



Department of Energy  
Office of Legacy Management

NOV 29 2006

Mr. Gary Janosko, Chief  
U.S. Nuclear Regulatory Commission  
Fuel Cycle Facilities Branch  
Mail Stop: T-8A33  
Washington, DC 20555-0001

Subject: 2006 Annual Site Inspection and Monitoring Compliance Report for UMTRCA Title II Disposal Sites

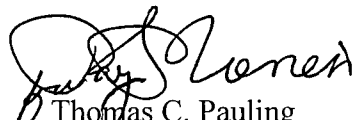
Dear Mr. Janosko:

Four copies of the 2006 *Annual Inspection and Monitoring Compliance Report for Uranium Mill Tailings Radiation Control Act Title II Disposal Sites* are enclosed. The Report covers the annual inspections of the five Title II disposal sites managed by the U.S. Department of Energy. All of the sites were found to be in good condition, and there were no conditions identified which would require corrective actions.

This report is submitted in compliance with the reporting requirements as set forth in 10 CFR 40.28, and each inspection was conducted in accordance with the inspection and monitoring requirements contained in the Long-Term Surveillance Plan for each site.

Please call me at (970) 248-6048 if you have any questions.

Sincerely,

  
Thomas C. Pauling  
Environment Team Lead

Enclosure

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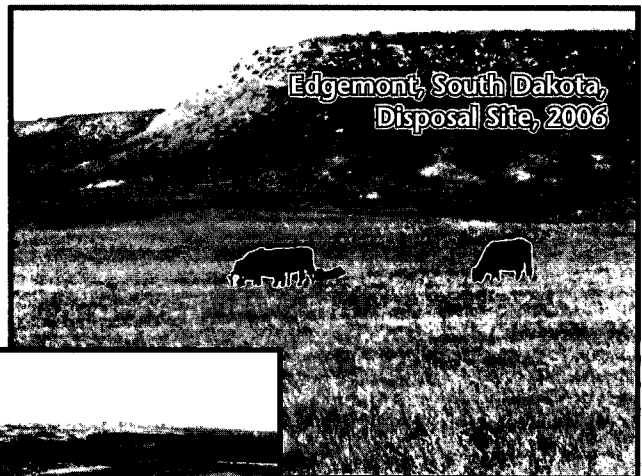
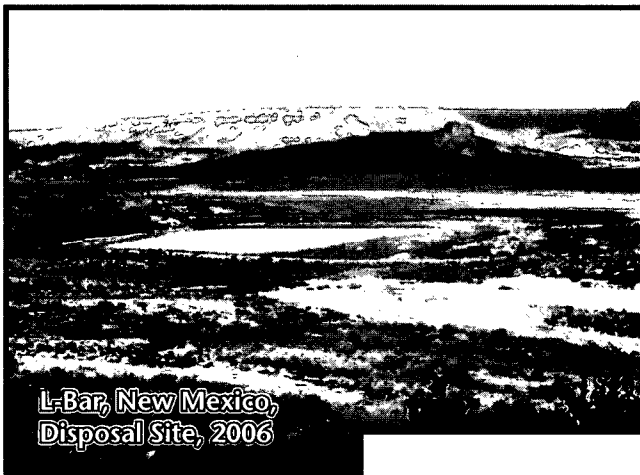
TCP/Title II Annual Report 2006.doc



*U.S. Department of Energy  
Office of Legacy Management*

# 2006 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title II Disposal Sites

November 2006



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**U.S. Department of Energy  
Office of Legacy Management**

**2006 Annual Site Inspection and Monitoring Report  
for  
Uranium Mill Tailings Radiation Control Act  
Title II Disposal Sites**

November 2006

Work Performed by S.M. Stoller Corporation under DOE Contract No. DE-AC01-02GJ79491  
for the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado



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## Acronyms

AAS	alternate abatement standard
ACL	alternate concentration limit
BIA	Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
CFR	<i>Code of Federal Regulations</i>
DOE	U.S. Department of Energy
EMP	erosion monitoring program
LM	Office of Legacy Management
LTSP	Long-Term Surveillance Plan
MCL	maximum concentration limit
mg/L	milligram(s) per liter
NRC	U.S. Nuclear Regulatory Commission
PCB	polychlorinated biphenyl(s)
pCi/L	picocurie(s) per liter
PL	photo location
POC	point of compliance
POE	point of exposure
TDS	total dissolved solids
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978 (88 USC 7901, <i>et seq.</i> )
WDEQ	Wyoming Department of Environmental Quality

## 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 Office of Legacy Management (DOE-LM) in 2006 at five uranium mill tailings disposal sites reclaimed under Title II of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978. These activities verified that the UMTRCA Title II disposal sites remain in compliance with license requirements.

DOE manages five UMTRCA Title II disposal sites under a general license granted by the U.S. Nuclear Regulatory Commission established at Title 10 *Code of Federal Regulations* Part 40.28. Reclamation activities continue at additional sites, and DOE ultimately expects to manage approximately 27 Title II disposal sites.

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

Annual site inspections and monitoring are conducted in accordance with site-specific long-term surveillance plans (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. LTSPs and site compliance reports are available on the Internet at [www.lm.doe.gov](http://www.lm.doe.gov).

The sites required routine monitoring and maintenance activities in 2006 including ground water monitoring, erosion and vegetation monitoring, vegetation and noxious weed control, and fence repairs. The following nonroutine activity<sup>1</sup> occurred in 2006:

- Bluewater, New Mexico—shipped contaminated pumps to an active UMTRCA Title II disposal site.
- L-Bar, New Mexico—sampled discolored soil at the base of the containment dam and found it to be radiologically contaminated leachate residue; remediation is scheduled for fall 2006.
- Shirley Basin South, Wyoming—ground water ACLs exceeded for cadmium and radium-228; DOE recommends continued monitoring followed by an evaluation after 5 years of data.

Results of the annual site inspection, maintenance, and monitoring activities are reported in the site-specific chapters that follow. Significant actions and issues at each site 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.

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<sup>1</sup>Nonroutine activities are activities implemented in response to changes in site conditions, regulatory setting, or management structure following an extraordinary event or regulatory compliance review.

Table ES-1. 2006 Summary of UMTRCA Title II Site Issues and Actions

Site	Chapter	Page	Index No.	Issues and Actions
Bluewater, New Mexico	1	1-2	1A	Maintenance: shipped contaminated pump equipment Ambrosia Lake West disposal site.
		1-2	1B	Maintenance: disposed of uncontaminated pump equipment and stock tanks.
		1-8	1C	Maintenance: repair of a depression in the asbestos disposal cell scheduled for FY07.
		1-8	1D	Maintenance: grazing license in process of negotiation.
		1-8	1E	Maintenance: repaired cut fence.
		1-9	1F	Maintenance: removed old radioactivity warning signs.
		1-9	1G	Maintenance: perimeter road eroded.
		1-9	1H	Monitoring: ground water compliance monitoring
Edgemont, South Dakota	2	2-5	2A	Maintenance: sprayed noxious weeds.
L-Bar, New Mexico	3	3-2	3A	Maintenance: additional grazing area allowed.
		3-2	3B	Maintenance: gates stolen or damaged.
		3-5	3C	Maintenance: remediation of contaminated materials required.
		3-7	3D	Maintenance: removed undesirable plants (tamarisk).
		3-8	3E	Monitoring: ground water compliance monitoring.
		3-10	3F	Monitoring: measured cell cover erosion.
3-11	3G	Monitoring: measured cell cover vegetation.		
Sherwood, Washington	4	4-2	4A	Maintenance: repaired site marker.
		4-2	4B	Maintenance: installed t-posts to mark boundary monuments.
		4-5	4C	Inspection: dam safety inspection.
		4-6	4D	Management: logging operations by BIA occurred on site; reclamation pending.
		4-7	4E	Maintenance: sprayed noxious weeds.
		4-7	4F	Monitoring: measured weed populations.
		4-8	4G	Monitoring: ground water best management practice monitoring.
Shirley Basin South, Wyoming	5	5-5	5A	Maintenance: proposed grazing agreement with a local rancher.
		5-5	5B	Maintenance: sprayed noxious weeds.
		5-6	5C	Monitoring: ground water compliance monitoring.
		5-7	5D	Monitoring: exceeded ground water ACLs.

## 1.0 Bluewater, New Mexico, Disposal Site

### 1.1 Compliance Summary

The Bluewater, New Mexico, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II Disposal Site was inspected on August 30 and 31, 2006, and was in good condition. The disposal cells and their cover materials were in excellent condition. Old monitor well pumps and appurtenances, removed and replaced in 2005, were disposed of in 2006 along with stock tanks that were formerly used to collect well purge water. A cut section of the perimeter fence was repaired, and legacy radioactivity warning signs located along the perimeter fence were removed. Additional erosion occurred along sections of the site perimeter road, and the need for repairs is being evaluated. Ground water monitoring results indicate that all compliance requirements continue to be met. No cause for a follow-up inspection was identified.

### 1.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Bluewater, New Mexico, Disposal Site are specified in the *Long-Term Surveillance Plan [LTSP] for the DOE Bluewater (UMTRCA Title II) Disposal Site Near Grants, New Mexico* (U.S. Department of Energy [DOE], Grand Junction, Colorado, July 1997) and in procedures established by DOE to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.28 (10 CFR 40.28). Table 1-1 lists license requirements for this site.

Table 1-1. License Requirements for the Bluewater, New Mexico, Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.3 and 3.4	Section 1.3.1
Follow-up Inspections	Section 3.5	Section 1.3.2
Routine Maintenance and Emergency Measures	Section 3.6	Section 1.3.3
Environmental Monitoring	Section 3.7	Section 1.3.4

**Institutional Controls**—The 3,300-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 40.28) in 1997. DOE is the licensee and, in accordance with the requirements for UMTRCA Title II sites, is responsible for the custody and long-term care of the site. Institutional controls at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no trespassing signs placed along the perimeter fence and around the disposal cells, and a locked gate at the site entrance. Verification of these institutional controls is part of the annual inspection. No offsite institutional controls are needed because contaminated ground water is limited to the area within the federal land boundary.

### 1.3 Compliance Review

#### 1.3.1 Annual Inspection and Report

The disposal site, located approximately 9 miles northwest of Grants, New Mexico and 1.5 miles northeast of Bluewater, New Mexico, was inspected on August 30 and 31, 2006. Results of the inspection are described below. Features and photograph locations (PLs) mentioned in this report are shown on Figures 1-1 (south area) and 1-2 (north area). Numbers in the left margin of this report refer to items summarized in the Executive Summary table.

### 1.3.1.1 Specific Site Surveillance Features

**Entrance Gate, Access Road, Site Access Gate, and Signs**—Access to the site is directly off of Cibola County Road 334; no private property is crossed to gain site access. The entrance gate (at County Road 334) is a steel, double-swing stock gate. The gate is secured by a chain and locks belonging to DOE and the various utility companies that have rights-of-way across the site. The access road leads from the entrance gate to the main site access gate that also is a steel, double-swing stock gate secured by locks. The access road is an all-weather road surfaced with crushed basalt and extends northward along a narrow strip of DOE property for approximately 1,700 feet from the entrance gate to the main site access gate. The entrance gate, access road, and access gate were all in good condition. A significant amount of windblown sand had accumulated at the entrance gate; however, the gate could be opened to allow vehicle access without removing sand.

Fifty-five warning signs, designated as perimeter signs P1 through P52 on the drawings (including perimeter signs P2A, P9A, and P9B), are mounted on steel posts at access points along right-of-way intersections within the site boundary and around the main and carbonate tailings disposal cells. Perimeter sign P3, damaged by a shotgun blast, is still legible. All other signs were in good condition.

**Site Marker and Boundary Monuments**—A granite site marker is located between the southwest corner of the main tailings disposal cell and the northwest corner of the carbonate tailings disposal cell. The marker was in excellent condition.

Twenty-four boundary monuments define the site boundary. These monuments are typically inside the perimeter fence and several feet inside the true corner or boundary line. Due to time constraints, not all of the boundary monuments were verified during the inspection; however, all of the monuments were located during a site maintenance visit in fall 2005. Some monuments tend to get covered by drifting sand, and metal t-posts have been driven at those locations to help locate them during future inspections.

**Monitor Wells**—The ground water monitoring network consists of nine wells located inside the site boundary. Five wells are screened in the alluvial aquifer and the other four wells are screened in the San Andres Limestone-Glorieta Sandstone, which is the bedrock aquifer of concern at the site. All of the wells are located inside wire fence enclosures.

The wells previously had dedicated pumps, PVC piping, and stock tanks to contain purge water. The old pumps and appurtenances were pulled in fall 2004 and replaced with new equipment. Where necessary, new steel surface casings with locking caps were installed to secure the wells. Radiological scans indicated that the old pumps and galvanized steel pipe fittings at bedrock wells MW-OBS-3 and MW-S(SG) had fixed contamination. This equipment was relocated to the stock tank at well MW-X(M), radiologically posted and stored, until it was shipped in May 2006 to the active UMTRCA Title II disposal facility operated by Rio Algom Mining Company (the future Ambrosia Lake West disposal site). The remaining uncontaminated pumps, piping, and wiring stored inside the well enclosures were disposed of at a local landfill in September 2006. Stock tanks located at the wells and scattered around the site, most of which were either rusted out or damaged beyond repair, also were disposed of or recycled in September 2006. The current micro-purge sampling methods preclude the need for stock tanks to collect purge water at the well locations.

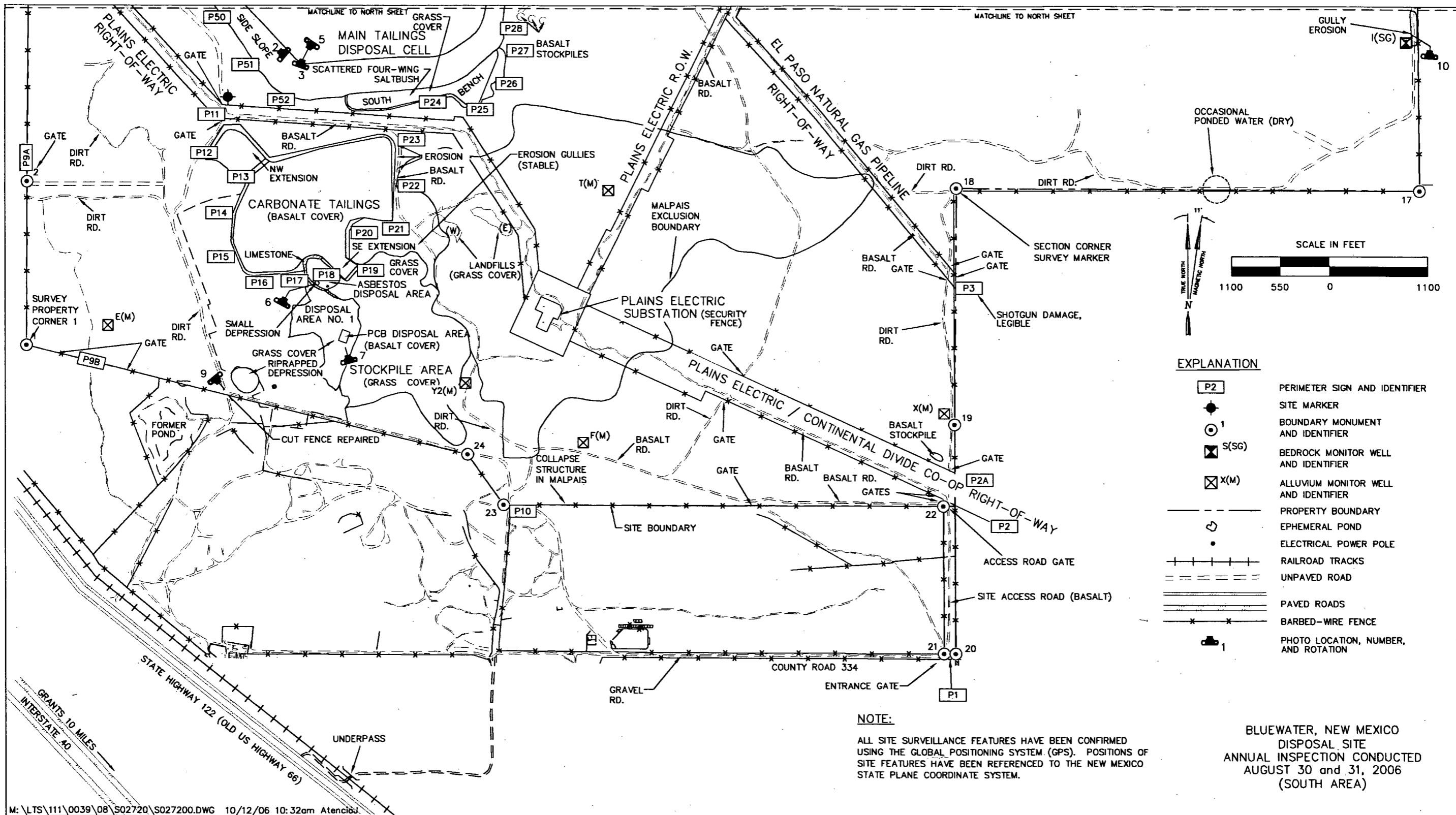


Figure 1-1. 2006 Annual Compliance Drawing for the Bluewater, New Mexico, Disposal Site (South Area)

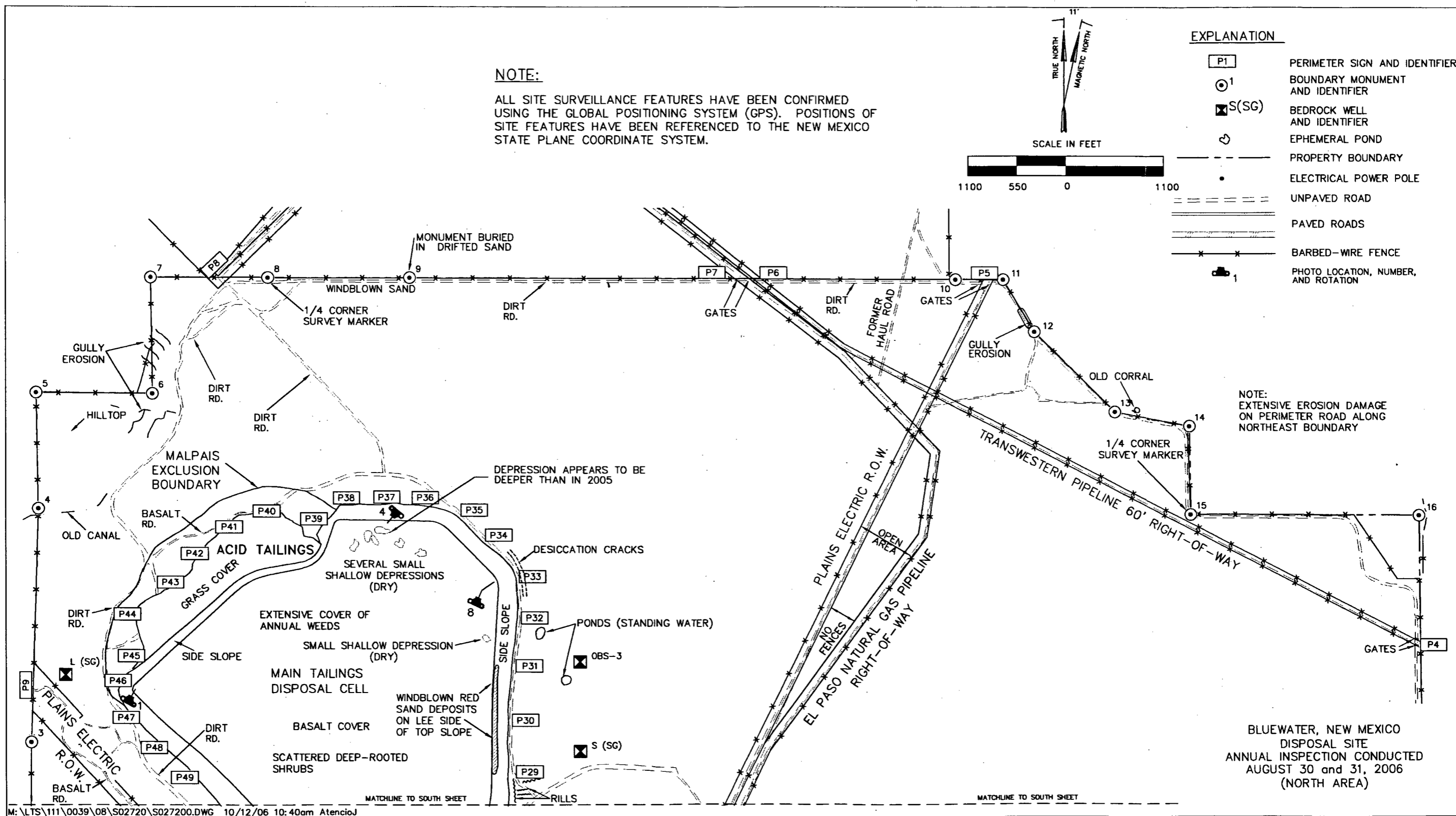


Figure 1-2. 2006 Annual Compliance Drawing for the Bluewater, New Mexico, Disposal Site (North Area)



### 1.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into four areas referred to as transects: (1) the main tailings disposal cell, including the acid tailings disposal area and the south bench; (2) the carbonate tailings disposal cell, including the asbestos disposal area, the polychlorinated biphenyls (PCB) disposal area, and associated landfills; (3) the region between the disposal structures and the site perimeter; and (4) the site perimeter and outlying area.

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

**Main Tailings Disposal Cell, the Acid Tailings Disposal Area, and the South Bench Disposal Area**—These three disposal areas are contiguous and together constitute one large disposal area of approximately 320 acres; all were in excellent condition. The main tailings disposal cell is covered with basalt riprap and slopes northward. The top slope grade decreases from 3 to 4 percent at the south end to less than 0.5 percent at the north end. The top slopes of the acid tailings (PL-1) and the south bench disposal areas are essentially flat and covered by healthy grass. The side slopes of the three disposal areas are protected by basalt riprap (PL-2). The riprap was in excellent condition.

As shown on photo PL-3, the top of the main tailings disposal cell had an extensive cover of annual weeds (primarily Russian thistle, which is not a listed noxious weed in New Mexico), along with some wildflowers and deep-rooted shrubs (rabbitbrush and four-wing saltbush). Patches of annual weeds also were present on the east side slope of the cell. Plant encroachment is not a concern at this site.

Several small shallow depressions exist on the relatively flat north end of the top slope of the main tailings disposal cell. Although ponded water has been observed in the past, the depressions were dry at the time of the inspection. Slimes from the settling ponds were placed in the northern part of the main tailings disposal cell and areas containing slimes are more likely to settle than areas containing drier waste materials. One depression appeared to be deeper than observed during the 2005 inspection (PL-4). The depressions will continue to be monitored for evidence of significant settling or displacement. Given that evaporation greatly exceeds precipitation in this area, ponding is believed to be infrequent and brief and, therefore, is not a concern.

Desiccation cracks are present in the soil adjacent to the northeast corner of the main tailings disposal cell. The features are caused by shrinkage of clay-rich backfill materials and do not impact the stability of the cell. Small ponds often form in an area along the east side of the disposal cell following storm events. Standing water was present at the time of inspection. The areas of ponding are far enough from the cell to not impact it.

**Carbonate Tailings Disposal Cell, Asbestos and PCB Disposal Areas, and Landfills**—The top and side slopes of the carbonate tailings disposal cell are covered by basalt riprap. The top, for the most part, slopes gently eastward. The small northwest and southeast extensions slope in their respective directions (PL-5). Annual weeds and scattered woody shrubs were present on the cell and its extensions. The carbonate tailings disposal cell was in excellent condition.

1C The asbestos disposal area is a bowl-like feature or depression just south of the carbonate pile. The north, west, and south side slopes of this depression are covered by limestone riprap; the bottom of the bowl is grass covered. A small depression is located along the south edge of the disposal area, and could represent piping or collapse of uncontaminated fill material incompletely compacted during final grading (PL-6). The depression was first noted during the 1999 annual inspection but has not been a concern because it does not encroach on asbestos-containing materials. However, to mitigate the potential for encroachment into these materials, the depression is scheduled to be filled with crushed basalt rock in 2007. Potential access routes to haul crushed rock to the disposal area were investigated. Other than the depression, the disposal area is in excellent condition.

The small riprap-covered PCB disposal area is in excellent condition (PL-7). The two grass-covered landfill areas east of the carbonate tailings disposal cell also are in excellent condition. Two other disposal areas, Disposal Area Number 1 and the Stockpile Area, are south of the carbonate tailings disposal cell. Both are grass-covered and in excellent condition.

**Area Between the Disposal Cells and the Site Perimeter**—Other areas inside the site were inspected by driving the site perimeter road and other roads and tracks. Much of the southern and western parts of the site are inaccessible by vehicle because they are covered by basalt flows.

Several utility company rights-of-way cross the site. These rights-of-way are enclosed by stock fences with gates where the rights-of-way intersect one another, cross the site boundary, or cross the perimeter road. Roads along the rights-of-way typically are covered with crushed basalt to provide the utility companies with all-weather access.

Stockpiles of basalt riprap that can be used by DOE for road repairs are in two areas. One pile is located north of the access road gate, and a cluster of three stockpiles is located east of the main tailings disposal cell.

An electric power substation is enclosed by a security fence near the center of the site along the Plains Electric Company right-of-way. Fencing around this station was in good condition.

1D Due to significant rainfall during the summer, the vegetation was in excellent health in several areas of the site. However, due to runoff and wind erosion, a portion of the site northeast of the main tailings disposal cell remains relatively barren (PL-8). Reuse of the site through controlled grazing of the vegetated areas of the site will maintain or improve the health of the vegetation. Therefore, DOE is in the process of negotiating a grazing license with a local subcontractor in exchange for maintaining the fence and checking security at the site.

1E **Site Perimeter and Outlying Areas**—A local subcontractor has been retained to repair the fencing and periodically check for unauthorized livestock use or trespassing on site property. Grazing is not part of the current management plan for this site and, if livestock are discovered on the site, the subcontractor is authorized to remove the animals. The perimeter barbed-wire fence had been recently cut where the fence crosses a reclaimed mill site access road along the south property boundary (PL-9). Two burros had gained access to the site at this location and were later observed on the site northeast of the main tailings disposal cell. The subcontractor was contacted after the inspection and subsequently repaired the fence; at the time of repair, the burros no longer were on the site and no other livestock or evidence of trespassing was observed.

1F Radioactivity warning signs remaining from the time the mill was operating were located along the perimeter fence. Because these signs do not represent the conditions at the site, they were removed and disposed of in fall 2006.

1G The perimeter road consists of a dirt track covered at places with crushed basalt. The road runs along the site boundary in much of the southern and most of the northern and eastern parts of the site. Erosion has occurred along portions of the road, but an evaluation in fall 2005 indicated that the eroded areas could easily be bypassed and that repairs were not needed at the time. Runoff from above-normal rainfall during summer 2006 has deepened gullies and washed out sections of the road along the northeast perimeter of the site (PL-10). Although these sections can be bypassed during dry conditions, the need for repairs will again be evaluated.

Surrounding land is used for livestock grazing and wildlife habitat. The area outside the site boundary for 0.25 mile was visually inspected for erosion, development, change in land use, or other phenomena that might affect the long-term integrity of the site. None was seen.

### 1.3.2 Follow-up Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed. No follow-up inspections were required in 2006.

### 1.3.3 Routine Maintenance and Emergency Measures

During 2006, old pump equipment and stock tanks were removed, a cut section of the perimeter fence was repaired, and legacy radioactivity warning signs were removed. The site was checked on a monthly basis by a local subcontractor for evidence of trespassing and to ensure that the perimeter fence is intact.

Emergency measures are corrective actions that DOE will take in response to unusual damage or disruption that threaten or compromise site health and safety, security, integrity, or compliance with 40 CFR 192. No emergency measures were required in 2006.

### 1.3.4 Environmental Monitoring

1H Ground water monitoring is required at the Bluewater site. In accordance with the LTSP, specified background and point-of-compliance wells are sampled annually for polychlorinated biphenyls (PCBs) and every 3 years for molybdenum, selenium, and uranium (Table 1-2). Only the alluvial wells are sampled for molybdenum and PCBs. Alluvial aquifer well MW-X(M) and bedrock aquifer well MW-I(SG), point-of-exposure (POE) wells located along the east (downgradient) property boundary, will be sampled only if specified alternate concentration limits (ACLs) are exceeded at the respective alluvial and bedrock aquifer point-of-compliance (POC) wells (Table 1-3). To date, sampling of the POE wells has not been required because ACLs have not been exceeded at the POC wells.

Molybdenum, selenium, and uranium concentrations were measured during the November 2004 sampling event; therefore, PCBs were the only laboratory parameters measured during the November 2005 sampling event. PCBs have never been detected in any of the wells at the site and were not detected during this event.

Table 1-2. Ground Water Monitoring Network for the Bluewater, New Mexico, Disposal Site

Monitor Well	Network Application	Analytes	Frequency
MW-E(M)	Alluvial background well	Mo, Se, U, and PCBs	Annually
MW-F(M)	Alluvial POC well	Mo, Se, U, and PCBs	Annually
MW-T(M)	Alluvial POC well	Mo, Se, U, and PCBs	Annually
MW-Y2(M)	Alluvial POC well	PCBs	Annually
MW-X(M)	Alluvial POE well	Mo, Se, U, and PCBs	If alluvial POC ACL exceeded
MW-L(SG)	Bedrock background well	Se and U	Every 3 years
MW-OBS-3	Bedrock POC well	Se and U	Every 3 years
MW-S(SG)	Bedrock POC well	Se and U	Every 3 years
MW-I(SG)	Bedrock POE well	Se and U	If bedrock POC ACL exceeded

Key: ACL = alternate concentration limit; Mo = molybdenum; PCB = polychlorinated biphenyl; POC = point-of-compliance; POE = point-of-exposure; Se = selenium; U = uranium

Table 1-3. Ground Water Alternate Concentration Limits for the Bluewater, New Mexico, Disposal Site

POC Well	Analyte	ACL (mg/L)
<u>Alluvium</u> MW-F(M) and MW-T(M)	Molybdenum	0.10
	Selenium	0.05
	Uranium	0.44
<u>Bedrock</u> MW-OBS-3 and MW-S(SG)	Selenium	0.05
	Uranium	2.15

Key: ACL = alternate concentration limit; mg/L = milligrams per liter; POC = point-of-compliance

### 1.3.5 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	30	Grass-covered acid tailings disposal cell; northwest side slope of the main tailings disposal cell is in the foreground.
PL-2	310	Southwest side slope of the main tailings disposal cell.
PL-3	20	Top of the main tailings disposal cell viewed from the southwest corner.
PL-4	220	Dry depression near the north edge of the main tailings disposal cell cover.
PL-5	215	Northwest extension of the carbonate tailings disposal cell.
PL-6	30	Depression in the asbestos disposal area.
PL-7	345	Basalt cover of the PCB disposal area.
PL-8	25	Barren terrain viewed from the northeast corner of the main tailings disposal cell.
PL-9	140	Cut section of the barbed-wire perimeter fence along the south property boundary.
PL-10	5	Gully erosion on the perimeter road near monitor well MW-I(SG).



*BLU 8/2006. PL-1. Grass-covered acid tailings disposal cell; northwest side slope of the main tailings disposal cell is in the foreground.*



*BLU 8/2006. PL-2 Southwest side slope of the main tailings disposal cell.*



*BLU 8/2006. PL-3. Top of the main tailings disposal cell viewed from the southwest corner.*



*BLU 8/2006. PL-4. Dry depression near the north edge of the main tailings disposal cell cover.*



*BLU 8/2006. PL-5. Northwest extension of the carbonate tailings disposal cell.*



*BLU 8/2006. PL-6. Depression in the asbestos disposal area.*





*BLU 8/2006. PL-7. Basalt cover of the PCB disposal area.*



*BLU 8/2006. PL-8. Barren terrain viewed from the northeast corner of the main tailings disposal cell.*





*BLU 8/2006. PL-9. Cut section of the barbed-wire perimeter fence along the south property boundary.*



*BLU 8/2006. PL-10. Gully erosion on the perimeter road near monitor well MW-1(SG).*

End of current text.

## 2.0 Edgemont, South Dakota, Disposal Site

### 2.1 Compliance Summary

The Edgemont, South Dakota, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II Disposal Site was inspected on June 20, 2006, and was in excellent condition. The site continues to be grazed by a local rancher in exchange for checking site security and repairing the perimeter fence. Noxious weeds continue to persist on and adjacent to rock-covered surfaces and will require continued monitoring and control. Ground water monitoring is not required at this site. No cause for other maintenance or a follow-up inspection was identified.

### 2.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Edgemont, South Dakota, Disposal Site are specified in the *Long-Term Surveillance Plan [LTSP] for the DOE Tennessee Valley Authority (UMTRCA) Title II Disposal Site, Edgemont, South Dakota*, (U.S. Department of Energy [DOE], Grand Junction, Colorado, June 1996) and procedures established by DOE to comply with the requirements of Title 10 *Code of Federal Regulations*, Part 40.28 (10 CFR 40.28). License requirements for this site are listed in Table 2-1.

Table 2-1. License Requirements for the Edgemont, South Dakota, Disposal Site

Requirement	Long Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.3 and 3.4	Section 2.3.1
Follow-up Inspections	Section 3.5	Section 2.3.2
Routine Maintenance and Emergency Measures	Section 3.6	Section 2.3.3
Environmental Monitoring	Section 3.7	Section 2.3.4

**Institutional Controls**—The 360-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 40.28) in 1996. DOE is the licensee and, in accordance with the requirements for UMTRCA Title II sites, is responsible for the custody and long-term care of the site. Institutional controls at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, a warning/no trespassing sign placed at the site entrance, and a locked gate at the site entrance. Verification of these institutional controls is part of the annual inspection.

### 2.3 Compliance Review

#### 2.3.1 Annual Inspection and Report

The site, located approximately 2 miles south of the town of Edgemont in Fall River County near the southwestern corner of South Dakota, was inspected on June 20, 2006. Results of the inspection are described below. Features and photograph locations (PLs) mentioned in this report are shown on Figure 2-1. Numbers in the left margin of this report refer to items summarized in the Executive Summary table.

##### 2.3.1.1 Specific Site Surveillance Features

**Site Access, Gates, Sign, and Fence**—Access to the Edgemont Disposal Site is immediately off County Road 6N and is unimpaired. No private property is crossed to gain access.

A tubular metal entrance gate is secured by a locked chain and was in excellent condition. Two wire gates are also present along the perimeter fence: one at the northwest corner of the property on the north perimeter fence line and one approximately 700 ft north of the southeast corner of the property on the east perimeter fence line. Both were in good condition. The wire gate on the east fence line was open to allow cattle access to the property. DOE allows a local rancher to graze the site in return for checking site security and maintaining the perimeter fence. Controlled grazing promotes turf vitality.

The entrance sign was the only warning/no trespassing sign installed at the site, and it is located inside the perimeter fence at the site entrance gate. The metal signpost is bent but stable.

A four-strand barbed wire fence was installed in spring 1999 along the site perimeter boundary to demarcate DOE property and to control grazing on the property. The fence is truncated at the southeast corner to allow livestock access to a pre-existing stock pond. Except for a short portion along the east boundary, where cattle were present, inspectors walked the site perimeter to assess the integrity of the fence. The fence was in excellent condition (PL-1).

**Site Marker and Monuments**—One unpolished granite site marker identifying the disposal site is located just inside the entrance gate and was in excellent condition. Four boundary monuments, located at each corner of the property, were in excellent condition.

**Monitor Wells**—There are no monitor wells at this site.

### 2.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into four areas referred to as transects: (1) the grass-covered disposal cell top; (2) the riprap-covered embankment face and associated drainage and diversion channels; (3) the region between the disposal cell and the site perimeter; and (4) the outlying area.

Within each transect, inspectors examined specific site surveillance features, such as boundary monuments. Each transect was inspected for evidence of erosion, settling, slumping, or other disturbance that might affect site integrity or the long-term performance of the cell.

**Top of the Disposal Cell**—The 100-acre top of the disposal cell, completed in 1989, is grass-covered and was in excellent condition (PL-2). DOE manages the grass cover through controlled grazing. The grass is well established and was not over-grazed when inspected. Numerous cattle trails are present on the cell top, but there were no indications of erosion, settlement, or other modifying processes that might affect the integrity of the cell.

**Embankment Face and Drainage and Diversion Channels**—The embankment face, the steepest man-made slope on site, is covered with riprap. The slope is stable, and the riprap showed no signs of degradation. Scattered plants, mostly grass and annual weeds, grow in the riprap (PL-3). These plants do not pose a threat to the stability or function of the embankment face.

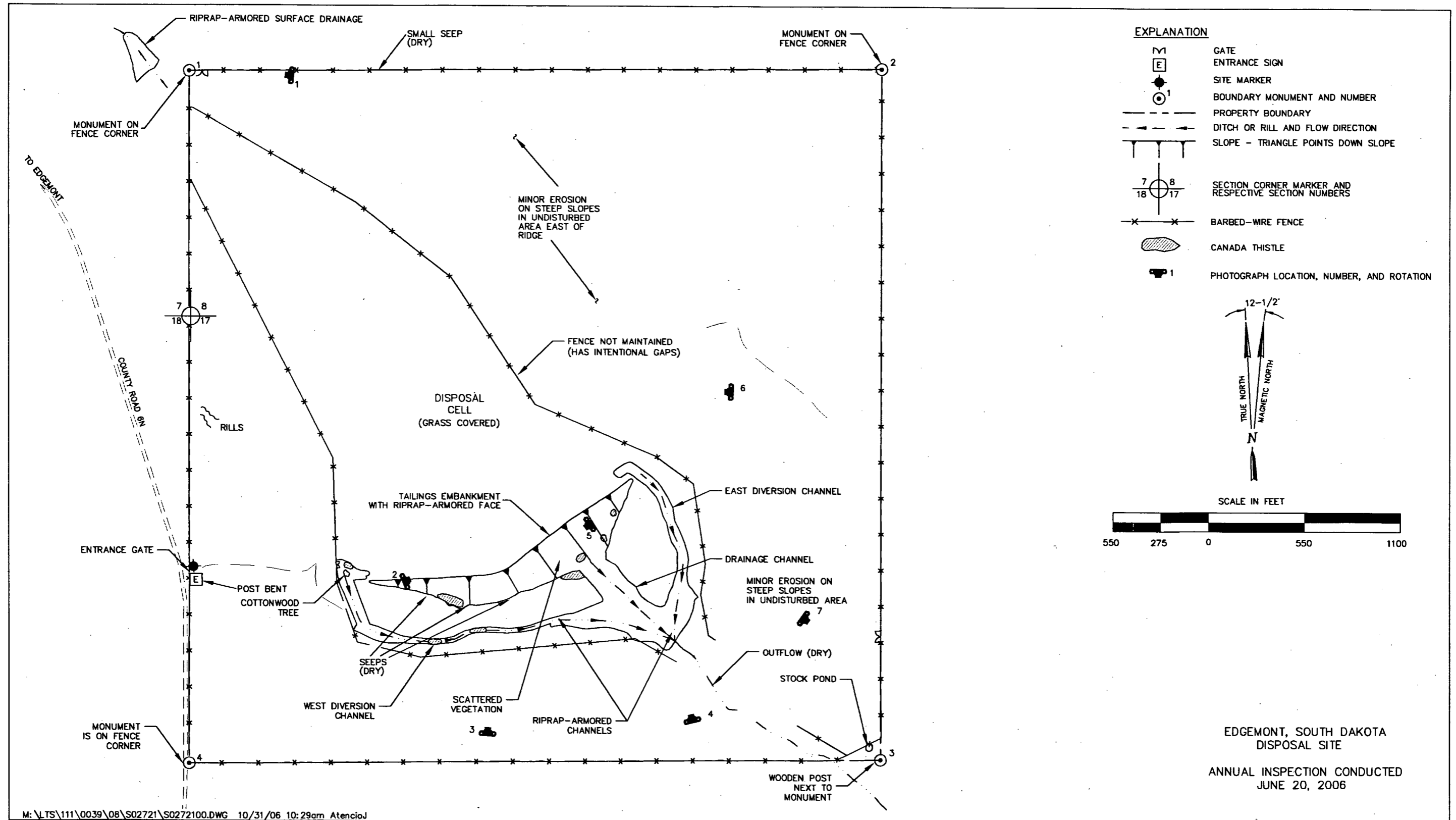


Figure 2-1. 2006 Annual Compliance Drawing for the Edgemont, South Dakota, Disposal Site

Diversion and drainage channels are grass-covered on their upgradient portions (these are gentle swales on each side of the disposal cell) and riprap-armored on their downgradient portions and on steeper slopes (PL-4). Minor amounts of vegetation occur in the riprap. However, as discussed above with respect to the riprap-covered tailings embankment face, the vegetation density does not appear to have increased significantly in the last few years and does not pose a threat to the function of the channels. Grass in the vegetated portions of the channels is dense and healthy, and there was no evidence of erosion. The riprap-armored surface drainage channel just outside the northwest corner of the property, designed to prevent headward erosion onto the disposal site, was also stable and in good condition (PL-1).

2A DOE has retained the Fall River County weed control agent to spray Canada thistle, a noxious weed persisting on the site, since 1998. The thistle usually has been found growing on and along the edges of the riprap-armored surfaces. Although only one small patch of Canada thistle was found and subsequently sprayed in 2005, numerous patches were present at the time of the 2006 inspection (PL-5). These patches subsequently were sprayed with herbicide by the county.

**Region Between the Disposal Cell and the Site Perimeter**—The area between the disposal cell and the site perimeter is grass-covered and in excellent condition. This region also is grazed in a controlled manner, and cattle were present on the site the day of the inspection (PL-6). The grass is well established but minor erosion persists on undisturbed steeper portions of the site east of a natural ridge that separates the east portion of the site from the area containing the cell (PL-7). This erosion does not threaten the integrity of the stabilized tailings.

**Outlying Area**—The site is surrounded by private land used primarily for grazing and wildlife habitat. The area approximately 0.25 mile beyond the site boundary was inspected from within the boundary fence. The town of Edgemont operates a municipal landfill north-northwest of the site, and minor amounts of windblown trash have been observed on site or along the fences; however, landfill trash was insignificant at the site this year. There was no evidence of activity or change in land use that could affect the site.

### 2.3.2 Follow-Up Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed. No follow-up inspections were required in 2006.

### 2.3.3 Routine Maintenance and Emergency Measures

Noxious weeds were sprayed with herbicide in 2006. No other maintenance or repairs were required.

Emergency measures are corrective actions that DOE will take in response to unusual damage or disruption that threaten or compromise site health and safety, security, integrity, or compliance with 40 CFR 192. No emergency measures were required in 2006.

### 2.3.4 Environmental Monitoring

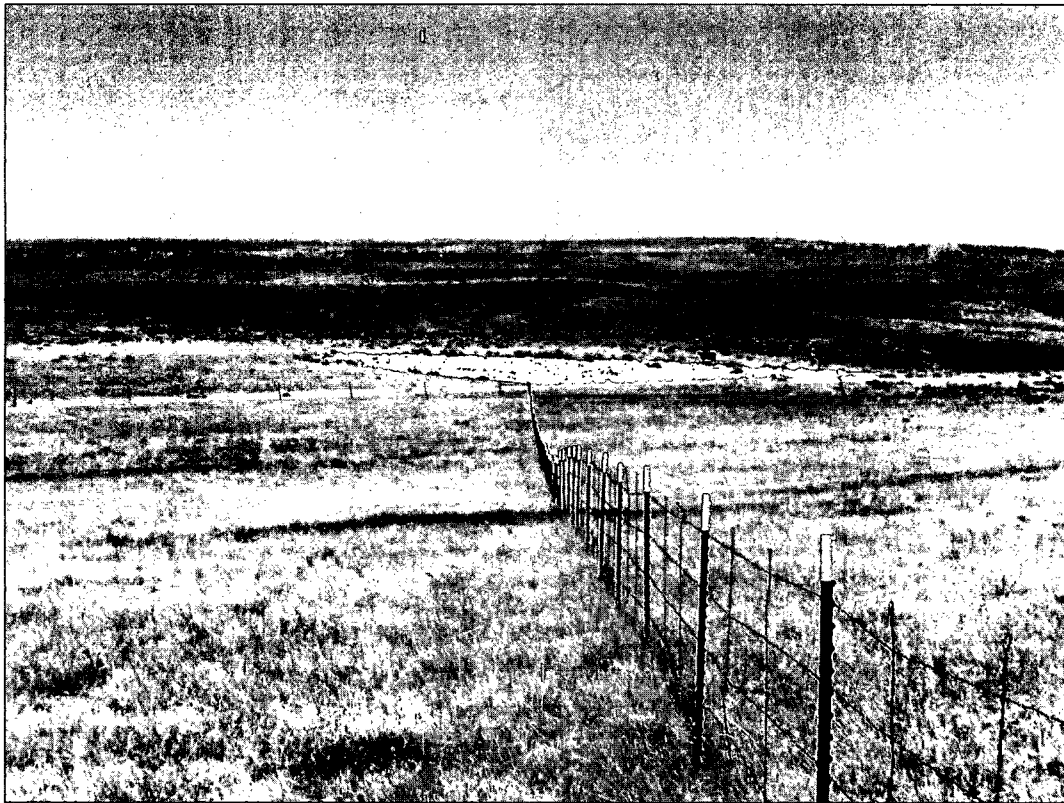
Ground water monitoring is not required at this site, as stipulated in the LTSP, due to the presence of a 300- to 700-foot-thick layer of competent unweathered shale bedrock lying

between the disposed tailings and the uppermost confined aquifer. Additionally, clay liners were constructed to isolate the tailings from the shallower unconfined perched ground water present as a result of local precipitation. There is no evidence of any direct hydraulic connection between the perched ground water and the underlying confined bedrock aquifer.

### 2.3.5 Photographs

*Table 2-2. Photographs Taken at the Edgemont, South Dakota, Disposal Site*

<b>Photograph Location Number</b>	<b>Azimuth</b>	<b>Description</b>
PL-1	275	Perimeter fence and riprap-armored drainage area near the northwest corner of the site.
PL-2	70	Contact between the grass-covered disposal cell top and the riprap-armored tailings embankment.
PL-3	5	Tailings embankment.
PL-4	350	Tailings embankment, drainage channel, and east diversion channel.
PL-5	235	Patch of Canada thistle on the tailings embankment.
PL-6	270	Cattle grazing on the site east of the disposal cell.
PL-7	130	Minor natural erosion occurring in an undisturbed area in the southeast portion of the site.



*EDG 6/2006. PL-1. Perimeter fence and riprap-armored drainage area near the northwest corner of the site.*



*EDG 6/2006. PL-2. Contact between the grass-covered disposal cell top and the riprap-armored tailings embankment.*





*EDG 6/2006. PL-3. Tailings embankment.*



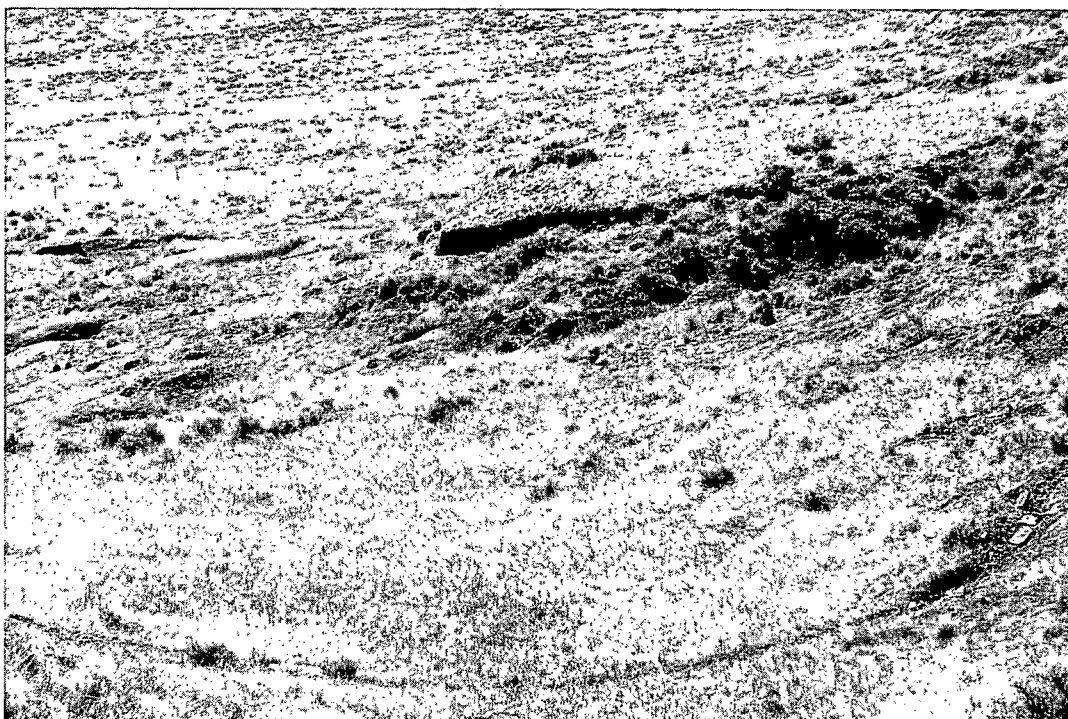
*EDG 6/2006. PL-4. Tailings embankment, drainage channel, and east diversion channel.*



*EDG 6/2006. PL-5. Patch of Canada thistle on the tailings embankment.*



*EDG 6/2006. PL-6. Cattle grazing on the site east of the disposal cell.*



*EDG 6/2006. PL-7. Minor natural erosion occurring in an undisturbed area in the southeast portion of the site.*

## 3.0 L-Bar, New Mexico, Disposal Site

### 3.1 Compliance Summary

The L-Bar, New Mexico, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II Disposal Site was inspected on August 29, 2006. The site is in good condition. Standing water was present in the diversion channels and on the impoundment cover due to above-normal rainfall during the summer. Erosion is active in several areas of the site but does not impact the tailings impoundment or the function of the diversion structures. Numerous small tamarisk plants found on the impoundment cover were cut and treated with herbicide. Erosion and vegetation measurements to monitor the condition of the impoundment cover indicated that no erosion is occurring and the foliar cover of the vegetation is increasing at the monitoring locations. Discolored rock and soil at decommissioned drain outlets along the toe of the containment dam was determined to be contaminated leachate residue; remediation of this material is scheduled for fall 2006. No cause for a follow-up or contingency inspection was identified.

### 3.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the L-Bar, New Mexico, Disposal Site are specified in the *Long-Term Surveillance Plan [LTSP] for the U.S. Department of Energy L-Bar, New Mexico, (UMTRCA Title II) Disposal Site, Seboyeta, New Mexico* (DOE-LM/GJ709-2004, September 2004) and in procedures established by DOE to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.28 (10 CFR 40.28). Table 3-1 lists license requirements for this site.

Table 3-1. License Requirements for the L-Bar, New Mexico, Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.3 and 3.4	Section 3.3.1
Follow-up Inspections	Sections 3.5	Section 3.3.2
Routine Maintenance and Emergency Measures	Section 3.6	Section 3.3.3
Environmental Monitoring	Section 3.7	Section 3.3.4

**Institutional Controls**—The 738-acre disposal site is owned by the United States of America and was accepted under the NRC general license (10 CFR 40.28) in 2004. DOE is the licensee and, in accordance with the requirements for UMTRCA Title II sites, is responsible for the custody and long-term care of the site. Institutional controls at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a perimeter fence around the impoundment and associated structures, warning/no trespassing signs placed along the perimeter fence, and a locked gate at the site entrance. Verification of these institutional controls is part of the annual inspection. No offsite institutional controls are needed because contaminated ground water is limited to the area within the federal land boundary.

### 3.3 Compliance Review

#### 3.3.1 Annual Inspection and Report

The disposal site, located approximately 10 miles north of Laguna, New Mexico, and 2 miles east of Seboyeta, New Mexico, was inspected on August 29, 2006. Results of the inspection are

described below. Features and photograph locations (PLs) mentioned in this report are shown on Figure 3-1. Numbers in the left margin of this report refer to items summarized in the Executive Summary table.

### 3.3.1.1 Specific Site Surveillance Features

**Access, Gates, Fences, and Perimeter Signs**—Access to the site is via the all weather public gravel road Cibola County Road 1. Approximately 300 feet of Cebolleta Land Grant (Land Grant) property is crossed to enter the site, and access is provided for and described in the Warranty and Quitclaim Deed for the disposal site. The site access gate, in a chain-link fence constructed along the north property boundary, was secured by a locked chain and was in good condition. The site entrance gate is a tubular metal stock gate located along a barbed-wire perimeter fence; it is accessed via a dirt track that enters the property through the chain-link access gate. The entrance gate was locked and in excellent condition.

3A A chain-link security fence encompasses the former mill site. This fence follows portions of the north and east site property lines; the remainder of the fence is inside DOE property. The chain-link fence is not included in the LTSP as a site surveillance feature; it was left in place to serve as a second barrier for site security, but was not intended to be maintained. Due to vandalized and missing gates (PL-1 and PL-2), damage caused by storm runoff (PL-3), and general deterioration (PL-4), DOE decided to remove the fence. Demolition is scheduled for 2007. This fence forms the boundary for a grazing license that allows the Cebolleta Land Grant to graze the 280-acre portion of DOE land that lies between the fence and the site property boundary. DOE will amend the license to allow the Land Grant to graze the additional area between the chain-link fence and the interior barbed-wire fence.

3B Inside the chain-link fence is a five-strand barbed-wire stock fence that encompasses the tailings impoundment and associated drainage structures. This perimeter fence is a site surveillance feature and is intended to prohibit trespassing on the disposal cell structures. An unused gate near the southeast corner of the fence was stolen during the past winter. The gate opening subsequently was permanently closed with new barbed-wire strands. The fence was in excellent condition at the time of the inspection. Thirty perimeter warning/no trespassing signs are attached to the fence at approximately 500-foot intervals, and are identical to the signs on the chain-link fence. The perimeter signs were in excellent condition.

**Site Markers and Boundary Monuments**—The granite site marker, located immediately inside the access gate, was in excellent condition. Eight flush-mounted boundary monuments installed at property tract corners are in excellent condition.

**Monitor Wells**—The site ground water monitoring network consists of ten wells. Nine of the wells are located on the DOE site; background monitor well MW-29A is located outside the northeast corner of the site. Some well locations do not have established access roads or tracks but are accessible by 4-wheel drive vehicle as long as the ground is dry. Each well was inspected and was secure and in good condition.

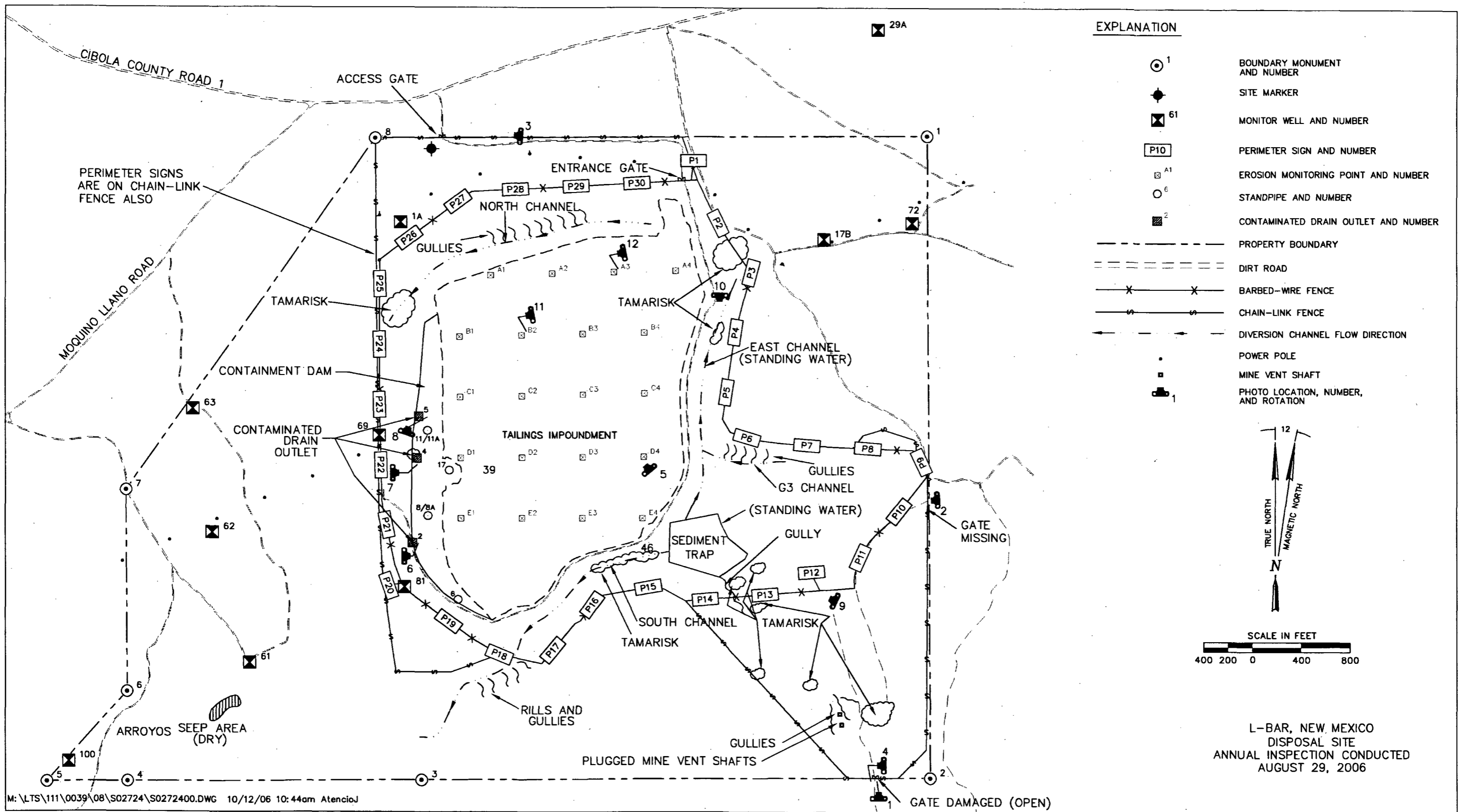


Figure 3-1. 2006 Annual Compliance Drawing for the L-Bar, New Mexico, Disposal Site

### 3.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into four areas referred to as transects: (1) the cover of the tailings impoundment; (2) the containment dam; (3) the diversion channels; and (4) the site perimeter, outlying areas, and balance of the site.

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

**Cover of the Tailings Impoundment**—The tailings impoundment, completed in 2000, occupies approximately 100 acres. The cover consists of a compacted clay layer overlain by clay-rich soil and ranges from 6 to 10 feet thick. Its surface is minimally sloped to the west towards the central portion of the containment dam to promote drainage and minimize runoff water velocities and the potential for erosion. The cover was not seeded; revegetation is occurring naturally with native species. The establishment and maturing of vegetation is expected to reduce wind and water erosion of the surface and mitigate precipitation and runoff infiltration to the radon barrier.

Due to above-normal rainfall during the summer, the surface of the impoundment cover was wet with numerous areas of shallow standing water (PL-5). The low areas accumulating the rainfall, which are no more than a couple of inches below the surrounding grade, most likely resulted from wind erosion shortly after the impoundment cover was completed. The hummocky appearance noted during the 2005 inspection was verified to be caused by wind erosion and deposition that is no longer actively occurring. Elongated mounds of fine-grained soil are aligned with the prevailing wind direction, and are located immediately downwind of old stalks from sunflower and kochia plants. Vegetation is establishing on the mounds. The ephemeral pools of water and windblown deposits do not impair the function of the cover materials.

In accordance with the LTSP, erosion and vegetation are monitored on the cell cover. A description of the monitoring program and the results to date are presented in Section 3.3.4.2.

**Containment Dam**—The tailings impoundment was constructed by damming the upper portion of a natural drainage basin. The face of the earthen containment dam has a 20 percent slope and is rock-armored to prevent erosion and degradation. Native vegetation is encroaching on the face, which is desirable for increasing the erosion protection of the surface. There were no indications of erosion, settlement, seepage, or other modifying processes that might affect the integrity of the dam.

3C During the 2005 inspection, discolored rock and soil were noted where a small polyvinyl chloride (PVC) pipe exited the base of the containment dam. A subsequent investigation of site records indicated that a network of eight PVC drainage systems was installed during remediation to collect leachate from the tailings stored behind the dam. The leachate was then pumped back to an evaporation pond in the impoundment area. The drains were grouted in 1996 after leachate discharge essentially ceased. In May 2006, the site was revisited to measure the radioactivity and collect a sample of the discolored material. The other drain outlets were found, and two of them also had discolored rock and soil. Surface scans indicated that the material was radioactive, and analytical results of the samples indicated that all three locations contained elevated levels of radiological constituents representative of the impounded tailings. It appears that three of the

grouted drains leaked for an unknown period of time after decommissioning and that leachate residue accumulated on the rock and bedding materials at the outlet locations (PL-6 through PL-8). Additional samples were collected in August 2006 and analyzed to provide information for shipping and disposal purposes. Remediation of the three contaminated areas is scheduled for fall 2006.

Several PVC standpipes formerly used for monitoring moisture levels during reclamation activities are present on the dam but are no longer active and are not surveillance features. The standpipes are scheduled for decommissioning in 2008.

**Diversion Channels**—The surface water diversion system consists primarily of the East, North, and South Channels that divert runoff water away from the impoundment. The system is designed to accommodate Probable Maximum Flood discharges.

Runoff from the watershed upgradient of the tailings impoundment is designed to be conveyed away from the site to a northeastward flowing drainage via the East Channel. The East Channel is separated from the impoundment by a riprap-armored dike. Storm runoff is expected to drop a significant portion of its sediment load in the Sediment Trap constructed at the base of the watershed before overtopping the trap and entering the East Channel. The Sediment Trap is designed to function for 600 years prior to needing to be excavated. A tributary channel, the G3 Channel, was constructed to divert runoff from a smaller watershed into the East Channel. Gullies are present in the soft soils and fill materials adjacent to the Sediment Trap and the G3 Channel; however, the erosion is not degrading the function of the structures or affecting the integrity of the tailings impoundment. Due to recent storm events, the Sediment Trap and East Channel were holding substantial quantities of water at the time of the inspection (PL-9 and PL-10).

Runoff water from the area north of the tailings impoundment is captured by the North Channel. The water is diverted away from the site to the west. Erosion is actively occurring on the south-facing slope of the channel but is not degrading the function of the channel or affecting the integrity of the tailings impoundment. Shallow standing water was present in much of the channel.

The South Channel diverts storm runoff from the higher terrain immediately south of the tailings impoundment towards the channel outlet to the west. Two riprap aprons were constructed on the north-facing slope to inhibit erosion along natural drainage paths. Erosion is occurring on the unprotected slope surfaces but is not degrading the performance of the channel or affecting the integrity of the tailings impoundment.

Despite active erosion on several channel slopes, the diversion channels were in an excellent condition to function as designed. The erosion is expected to stabilize as vegetation continues to establish.

**Site Perimeter, Outlying Areas, and Balance of the Site**—Only portions of the north and east property boundaries are fenced as described in Section 3.1.1 above. The site is surrounded by open private land that is used primarily for grazing. Grazing is allowed on DOE property outside of the barbed-wire fence. Due to vandalism and trespassing issues at the site, a local contractor has been retained to check site security periodically, remove trespassing livestock, and repair fences.



The Tres Hermanos Sandstone unit of the Mancos Shale Formation crops out in the southwest corner of the site. This unit is hydraulically connected to contaminated ground water under the impoundment, and the outcrop has been observed as an evapotranspiration area. There was no evidence of seepage from the unit at the time of the inspection. This location will continue to be monitored for seepage and recommended for sampling if water is present.

Several legacy features including concrete pads, sewer manholes, and plugged mine ventilation shafts are present near the southeast corner of the site. These features will be monitored to ensure that they remain secure.

The southwest portion of the property has arroyos that are typical of the region. Access to monitor well MW-100, located in the extreme southwest corner of the property, is via an unimproved dirt track that could be eroded away by an adjacent arroyo. The track was accessible at the time of the inspection.

### **3.3.1.3 Noxious Plants**

3D Noxious weeds were not observed on the site during the inspection. However, tamarisk, commonly known as salt cedar, is present on the impoundment cover, in diversion channels, and in other locations downstream of the impoundment. Stands of mature tamarisk are common in the arroyos in the vicinity of the site. In accordance with State of New Mexico requirements, tamarisk needs to be controlled at the site to eliminate it as a seed source. The tamarisk plants on the impoundment cover are small, and most were cut and their stems treated with herbicide during the inspection. Some plants were inaccessible due to standing water. Removal of the mature tamarisk on site is scheduled for 2007. Efforts to eradicate the tamarisk on the site will continue.

### **3.3.2 Follow-up Inspections**

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed. The site was revisited in May 2006 to investigate the discolored material found at the base of the containment dam as described in Section 3.3.1.2.

### **3.3.3 Routine Maintenance and Emergency Measures**

During 2006, the opening resulting from a missing unused gate was permanently closed with barbed wire, and tamarisk on the cell cover was cut and treated with herbicide.

Emergency measures are corrective actions that DOE will take in response to unusual damage or disruption that threaten or compromise site health and safety, security, integrity, or compliance with 40 CFR 192. No emergency measures were required in 2006.

### 3.3.4 Environmental Monitoring

#### 3.3.4.1 Ground Water Monitoring

3E Ground water monitoring is required at the L-Bar site. The monitoring network consists of 10 DOE wells and two Moquino Water Users Association wells. Table 3-2 lists the wells that are in the monitoring network. Water level, pH, and electrical conductivity will be measured at the time of sampling, and the samples will be analyzed for uranium, selenium, chloride, sulfate, nitrate, and total dissolved solids. Analytical results will be compared to the alternate concentration limits (ACL) and alternative abatement standards (AAS) provided in Table 3-3.

Table 3-2. Ground Water Monitoring Network for the L-Bar, New Mexico, Disposal Site

Monitor Well	Network Application
MW-1A	POC source zone well
MW-17B	POC source zone well
MW-29A	Background well
MW-61	Seepage indicator well
MW-62	Seepage affected area indicator well
MW-63	POE seepage indicator well
MW-69	POC source zone well
MW-72	POE well on east property boundary
MW-81	POC source zone well
MW-100	POE well on west property boundary
Moquino Well (new)	Water users supply well in Moquino
Moquino Well (old)	Backup supply well in Moquino

Key: POC = point-of-compliance; POE = point-of-exposure

Table 3-3. Ground Water Alternate Concentration Limits and Alternate Abatement Standards for the L-Bar, New Mexico, Disposal Site

Analyte	New Mexico Standard	ACL (MW-1A, 17B, 69, 81)	AAS Source Zone (MW-1A, 17B, 69, 81)	AAS Affected Area (MW-62)
Chloride (mg/L)	250	N/A	1,127	N/A
Nitrate (mg/L)	10.0	N/A	1,180	N/A
Selenium (mg/L)	0.05	2.0	2.0	N/A
Sulfate (mg/L)	4,000 <sup>a</sup>	N/A	13,110	5,185
TDS (mg/L)	5,880 <sup>a</sup>	N/A	20,165	7,846
Uranium (mg/L)	5.0	13.0	13.0	N/A

<sup>a</sup>Background value.

Key: AAS = alternate abatement standard; ACL = alternate concentration limit; mg/L = milligrams per liter; N/A = not applicable; TDS = total dissolved solids

Annual ground water monitoring commenced in November 2005, and the results are provided in Table 3-4 (the old Moquino Well could not be sampled). The intent of the initial annual monitoring is to determine the effect of discontinuing the barrier well pumping on ground water quality at the site. If annual monitoring results demonstrate that seepage from the impoundment is under control, after 3 years the sampling frequency will be reduced to once every 3 years in accordance with the LTSP. Ground water monitoring will continue as long as a New Mexico Standard (Table 3-3) is exceeded in any well.

If an ACL or AAS is exceeded, DOE will inform NRC of the exceedance and conduct confirmatory sampling. If confirmatory sampling verifies the exceedance, DOE will develop an evaluative monitoring work plan and submit that plan to NRC for review prior to initiating the evaluative monitoring program. Results of the evaluative monitoring program will be used, in consultation with NRC, to determine if corrective action is necessary.

Table 3-4. November 2005 Ground Water Monitoring Results at the L-Bar, New Mexico, Disposal Site

Monitor Well	Analyte (mg/L)					
	Chloride	Nitrate	Selenium	Sulfate	TDS	Uranium
MW-1A	270	0.031	0.00002	3,000	5,400	0.0031
MW-17B	430	490	0.3	5,000	12,000	0.034
MW-29A	150	0.011	0.00002	4,100	6,600	0.00016
MW-61	98	0.045	0.00002	3,100	4,900	0.00028
MW-62	44	0.01	0.00002	520	1,400	0.00007
MW-63	42	0.21	0.00003	500	1,400	0.00016
MW-69	740	39	0.0052	9,400	16,000	5.6
MW-72	160	4.3	0.013	3,900	6,200	0.0079
MW-81	120	16	0.05	4,800	7,700	0.019
MW-100	31	0.53	0.00006	2,600	3,900	0.0015
Moquino Well (new)	4.4	0.01	0.00002	110	530	0.00023

Key: mg/L = milligrams per liter; TDS = total dissolved solids

No ACL or AAS Source Zone levels were exceeded in any of the POC wells, and no AAS Affected Area levels were exceeded in MW-62. Therefore, the ground water at the site is in compliance with the LTSP requirements. At least one New Mexico Standard is exceeded in six of the DOE wells, including background well MW-29A (sulfate and TDS), so ground water monitoring at the site is expected to continue indefinitely.

### 3.3.4.2 Erosion Monitoring Program

As required by the LTSP, an Erosion Monitoring Program (EMP) was developed to address potential erosion of the tailings impoundment cover over time. Sohio Western Mining Company developed the plan at the request of the New Mexico Water Quality Control Commission as a condition for granting Alternate Abatement Standards for ground water at the L-Bar site.

The cover of the impoundment consists of a compacted layer of clay, to function as a radon barrier, overlain by clay-rich soil materials. Total thickness of the cover ranges from 6 to 10 feet. The cover, completed in 2000, was not seeded, so revegetation is occurring naturally with locally occurring annual and perennial plant species. Vegetation is expected to help mitigate wind and water erosion.

The EMP consists of two parts: (1) measuring erosion and (2) measuring the progress of revegetation. Measurements were made during the annual site inspection on August 29, 2006.

**Erosion Monitoring**—In accordance with the EMP, a grid of 20 evenly spaced monitoring points was installed on the cover in November 2003 by the former licensee. These points are shown on Figure 3-1. The locations were measured in December 2003 to provide a baseline data set.

Each monitoring point consists of a rebar surrounded by three metal t-posts that were installed to help locate the rebar and provide orientation for the measurements. A 5-foot long piece of half-inch diameter epoxy-coated rebar was driven at each point such that approximately 1 foot remained above the cover surface. Each rebar has an attached circular metal tag indicating the point location number. The t-posts are set approximately 6 feet from the rebar and form an equilateral triangle, with one point of the triangle due east from the rebar. As an additional identification aid, the t-posts have been sprayed with orange anti-rust enamel paint.

Erosion measurement is accomplished by placing a 4-foot level centered at the base of the rebar such that the east end of the level points to the easternmost t-post (PL-11). The height of the rebar is measured from the base of the level to the top of the rebar and is recorded to the nearest 1/16-inch, in accordance with the method established during baseline measurements in 2003.

In accordance with Appendix C of the LTSP, erosion measurements will be performed annually for 20 years (through 2024), and once every 10 years for the following 80 years. The decision point for considering erosion "excessive" will be reached when 2 feet of erosion is noted at greater than 50 percent of the monitoring points. If this occurs, DOE will initiate discussions with NRC to assess likely remedial scenarios and develop an appropriate mitigation protocol, if required.

3F

Results of the 2006 measurements are presented in Table 3-4. Baseline measurements are included for comparison. As indicated in Table 3-4, the surface elevation has increased at all of the monitoring points when compared to the baseline measurements, with increases ranging from 0.375 to 2.438 inches. Furthermore, the surface elevation increased at all monitoring points when compared to 2005 measurements. These results indicate that erosion is not occurring at the monitoring points. The soil cover includes weathered Mancos Shale, which often contains high concentrations of swelling clay and gypsum. When the surface is dry, it is characterized by cracked and fluffy soil, often resulting in minor increases in surface elevation of the cover. Also, the amount of vegetation on the cover has increased substantially since 2003, which may be raising the surface elevation through root growth, accumulation of organic materials in the surface soil, and/or trapping windblown sediment derived from locations upwind of the tailings impoundment.

**Vegetation Monitoring**—Ten vegetation monitoring locations were established in accordance with the EMP. Plots were established at existing erosion monitoring points to streamline measurement activities at the site (monitoring points A1, A3, B2, B4, C1, C3, D2, D4, E1, and E3). At each location, the three t-posts were used to form three corners of the plot; the fourth point was projected south of the easternmost t-post to form a parallelogram covering approximately 100 square feet.

The primary requirement is to measure the density of live vegetation within the plot. However, vegetation types were also noted, in addition to the percentage of litter (organic detritus often consisting of dead annual plants), rock, and bare ground.

Table 3-4. Erosion Monitoring Measurements on the L-Bar, New Mexico, Tailings Impoundment Cover

Monitoring Point	Length of Rebar Above Surface (inches)				Change in Surface Elevation* Baseline to Present (decimal inches)
	2003 (Baseline)		2006		
	(fraction)	(decimal)	(fraction)	(decimal)	
A1	12 10/16	12.625	10 12/16	10.750	1.875
A2	12 7/16	12.438	11 10/16	11.625	0.813
A3	12 15/16	12.938	10 8/16	10.500	2.438
A4	12 6/16	12.375	10 14/16	10.875	1.500
B1	12 10/16	12.625	10 15/16	10.938	1.688
B2	12 8/16	12.500	12 2/16	12.125	0.375
B3	13	13.000	11 4/16	11.250	1.750
B4	12 15/16	12.938	11 2/16	11.125	1.813
C1	12 8/16	12.500	10 13/16	10.813	1.688
C2	13 1/16	13.063	11 12/16	11.750	1.313
C3	12 2/16	12.125	11 1/16	11.063	1.063
C4	12 6/16	12.375	11 9/16	11.563	0.813
D1	12 7/16	12.438	11 3/16	11.188	1.250
D2	12 12/16	12.750	11 10/16	11.625	1.125
D3	12 3/16	12.188	10 4/16	10.250	1.938
D4	12 12/16	12.750	11 7/16	11.438	1.313
E1	13 1/16	13.063	11 10/16	11.625	1.438
E2	12 14/16	12.875	11 3/16	11.188	1.688
E3	12 9/16	12.563	10 8/16	10.500	2.063
E4	12 15/16	12.938	12 4/16	12.250	0.688

\*A positive change indicates that the surface elevation at that point increased.

The average foliar cover (canopy) of live vegetation in the vicinity of the L-Bar disposal site, according to the U.S. Department of Agriculture, is approximately 25 percent. The predominant vegetation in the area consists of grasses, forbs, and shrubs. In accordance with the EMP, DOE will perform annual vegetation measurements until at least 20 percent foliar cover is achieved. This criterion will be satisfied when over half of the measurement plots exceed 20 percent cover. If a significant reduction in plant density is noted during an annual site inspection, then the plots will be measured again. And, if the plant coverage is less than 20 percent, annual vegetation monitoring will be reinstated until the termination criterion has again been satisfied.

3G Vegetation on the cover appeared to be very healthy due to above-average rainfall during the summer of 2006 (PL-12). Results of the 2006 measurements are presented in Table 3-5. Percent foliar cover represents the approximate total area under the maximum circumference of each of the live plants within the plot. Of the 10 plots assessed for vegetative cover, eight (80 percent) meet or exceed the 20-percent requirement for foliar cover, when both perennial and annual plants are considered. Only three of the vegetation monitoring plots had 20 percent or greater foliar cover in 2005; therefore, vegetation on the cover increased significantly during 2006.

Annual plants do not necessarily germinate each year, and their germination is highly dependent upon weather conditions. Perennial plants produce foliar cover (flowers, leaves) year after year

from the same root structure. If only perennial plants are considered in the vegetative assessment, then 50 percent of the plots meet or exceed the 20-percent foliar cover requirement. Monitoring will continue until more than 50 percent of the plots meet or exceed the 20-percent foliar cover requirement based on perennial plant measurements.

Table 3-5. Vegetation Monitoring Measurements on the L-Bar, New Mexico, Tailings Impoundment Cover

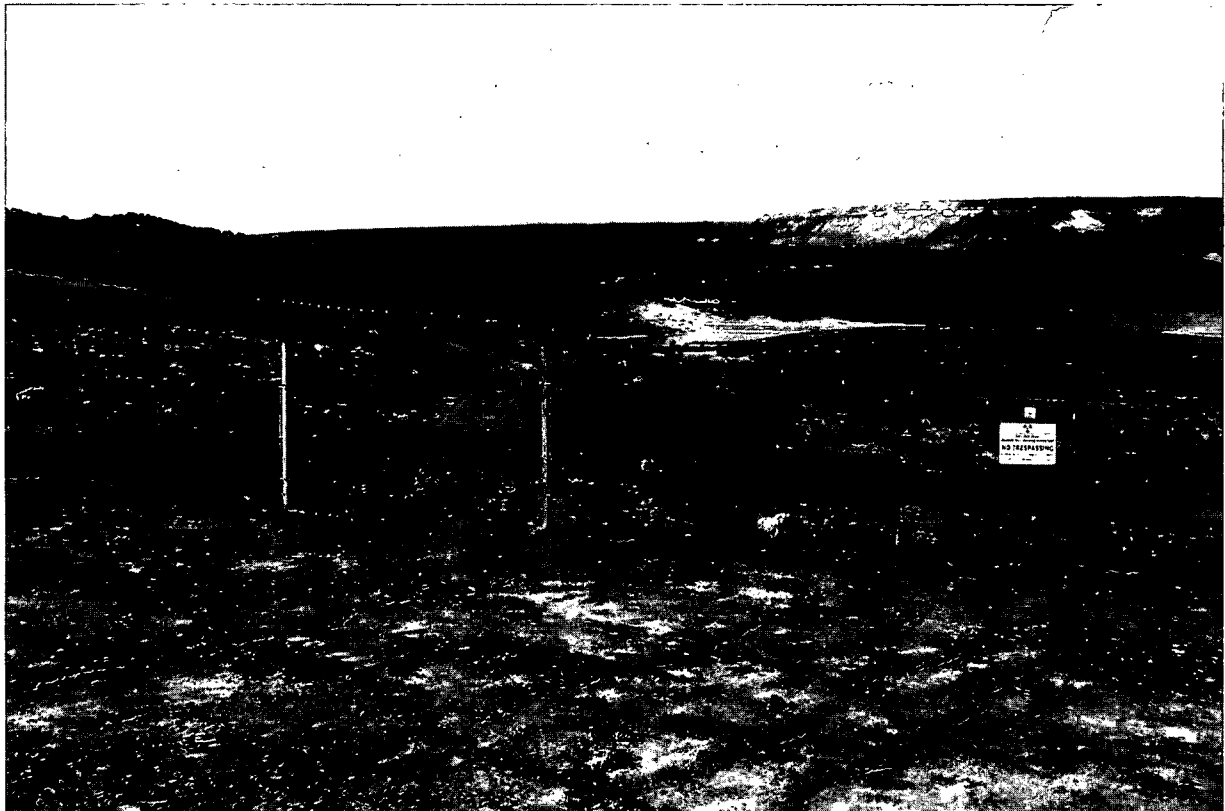
Plot Location	Percent Cover in 100-ft <sup>2</sup> Plots, August 29, 2006				
	Foliar Cover		Litter	Rock	Bare Ground
	Perennial Plants Only	All Live Plants			
A1	69	70	2	trace	28
A3	22	35	2	0	63
B2	0	20	trace	15	65
B4	46	55	2	trace	43
C1	30	30	2	1	67
C3	0	35	2	10	53
D2	0	0	8	2	90
D4	0	2	8	2	88
E1	4	58	2	5	35
E3	22	35	2	trace	63

### 3.3.5 Photographs

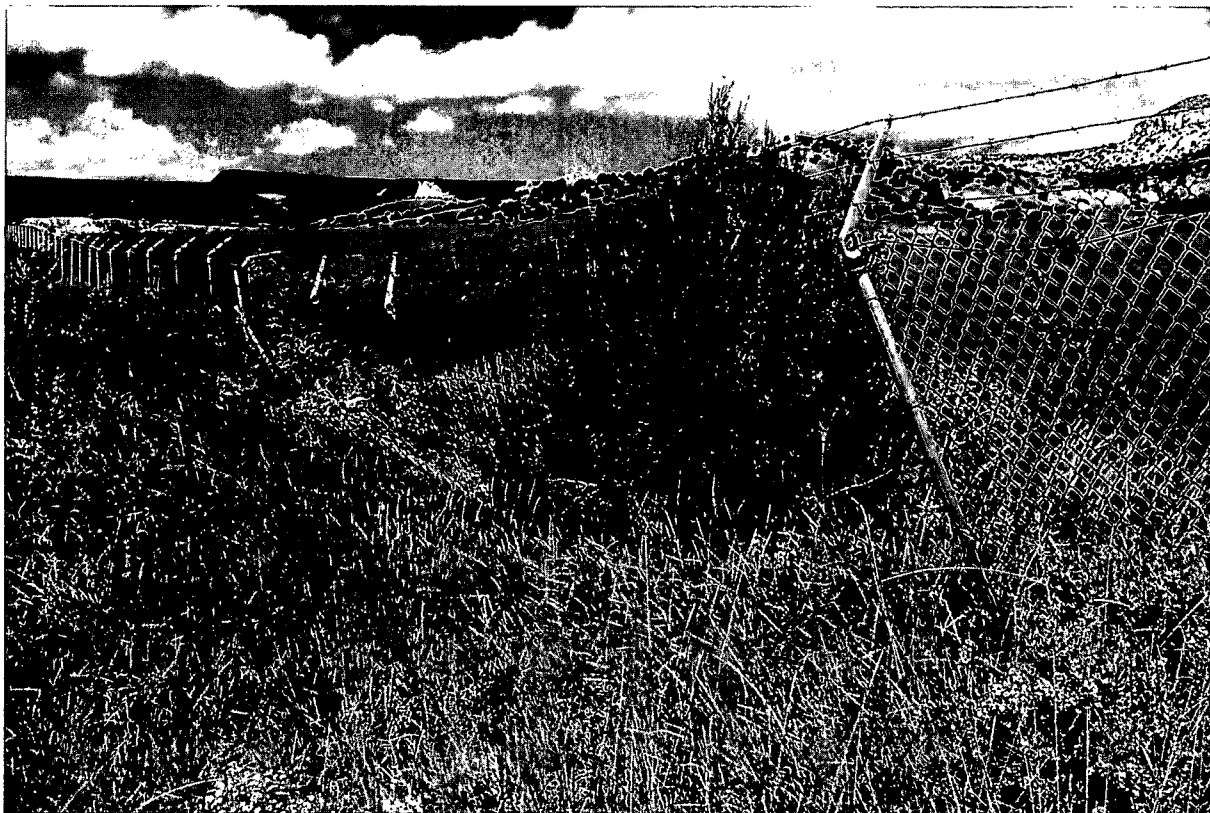
Photograph Location Number	Azimuth	Description
PL-1	0	Damaged chain-link fence gate located in the southeast corner of the site.
PL-2	265	Missing chain-link fence gate located on the east side of the site.
PL-3	275	Runoff-damaged section of chain-link fence east of the site access gate.
PL-4	270	Poor condition of the chain-link fence in the southeast corner of the site.
PL-5	320	Standing water in a shallow windblown depression on the impoundment cover.
PL-6	90	Contaminated drain outlet #2 at the base of the containment dam.
PL-7	90	Contaminated drain outlet #4 at the base of the containment dam.
PL-8	20	Contaminated drain outlet #5 at the base of the containment dam.
PL-9	295	Standing water in the Sediment Trap.
PL-10	180	Standing water in the East Channel.
PL-11	260	Erosion monitoring point and vegetation plot B2.
PL-12	260	Erosion monitoring point and vegetation plot A3.



*BAR 8/2006. PL-1. Damaged chain-link fence gate located in the southeast corner of the site.*



*BAR 8/2006. PL-2. Missing chain-link fence gate located on the east side of the site.*



*BAR 8/2006. PL-3. Runoff-damaged section of chain-link fence east of the site access gate.*



*BAR 8/2006. PL-4. Poor condition of the chain-link fence in the southeast corner of the site.*





*BAR 8/2006. PL-5. Standing water in a shallow windblown depression on the impoundment cover.*



*BAR 8/2006. PL-6. Contaminated drain outlet #2 at the base of the containment dam.*



*BAR 8/2006. PL-7. Contaminated drain outlet #4 at the base of the containment dam.*



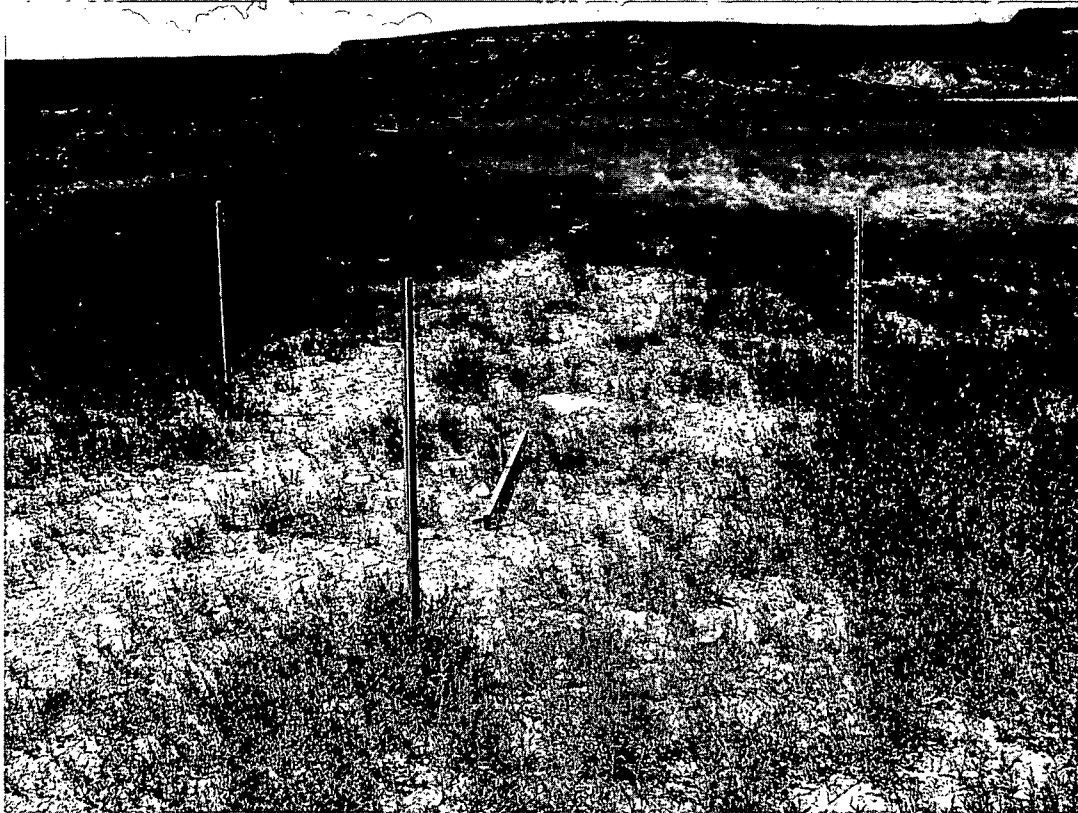
*BAR 8/2006. PL-8. Contaminated drain outlet #5 at the base of the containment dam.*



*BAR 8/2006. PL-9. Standing water in the Sediment Trap.*



*BAR 8/2006. PL-10. Standing water in the East Channel.*



*BAR 8/2006. PL-11. Erosion monitoring point and vegetation plot B2.*



*BAR 8/2006. PL-12. Erosion monitoring point and vegetation plot A3.*

## 4.0 Sherwood, Washington, Disposal Site

### 4.1 Compliance Summary

The Sherwood, Washington, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II Disposal Site was inspected on July 12, 2006, and was in good condition. The tailings impoundment, dam, and diversion channel were in good condition. Vegetation monitoring continues in an effort to evaluate the effectiveness of biological control of noxious weeds at the site. Ground water monitoring, performed as a best management practice, showed constituent concentrations were less than the action level (State of Washington water quality criteria) for confirmatory sampling. Piezometer water level measurements and the dam inspection verified that the tailings embankment is functioning as designed. No cause for maintenance or a follow-up inspection was identified.

### 4.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Sherwood, Washington, Disposal Site are specified in the *Long-Term Surveillance Plan for the Sherwood Project (UMTRCA Title II) Reclamation Cell, Wellpinit, Washington* (Document Number S00204, U.S. Department of Energy [DOE], Grand Junction, Colorado, February 2001) and in procedures established by DOE to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.28 (10 CFR 40.28). License requirements for this site are listed in Table 4-1.

Table 4-1. License Requirements for the Sherwood, Washington, Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.3 and 3.4	Section 4.3.1
Follow-up Inspections	Section 3.5	Section 4.3.2
Routine Maintenance and Emergency Measures	Section 3.6	Section 4.3.3
Environmental Monitoring	Section 3.7	Section 4.3.4

**Institutional Controls**—The United States of America, in trust for the Spokane Tribe of Indians, owns the 380-acre disposal site. The site was accepted under the U.S. Nuclear Regulatory Commission general license (10 CFR 40.28) in 2001. Because the site is located on the Spokane Indian Reservation, no agreement of transfer was necessary for conveying the property rights to DOE. However, an agreement for long-term surveillance, maintenance, and permanent right of access, which allows DOE to fulfill its custodial responsibilities required for UMTRCA Title II sites, was executed between the Tribe and DOE. The agreement does not prohibit the future use of the site for activities related to uranium mining and milling.

Institutional controls at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, and warning/no trespassing signs placed along the property boundary; the site is not fenced. Verification of these institutional controls is part of the annual inspection.

### 4.3 Compliance Review

#### 4.3.1 Annual Inspection and Report

The site, located near Wellpinit, Washington, was inspected on July 12, 2006. Features and photograph locations (PLs) mentioned in this report are shown on Figure 4-1. Results of the

inspection are described below. Numbers in the left margin of this report refer to items summarized in the Executive Summary table.

#### 4.3.1.1 Specific Site Surveillance Features

**Access, Gates, and Signs**—The disposal site and adjacent lands are part of the Spokane Indian Reservation. The Bureau of Indian Affairs (BIA) maintains the all-weather site road over which DOE has permanent right-of-access. A double-swing steel gate across the road controls access to the Sherwood mine area and Tribe-owned facilities near the disposal site. A chain with several locks (both DOE and BIA) secures the gate. The gate was open at the time of the inspection, apparently to accommodate activities at the Tribe's pump station located near the DOE site.

Six perimeter signs, designated P1 through P6, are placed at likely access points around the site property. The signs are attached at a height of about 5 feet above ground to steel posts set in concrete. Perimeter sign P4 is on a fence line north of the actual site boundary on an old two-track road that is used by ground water samplers to access the site. Perimeter sign P6 has four bullet holes but remains legible; otherwise, the signs are in excellent condition.

4A **Site Markers and Monuments**—One inscribed granite site marker is present on the southwest side of the site where the access road lies closest to the site boundary. The marker was in excellent condition. The scale representing the site dimensions had an incorrect number engraved into the granite (PL-1). The incorrect number was chiseled out and the hole was filled with a mixture of powdered granite and epoxy (PL-2).

4B Six boundary monuments, designated BM-1, BM-2, BM-3, BM-3A, BM-4, and BM-5 define the site boundary. Boundary monument BM-3A is bent but does not require any repairs; all other monuments were in excellent condition. Because surrounding vegetation has made it difficult to locate some of the monuments, metal t-posts were installed at each monument location.

**Monitor Wells**—Three monitor wells are located on the Sherwood site and are designated MW-2B, MW-4, and MW-10. The wells were secure and in good condition.

Four piezometers, designated PZ-1 through PZ-4, were installed in November 2000 along the crest of the tailings dam to a depth equivalent with the base of the dam, as part of the dam safety inspection program. All piezometers were secure and in good condition.

#### 4.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into three areas referred to as transects: (1) the cover of the tailings impoundment; (2) the diversion channel and impoundment dam face; and (3) the area between diversion channel and site boundary, and the outlying area.

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



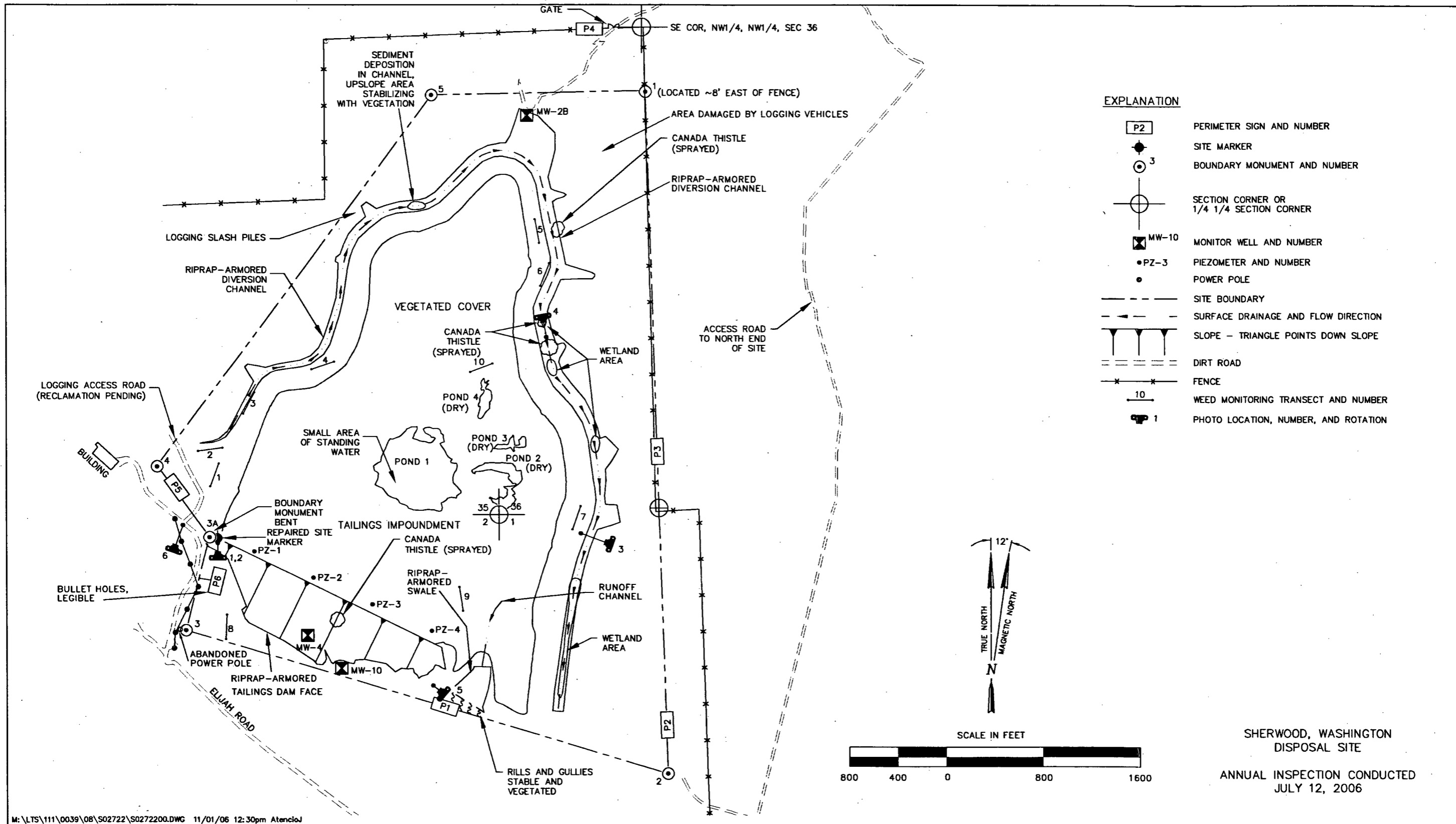


Figure 4-1. 2006 Annual Compliance Drawing for the Sherwood, Washington, Disposal Site

**Tailings Impoundment Cover**—The tailings impoundment cover for the Sherwood site, completed in 1996, consists of 12 to 20 feet of uncompacted soils. During site reclamation, surface soils were seeded and planted with native shrubs, forbs, grasses, and trees. A healthy vegetative cover is needed to provide necessary protection and evapotranspiration of the cover in order to limit infiltration of meteoric water into the impoundment. Reclamation has been successful, as a healthy stand of vegetation is now established. A small, shallow channel developed by runoff from the cell top is present near the southeast corner of the cell. The channel discharges into a riprap-armored swale located east of the tailings dam. The channel is not over an area containing tailings and is stable (it has scoured down to quartz monzonite bedrock).

Designers of the cell predicted that some settlement would continue to occur after placement of the uncompacted cover and that it would be self-healing with regard to impacts from freeze-thaw, biointrusion, and settlement (LTSP, page 2–14). The largest area of settlement is now referred to as Pond 1. Some standing water was present in Pond 1 at the time of the inspection, and the plant species present indicate there is year-round moisture below the surface throughout the approximate 7.7-acre pond area. Other minor depressions designated as Ponds 2, 3, and 4, with a total area of approximately 2 acres, did not contain standing water. The shallow ponds are considered to be favorable features on the cell top, but DOE will continue to monitor the top slope for unusual settlement features such as sinkholes or differential displacement to verify cell cover integrity and ensure that the impoundment is performing as designed.

Vegetation in the area of Pond 1 is composed primarily of native wetland species; the other pond areas contain primarily riparian vegetation. The ponds provide habitat for small mammals, birds, amphibians, and reptiles, and provide an important water source for larger mammals such as deer, elk, and buffalo. A small herd of apparently wild horses was on the disposal cell and at Pond 1 during the time of the inspection (PL–3).

**Diversion Channel and Impoundment Dam Face**—Inspectors walked the length of the riprap-armored diversion channel. Volunteer plant intrusion within the diversion channel, including trees, is evident in most areas of the channel. The channel was designed to allow trees to grow and stabilize the surfaces, and that their presence in the channel is not expected to impact the function of the channel in conveying designed flows. The condition of the riprap cover is good and is the same as that observed during earlier inspections. Sediment deposition is evident in places on the west side of the diversion channel, but does not interfere with the channel's design function; upslope areas that have contributed to the sedimentation are becoming stabilized with vegetation. Several locations of standing water were noted in the channel along the east side of the impoundment during the 2006 inspection. These areas are developing into permanent wetland areas containing wetland plant species and providing habitat for a variety of small mammals and birds (PL–4).

Adjacent to the eastern end of the dam face is a steep slope that is underlain by rock and covered with soil. Rills and gullies noted during previous annual inspections were inspected on this slope at the base of the riprap-armored swale. No new rills were identified, and the existing rills and gullies are becoming well-vegetated and appear to be stable.

4C

The tailings embankment on this site is classified as a dam because of the saturated condition of the impoundment, so an annual dam safety inspection is required to ensure continued compliance with the Federal Dam Safety Act. The impoundment dam face was inspected in accordance with



the attached Dam Inspection Checklist. No evidence of seepage, slumping, erosion, or instability was observed. The rock cover, consisting primarily of highly durable quartz monzonite, is in excellent condition and is effectively preventing erosion of the dam face until vegetation is well established.

The tailings dam face was designed to allow a vegetative cover, including mature trees, to establish and stabilize the surface and prevent erosion. Consequently, the presence of this vegetation does not negatively affect the function of the dam, and the dam will not be compromised if the rock cover eventually degrades. To outcompete undesirable weeds that were establishing on the face of the dam, seeding with desirable species occurred in fall 2004. Extensive vegetative cover, including small Ponderosa pine trees, was observed on the dam face (PL-5). Many seeded species also were observed.

Water level measurements in the four piezometers were taken at the time of the annual ground water sampling. These annual measurements provide a direct means of determining moisture conditions in the dam. Significant increases would trigger an investigation of the performance of the dam. Measurement results from 2000 through 2006 are presented in Table 4-2. Standing water levels in 2006 were consistent with previous years, with no water in piezometers PZ-1, PZ-2, and PZ-4, and 3.04 feet of water in PZ-3. The results verify that moisture conditions in the dam remain constant and that the dam is performing as designed.

Table 4-2. Tailings Dam Piezometer Standing Water Level Measurements at the Sherwood, Washington, Disposal Site

Date	Piezometer (height of water column in feet)			
	PZ-1	PZ-2	PZ-3	PZ-4
November 2000	Dry	3.05	Dry	Dry
July 2001	Dry	1.95	Dry	Dry
August 2002	Dry	2.80	Dry	Dry
July 2003	Dry	3.22	Dry	Dry
July 2004	Dry	2.00	Dry	Dry
July 2005	Dry	0.91	Dry	Dry
July 2006	Dry	3.04	Dry	Dry

Note: The 2000 measurements were taken just after installation.

**Area Between Diversion Channel and Site Boundary, and Outlying Area**—Much of the site perimeter was inspected while locating boundary monuments and warning signs. Ponderosa pine forest comprises most of the surrounding area. The surrounding lands are part of the Spokane Indian Reservation and are used for timber, livestock grazing, and wildlife habitat. No residences are located within 0.25 mile of the site boundary.

4D During the summer of 2005, the BIA proposed to construct a portion of an access road across the southwest corner of the property. The road would follow a reclaimed former mining road and not encroach upon the tailings impoundment, and would be used only for logging operations planned for fall 2005. DOE agreed with the proposal and stipulated requirements to reclaim the road and any other areas on the site damaged by logging operations. Logging operations were completed by the time of the 2006 inspection, but no reclamation activities had occurred. The logging access road provided easy access to the site (PL-6) and there was evidence of trespassing on the diversion channel dike road (vehicle tracks and trash). Also, extensive surface damage caused by logging vehicles was noted in the forested area in the northeast portion of the site. DOE

subsequently sent a letter to BIA requesting that the stipulated reclamation requirements be met. Confirmation of site reclamation has not yet been received by DOE.

#### 4.3.1.3 Noxious Weeds

4E Several infestations of Canada thistle, a Washington State noxious weed, were found in the diversion channel and on the dam face. These plants can be effectively controlled with herbicide. A commercial applicator treated the infested areas in September 2006.

Significant populations of two noxious weed species, diffuse knapweed and dalmatian toadflax, occur throughout and around the Sherwood site, particularly along the diversion channel, its berm, and the access road. The widespread nature and inaccessibility of these noxious weed infestations make chemical control difficult, if not impossible. Therefore, a biological control program was initiated in spring 2003 with the release of six species of insects. The program was continued in 2004 with the release of additional insects by both DOE and Stevens County. The insects attack the target plants in a number of ways, through external feeding of foliage, internal feeding of seed-producing organs by adults and larvae, and internal mining of central taproots. Future applications of insects by DOE will be dependent on the success of biological control efforts.

4F To monitor the progress of the biological weed control efforts, inspectors counted live noxious weeds along ten permanent weed monitoring transects established during the 2004 inspection. The *Methodology for Conducting Annual Monitoring of Noxious Weeds at the Sherwood, Washington, Disposal Site* (GJO-2004-553-TAC, January 2004) describes the monitoring procedure.

The 2006 monitoring data indicate that the number of diffuse knapweed plants along the transects has decreased dramatically. An obvious decrease in diffuse knapweed populations was noted throughout the site as well. It is likely that the released insects are responsible for this change, as weevils were found on most of the remaining knapweed plants. Concurrently, the number of dalmation toadflax plants along the transects has steadily increased or stayed about the same during the last 3 years. Throughout the site, inspectors noted that some dalmation toadflax plants were visibly stressed but, overall, populations of this weedy species were healthy and had noticeably increased. A period of 5 to 7 years, from the time of insect release, is typically needed before significant changes in dalmation toadflax populations occur. Weed monitoring will continue during subsequent inspections.

#### 4.3.2 Follow-up Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed. No follow-up inspections were required in 2006.

#### 4.3.3 Routine Maintenance and Emergency Measures

The granite site marker was modified, metal t-posts were installed at boundary monument locations, and patches of Canada thistle were sprayed with herbicide in 2006. No other maintenance or repairs were required.

Emergency measures are corrective actions that DOE will take in response to unusual damage or disruption that threaten or compromise site health and safety, security, integrity, or compliance with 40 CFR 192. No emergency measures were required in 2006.

#### 4.3.4 Environmental Monitoring

4G Ground water compliance monitoring is not required at the Sherwood site. However, as a best management practice stipulated in the LTSP, DOE conducts limited ground water monitoring for designated indicator parameters. Samples are collected annually from one background well, identified as MW-2B, and two point-of-compliance (POC) wells, identified as MW-4 and MW-10. Samples are analyzed for sulfate, chloride, and total dissolved solids (TDS). Sulfate and chloride are the primary indicator parameters.

Monitoring results will be evaluated for evidence of ground water impact from the reclamation cell. Should the concentration of sulfate or chloride exceed the State of Washington water quality criteria values of 250 milligrams per liter for either parameter, DOE will conduct confirmatory sampling of the POC wells. If the confirmatory sampling verifies the exceedance, DOE will develop an evaluative monitoring work plan, in consultation with the Tribe and BIA, and submit that plan to the U.S. Nuclear Regulatory Commission for review prior to initiating the evaluative monitoring program. Results of an evaluative monitoring program would be used to determine if corrective action is necessary.

Ground water sampling was conducted on July 26, 2006. Analytical results for annual ground water samples collected from 2001 thru 2006 are presented in Table 4-3. Ground water constituent concentrations were substantially less than the action levels (State of Washington water quality criteria) for confirmatory sampling.

Table 4-3. Ground Water Quality Summary for the Sherwood, Washington, Disposal Site

Constituent	Water Quality Criterion	Year	Background Well MW-2B	POC Well MW-4	POC Well MW-10
Chloride, mg/L	250	2001	1.46	6.29	2.35
		2002	1.79	3.10	2.63
		2003	1.33	5.26	2.19
		2004	1.3	2.1	2.5
		2005	1.6	1.8	2.5
		2006	1.8	32	1.3
Sulfate, mg/L	250	2001	3.04	27.50	25.50
		2002	3.17	20.90	27.50
		2003	3.50	27.40	28.10
		2004	3.4	22	28
		2005	3.3	21	30
		2006	3.3	97	30
TDS, mg/L	N/A	2001	242	445	742
		2002	258	418	715
		2003	287	432	705
		2004	250	530	690
		2005	240	410	660
		2006	140	670	610

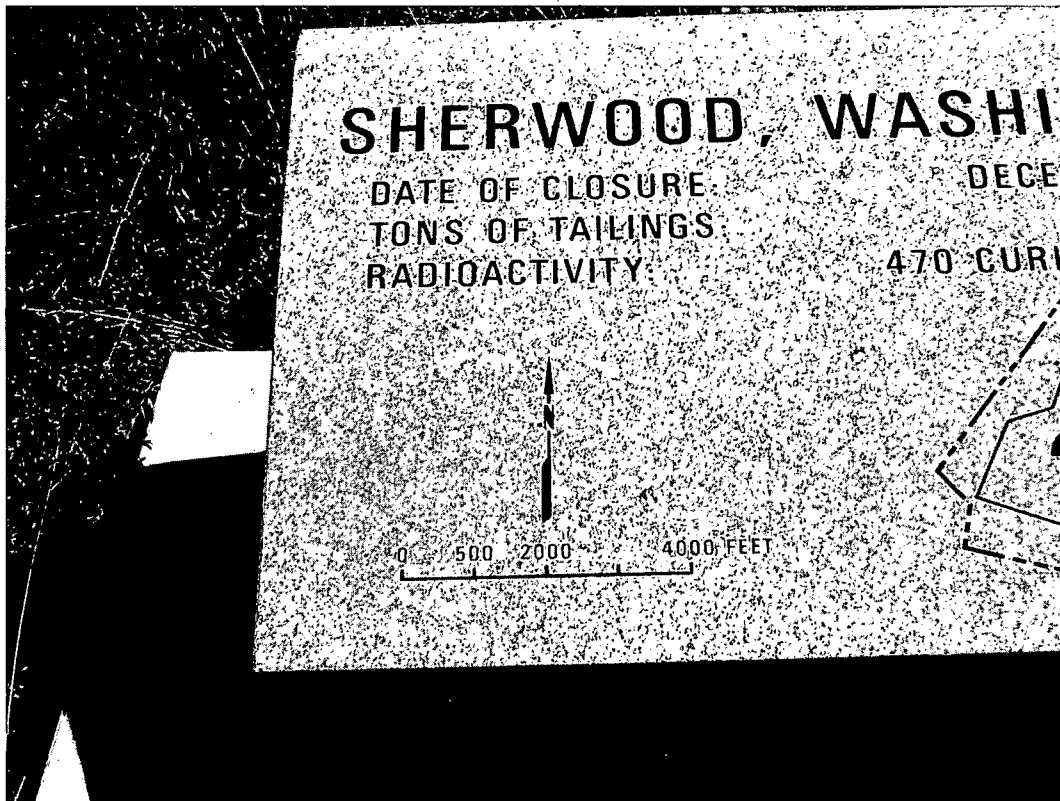
Key: mg/L = milligrams per liter; POC = point of compliance; TDS = total dissolved solids

Note: State of Washington water quality criteria used as action levels.

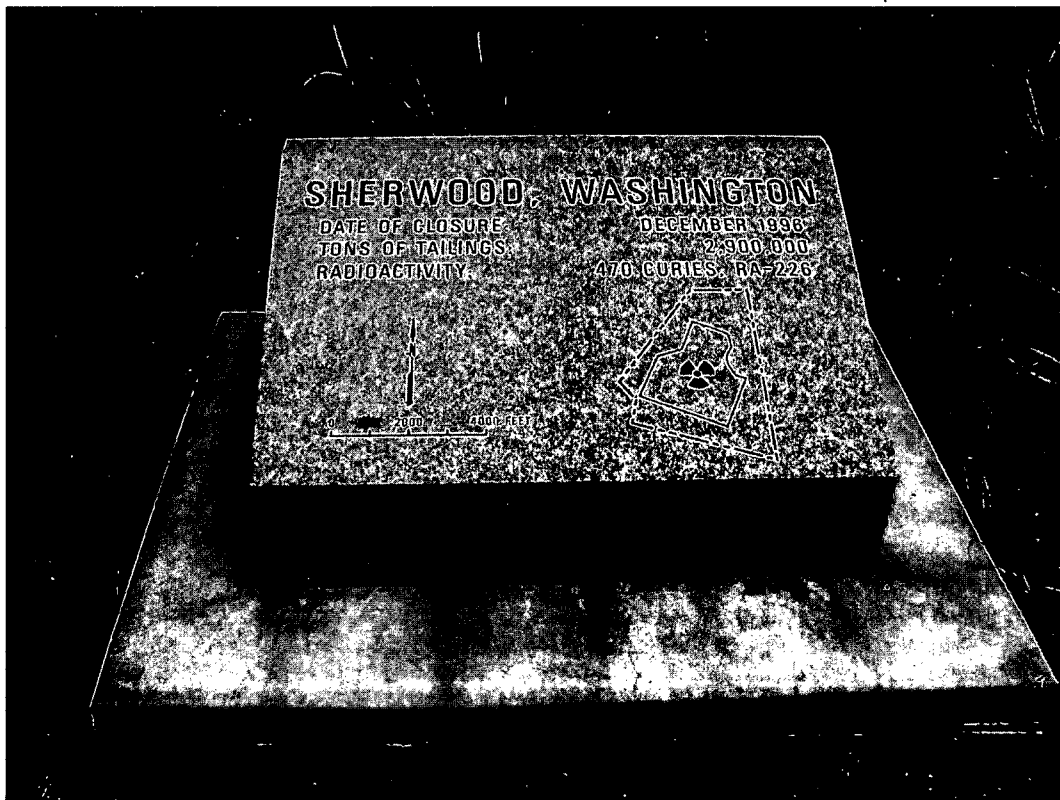
### 4.3.5 Photographs

Table 4-4. Photographs Taken at the Sherwood, Washington, Disposal Site

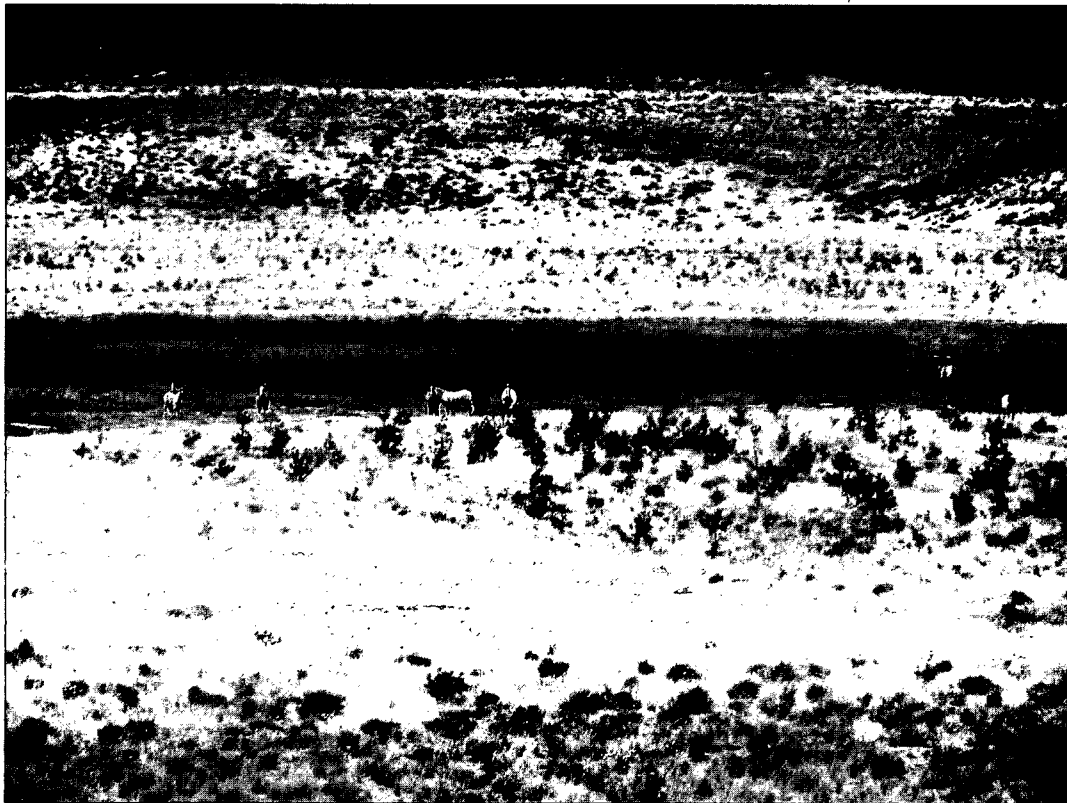
Photograph Location Number	Azimuth	Description
PL-1	0	The site marker prior to repair of the scale.
PL-2	0	The site marker after repair of the scale.
PL-3	290	Wild horses at Pond 1 on the disposal cell top.
PL-4	170	Wetland vegetation in the diversion channel.
PL-5	310	Vegetation on the face of the tailings dam.
PL-6	20	Widened access road entrance to accommodate logging operations.



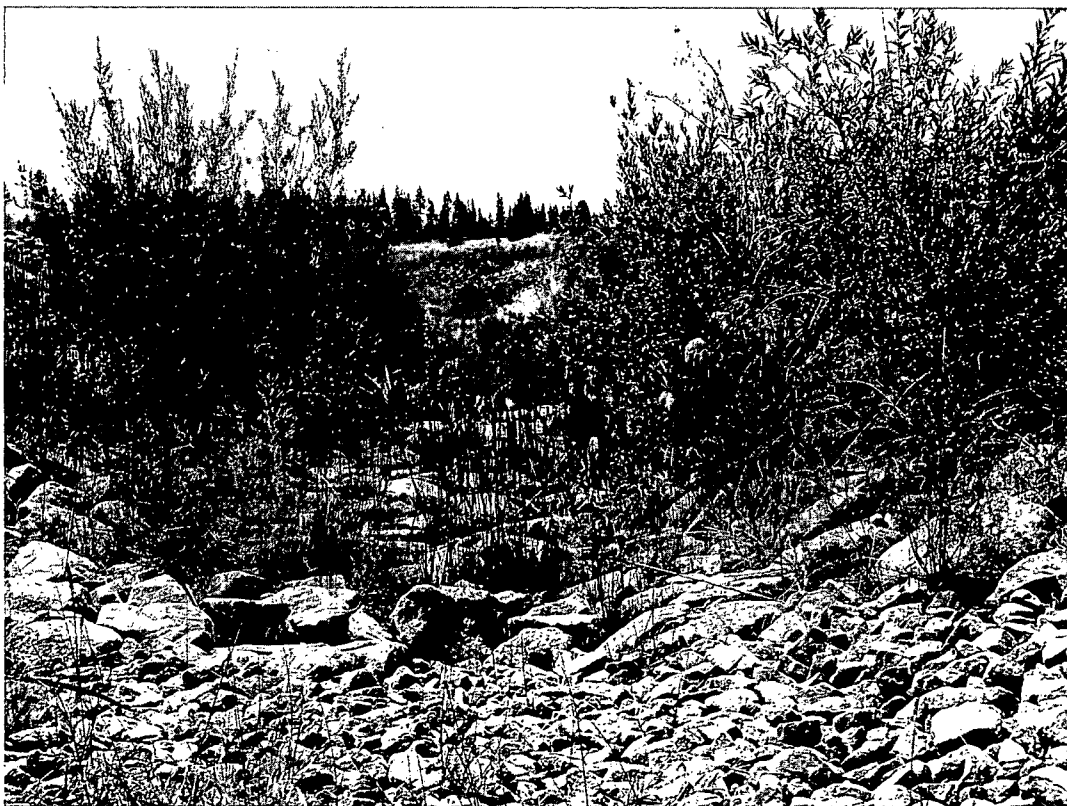
SHE 7/2006. PL-1. The site marker prior to repair of the scale.



SHE 7/2006. PL-2. The site marker after repair of the scale.



*SHE 7/2006. PL-3. Wild horses at Pond 1 on the disposal cell top.*



*SHE 7/2006. PL-4. Wetland vegetation in the diversion channel.*



*SHE 7/2006. PL-5. Vegetation on the face of the tailings dam.*



*SHE 7/2006. PL-6. Widened access road entrance to accommodate logging operations.*

**Dam Inspection Checklist**  
**Sherwood, Washington, UMTRCA Title II Disposal Site**

Date of Inspection: July 12, 2006

<u>Inspector</u>	<u>Organization</u>
R. K. Johnson	S.M. Stoller Corp.

Piezometer PZ-1 current year water depth: Dry  
(Previous year depth: dry)

Piezometer PZ-2 current year water depth: 3.04'  
(Previous year depth: 0.91')

Piezometer PZ-3 current year water depth: Dry  
(Previous year depth: dry)

Piezometer PZ-4 current year water depth: Dry  
(Previous year depth: dry)

Was evidence of significant seepage observed on the dam face?  
If yes discuss in report. No

Was evidence of significant slumping observed on the dam?  
If yes discuss in report. No

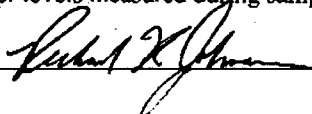
Was evidence of significant erosion observed on the dam?  
If yes discuss in report. No

Was vegetative growth that could compromise dam stability observed?  
If yes discuss in report. No

Was any condition that presents an imminent hazard to human health and  
safety or to the environment observed? No  
If yes immediately contact the following:

DOE Project Manager (970) 248-6048  
NRC Operations Center (301) 951-0550  
Spokane Tribal Police/Sheriff (509) 258-4400  
State Department of Ecology—Dam Safety (360) 407-6625

Note: Piezometer water levels measured during sampling trip on July 26, 2006.

Inspector Signature:  Date: 8/17/06



End of current text

## 5.0 Shirley Basin South, Wyoming, Disposal Site

### 5.1 Compliance Summary

The Shirley Basin South, Wyoming, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II Disposal Site, inspected on June 21, 2006, was in excellent condition. Patches of Canada thistle, a noxious weed, were found at several locations and subsequently were sprayed with herbicide. No other maintenance needs were identified. The second annual ground water sampling event indicated that radium-228 continues to exceed its alternate concentration limit at one point-of-compliance (POC) well. No cause for a follow-up inspection was identified.

### 5.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Shirley Basin South, Wyoming, Disposal Site are specified in the *Long-Term Surveillance Plan [LTSP] for the U.S. Department of Energy Shirley Basin South (UMTRCA Title II) Disposal Site, Carbon County, Wyoming* (DOE-LM/GJ766-2004, December 2004) and in procedures established by DOE to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.28 (10 CFR 40.28). Table 5-1 lists license requirements for this site.

Table 5-1. License Requirements for the Shirley Basin South, Wyoming, Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 3.3 and 3.4	Section 5.3.1
Follow-up Inspections	Sections 3.5	Section 5.3.2
Routine Maintenance and Emergency Measures	Section 3.6	Section 5.3.3
Environmental Monitoring	Section 3.7	Section 5.3.4

**Institutional Controls**—The 1,512-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 40.28) in 2005. DOE is the licensee and, in accordance with the requirements for UMTRCA Title II sites, is responsible for the custody and long-term care of the site. Institutional controls at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no trespassing signs placed along the property boundary, and a locked gate at the site entrance. Verification of these institutional controls is part of the annual inspection. No offsite institutional controls are needed because contaminated ground water is limited to the area within the federal land boundary.

### 5.3 Compliance Review

#### 5.3.1 Annual Inspection and Report

The disposal site, located approximately 35 miles south of Casper, Wyoming, was inspected on June 21, 2006. Results of the inspection are described below. Features and photograph locations (PLs) mentioned in this report are shown on Figure 5-1. Numbers in the left margin of this report refer to items summarized in the Executive Summary table.

### 5.3.1.1 Specific Site Surveillance Features

**Access, Gates, Fences, and Perimeter Signs**—Access to the Shirley Basin South Disposal Site is immediately off of Carbon County Road 2 and is unimpaired; no private property is crossed to gain access. A wire entrance gate is secured by a locked chain and was in excellent condition.

A four-strand barbed wire perimeter fence encompasses the site and is in excellent condition. Sections along the north perimeter that were open at the time of the 2005 inspection were closed with temporary wire fence at the time of the 2006 inspection. These sections are used by Pathfinder Mines Corporation (Pathfinder) to gain access to a topsoil stockpile area on the DOE site. Additional information regarding this activity is provided in Section 5.3.1.2.

Property ownership/warning signs (perimeter signs) are positioned around the disposal cell at 25 locations, and another 9 signs are located along the site perimeter at potential points of access. Other than bullet damage to one sign (P2), the signs were in excellent condition.

**Site Marker and Boundary Monuments**—The granite site marker, located at the site entrance, was in excellent condition. All 27 boundary monuments delineating DOE property were located and found to be in excellent condition during the 2005 inspection, and several were verified during the 2006 inspection.

**Monitor Wells**—The site ground water monitoring network consists of eight wells, and all of them are located on the site. Each well was inspected and found to be in excellent condition and secured with a DOE lock. The wells are accessible by vehicle along reclaimed former mine roads.

### 5.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into three areas referred to as transects: (1) the cover of the tailings impoundment; (2) the containment dam and diversion channels; and (3) the balance of the site and the site perimeter.

Within each transect, inspectors examined specific site surveillance features. Each transect was inspected for evidence of erosion, settling, slumping, or other disturbances that might affect site integrity or the long-term performance of the cell.

**Cover of the Tailings Impoundment**—The tailings impoundment, completed in 2000, covers approximately 142 acres and has a grass cover. The cover is constructed at two elevations separated by a riprap-protected slope (PL-1). The eastern (upper) surface is contoured to drain into a basin east of the cover and west over a riprap-protected slope to the western (lower) surface. The lower surface drains (PL-2) to the north and south toward riprap-protected discharge points (PL-3). The grass was well established and healthy. There were no indications of erosion, settlement, or other modifying processes that might affect the integrity of the cell.

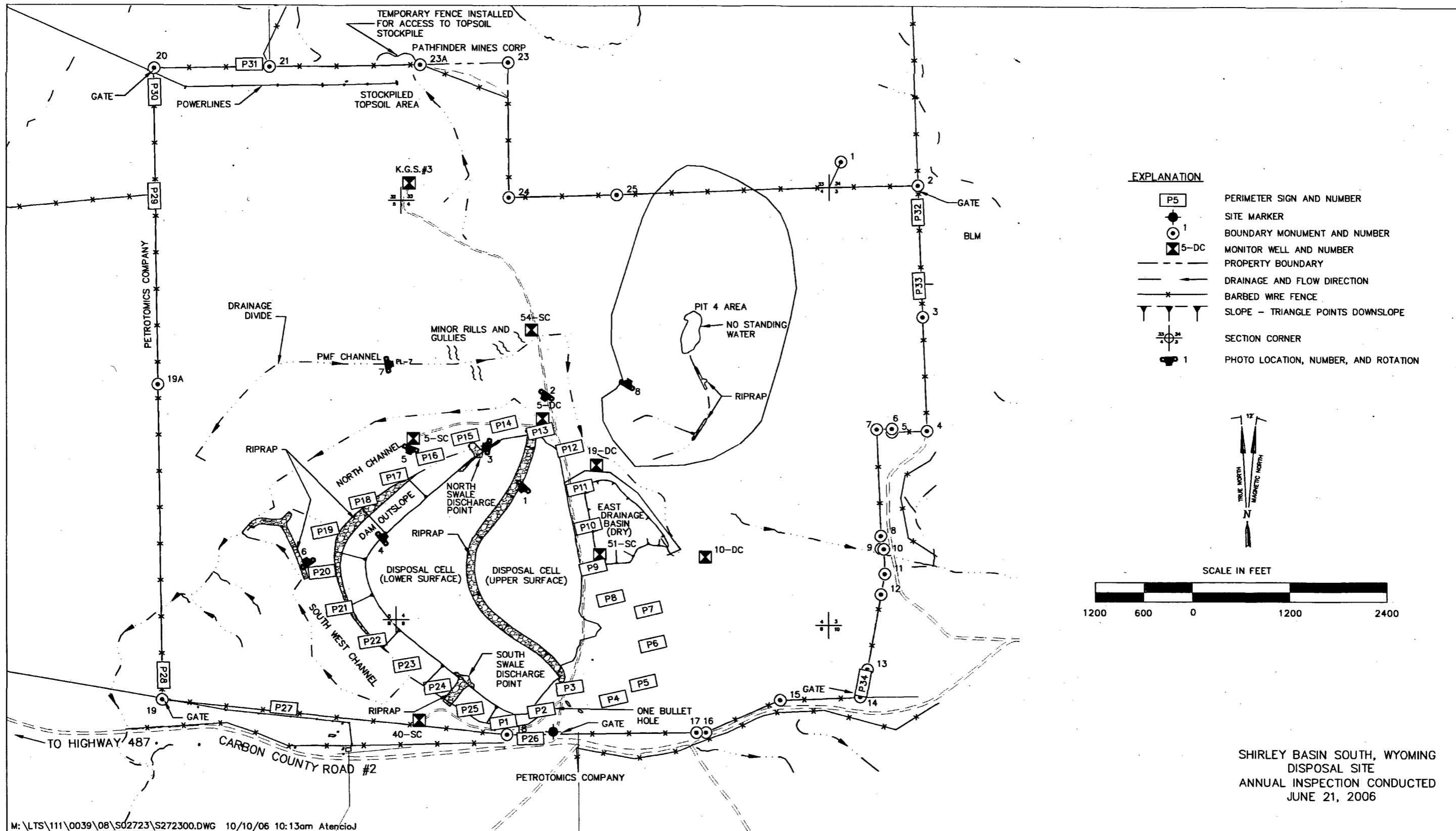


Figure 5-1. 2006 Annual Compliance Drawing for the Shirley Basin South, Wyoming, Disposal Site

**Containment Dam and Diversion Channels**—The tailings pile was reclaimed in place and was contained behind a horseshoe-shaped earthen dam. The containment dam is predominantly grass covered (PL-4), with the north and south swale discharge points and the steeper sections at the toe of the dam protected by riprap (PL-5). There were no indications of erosion, settlement, or other modifying processes that might affect the integrity of the dam.

The surface water diversion system consists of a combination of contoured surfaces and drainage and collection channels. Riprap armor was placed on the steeper slopes and flow concentration points where design flow velocities would have the potential to erode surfaces and possibly impact the tailings dam and impoundment (PL-6). A probable maximum flood (PMF) channel was constructed north of the tailings impoundment. Part of the PMF channel drains to the southwest and discharges to a small closed basin. A larger drainage area is captured by the portion of the PMF channel that flows eastward (PL-7) and discharges into the East Drainage Basin. These closed drainage basins are large enough to accommodate the PMF water volumes. Minor erosion is occurring at locations on the uphill and downhill slopes along the PMF channel, but is not affecting the function of the channel.

**Balance of the Site and the Site Perimeter**—The other major feature on the site is reclaimed Pit 4 located in the northeast portion of the site (PL-8). Reclamation activities included rounding the side slopes, partially backfilling the pit to an elevation above the local water table, revegetating the surfaces, and protecting potential erosion areas with riprap. Vegetation is well established, and no areas of active erosion were observed from the rim of the excavation.

The site is surrounded by private property and public land administered by the U.S. Bureau of Land Management (BLM). Land on three sides is used primarily for livestock grazing. Pathfinder is the property owner north of the site and is in the process of completing the UMTRCA Title II Shirley Basin North disposal site. Pathfinder's access to and use of stockpiled topsoil on the DOE site is in accordance with an agreement between Petrotomics Company, the former owner of the Shirley Basin South site, and Pathfinder. In accordance with the agreement, DOE is the successor to Petrotomics and the terms of the agreement remain in effect. The Wyoming Department of Environmental Quality (WDEQ) extended Pathfinder's mine area permit to include the soil stockpile area and requires that Pathfinder reclaim the disturbed area, including fence replacement, when finished removing topsoil from the stockpile. DOE contacted Pathfinder and WDEQ following the 2005 inspection and clarified responsibilities, work scope and duration, and liabilities.

5A DOE is in the process of establishing a grazing license with a local rancher. The license will allow the rancher to graze the site with his livestock, mow the grass on the disposal cell, and use water from well K.G.S. #3 for stock watering purposes (at the request of DOE, the State of Wyoming has changed the permitted use of the well from monitoring only to monitoring and stock water use). In exchange for these uses of the site, the rancher will be responsible for maintaining the perimeter fence and notifying DOE of observed trespassing, vandalism, erosion, or other problems at the site.

### 5.3.1.3 Noxious Weeds

5B Patches of Canada thistle, a state-listed noxious weed, were found at several locations on the site. They were most prevalent along the edges of riprap. The infestations were sprayed with herbicide in July and September 2006 in an effort to prevent the spread of the weeds and eventually eradicate them.

### 5.3.2 Follow-up Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed. No follow-up inspections were required in 2006.

### 5.3.3 Routine Maintenance and Emergency Measures

Noxious weeds were sprayed with herbicide in 2006. No other maintenance or repairs were required.

Emergency measures are corrective actions that DOE will take in response to unusual damage or disruption that threaten or compromise site health and safety, security, integrity, or compliance with 40 CFR 192. No emergency measures were required in 2006.

### 5.3.4 Environmental Monitoring

5C Ground water monitoring is required at the Shirley Basin South site. The monitoring network consists of eight DOE wells (Table 5-2). Water level, pH, and electrical conductivity will be measured at the time of sampling, and the samples will be analyzed for uranium, radium-226, radium-228, thorium-230, cadmium, chromium, lead, nickel, selenium, chloride, nitrate, sulfate, and total dissolved solids. Analytical results will be compared to the alternate concentration limits (ACLs) and ground water protection standards provided in Table 5-3. There are no applicable limits or standards for nitrate at this site; it will be measured as an indicator of contaminant migration. Water level elevations are measured at the wells to evaluate flow direction as the upper aquifers recover from mining and reclamation activities.

Table 5-2. Ground Water Monitoring Network  
for the Shirley Basin South, Wyoming, Disposal Site

Monitor Well	Network Application
5-SC	POC well; Upper Sand Aquifer
40-SC	Upgradient well; Upper Sand Aquifer
51-SC	POC well; Upper Sand Aquifer
54-SC	Upper Sand Aquifer
5-DC	POC well; Main Sand Aquifer
10-DC	Main Sand Aquifer
19-DC	POC well; Main Sand Aquifer
K.G.S. #3	Lower Sand Aquifer

Key: POC = point-of-compliance

Table 5-3. Alternate Concentration Limits and Ground Water Protection Standards for the Shirley Basin South, Wyoming, Disposal Site

Analyte	ACL	Ground Water Protection Standard <sup>a</sup>
Uranium (mg/L)	9.2	N/A
Radium-226 (pCi/L)	91.3	N/A
Radium-228 (pCi/L)	25.7	N/A
Thorium-230 (pCi/L)	2409	N/A
Cadmium (mg/L)	0.079	N/A
Chromium (mg/L)	1.83	N/A
Lead (mg/L)	0.05	N/A
Nickel (mg/L)	6.15	N/A
Selenium (mg/L)	0.12	N/A
Chloride (mg/L)	N/A	2,000
Sulfate (mg/L)	N/A	3,000
TDS (mg/L)	N/A	5,000

<sup>a</sup>Wyoming Class III Ground Water Protection Standards for livestock use are applicable to this site.

Key: ACL = alternate concentration limit; mg/L = milligrams per liter; pCi/L = picocuries per liter; TDS = total dissolved solids

The intent of the annual ground water quality monitoring is to verify that the ACLs are not exceeded at POC wells, and to verify continued compliance with the pertinent ground water protection standards. If an ACL is exceeded at a POC well, or trends indicate a ground water protection standard may be exceeded at the site boundary, DOE will inform NRC and WDEQ of the results and conduct confirmatory sampling. If the confirmatory sampling verifies the exceedance or threat of exceedance, DOE will develop an evaluative monitoring work plan and submit that plan to NRC for review prior to initiating the evaluative monitoring program. Results of the evaluative monitoring program will be used, in consultation with NRC, to determine if corrective action is necessary.

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The results for cadmium in POC well MW-5-SC and radium-228 in POC well MW-5-DC for the initial sampling in July 2005 exceeded their respective ACL. Therefore, confirmatory sampling and analysis for cadmium and radium-228 at the two POC wells was conducted in November 2005 and the results confirmed the initial findings. When compared with historical results provided by the previous site owner, the results for cadmium in well MW-5-SC were within the range of historical measurements with no apparent upward or downward trend. The 2005 results for radium-228 in well MW-5-DC were substantially above historical measurements. Although an ACL is not applicable to non-POC well MW-54-SC, the 2005 radium-228 concentrations were substantially above the ACL value of 25.7 pCi/L; however, historical data indicate that radium-228 has equaled or exceeded the ACL on all but four semi-annual sampling events beginning in 1995. This analytical information was provided to NRC and WDEQ with a recommendation to continue annual monitoring and perform an evaluation after 5 years of results to determine if corrective action is necessary.

Ground water sampling was conducted in July 2006. Analytical results, validated in October 2006, are provided Table 5-4. The concentration for cadmium in POC well MW-5-SC returned to a value below the ACL. However, radium-228 continued above the ACL in POC well MW-5-DC and non-POC well MW-54-SC. There are insufficient data to confirm trends at this point in time. No other ACLs were exceeded.

Table 5-4. 2006 Ground Water Monitoring Results at the Shirley Basin South, Wyoming, Disposal Site

Analyte (Limit or Standard)	Upper Sand Aquifer Wells				Main Sand Aquifer Wells			Lower Sand Aquifer Well
	5-SC (POC)	40-SC	51-SC (POC)	54-SC	5-DC (POC)	10-DC	19-DC (POC)	KGS #3
Cadmium (0.079 mg/L)	0.044	0.00021	0.00067	0.0012	0.00018	0.00012	0.0002	0.00013
Chloride (2,000 mg/L)	310	120	370	340	180	58	87	10
Chromium (1.83 mg/L)	0.36	0.0014	0.37	0.230	0.034	0.0007	0.0014	0.0012
Lead (0.05 mg/L)	0.0012	0.00016	0.00017	0.00037	0.00019	0.00016	0.0002	0.00017
Nickel (6.15 mg/L)	3.0	0.018	2.3	3.5	0.94	0.00095	0.14	0.0021
Nitrate/Nitrite as N (mg/L)	1.2	0.28	0.45	0.31	0.35	0.016	0.072	0.01
Radium-226 (91.3 pCi/L)	ND	0.198	0.183	14.5	10.3	17.8	6.23	0.226
Radium-228 (25.7 pCi/L)	1.85	1.55	0.51	101	47.1	5.17	7.71	0.682
Selenium (0.12 mg/L)	0.022	0.004	0.00019	0.00014	0.0001	0.00002	0.00002	0.00002
Sulfate (3,000 mg/L)	13,000	2,400	11,000	8,100	5,500	1,000	2,700	220
Thorium-230 (2,409 pCi/L)	489	ND	6.71	6.07	1.86	0.426	ND	ND
TDS (5,000 mg/L)	20,000	4,000	16,000	13,000	8,600	1,800	4,200	430
Uranium (9.2 mg/L)	3.8	0.0004	0.023	0.066	0.1	0.011	0.0002	0.00012
Water Elev. (feet)	7000.07	7049.32	6993.75	6950.67	6938.44	6940.05	6939.28	6944.34

Key: mg/L = milligrams per liter; ND = not detected; pCi/L = picocuries per liter; POC = point-of-compliance well; TDS = total dissolved solids

Although ground water protection standards apply to water quality at the site boundary, the values were exceeded for sulfate and TDS in wells MW-5-SC, 51-SC, 54-SC, and 5-DC. When compared with 2005 data and historical results provided by the previous site owner, the 2006 results were within the range of historical measurements and there is no apparent upward trend that would indicate ground water protection standards may be exceeded at the site boundary.

Analytical results from well MW-K.G.S. #3 confirm that the Lower Sand Aquifer is hydraulically isolated from the upper aquifers. This conclusion is based on significantly lower concentrations of chloride, nitrate, sulfate, TDS, and uranium in the Lower Sand Aquifer when compared with the upper aquifers.

The LTSP specifies that this report provide iso-concentration maps for uranium and sulfate. However, the four wells in the Upper Sand Aquifer and the three wells in the Main Sand Aquifer do not provide sufficient data points to develop contour maps of the contaminant plumes. Instead, 2006 concentrations for uranium in the two aquifers are shown on Figures 5-2 and 5-3, and concentrations for sulfate are shown on Figures 5-4 and 5-5.



Ground water contour maps are also specified in the LTSP; however, insufficient data points are provided through the well network to develop them. Estimated flow directions for the Upper Sand Aquifer and the Main Sand Aquifer are shown on Figures 5-6 and 5-7. The flow directions are based on the 2006 data in combination with historical measurements obtained from a much larger well network that existed prior to transfer of the site to DOE.

### 5.3.5 Photographs

Photograph Location Number	Azimuth	Description
PL-1	225	Riprap-armored slope separating the upper and lower disposal cell surfaces.
PL-2	215	The lower surface of the disposal cell with monitor well 5-DC in the foreground.
PL-3	280	The north swale discharge point.
PL-4	50	View northeast along the dam of the lower disposal cell surface.
PL-5	200	Riprap-armored toe of the dam outslope.
PL-6	325	Riprap-armored drainage channel west of the disposal cell.
PL-7	80	View downgradient (east) along the PMF channel.
PL-8	30	The north end of Pit 4.

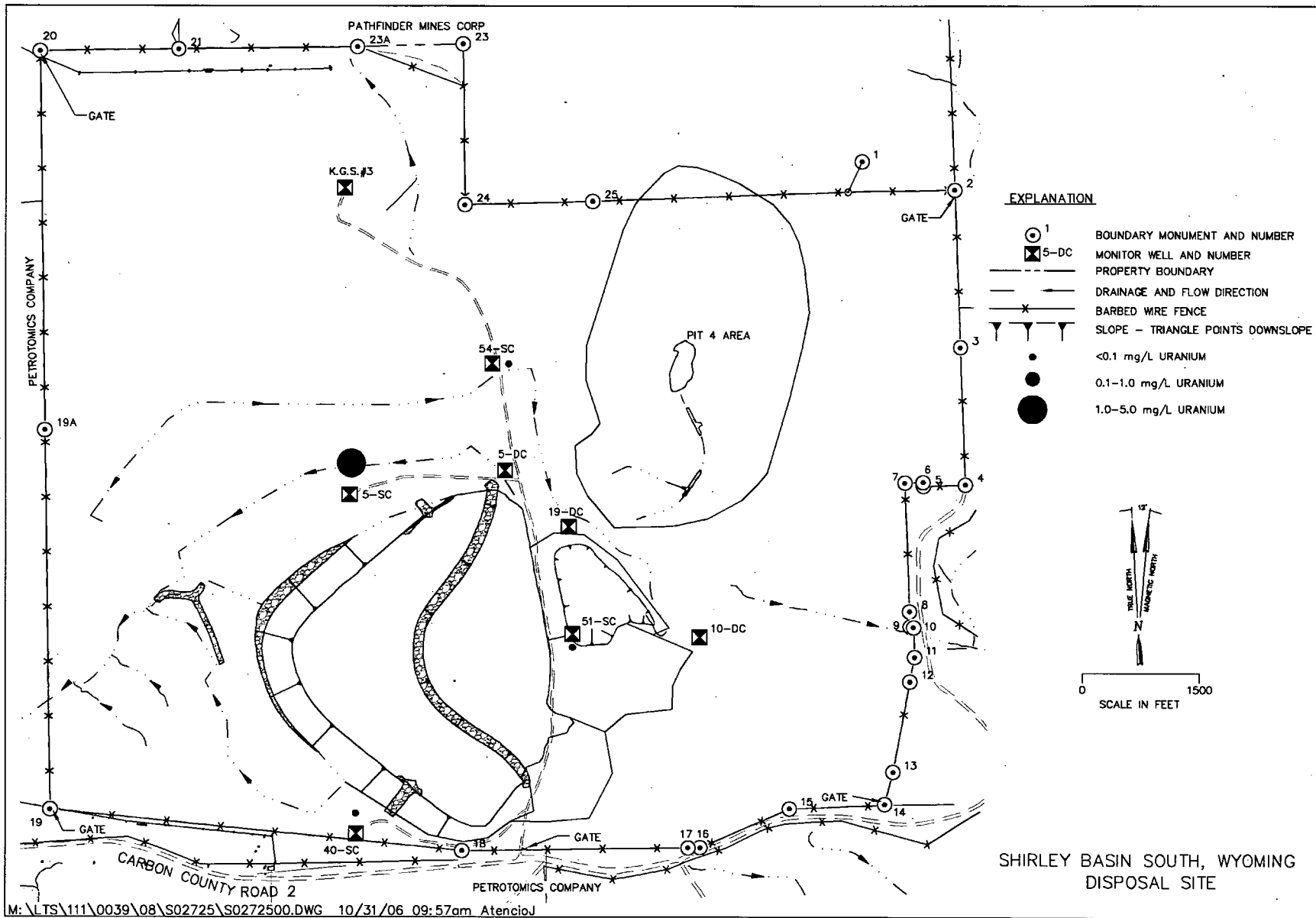


Figure 5-2. July 2006 Uranium Concentrations in the Upper Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

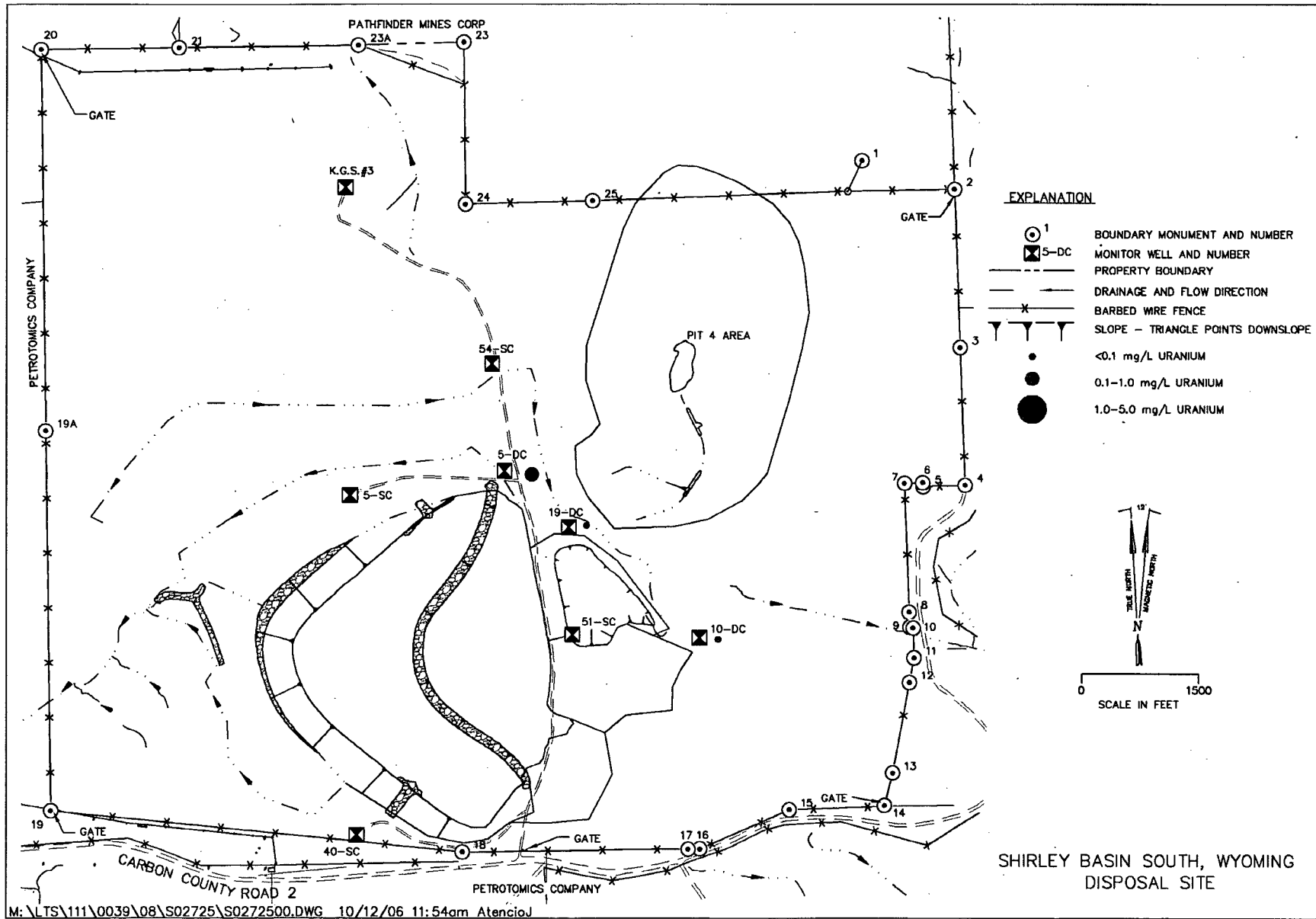


Figure 5-3. July 2006 Uranium Concentrations in the Main Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

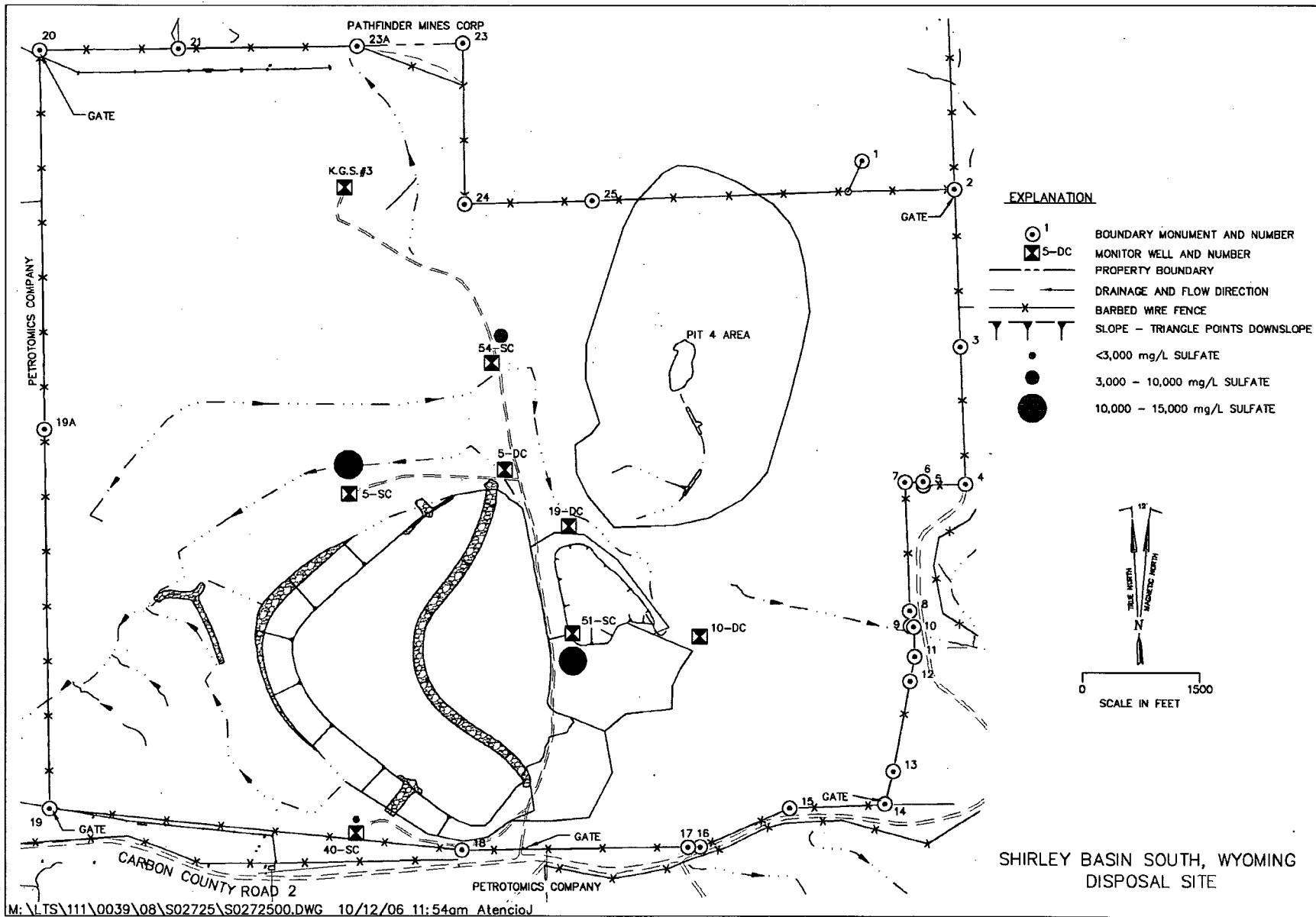


Figure 5-4. July 2006 Sulfate Concentrations in the Upper Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

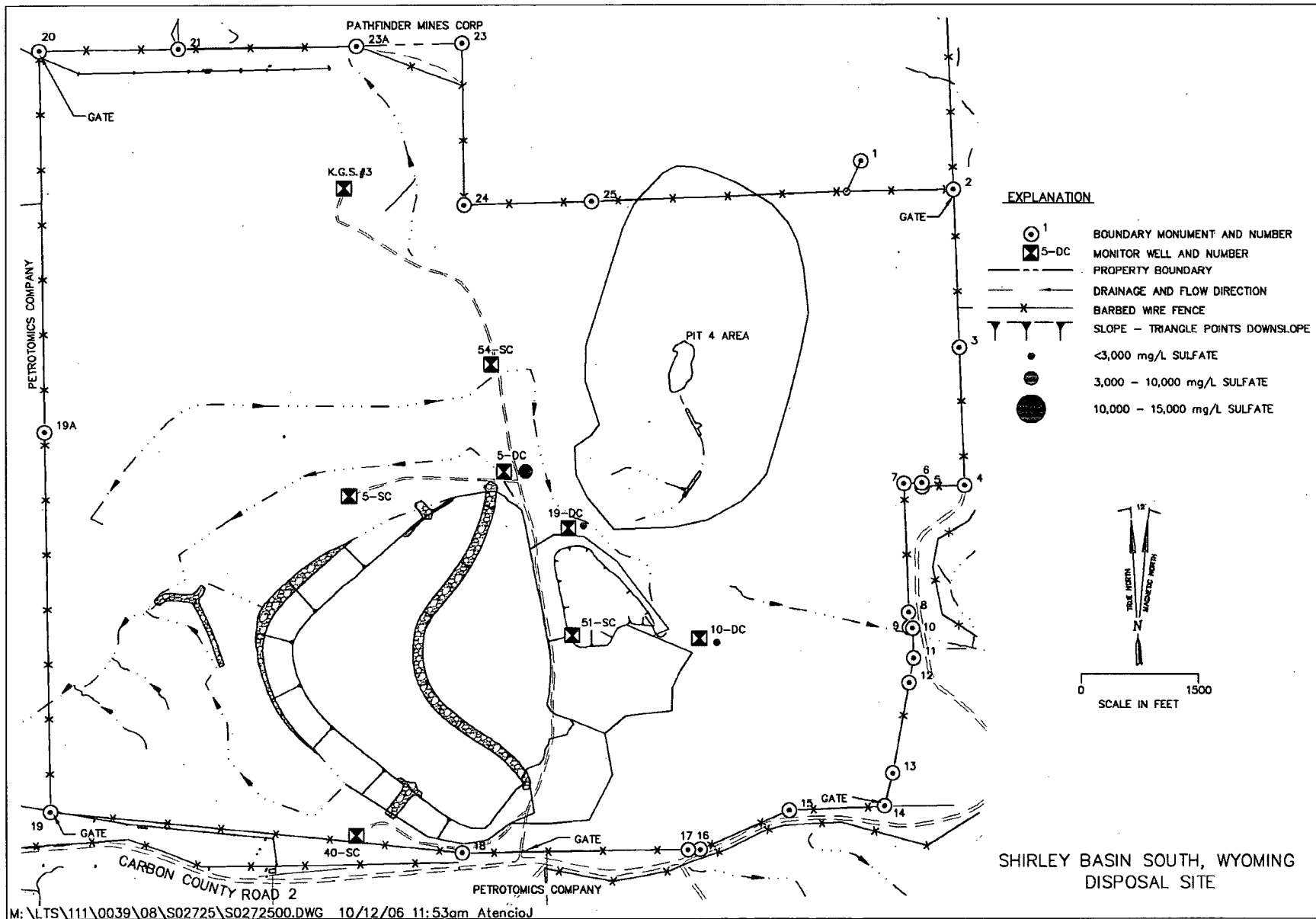


Figure 5-5. July 2006 Sulfate Concentrations in the Main Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

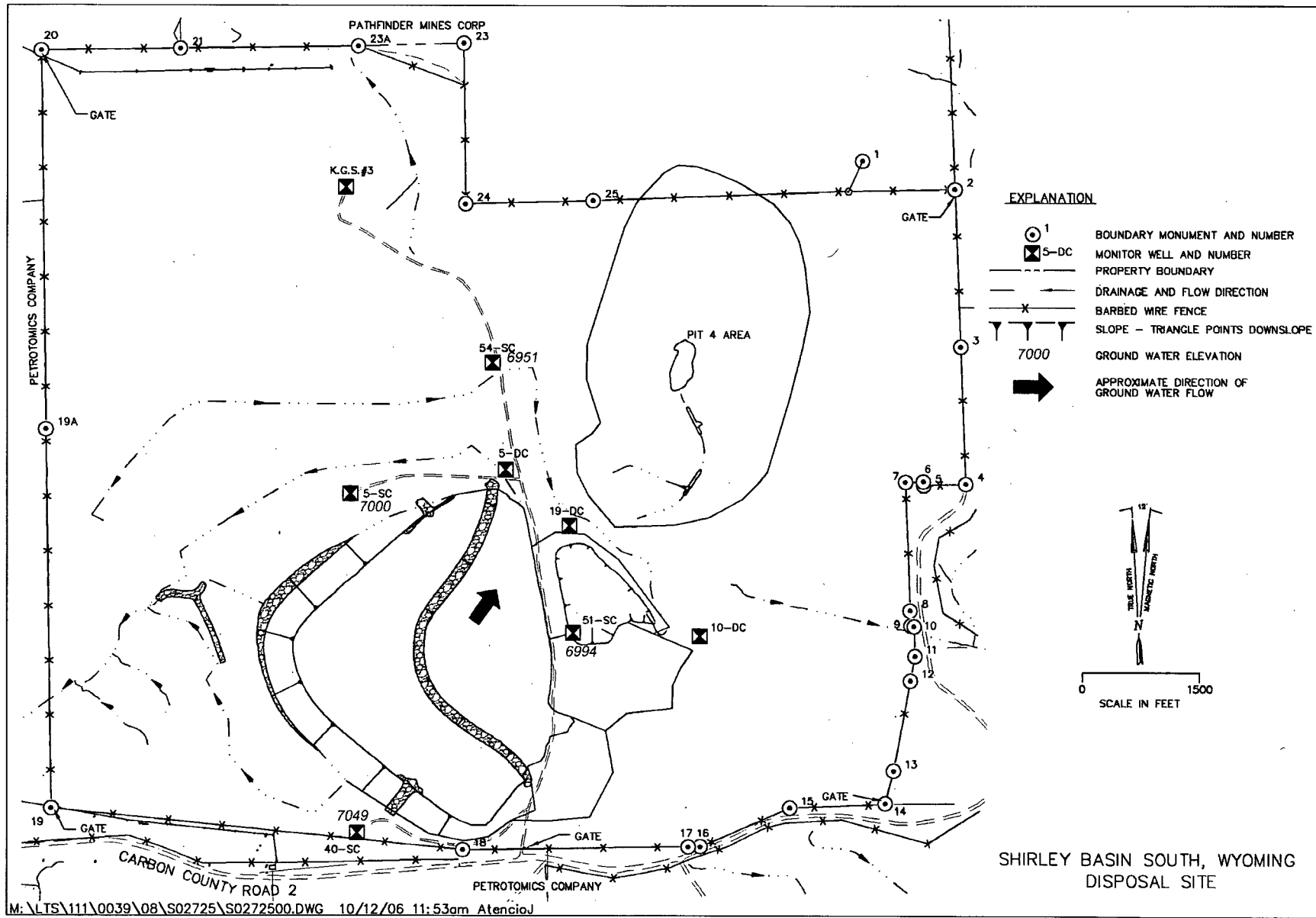


Figure 5-6. Ground Water Flow in the Upper Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

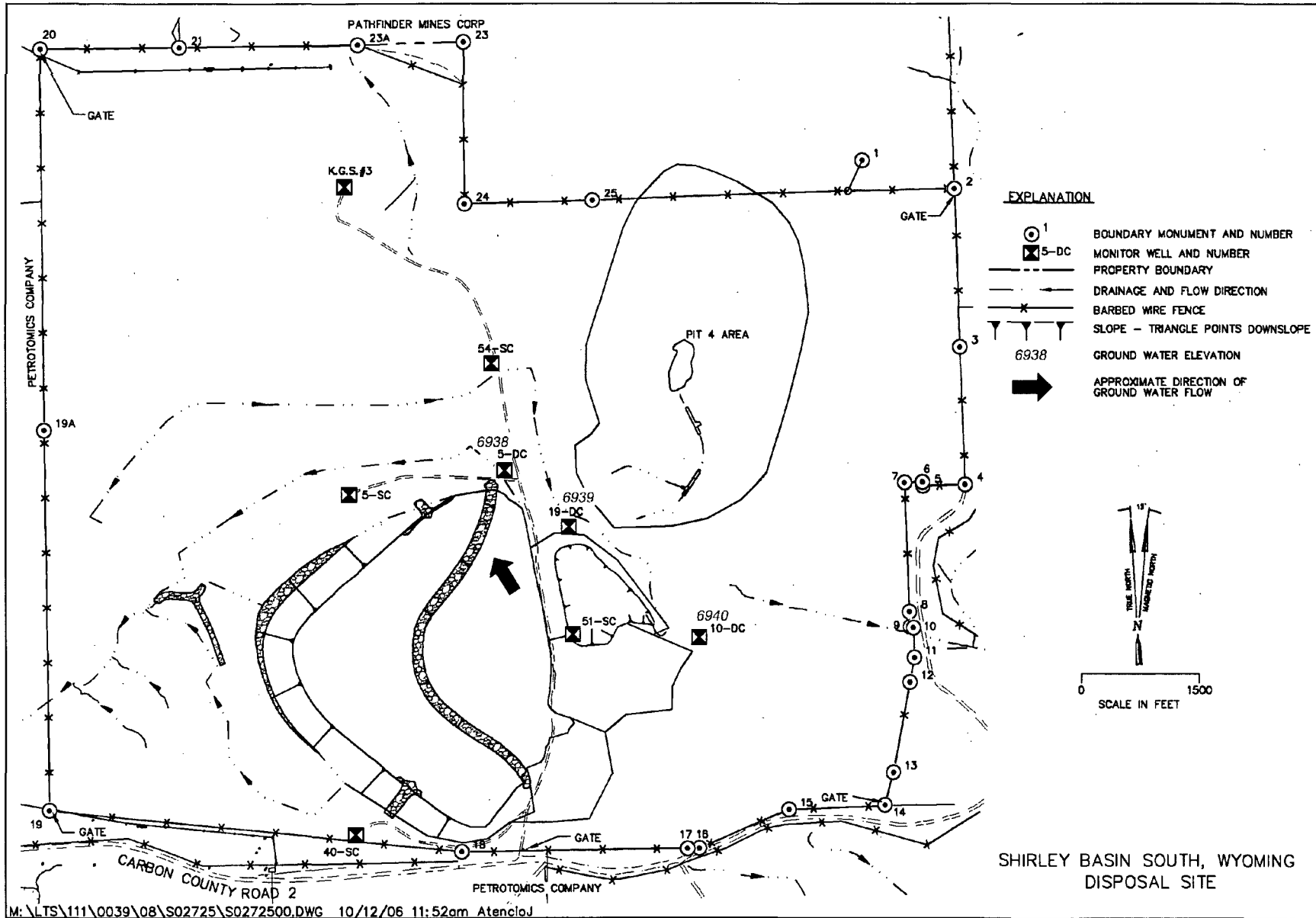
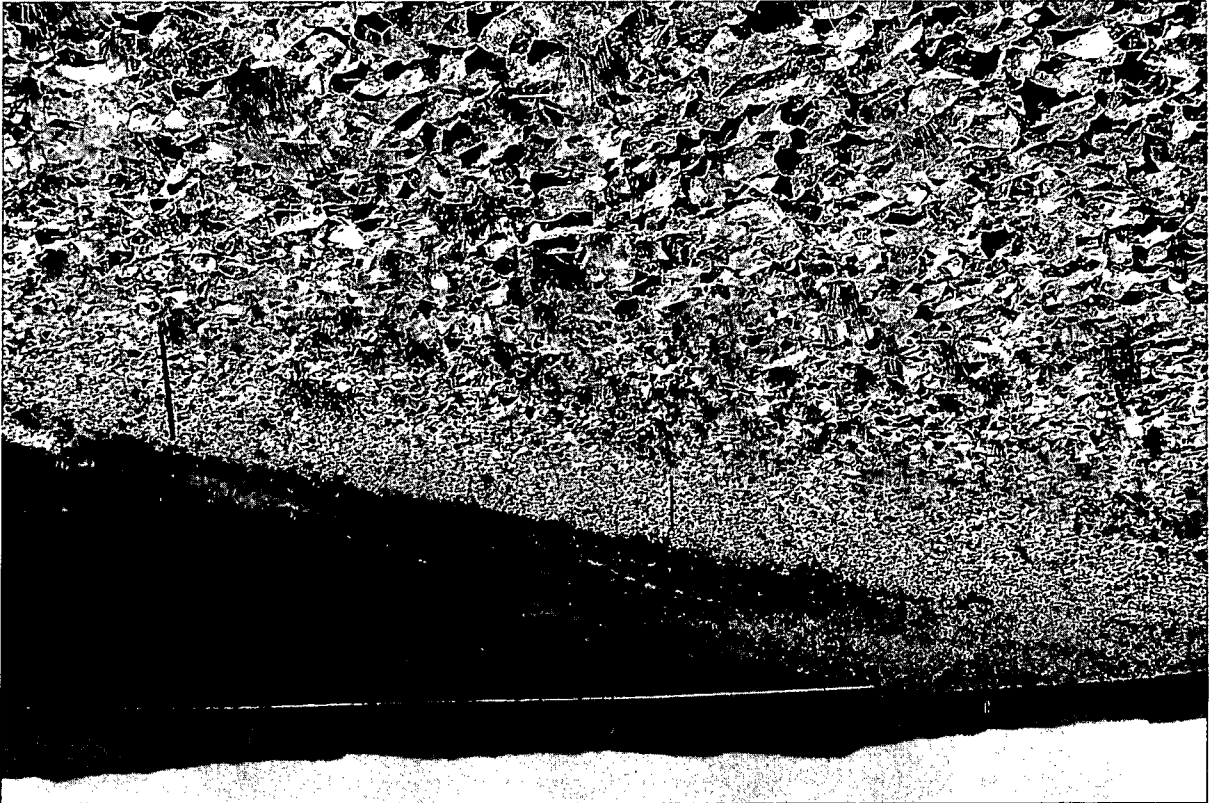


Figure 5-7. Ground Water Flow in the Main Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

SBS 6/2006. PL-2. The lower surface of the disposal cell with monitor well 5-DC in the foreground.



SBS 6/2006. PL-1. Riprap-armored slope separating the upper and lower disposal cell surfaces.







*SBS 6/2006. PL-3. The north swale discharge point.*



*SBS 6/2006. PL-4. View northeast along the dam of the lower disposal cell surface.*



*SBS 6/2006. PL-5. Riprap-armored toe of the dam outslope.*



*SBS 6/2006. PL-6. Riprap-armored drainage channel west of the disposal cell.*



*SBS 6/2006. PL-7. View downgradient (east) along the PMF channel.*



*SBS 6/2006. PL-8. The north end of Pit 4.*

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