to accumulate on the rock-covered surfaces, providing a favorable environment for plant growth.

Sand accretion and vegetation encroachment are still evident at several locations along the south side slope of the disposal cell. Photographs are taken at these locations annually to document changes in sand accretion and vegetation conditions (PL–9, PL–10, and PL–11). The gradually increasing vegetation coverage likely indicates that sand accumulation on the rock-covered slope continues to increase.

19.4.2.2 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, were in good condition (PL–12). Windblown sand deposition continues to be monitored at the site because unstable dunes in outlying areas can contribute to sand accumulation along fence lines (PL–13), in diversion channels, and in the rock cover of the disposal cell. Sand accretion and vegetation encroachment have been checked annually since 2001 in the diversion channel and apron drainage ditch on the north and northwest sides of the cell (PL–14 and PL–15). The sand tends to periodically accumulate and scour. The accumulations are not adversely affecting the performance of these features.

Two of the three evaporation ponds located near the northwest side of the disposal cell were removed in 2007, and the area was reclaimed and seeded with a native vegetation seed mix. Although the area is scoured by wind, perennial vegetation continues to establish. The remaining pond is retained as a backup for the main evaporation pond located on the east side of the site.

19.4.2.3 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. No changes were observed.

19.5 Follow-Up or Contingency Inspections

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

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

19.6 Maintenance and Repairs

No maintenance needs were identified during the inspection.

19.7 Environmental Monitoring

19.7.1 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 beneath and downgradient of the disposal cell has been degraded by contamination from former
19A 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 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 point-of-compliance wells in the uppermost aquifer to demonstrate cell performance is not technically feasible at the 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. Active groundwater remediation is ongoing at the site. The wells used for the evaluative monitoring of cell performance are a subset of the larger groundwater remediation monitoring well network. The progress of groundwater remediation is evaluated annually.

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

Monitoring Well	Hydrologic Relationship	Monitoring Frequency
0903	Downgradient (Offsite)	Annually
0906	Downgradient	Semiannually
0908	Downgradient	Semiannually
0940[a]	Downgradient	Semiannually
0941	Downgradient	Semiannually
0942	Downgradient	Semiannually
0945	Upgradient (Background)	Annually

[a] Between August 2004 and February 2010, it was not possible to obtain a sample from well 0940 because of an insufficient volume of water, reflecting the ongoing groundwater remediation pumping being conducted at the site. However, in July 2010 and during both 2011 monitoring events, the volume of water in well 0940 has been sufficient for sampling.

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

Constituent	Provisional UBL (mg/L)[a]	MCL (mg/L)
Molybdenum	0.14	0.10
Nitrate (as Nitrogen)	311[b]	10[c]
Selenium	0.05	0.01
Uranium	1.17	0.044

[a] As documented in the 1996 LTSP.
[b] 311 mg/L (for nitrate as nitrogen) was calculated based on the 1,379 mg/L UBL for nitrate as NO_3.
[c] 10 mg/L (for nitrate as nitrogen) was calculated based on the 44 mg/L MCL for nitrate cited in the LTSP.
mg/L = milligrams per liter

Evaluative groundwater monitoring in 2012 was conducted in February (for those wells sampled semiannually) and in August (for all wells; see Table 19–2). Figures 19−2 through 19−5 show the time-concentration plots for the four target analytes. The UBLs and MCLs listed in Table 19–3 are also shown.

Sample results from the 2012 evaluative monitoring indicate that groundwater quality immediately downgradient of the former millsite (in onsite wells, 0940, 0941, 0942, 0906, and 0908) is still degraded with respect to concentrations of nitrate, selenium, and uranium in the background well (0945). However, this is not the case for the more distal offsite downgradient well 0903 (approximately 1,250 feet from the site). For all four target analytes, concentrations in this well are still comparable with those detected in the upgradient (background) well 0945, significantly lower than the onsite cell performance wells, and well below corresponding MCLs and UBLs.

As has been the case since 2004, molybdenum concentrations in groundwater were below both the MCL of 0.1 milligram per liter (mg/L) and the UBL of 0.14 mg/L in all wells (Figure 19–2). With respect to background well 0945, molybdenum has been elevated only in wells 0906, 0941, and 0942. Concentrations of molybdenum in wells 0908 and 0940, and in offsite well 0903, have been comparable to background. Molybdenum concentrations in wells 0906 and 0941 were highly variable between 1998 and 2005 (occasionally exceeding the UBL), but they have since stabilized (less than 0.04 mg/L).

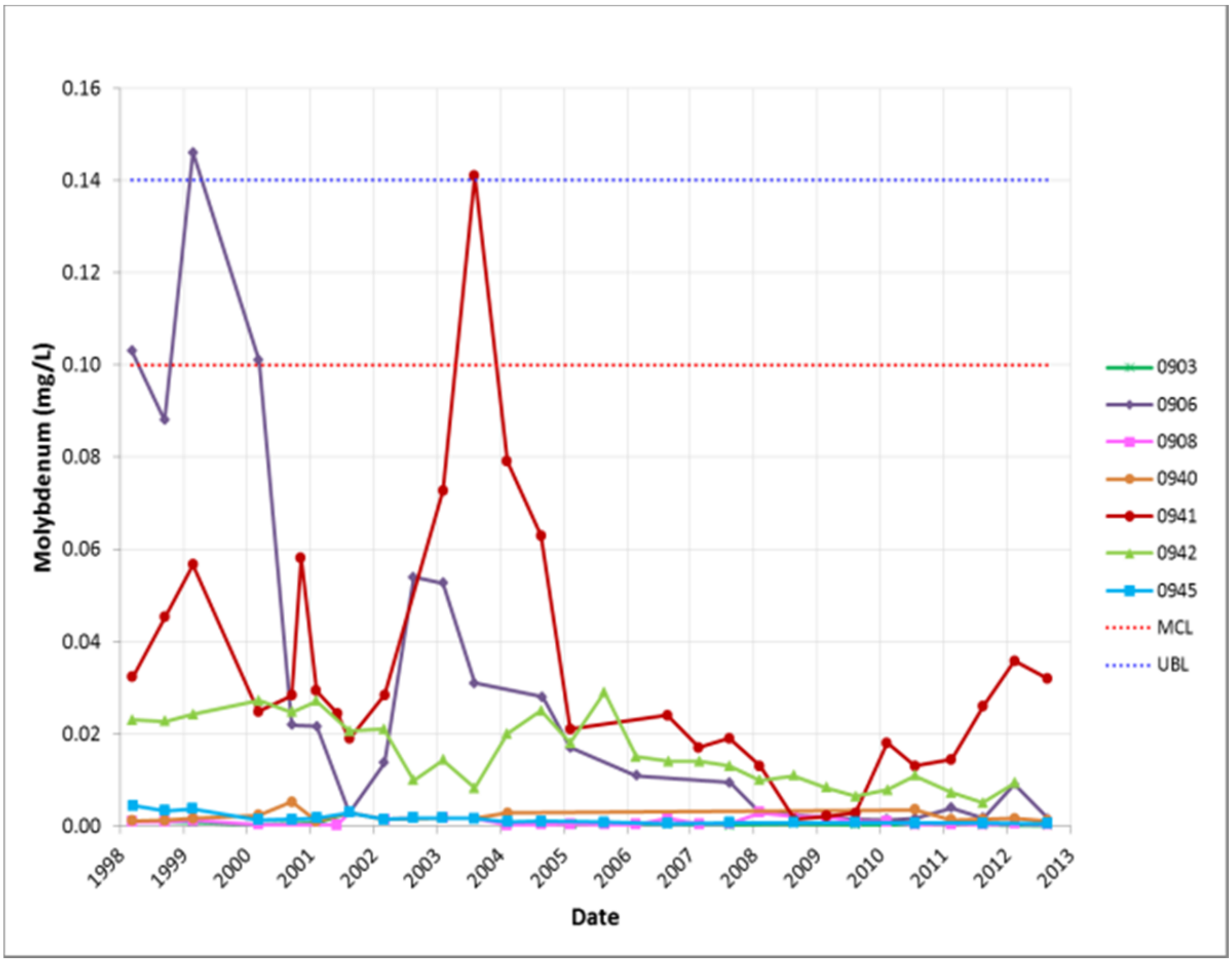

Figure 19–2. Time-Concentration Plots of Molybdenum in Groundwater at the Tuba City Disposal Site

Since 1998, nitrate concentrations in all onsite downgradient wells—0906, 0908, 0941, and 0942—have exceeded the 10 mg/L MCL, most by an order of magnitude or more (Figure 19–3). Nitrate concentrations exceeding the 311 mg/L UBL have only been measured in 0906 (currently 530 mg/L), 0942 (last exceedance in August 2008), and 0940 (currently 420 mg/L). Wells 0908 and 0941 are the only wells that indicate any notable trending (with gradual increases evident since 1998–2000), but nitrate concentrations have stabilized somewhat in the last few years. Nitrate concentrations measured in the offsite downgradient well 0903, although above background and occasionally exceeding the MCL, are still well below the UBL. Concentrations in the upgradient background well 0945 remain below the MCL.

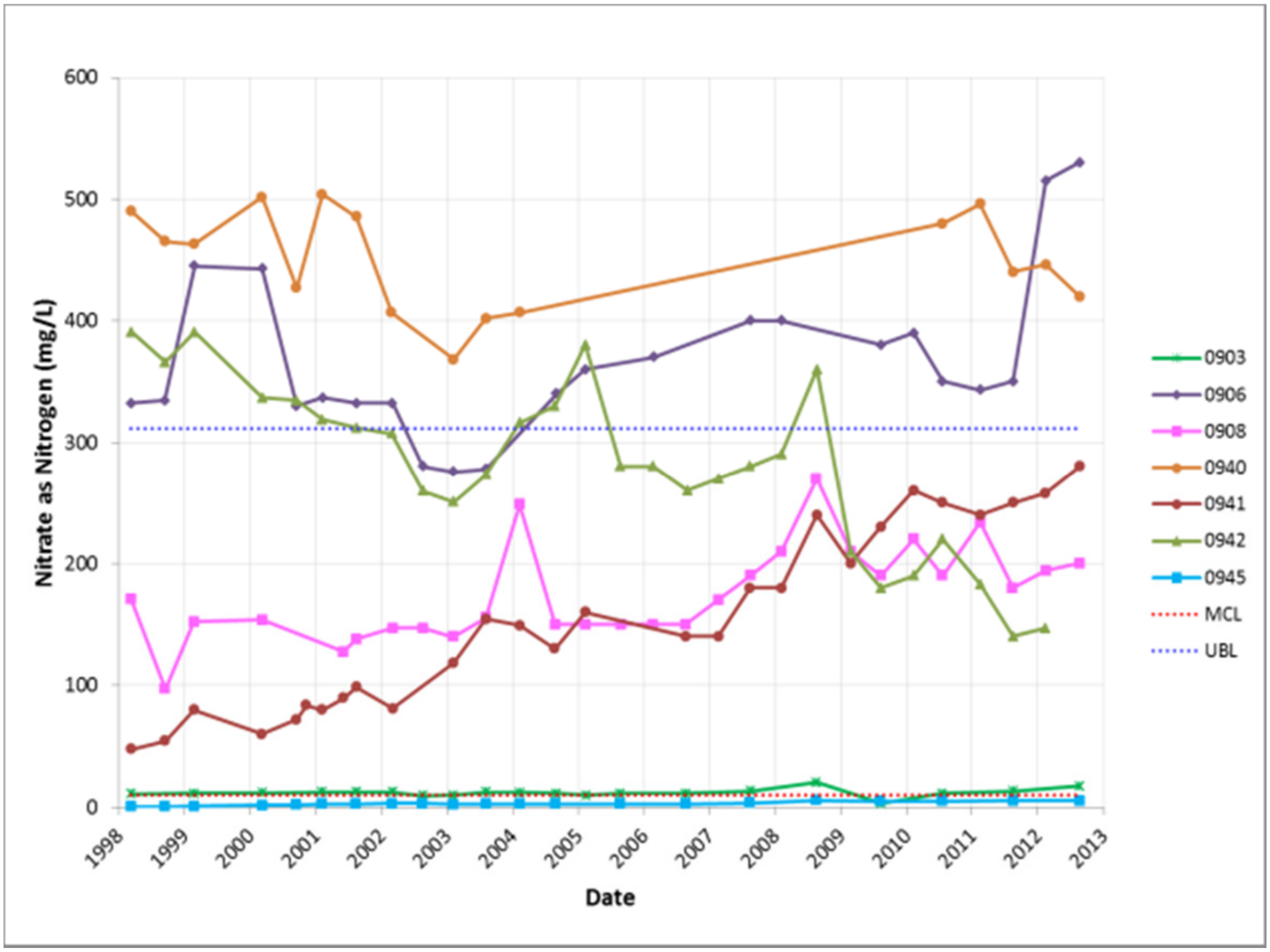

Figure 19–3. Time-Concentration Plots of Nitrate in Groundwater at the Tuba City Disposal Site

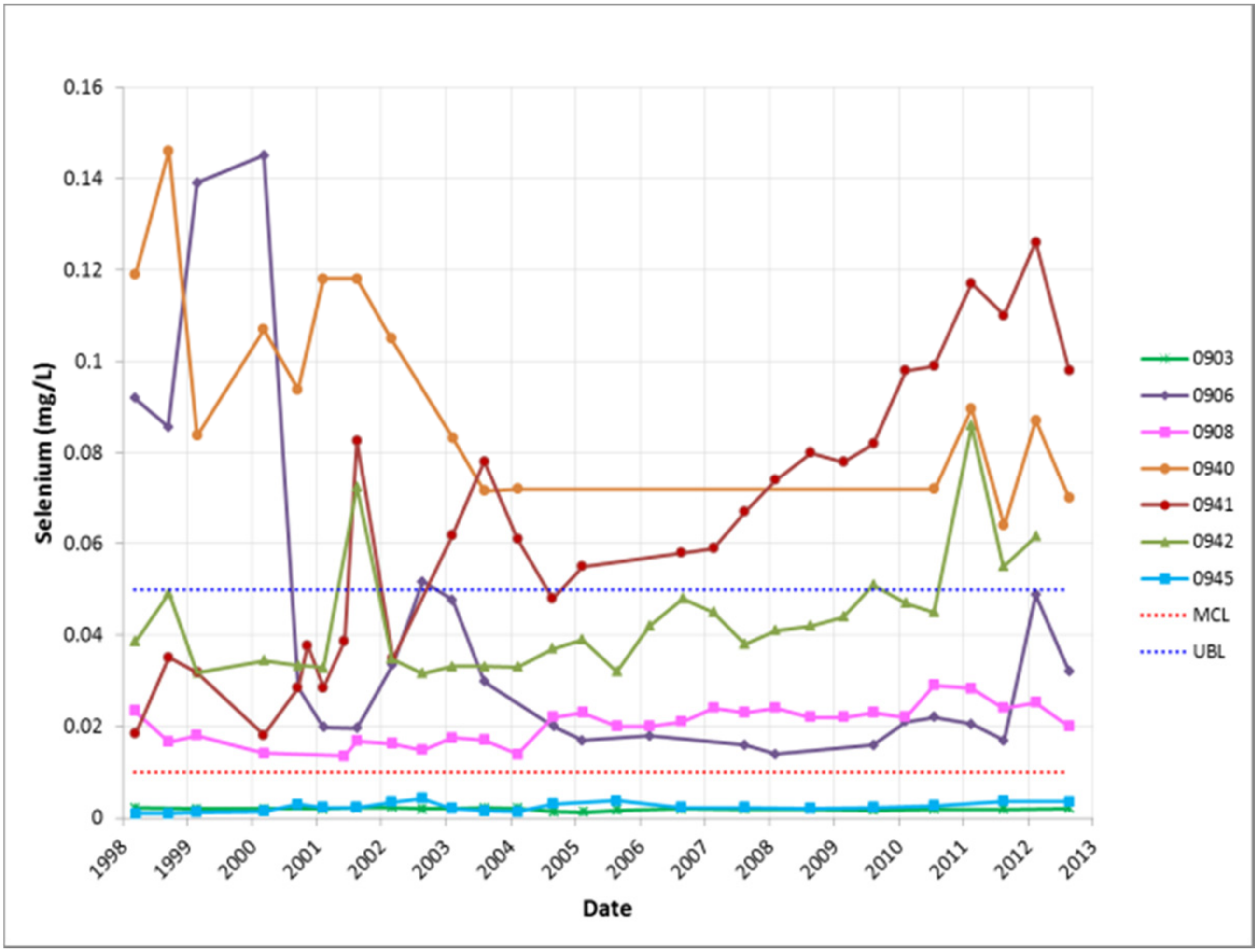

Figure 19–4. Time-Concentration Plots of Selenium in Groundwater at the Tuba City Disposal Site

As shown in Figure 19–4, selenium concentrations measured in groundwater in 2012 exceeded the 0.01 mg/L MCL in all wells except for the offsite downgradient well 0903 and background well 0945. Selenium concentrations exceed the 0.05 mg/L UBL in wells 0940, 0941, and 0942. Selenium concentrations in 0903 have consistently been below both the UBL and the MCL.

In 2012, uranium concentrations in groundwater exceeded the 0.044 mg/L MCL but remained below the 1.17 mg/L UBL in all onsite downgradient wells. This has been the case historically, as shown in Figure 19–5. Concentrations in the upgradient well 0945 and the offsite downgradient well 0903 remain below the MCL. Uranium concentrations in most wells have been quite stable. Exceptions are found in wells 0906 and 0942, where uranium has varied erratically at times.

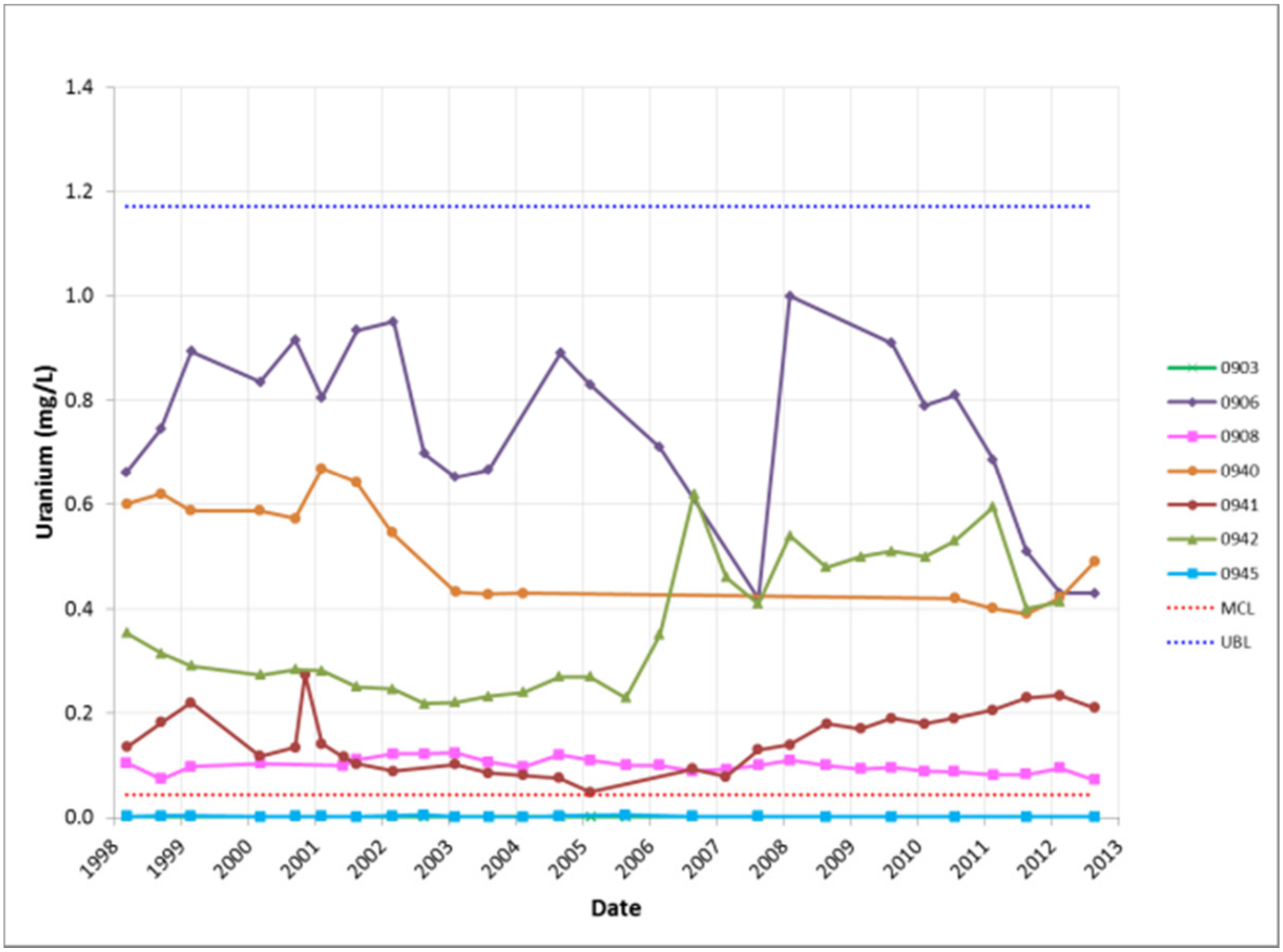

Figure 19–5. Time-Concentration Plots of Uranium in Groundwater at the Tuba City Disposal Site

19.8 Corrective Action

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

No corrective action was required in 2012.

19.9 Photographs

Photo Location Number	Azimuth	Photograph Description
PL–1	210	Site entrance gate.
PL–2	255	Northwest security fence line.
PL–3	160	Perimeter sign P30 near the entrance gate.
PL–4	0	Site marker SMK–1 near the entrance gate.
PL–5	340	Boundary monument BM–2.
PL–6	310	Monitoring well 0942 vault open for maintenance.
PL–7	325	View northwest across the disposal cell cover.
PL–8	150	East side slope of the disposal cell and the groundwater treatment plant facilities.
PL–9	45	Vegetation encroachment on the south side slope of the disposal cell. Repeat photograph taken from extraction well 1107.
PL–10	45	Vegetation encroachment on the south side slope of the disposal cell. Repeat photograph taken from extraction well 1105.
PL–11	310	Vegetation encroachment on the south side slope of the disposal cell. Repeat photograph taken from monitoring well 0942.
PL–12	310	North side slope of the disposal cell, apron ditch, and diversion channel.
PL–13	185	Sand accumulation along the west fence line.
PL–14	240	Windblown sand deposition on the south bank of the west diversion channel. Repeat photograph taken from the footbridge.
PL–15	90	East diversion channel and apron ditch viewed from the footbridge.

TUB 4/2012. PL–1. Site entrance gate.

TUB 4/2012. PL–2. Northwest security fence line.

TUB 4/2012. PL–3. Perimeter sign P30 near the entrance gate.

TUB 4/2012. PL–4. Site marker SMK–1 near the entrance gate.

TUB 4/2012. PL–5. Boundary monument BM–2.

TUB 4/2012. PL–6. Monitoring well 0942 vault open for maintenance.

TUB 4/2012. PL–7. View northwest across the disposal cell cover.

TUB 4/2012. PL–8. East side slope of the disposal cell and the groundwater treatment plant facilities.

TUB 4/2012. PL–9. Vegetation encroachment on the south side slope of the disposal cell. Repeat photograph taken from extraction well 1107.

TUB 4/2012. PL–10. Vegetation encroachment on the south side slope of the disposal cell. Repeat photograph taken from extraction well 1105.

TUB 4/2012. PL–11. Vegetation encroachment on the south side slope of the disposal cell. Repeat photograph taken from monitoring well 0942.

TUB 4/2012. PL–12. North side slope of the disposal cell, apron ditch, and diversion channel.

TUB 4/2012. PL–13. Sand accumulation along the west fence line.

TUB 4/2012. PL–14. Windblown sand deposition on the south bank of the west diversion channel. Repeat photograph taken from the footbridge.

TUB 4/2012. PL–15. East diversion channel and apron ditch viewed from the footbridge.