Department of Energy
Office of Legacy Management

NOV 2 8 2005

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

Subject: 2005 Annual Site Inspection and Monitoring Compliance Report for UMTRCA Title II Disposal Sites

Dear Mr. Janosko:

Four copies of the 2005 *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 cause concern or 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.

If NRC has comments or questions about this report, please call me at (970) 248-6048.

Sincerely,

Thomas C. Pauling
Site Manager

Enclosures

cc w/o enclosures:
J. Sink, LM-50
D. Johnson, Stoller
Project Record File ADM 535.10(A) (Thru D. Roberts)

TCP\Title II Report to NRC.doc

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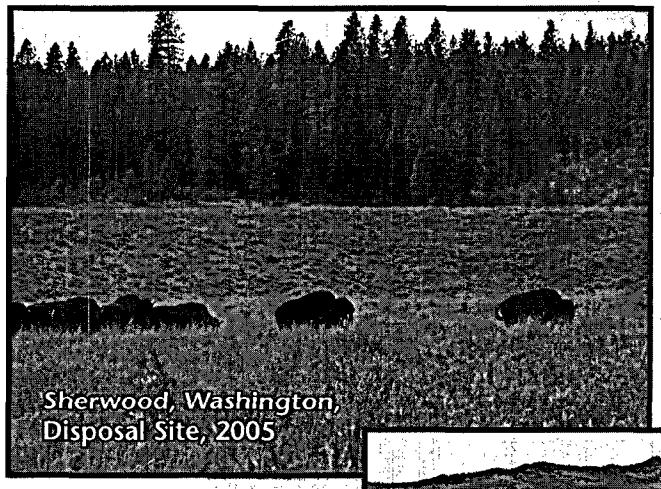
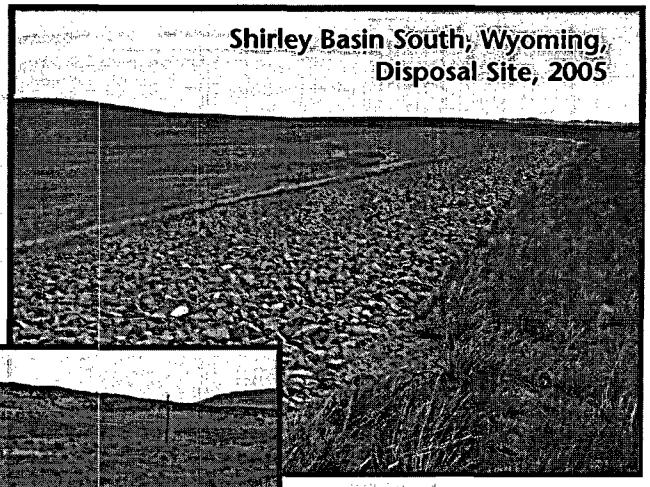
DOE–LM/GJ1000–2005

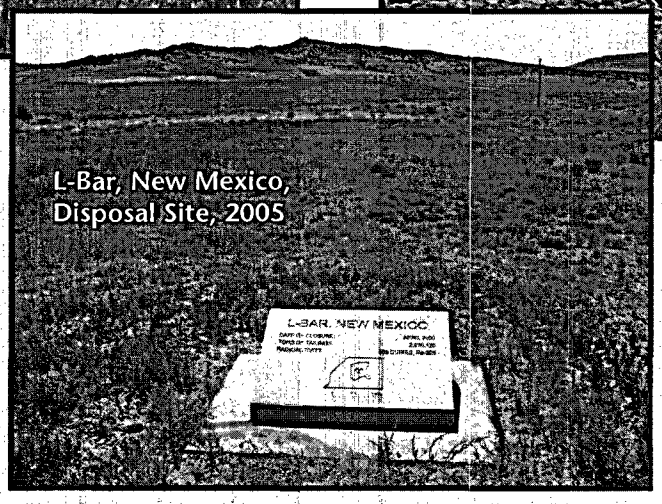
U.S. Department of Energy
Office of Legacy Management

2005 Annual Site Inspection and Monitoring Report for Uranium Mill Tailings Radiation Control Act Title II Disposal Sites

November 2005







Work Performed by the S.M. Stoller Corporation under DOE Contract No. DE–AC01–02GJ79491
for the U.S. Department of Energy Office of Legacy Management.
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DOE-LM/GJ1000-2005

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Table of Contents

Acronyms v
Executive Summary vii
Bluewater, New Mexico, Disposal Site 1–1
Edgemont, South Dakota, Disposal Site 2–1
L-Bar, New Mexico, Disposal Site 3–1
Sherwood, Washington, Disposal Site 4–1
Shirley Basin South, Wyoming, Disposal Site 5–1

Acronyms

AAS	alternate abatement standard
ACL	alternate concentration limit
BIA	Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
CFR	*Code of Federal Regulations*
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, *et seq.*)

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 2005 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. Two of the sites were inspected for the first time in 2005—the L-Bar, New Mexico, disposal site was accepted under the general license on October 1, 2004, and the Shirley Basin South, Wyoming, disposal site was accepted on June 8, 2005. 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**.

The sites required routine monitoring and maintenance activities in 2005 including ground water monitoring, erosion and vegetation monitoring, vegetation and noxious weed control, fence repairs, and sign replacement. The following nonroutine activity[1] occurred in 2005:

- Shirley Basin South, Wyoming—conducted confirmatory ground water sampling in November 2005 because two constituents exceeded their respective alternate concentration limit during the first annual sampling event; analytical results and evaluation are pending.

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.

[1]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. 2005 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: replaced perimeter sign at the site entrance.
		1–2	1B	Maintenance: secured monitor wells with new casings and caps.
		1–7	1C	Maintenance: removed undesirable plants (tamarisk).
		1–8	1D	Surveillance: retained subcontractor to monitor trespassing.
		1–9	1E	Monitoring: ground water compliance monitoring.
		1–9	1F	Monitoring: confirmatory sampling conducted for PCBs.
Edgemont, South Dakota	2	2–2	2A	Maintenance: removed trash at the site entrance.
		2–5	2B	Maintenance: sprayed noxious weeds.
L-Bar, New Mexico	3	3–1	3A	Inspection: first annual site inspection.
		3–2	3B	Maintenance: installed t-posts at the boundary monuments.
		3–2	3C	Maintenance: painted identification numbers on the monitor wells.
		3–5	3D	Maintenance: removed undesirable plants (tamarisk).
		3–6	3E	Maintenance: removed cattle and repaired fence.
		3–7	3F	Monitoring: ground water compliance monitoring.
		3–9	3G	Monitoring: measured cell cover erosion.
		3–10	3H	Monitoring: measured cell cover vegetation.
Sherwood, Washington	4	4–6	4A	Inspection: dam safety inspection.
		4–6	4B	Management: agreed to a proposed logging access road across a corner of the site.
		4–7	4C	Maintenance: sprayed noxious weeds.
		4–7	4D	Monitoring: measured weed populations.
		4–7	4E	Monitoring: ground water best management practice monitoring.
Shirley Basin South, Wyoming	5	5–1	5A	Inspection: first annual site inspection.
		5–5	5B	Management: access agreement to use topsoil on the disposal site.
		5–5	5C	Maintenance: proposed grazing agreement with a local rancher.
		5–6	5D	Monitoring: ground water compliance monitoring.
		5–7	5E	Monitoring: exceeded ground water ACLs, requiring confirmatory sampling.

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 31, 2005, and was in good condition. The disposal cells and their cover materials are in excellent condition. Old monitor well pumps and appurtenances, removed and replaced prior to the inspection, are stored at the well locations and will be disposed of in 2006. New steel casings with locking caps were installed at several monitor wells for wellhead protection and security. Several stands of tamarisk located east of the disposal cell were cut and treated with herbicide. Sections of the site perimeter road were eroded or washed out due to storms prior to the inspection; however, these sections can be bypassed and there is no need for repairs. 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. 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 31, 2005. 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—also a steel, double-swing stock gate secured by locks. The access road is an all-weather road surfaced with crushed basalt extending northward for approximately 1,700 feet along a narrow strip of DOE property. 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 without removing sand to allow vehicle access.

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
1A tailings disposal cells. Perimeter sign P1, missing at the time of the 2004 inspection, was replaced by a new sign installed on the entrance gate (PL–1). 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 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. All boundary monuments were located during the baseline site inspection and have been verified by global positioning system equipment. Due to time constraints, the boundary monuments were not checked during the 2005 inspection. Several monuments routinely covered by sediment or windblown sand were located and marked with t-posts during a site visit in October 2005.

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 are identified as E(M), F(M), T(M), X(M), and Y2(M). The other four wells are screened in the San Andres Limestone-Glorieta Sandstone, which is the bedrock aquifer at the site. The bedrock wells are L(SG), OBS–3, S(SG), and I(SG). 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.
1B The old pumps and appurtenances were pulled in November 2004 and replaced with new equipment. Where necessary, new steel surface casings with locking caps were installed in May 2005 to secure the wells. Radiological scans indicated that the old pumps and galvanized steel pipefittings at wells OBS–3 and S(SG) had fixed contamination. This equipment was relocated to the stock tank at well X(M) for storage until it can be shipped to an approved disposal facility (PL–2). The remaining uncontaminated pumps, piping, and wiring are stored inside the well enclosures and will be disposed of at a local landfill. Wells E(M) and Y2(M) do not have stock tanks; the tanks were blown downwind from the wells and are damaged. Because they are no longer needed, the stock tanks will be disposed of also.

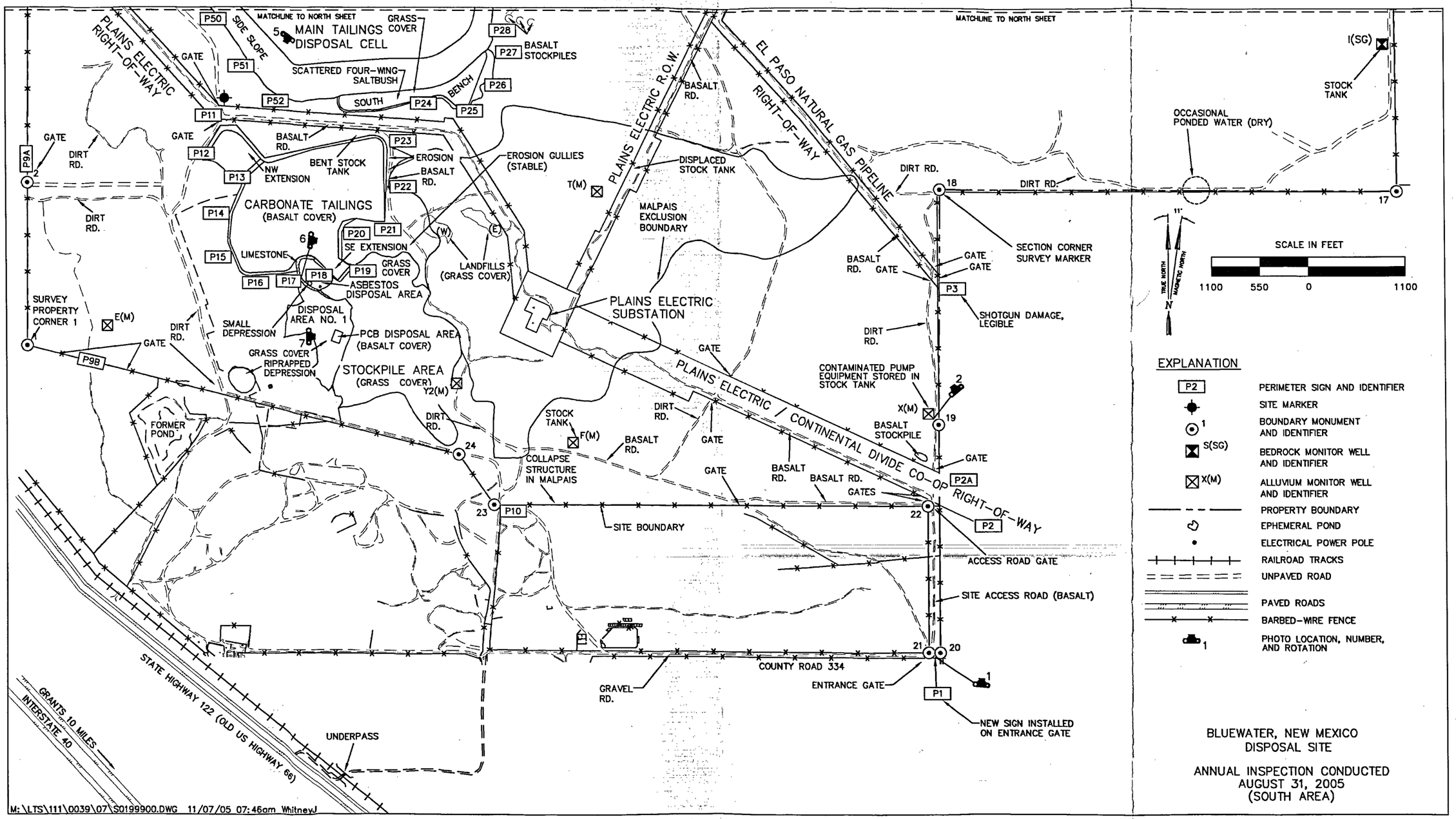


Figure 1–1. 2005 Annual Compliance Drawing for the Bluewater, New Mexico, Disposal Site (South Area)

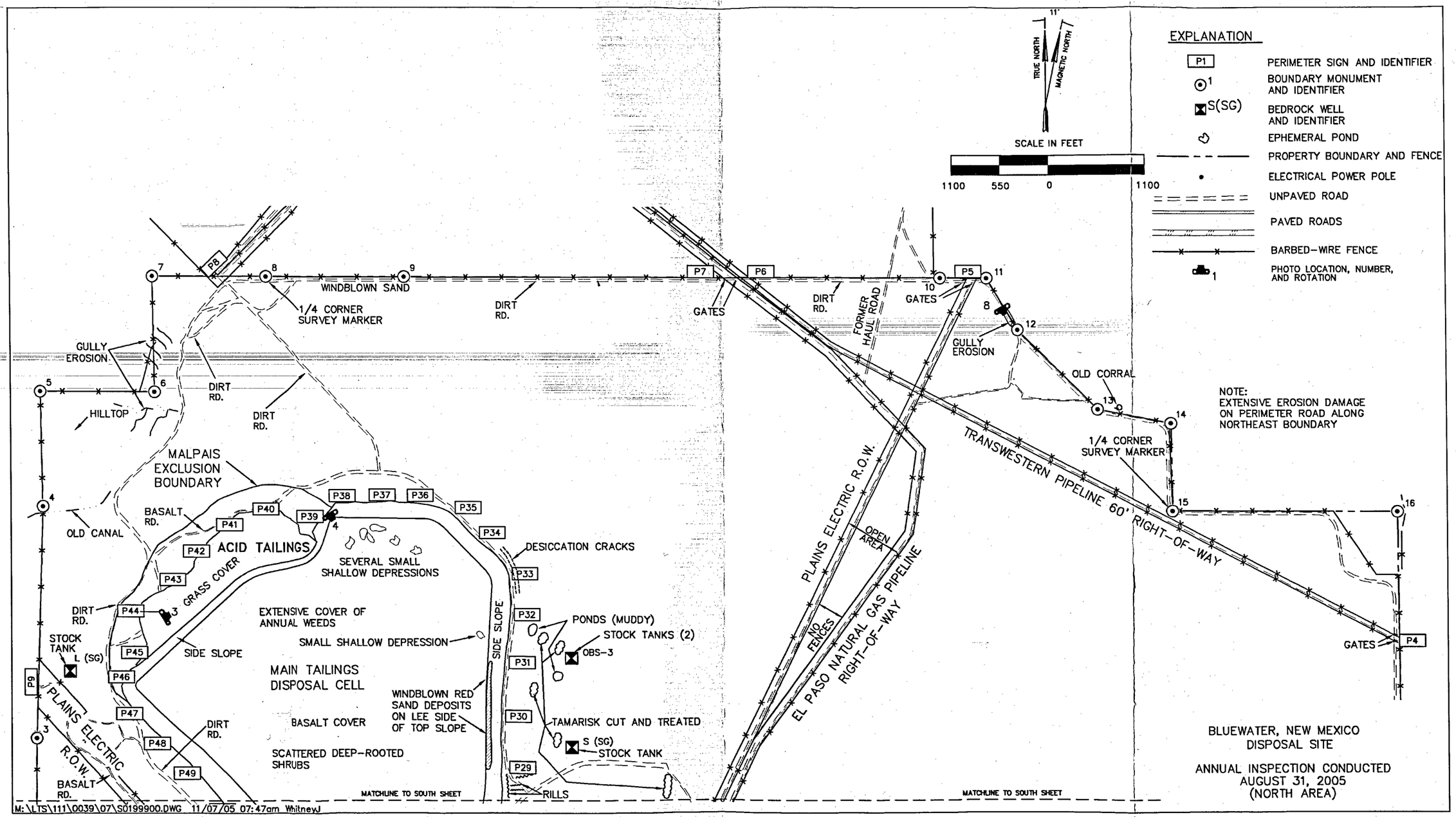


Figure 1–2. 2005 Annual Compliance Drawing for the Bluewater, New Mexico, Disposal Site (North Area)

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–3) 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. The riprap was in excellent condition.

As shown on photo PL–4, 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.

Fine-grained windblown sand continues to accumulate along the top of the east side slope on the main tailings disposal cell. Sand accumulation is expected to continue but is not expected to degrade the protectiveness of the riprap cover. Plant encroachment is limited to annual weeds and is expected to increase as sand accumulates.

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 2005 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. 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 not present at the time of inspection, but the locations were muddy from a recent storm. The areas of ponding are far enough from the
1C cell to not impact it. Stands of tamarisk present in the pond area and other nearby locations were cut and treated with herbicide.

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. Annual weeds and scattered woody shrubs were present on the cell and its extensions (PL–5). The carbonate tailings disposal cell was in excellent condition.

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 is not a concern at this time because it does not encroach on asbestos-containing materials; however, it will be filled with rock to prevent possible erosion into those materials. Otherwise, the disposal area was in excellent condition.

The small riprap-covered PCB disposal area was in excellent condition (PL–7). The two landfills in grass-covered depressions east of the carbonate tailings disposal cell also were 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 Malpais basalt flows.

Several utility company rights-of-way cross the site. Stock fences with locked gates enclose these rights-of-way 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.

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 were in excellent condition.

Site Perimeter and Outlying Areas—The perimeter barbed-wire fence was in good condition.
1D A local subcontractor has been retained to repair the fencing and periodically check for unauthorized livestock use of 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 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. A storm prior to the inspection deepened gullies and washed out sections of the road along

the northeast perimeter of the site (PL–8); however, these sections can be bypassed and there is no need for repairs at this time.

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 2005.

1.3.3 Routine Maintenance and Emergency Measures

During 2005, missing perimeter sign P1 was replaced, monitor well surface casings were replaced with new steel surface casings with locking caps, and stands of tamarisk located east of the main tailings disposal cell were cut and treated with herbicide. 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 2005.

1.3.4 Environmental Monitoring

Ground water monitoring is required at the Bluewater site. Specified background and point-of-compliance wells are sampled annually for polychlorinated biphenyls (PCBs) and every 3 years for molybdenum, selenium, and uranium. Only the alluvial wells are sampled for molybdenum
1E and PCBs. This report provides the results for the 2004 sampling event conducted in November 2004. The point-of-exposure wells X(M) and I(SG) were not sampled because alternate concentration limits (ACLs) had not been exceeded in the other wells during previous sampling events. The 2005 sampling event for PCBs is scheduled for November 2005.

The PCB mixture Aroclor 1254 was detected in samples from alluvial wells F(M) and T(M). The results were suspected to be false positives because of the lack of agreement between duplicate sample results and because Aroclor 1254 was not detected in the matrix spike samples collected from well F(M). Additionally, wells F(M) and T(M) are not the closest wells to the PCB disposal
1F area. The wells were resampled and analyzed for PCBs in May 2005. PCBs were not detected in the May results, confirming that the results from the November sampling were due to laboratory contamination. Therefore, PCBs were not present in detectable concentrations in the alluvial wells and have not been detected since sampling was initiated in 1998.

Analytical results from the November 2004 sampling event are provided in Table 1–2. All concentrations were less than the specified ACL for each constituent.

Table 1–2. 2004 Ground Water Monitoring Analytical Results at the Bluewater, New Mexico, Site

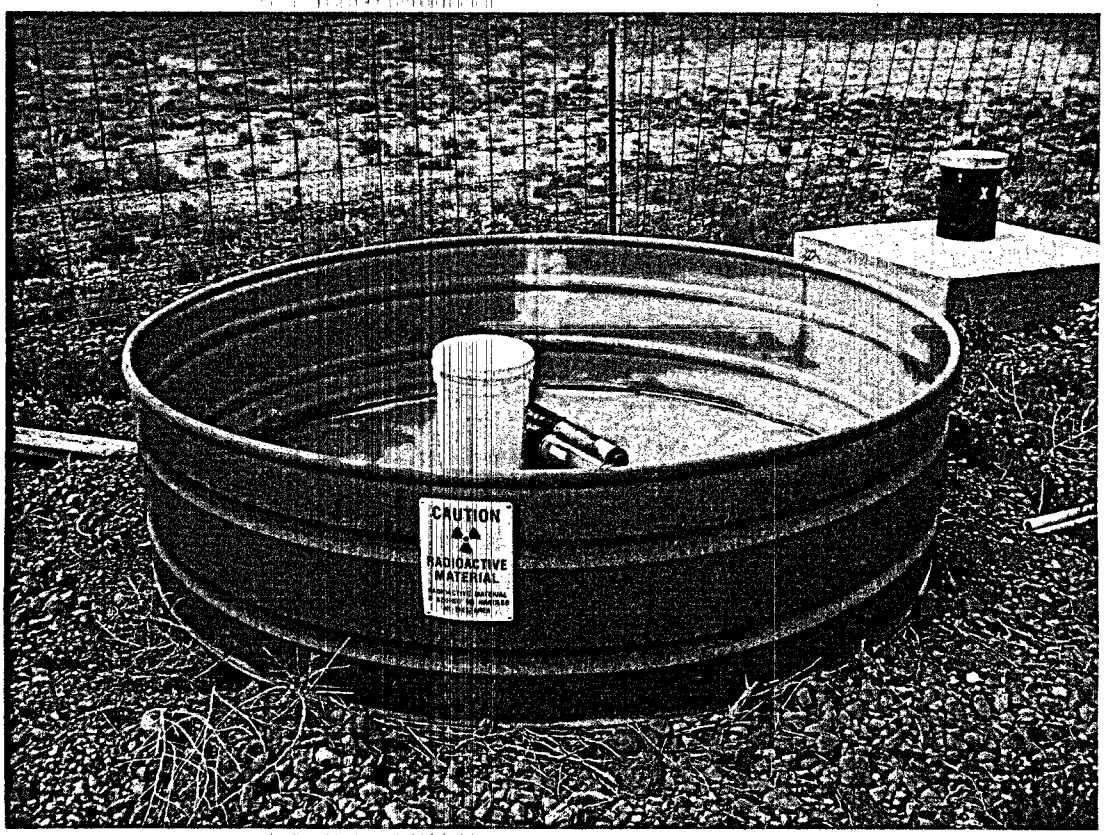
Constituent	ACL	Alluvial Wells			Bedrock Wells		
		E(M) (Bkgd)	F(M) (POC)	T(M) (POC)	L(SG) (Bkgd)	OBS–3 (POC)	S(SG) (POC)
Molybdenum (mg/L)	0.10	0.00061	0.0011	0.035	N/A	N/A	N/A
Selenium (mg/L)	0.05	0.000055	0.0011	0.019	0.00032	0.00015	0.000029
Uranium (mg/L)	0.44	0.00017	0.011	0.17	0.000075	0.0054	0.00043

Key: ACL = alternate concentration limit; Bkgd = background well; mg/L = milligrams per liter; N/A = not applicable; POC = point-of-compliance well

1.3.5 Photographs

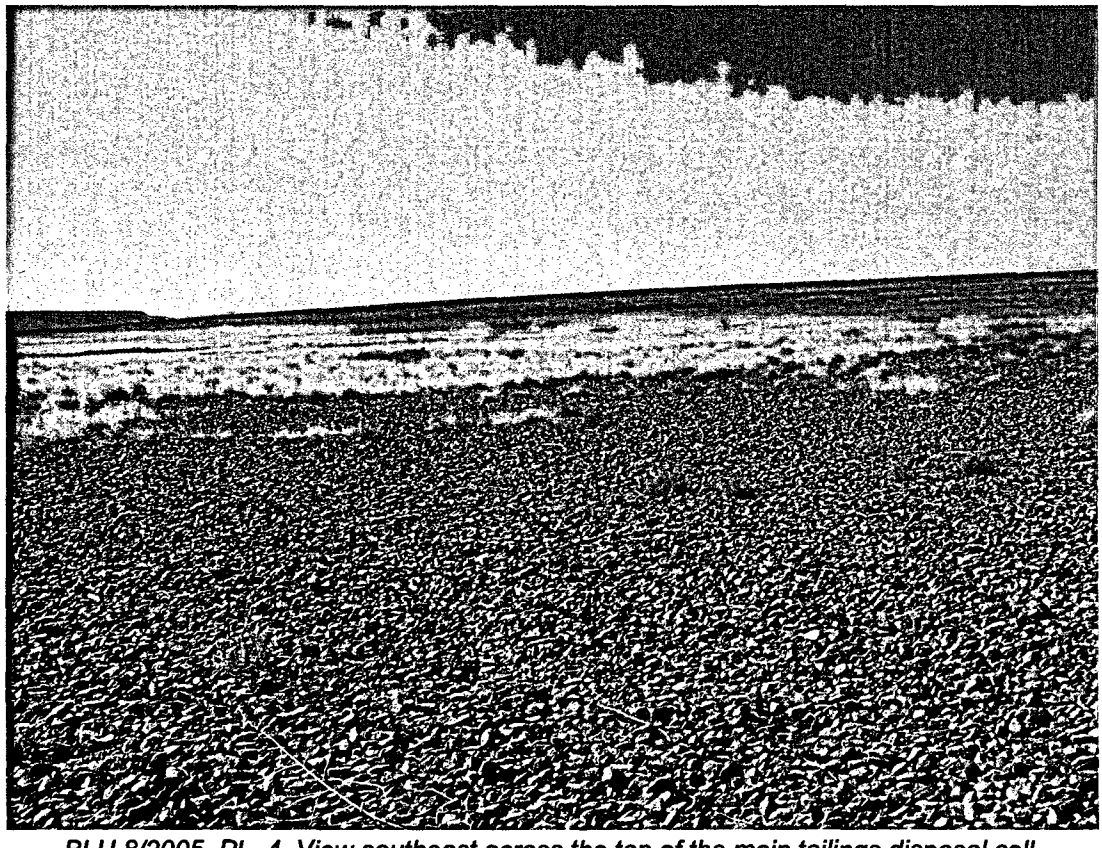
Photograph Location Number	Azimuth	Photograph Description
PL–1	5	Perimeter sign P1 on the site entrance gate.
PL–2	320	Contaminated pumps and pipefittings stored in the stock tank at monitor well X(M).
PL–3	60	View northeast across the grass-covered acid tailings disposal cell.
PL–4	150	View southeast across the top of the main tailings disposal cell.
PL–5	210	The northwest extension of the carbonate tailings disposal cell viewed from the top of the main tailings disposal cell.
PL–6	95	Small depression at the south edge of the asbestos disposal area.
PL–7	90	View toward the basalt-covered PCB disposal area.
PL–8	150	Gully along the perimeter road between boundary monuments BM–11 and BM–12.

BLU 8/2005. PL–1. Perimeter sign P1 on the site entrance gate.

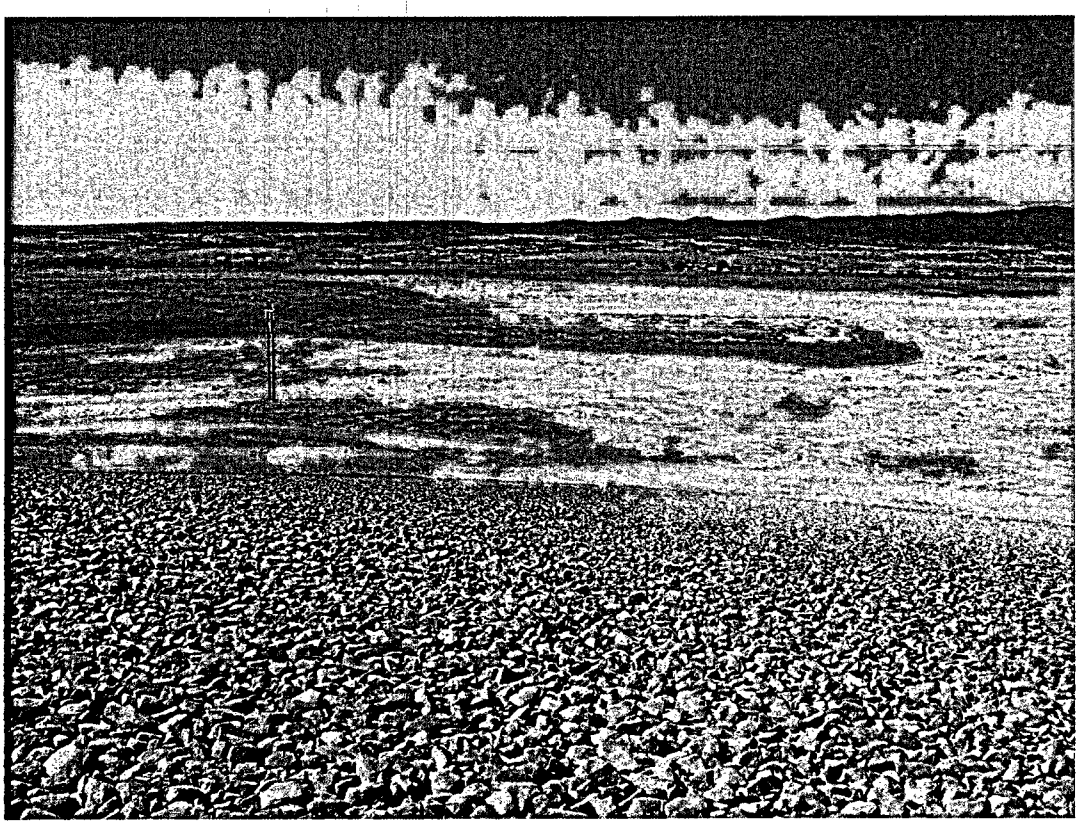


BLU 8/2005. PL–2. Contaminated pumps and pipefittings stored in the stock tank at monitor well X(M).

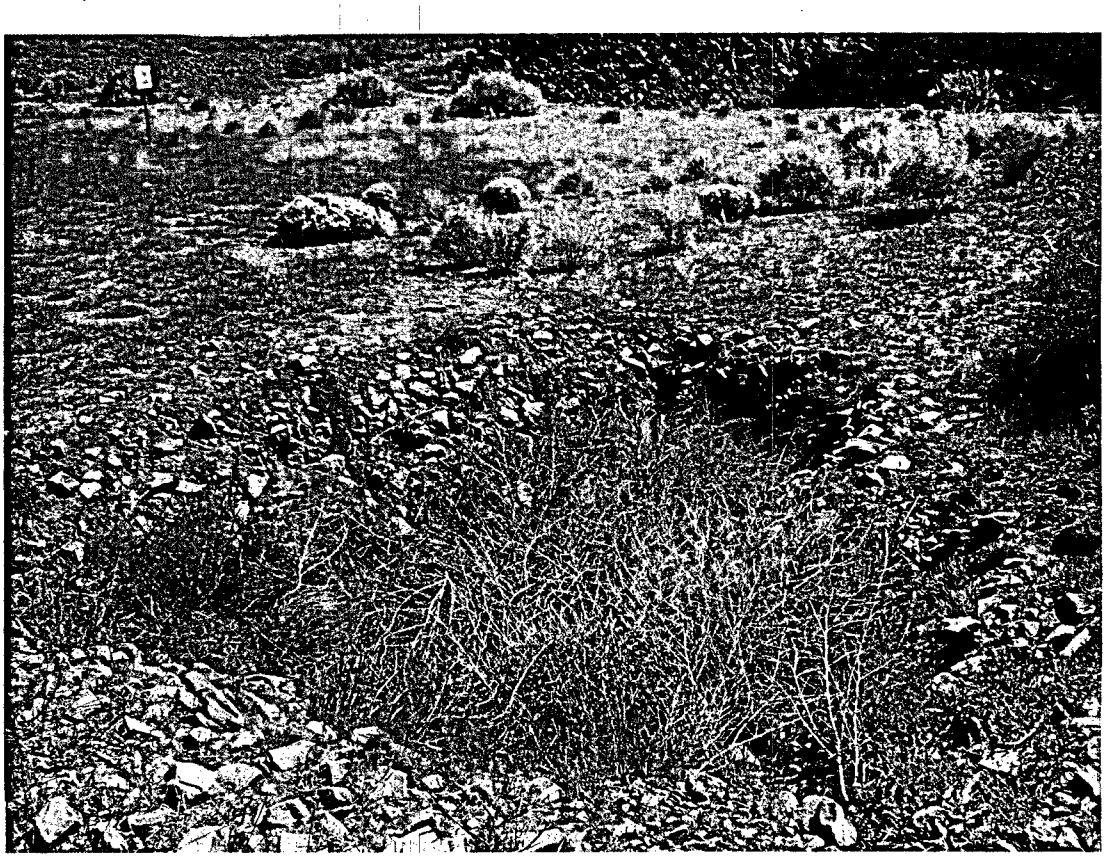
BLU 8/2005. PL–3. View northeast across the grass-covered acid tailings disposal cell.



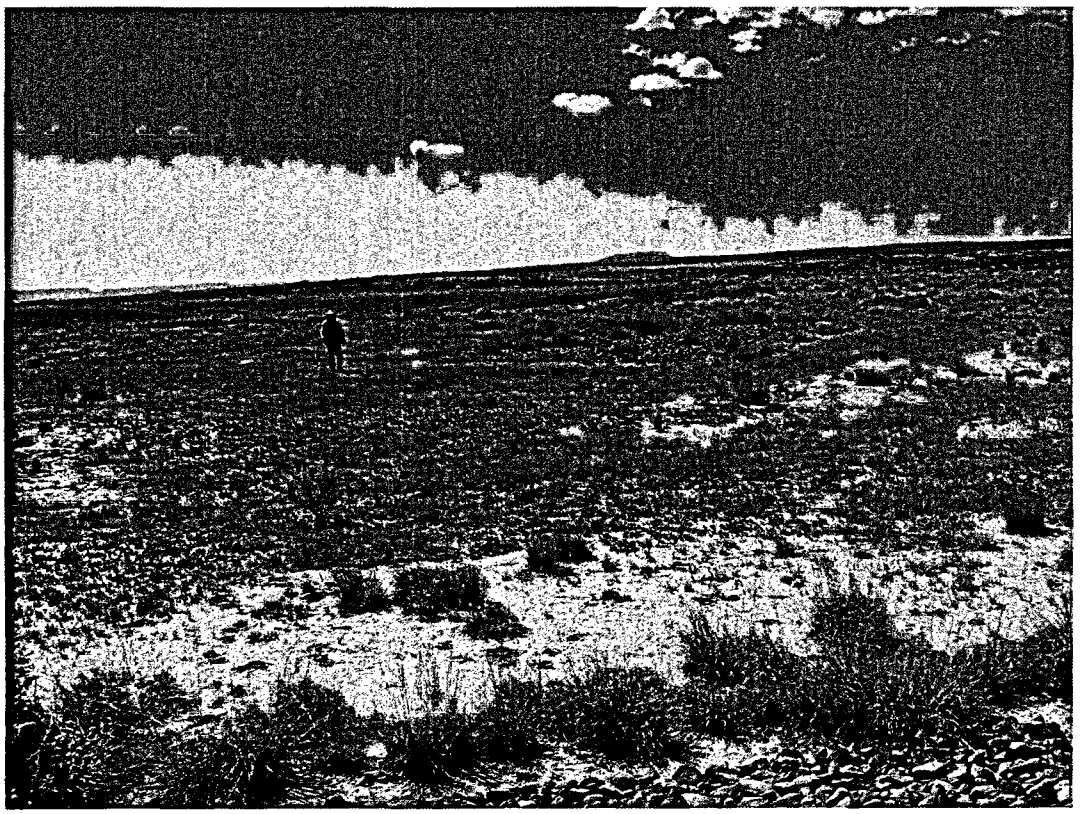
BLU 8/2005. PL–4. View southeast across the top of the main tailings disposal cell.



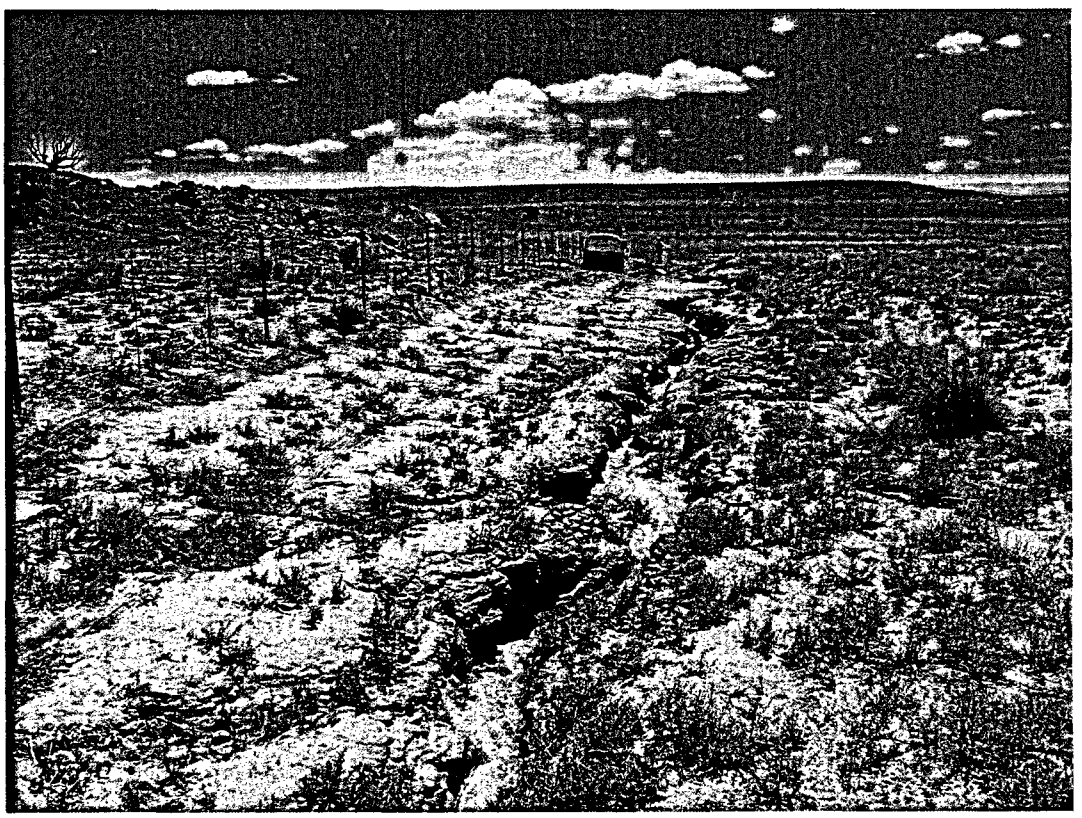
BLU 8/2005. PL–5. The northwest extension of the carbonate tailings disposal cell viewed from the top of the main tailings disposal cell.



BLU 8/2005. PL–6. Small depression at the south edge of the asbestos disposal area.



BLU 8/2005. PL–7. View toward the basalt-covered PCB disposal area.



BLU 8/2005. PL–8. Gully along the perimeter road between boundary monuments BM–11 and BM–12.

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 14, 2005, and was in excellent condition. The entrance signpost was bent but is stable. Noxious weeds, though significantly reduced, continue to persist at the site 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.

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 14, 2005. 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, Signs, 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 fence maintenance. Controlled grazing promotes turf vitality.
The entrance signpost is bent but stable (PL–1), caused either by cattle or by vandalism. Some trash, consisting mainly of bottles and cans, was present in the immediate vicinity of the entrance
2A to the site. Inspectors removed the trash.

A four-strand barbed wire fence was installed in spring 1999 along most of 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–2).

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–3). DOE manages the grass cover through controlled grazing. The grass is well established and was not over-grazed when inspected. Cattle were present on the property near the southeast corner of the site the day of the inspection. 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–4). These plants do not pose a threat to the stability or function of the embankment face.

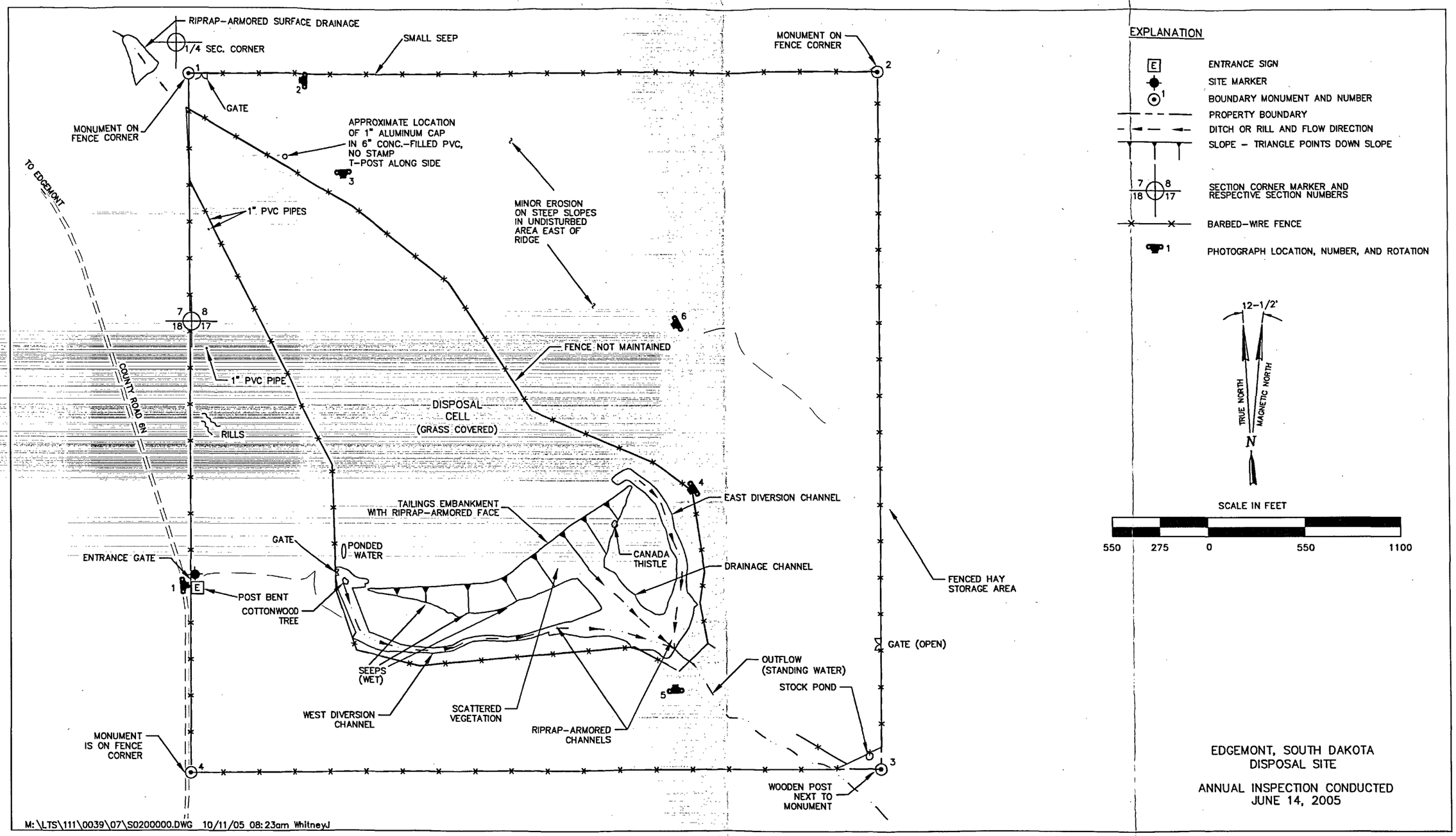


Figure 2–1. 2005 Annual Compliance Drawing for the Edgemont, South Dakota, Disposal Site

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–5). All soil surfaces at the site were very moist due to recent rains, and standing water was present in the drainage outlet below the tailings embankment and in the stock pond located in the southeast corner of the site. 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 stability or 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–2).

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 along the edges of the riprap-armored embankment face and drainages and in the outlet channel. Weed control efforts have significantly reduced infestations. The one patch of Canada thistle found near the west end of the embankment during the 2004 inspection was gone, but a new small
2B patch was found near the east end. This patch subsequently was 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. The grass is well established but minor erosion persists on steeper portions of the site east of the ridge that separates the northeast portion of the site from the area containing the cell (PL–6). 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 not apparent 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 2005.

2.3.3 Routine Maintenance and Emergency Measures

Trash was removed and noxious weeds were sprayed with herbicide in 2005. 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 2005.

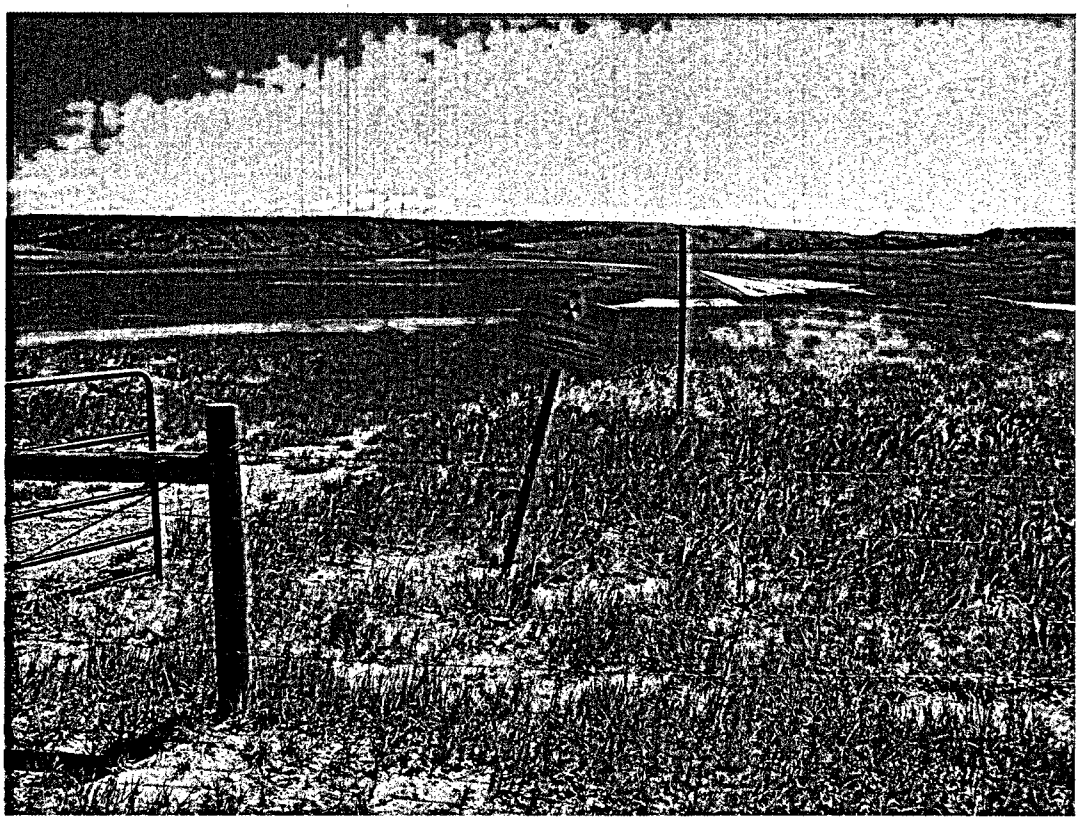
2.3.4 Environmental Monitoring

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.

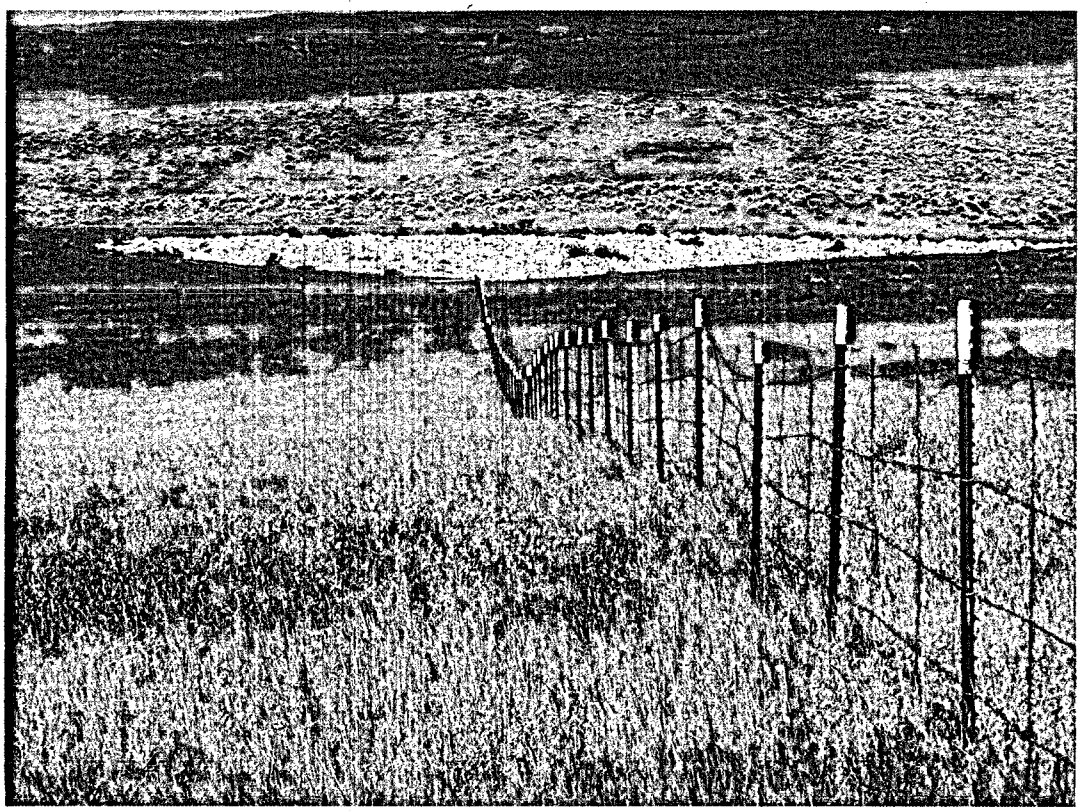
2.3.5 Photographs

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

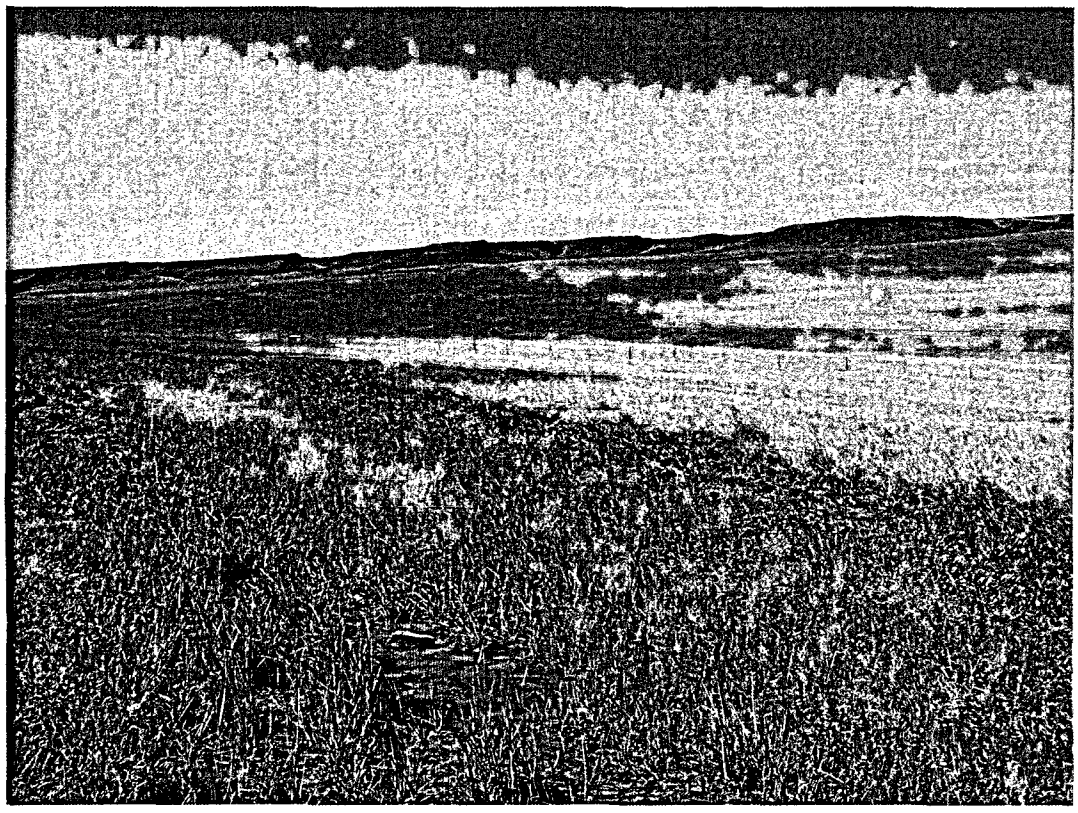
Photograph Location Number	Azimuth	Description
PL–1	90	Bent entrance signpost.
PL–2	275	Perimeter fence and an armored surface drainage just outside the northwest corner of the site.
PL–3	180	View south across the top of the disposal cell with an upgradient drainage feature in the foreground.
PL–4	240	The east diversion channel and the tailings embankment.
PL–5	0	The drainage channel and the east diversion channel.
PL–6	245	Active erosion area on steep slopes in an undisturbed area northeast of the disposal cell.



EDG 6/2005. PL–1. Bent entrance signpost.

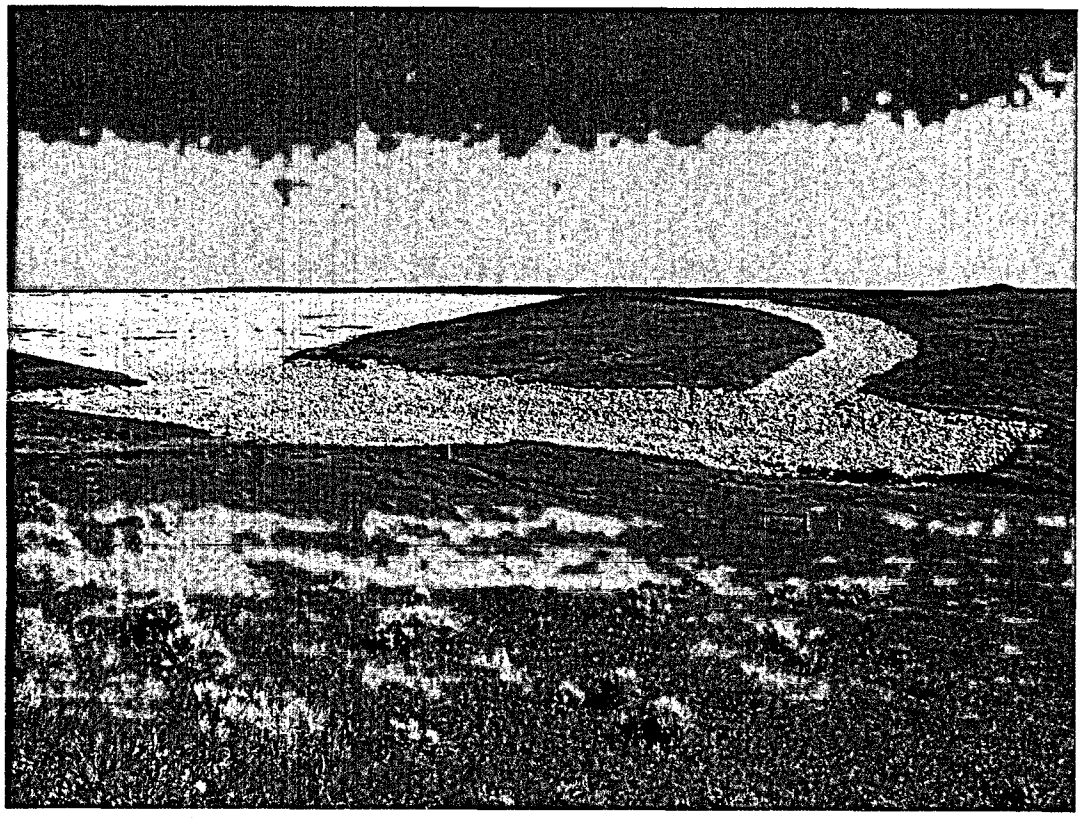


EDG 6/2005. PL–2. Perimeter fence and an armored surface drainage just outside the northwest corner of the site.

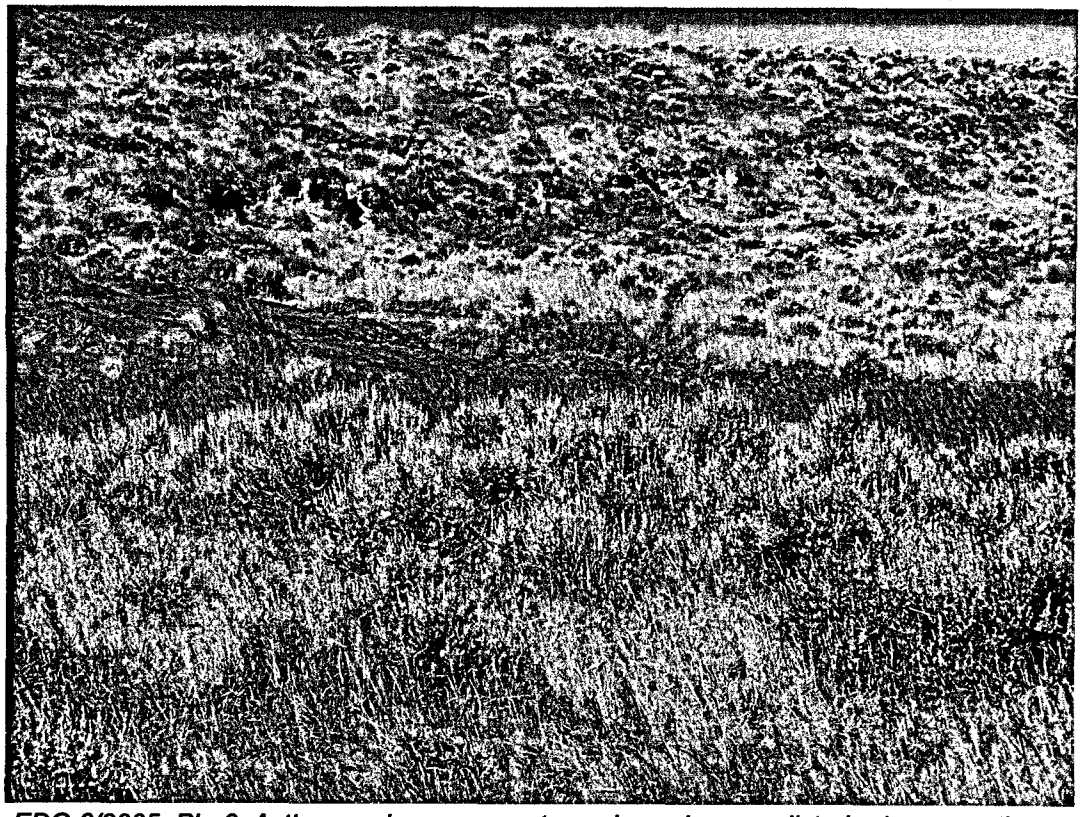


EDG 6/2005. PL–3. View south across the top of the disposal cell with an upgradient drainage feature in the foreground.

EDG 6/2005. PL–4. The east diversion channel and the tailings embankment.



EDG 6/2005. PL–5. The drainage channel and the east diversion channel.



EDG 6/2005. PL–6. Active erosion area on steep slopes in an undisturbed area northeast of the disposal cell.

End of current text

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 September 1, 2005. The site was accepted under the U.S. Nuclear
3A Regulatory Commission (NRC) general license on October 21, 2004, and this was the first annual inspection conducted by the U.S. Department of Energy (DOE). The site was in good condition. Erosion is active in several areas of the site but does not impact the tailings impoundment or the function of the diversion structures. Tamarisk was growing on the impoundment cover and was removed. Erosion and vegetation measurements were taken on the impoundment cover; there was no evidence of erosion and revegetation is progressing well. No cause for a follow-up 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. 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 September 1, 2005. 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 (PL–1). 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 (PL–2).

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. However, this fence forms the boundary for a grazing license that allows the Land Grant to graze the 280-acre portion of DOE land that lies between the fence and the site property boundary. Therefore, the chain-link fence will either need to be maintained to keep cattle outside the fenced boundary in accordance with the grazing license or eventually removed, which may necessitate a revision of the grazing license. The fence, though still continuous and adequately serving as a barrier, is deteriorating (leaning posts, missing bracing, broken strands, etc.) and is in need of repair. Warning/no trespassing signs are installed at irregular intervals along the fence (PL–3). These signs are not site surveillance features and are not shown on Figure 3–1.

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. The fence was in excellent condition. 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 (PL–4).

Eight boundary monuments were installed at surveyed property tract corners along the property boundary. Due to the difficulty in finding the flush-mounted monuments and time constraints, none of the monuments were located during the inspection. The monuments were found during a site visit in October 2005 using global positioning system (GPS) equipment, and were marked by
3B metal t-posts to help locate them during future site visits.

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. Each well was inspected and found to be in good condition. Monitor well MW–69 did not have a lock but is inside the fenced area, and the other wells were secured with non-DOE locks; new DOE locks were installed on all of the wells during the November
3C 2005 sampling event. Not all the wells had visible identification numbers (PL–5), but the numbers were painted on during the November 2005 sampling event. 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.

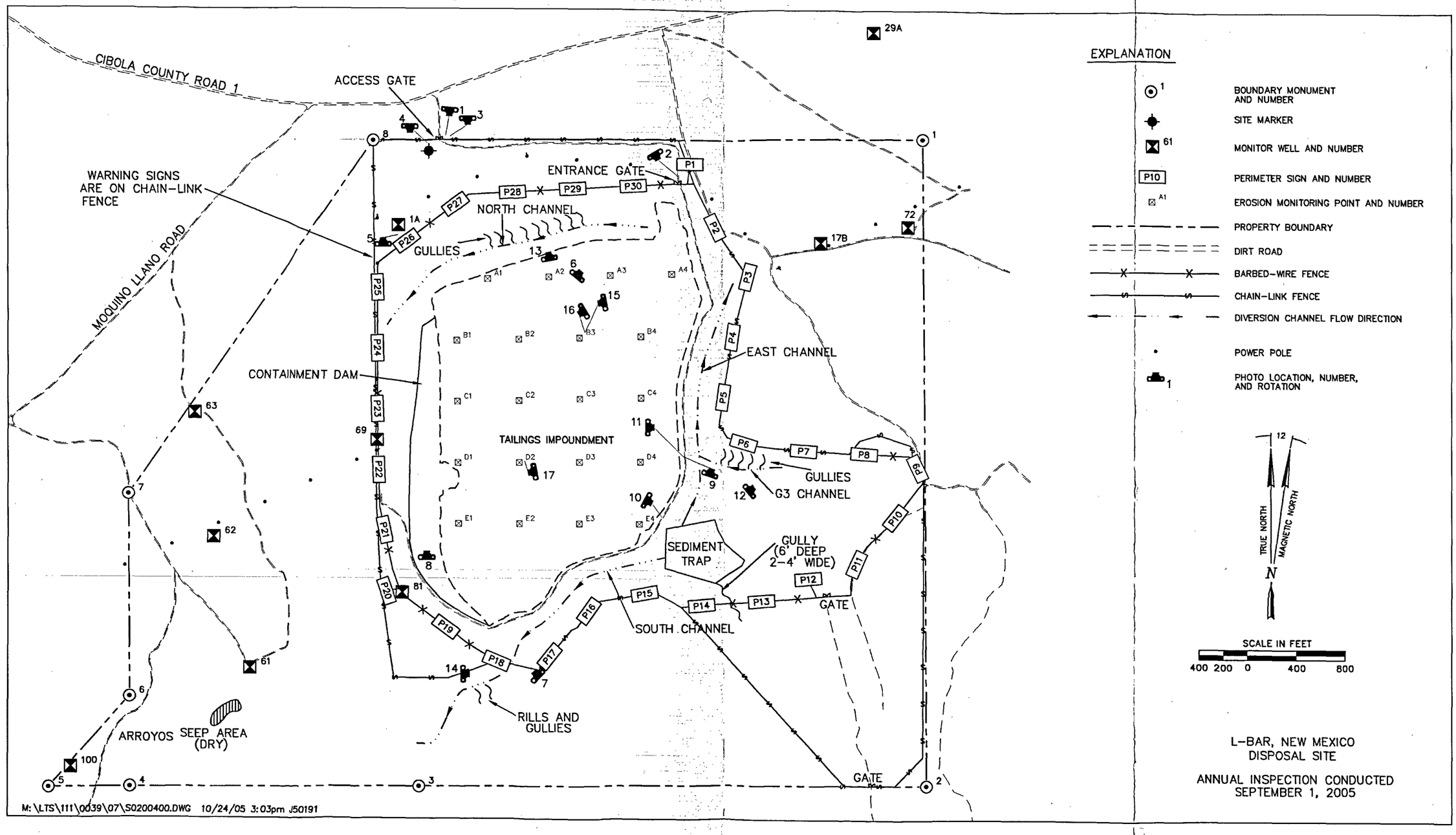


Figure 3–1. 2005 Annual Compliance Drawing for the L-Bar, New Mexico, Disposal Site

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.

Most of the impoundment cover displayed cracked soils with a fluffy texture, and some areas had elongated mounds with vertical rises that were as much as approximately a foot above the surrounding grade (PL–6). The cracked and fluffy texture is likely due to the interaction of infrequent precipitation events with the high swelling clay and gypsum content of the cover soil. The mounds are windblown deposits that developed soon after the cover was completed. These surface features do not degrade the performance of the cover system.

3D Tamarisk, a noxious plant, was found on the cover. The tamarisk was cut and treated with herbicide during a site visit in October 2005. No other noxious plants/species were observed at the time of the inspection.

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 (PL–7). 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. Several PVC standpipes, artifacts from former site operations, are present on the dam but are no longer active and are not surveillance features (PL–8). The disposition of the standpipes will be evaluated.

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 (PL–9). 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 (PL–10). 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 (PL–11). Gullies are present in the soft soils and fill materials adjacent to the Sediment Trap and the G3 Channel (PL–12); however, the erosion is not degrading the performance of the structures or affecting the integrity of the tailings impoundment.

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 (PL–13).

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 (PL–14). 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 and will function as designed. The erosion is expected to stabilize as vegetation continues to establish.

Mature tamarisk was present in the diversion channels. The need for removal will be evaluated in consultation with the State during 2006.

Site Perimeter, Outlying Areas, and Balance of the Site—Only portions of the north and east property boundaries are fenced as described in Section 3.3.1.1 above. The site is surrounded by open private land managed by the Land Grand and is used primarily for grazing. Grazing is allowed on DOE property outside of the chain-link fence. Cattle entered the area between the
3E chain-link and barbed wire fences during the winter of 2005; they were removed and a local contractor repaired the damaged chain-link fence. The need for a maintenance agreement with a local contractor to check and repair fences, remove cattle as necessary, and report other trespassing or vandalism will be evaluated.

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. A sinkhole is present in the area, but 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.

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; inspectors and ground water samplers may eventually find another route of access to this well.

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. No follow-up inspections were required in 2005.

3.3.3 Routine Maintenance and Emergency Measures

Several routine maintenance activities occurred during 2005. Metal t-posts were installed at the boundary monuments, identification numbers were painted onto the monitor wells and old locks were replaced with DOE locks, tamarisk on the cell cover was cut and treated with herbicide, and an opening in the chain-link fence was repaired after trespassing cattle were removed from the site.

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 2005.

3.3.4 Environmental Monitoring

3.3.4.1 Ground Water Monitoring

Ground water monitoring is required at the L-Bar site. The monitoring network consists of 10
3F 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	AAS Source Zone	AAS Affected Area
Uranium (mg/L)	5.0	13.0	13.0	N/A
Selenium (mg/L)	0.05	2.0	2.0	N/A
Chloride (mg/L)	250	N/A	1,127	N/A
Sulfate (mg/L)	4,000[a]	N/A	13,110	5,185
Nitrate (mg/L)	10.0	N/A	1,180	N/A
TDS (mg/L)	5,880[a]	N/A	20,165	7,846

[a]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; results will be provided in the 2006 compliance report. 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.

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 September 1, 2005.

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 the inspection drawing. 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 rebar and t-posts were sprayed with high-visibility orange surveyor paint. The paint had washed off, so the tops of the t-posts were re-sprayed with orange anti-rust enamel paint in 2005 (PL–15).

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. 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 (PL–16), in accordance with the method established during baseline measurements in 2003. All of the monitoring points were photographed for comparison with the baseline photographs taken 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.

Results of the 2005 measurements are presented in Table 3–4. Baseline measurements are included for comparison. As indicated in Table 3–4, the surface elevation increased at all but one monitoring point, with the increases ranging from 0.063 to 1.125 inches. The surface at monitoring point D2 decreased by 0.063 inch. The soil cover includes weathered Mancos Shale,
3G which often contains high concentrations of swelling clay and gypsum. As noted in the inspection report, the surface of the impoundment was characterized by cracked and fluffy soil. This condition apparently is caused by the effects of infrequent precipitation, followed by extended periods of evaporation, on the soil materials. Therefore, the increases in elevation are not likely caused by wind-deposited soil.

Vegetation Monitoring—Ten vegetation monitoring locations were established in accordance with the EMP. Plots were established at existing erosion monitoring points (PL–17) 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[a] Baseline to Present (decimal inches)
	2003 (Baseline)		2005		
	(fraction)	(decimal)	(fraction)	(decimal)	
A1	12 10/16	12.625	11 11/16	11.688	0.938
A2	12 7/16	12.438	12	12.000	0.438
A3	12 15/16	12.938	11 13/16	11.813	1.125
A4	12 6/16	12.375	11 10/16	11.625	0.750
B1	12 10/16	12.625	11 15/16	11.938	0.688
B2	12 8/16	12.500	12 3/16	12.188	0.313
B3	13	13.000	12 9/16	12.563	0.438
B4	12 15/16	12.938	12 7/16	12.438	0.500
C1	12 8/16	12.500	12	12.000	0.500
C2	13 1/16	13.063	13	13.000	0.063
C3	12 2/16	12.125	11 12/16	11.750	0.375
C4	12 6/16	12.375	11 15/16	11.938	0.438
D1	12 7/16	12.438	11 13/16	11.813	0.625
D2	12 12/16	12.750	12 13/16	12.813	-0.063
D3	12 3/16	12.188	11 12/16	11.750	0.438
D4	12 12/16	12.750	12 11/16	12.688	0.063
E1	13 1/16	13.063	12 5/16	12.313	0.750
E2	12 14/16	12.875	12 5/16	12.313	0.563
E3	12 9/16	12.563	12 1/16	12.063	0.500
E4	12 15/16	12.938	12 11/16	12.688	0.250

[a]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.

Results of the 2005 measurements are presented in Table 3–5. Percent foliar cover represents the total area under the maximum circumference of each of the live plants within the plot. Foliar cover ranged from 0 to 60 percent. Three of the ten plots exceeded 20 percent coverage. Plants noted at the plots included kochia, Russian thistle, annual sunflower, curly-cup gumweed, aster, white sweet clover, bottlebrush squirreltail, Indian ricegrass, broom snakeweed, rubber rabbitbrush, and four-wing saltbush. Comparison with photographs taken during the 2003 baseline erosion measurements indicate that vegetation cover had increased substantially at most of the measurement plots.

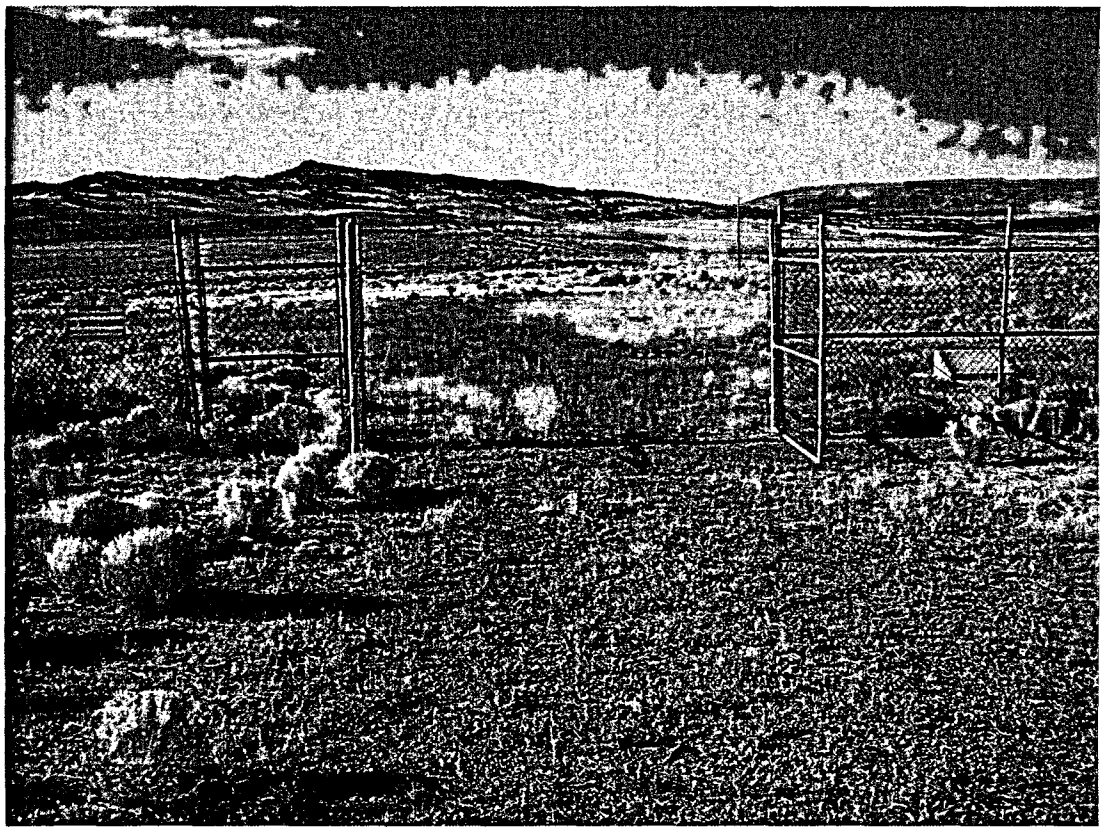
3H

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

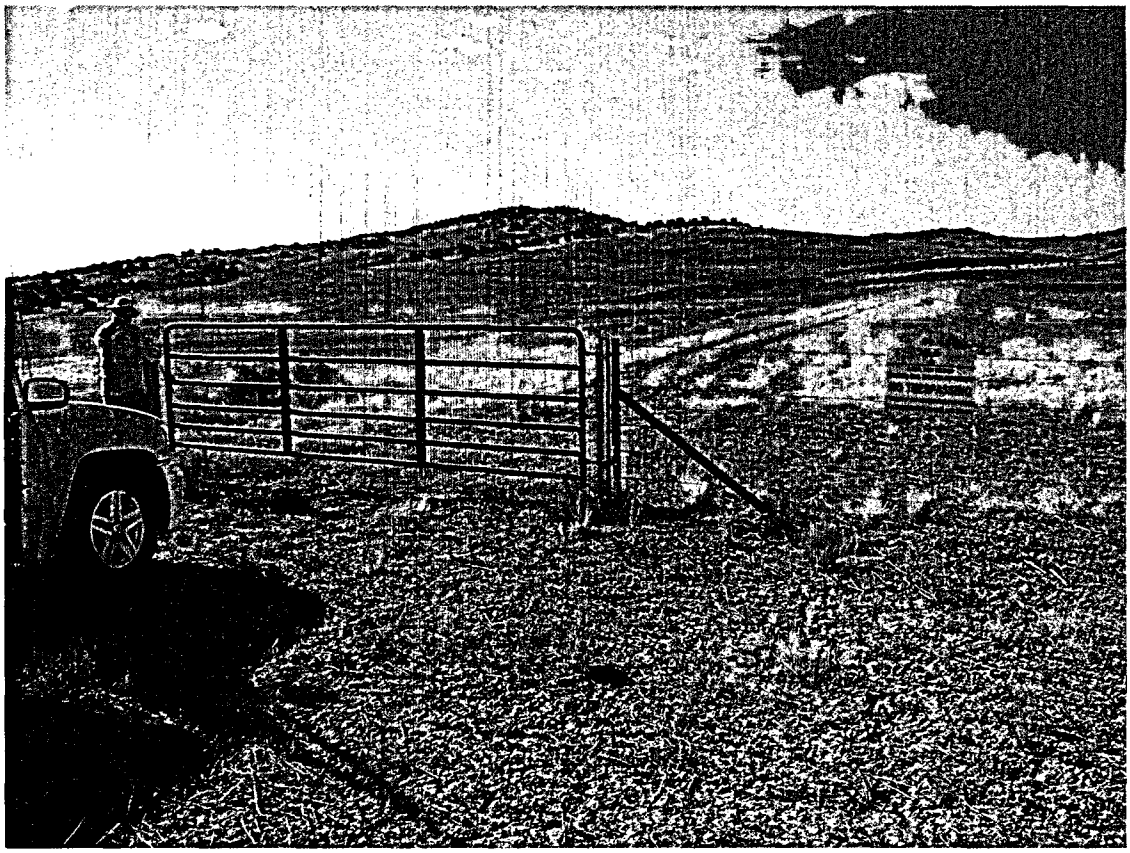
Plot Location	Percent Foliar Cover in 100-ft^2 Plots, September 1, 2005			
	Live Plants	Litter	Rock	Bare Ground
A1	60	5	2	33
A3	15	10	trace	75
B2	15	40	15	30
B4	30	43	2	25
C1	33	5	1	72
C3	20	25	10	45
D2	20	20	2	58
D4	0	85	2	13
E1	15	20	5	60
E3	15	25	trace	60

3.3.5 Photographs

Photograph Location Number	Azimuth	Description
PL–1	185	Access gate in chain-link fence.
PL–2	150	Tailings impoundment entrance gate and perimeter sign P1.
PL–3	180	No trespassing sign on the chain-link fence.
PL–4	180	Site marker at the chain-link fence access gate.
PL–5	NA	Monitor well MW–1A.
PL–6	40	Windblown deposits and cracked soil on the surface of the tailings impoundment cover.
PL–7	315	The containment dam viewed from perimeter sign P17.
PL–8	NA	PVC standpipe on the containment dam face.
PL–9	20	View north along the East Channel.
PL–10	120	The Sediment Trap viewed from the tailings impoundment dike.
PL–11	90	G3 Channel viewed from the tailings impoundment dike.
PL–12	50	Erosion on the south-facing slope of the G3 Channel.
PL–13	350	Erosion on the south-facing slope of the North Channel.
PL–14	90	Erosion protection apron on the north-facing slope of the South Channel.
PL–15	260	Erosion monitoring point B3.
PL–16	240	Measuring height of rebar at erosion monitoring point B3.
PL–17	260	Erosion monitoring point and vegetation monitoring plot D2.



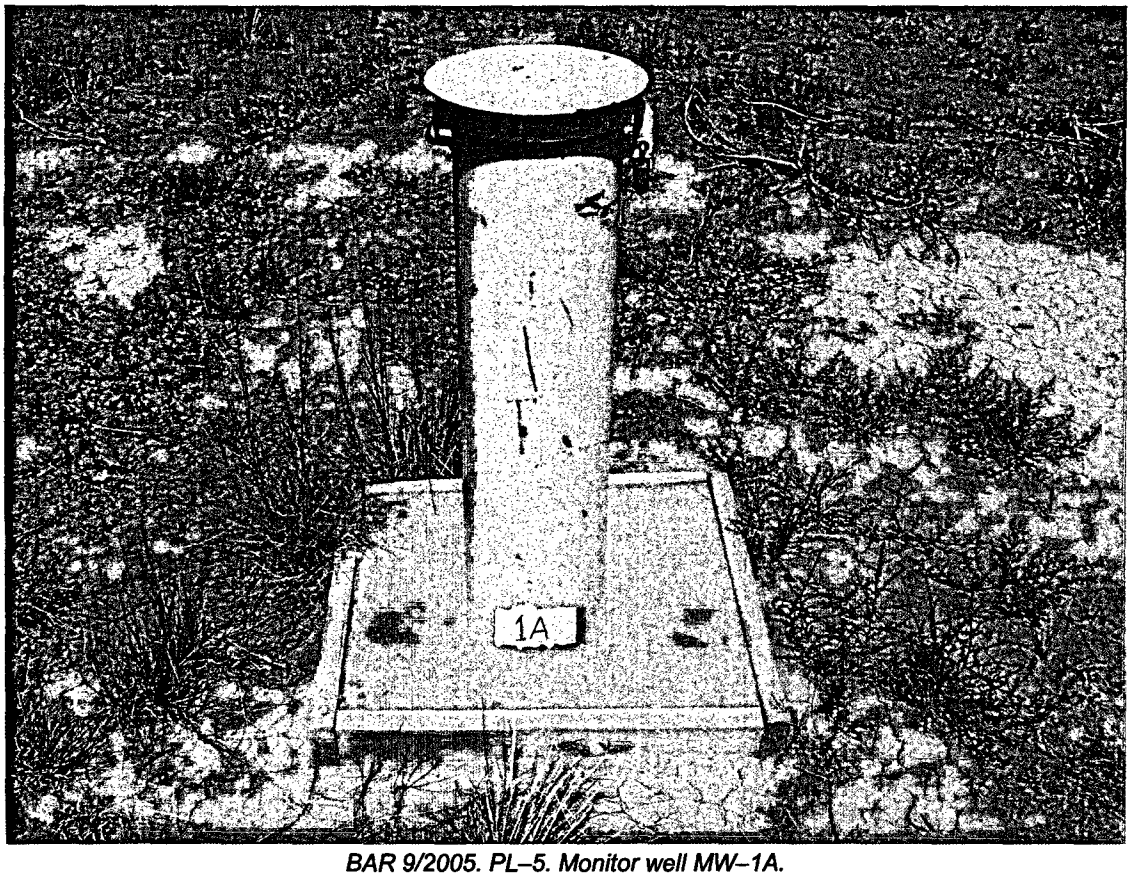
BAR 9/2005. PL–1. Access gate in chain-link fence.



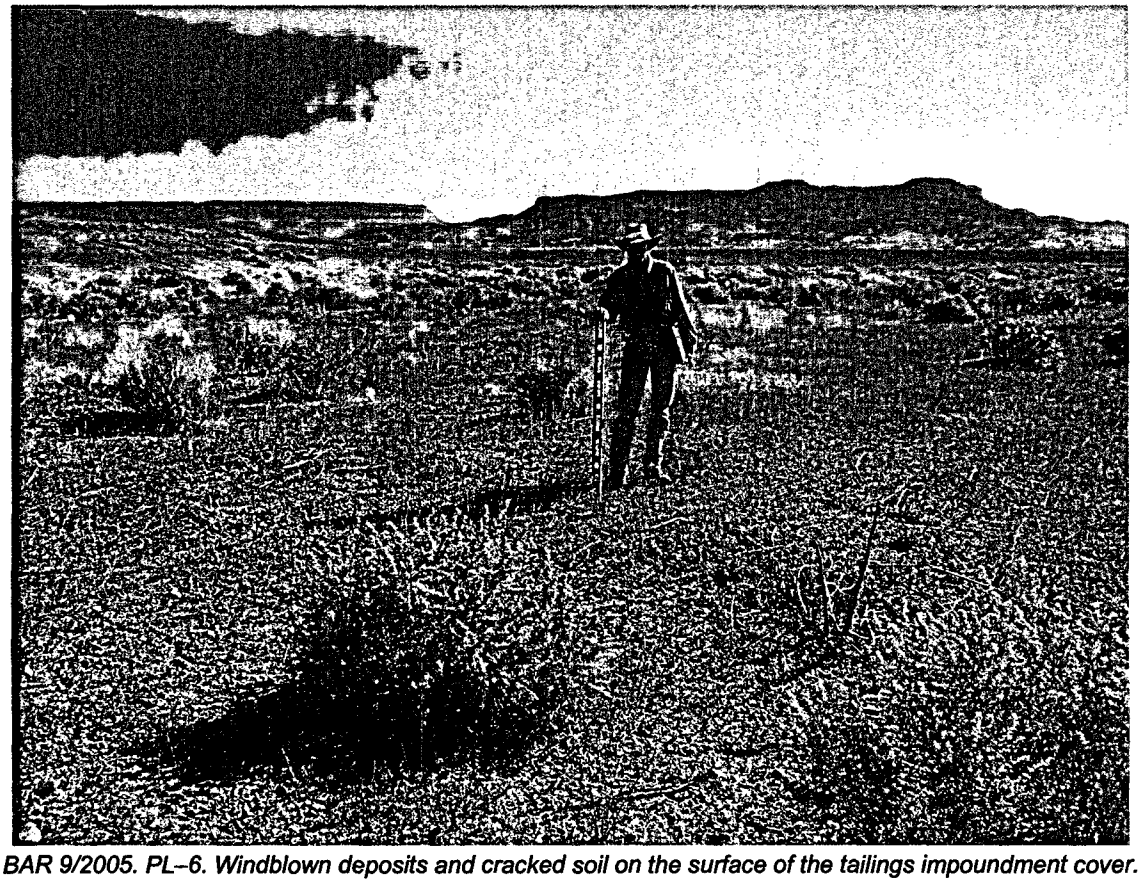
BAR 9/2005. PL–2. Tailings impoundment entrance gate and perimeter sign P1.

BAR 9/2005. PL–3. No trespassing sign on the chain-link fence.

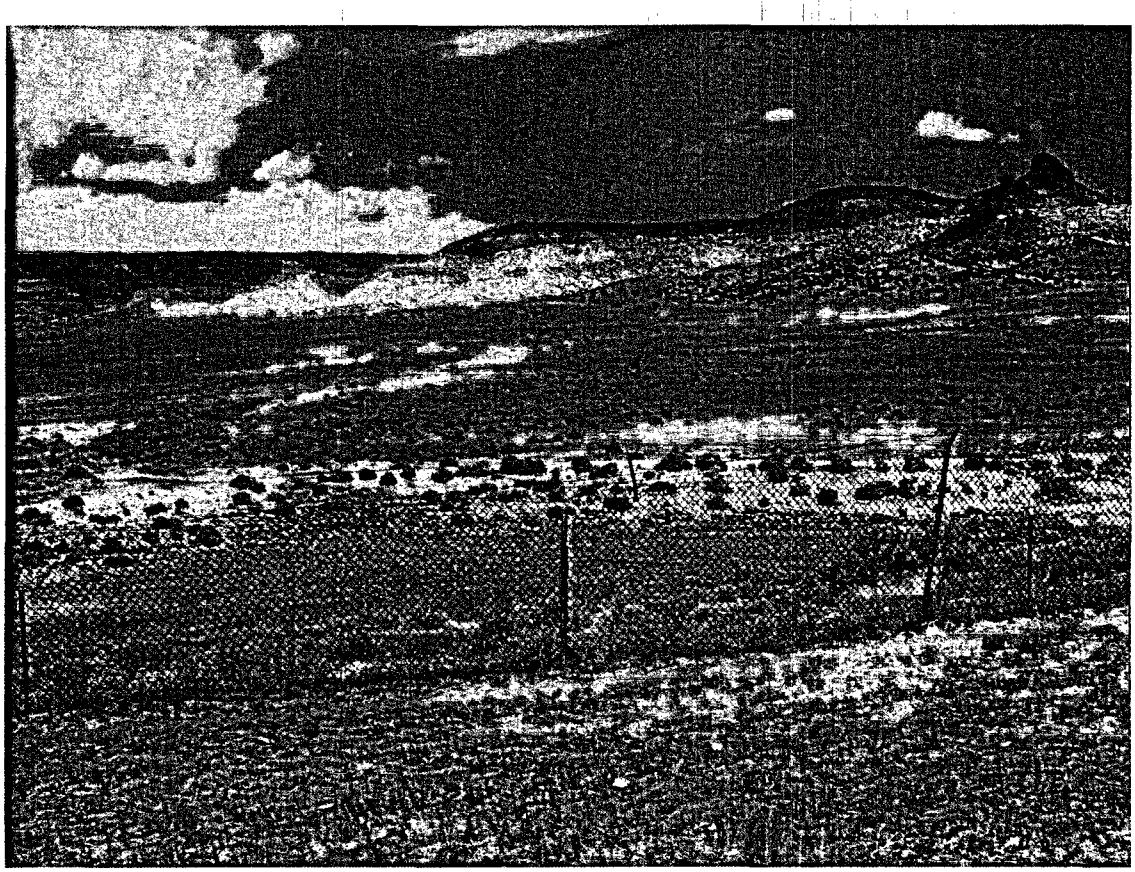
BAR 9/2005. PL–4. Site marker at the chain-link fence access gate.



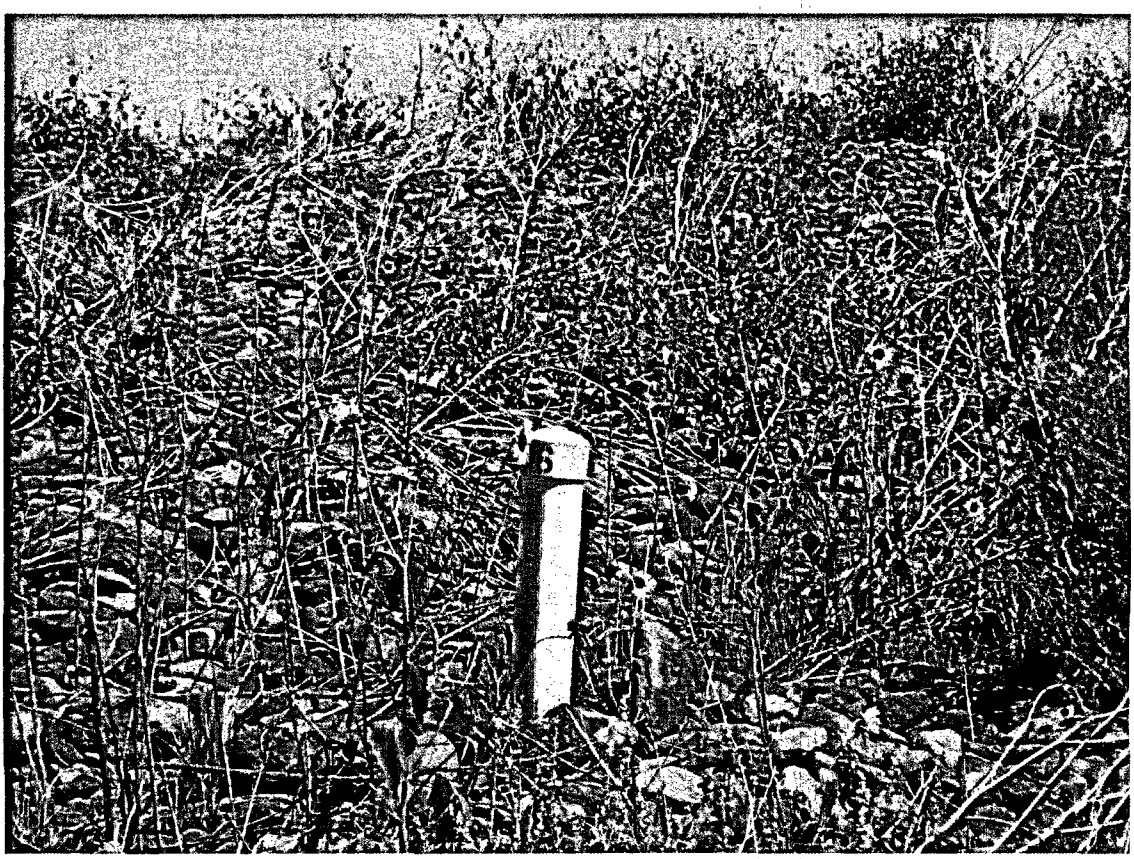
BAR 9/2005. PL–5. Monitor well MW–1A.



BAR 9/2005. PL–6. Windblown deposits and cracked soil on the surface of the tailings impoundment cover.

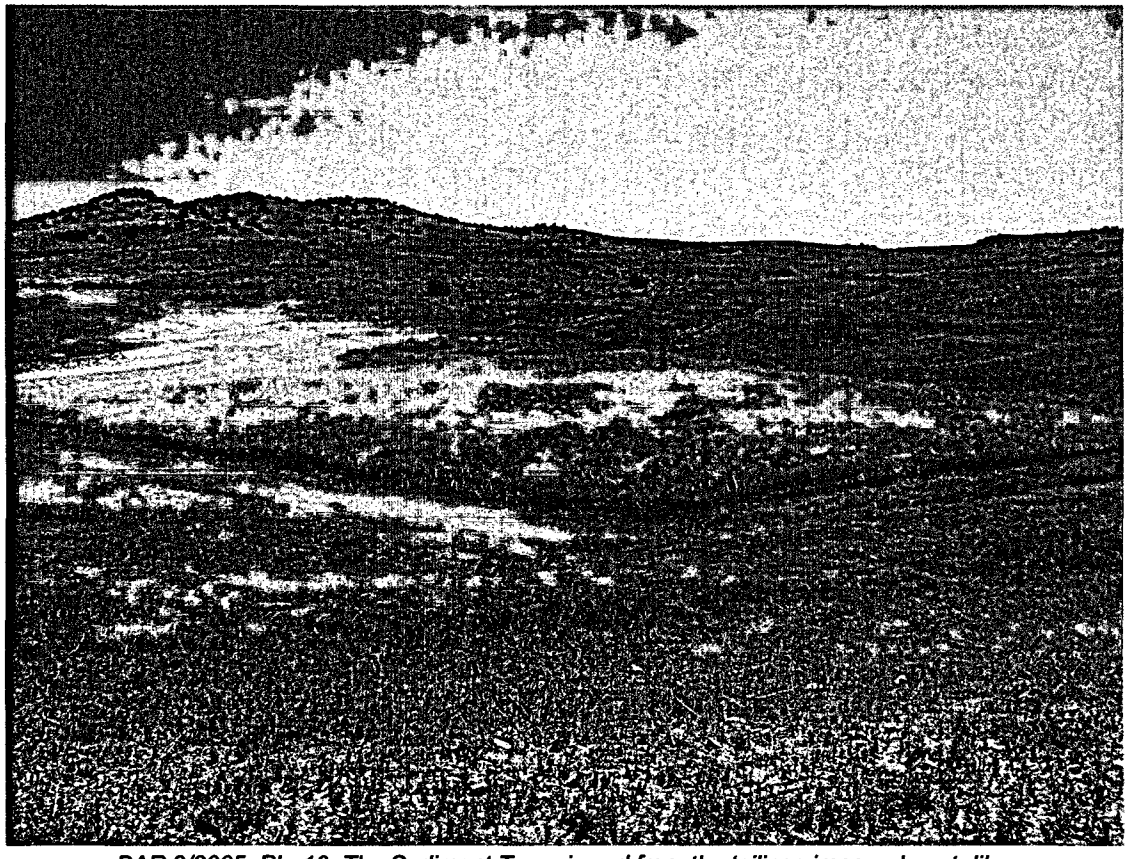


BAR 9/2005. PL–7. The containment dam viewed from perimeter sign P17.

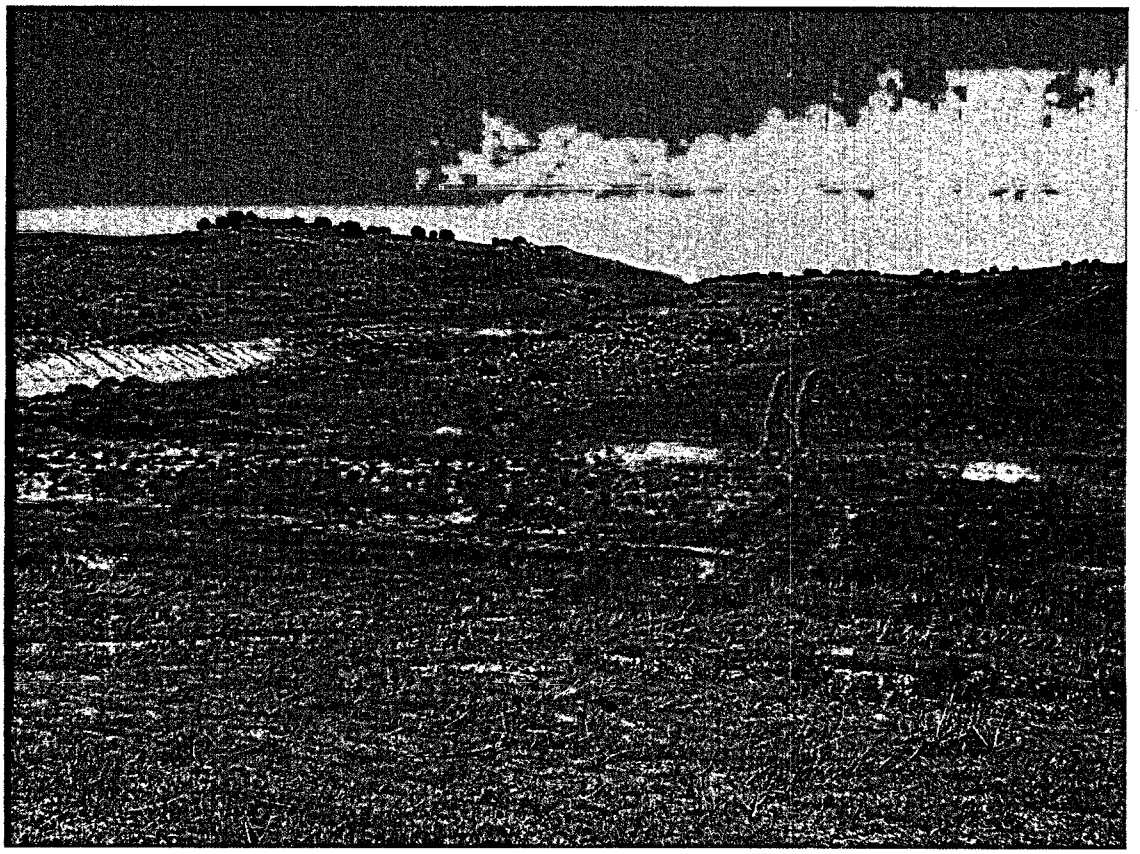


BAR 9/2005. PL–8. PVC standpipe on the containment dam face.

BAR 9/2005. PL–9. View north along the East Channel.

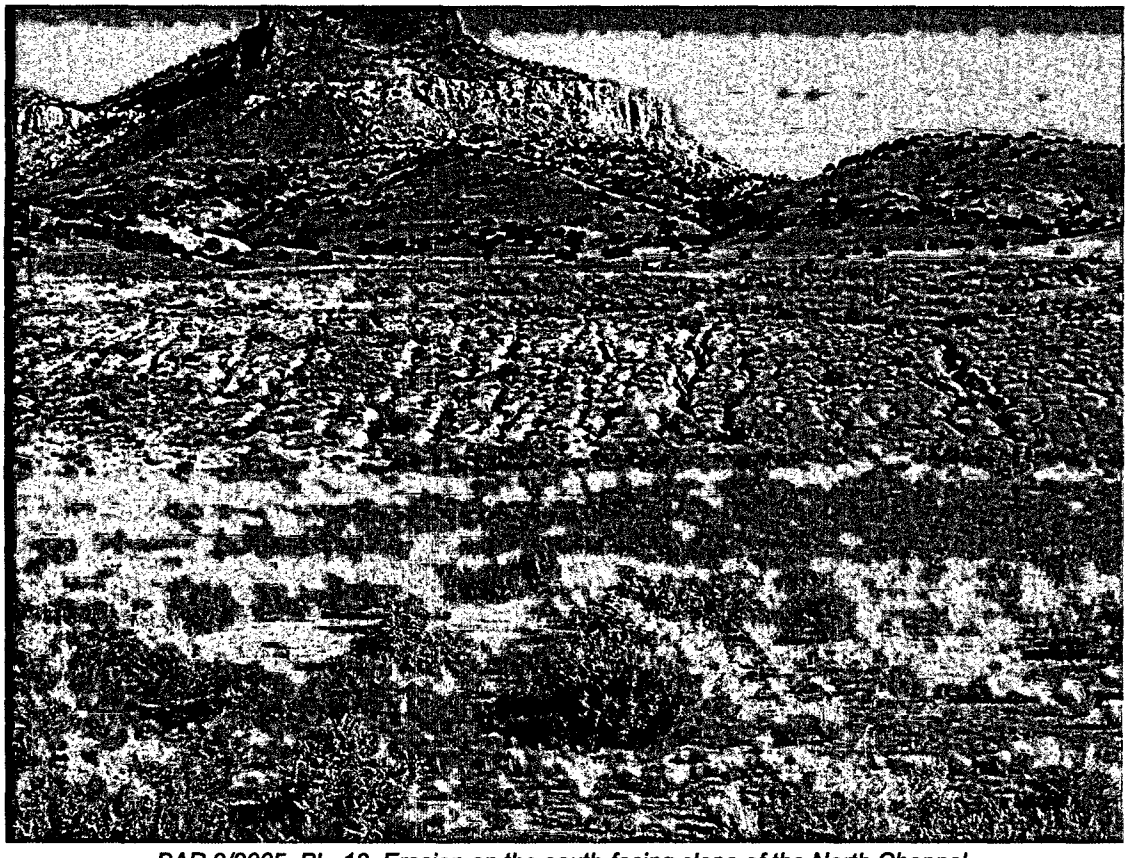


BAR 9/2005. PL–10. The Sediment Trap viewed from the tailings impoundment dike.



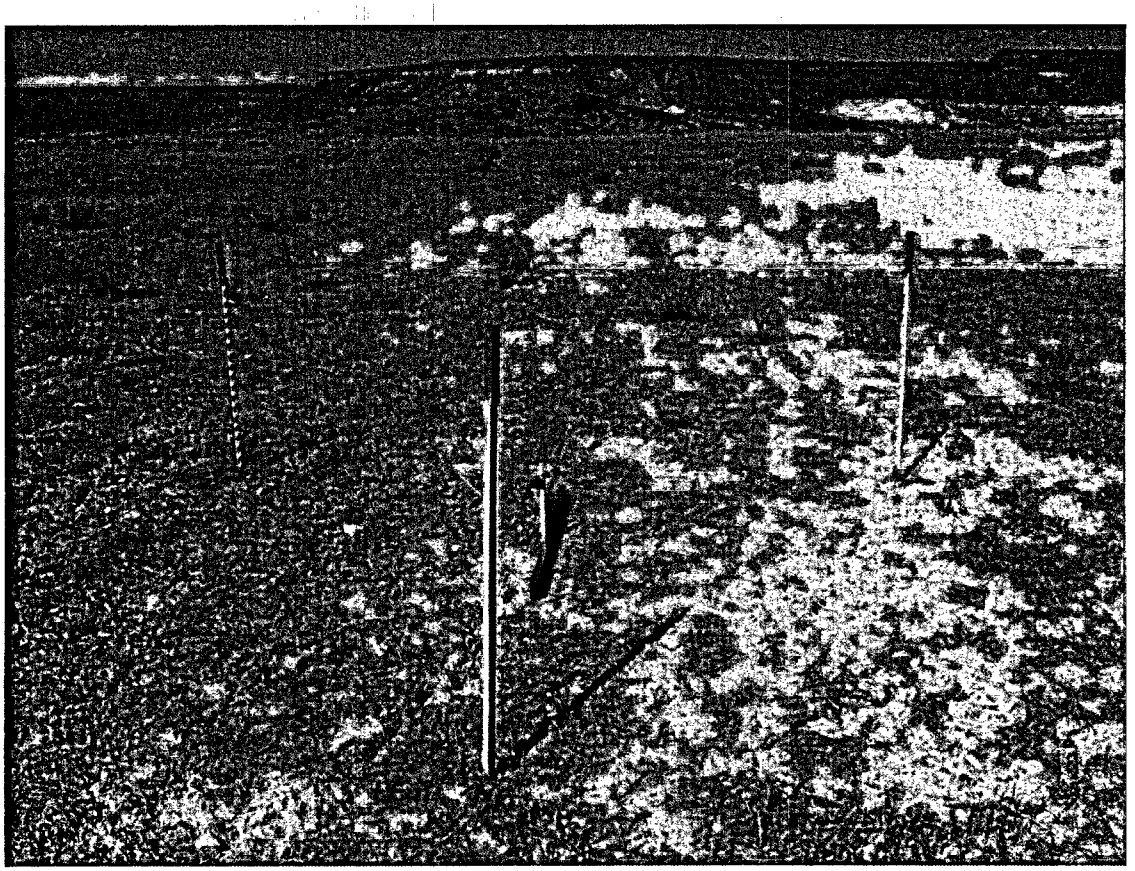
BAR 9/2005. PL–11. G3 Channel viewed from the tailings impoundment dike.

BAR 9/2005. PL–12. Erosion on the south-facing slope of the G3 Channel.

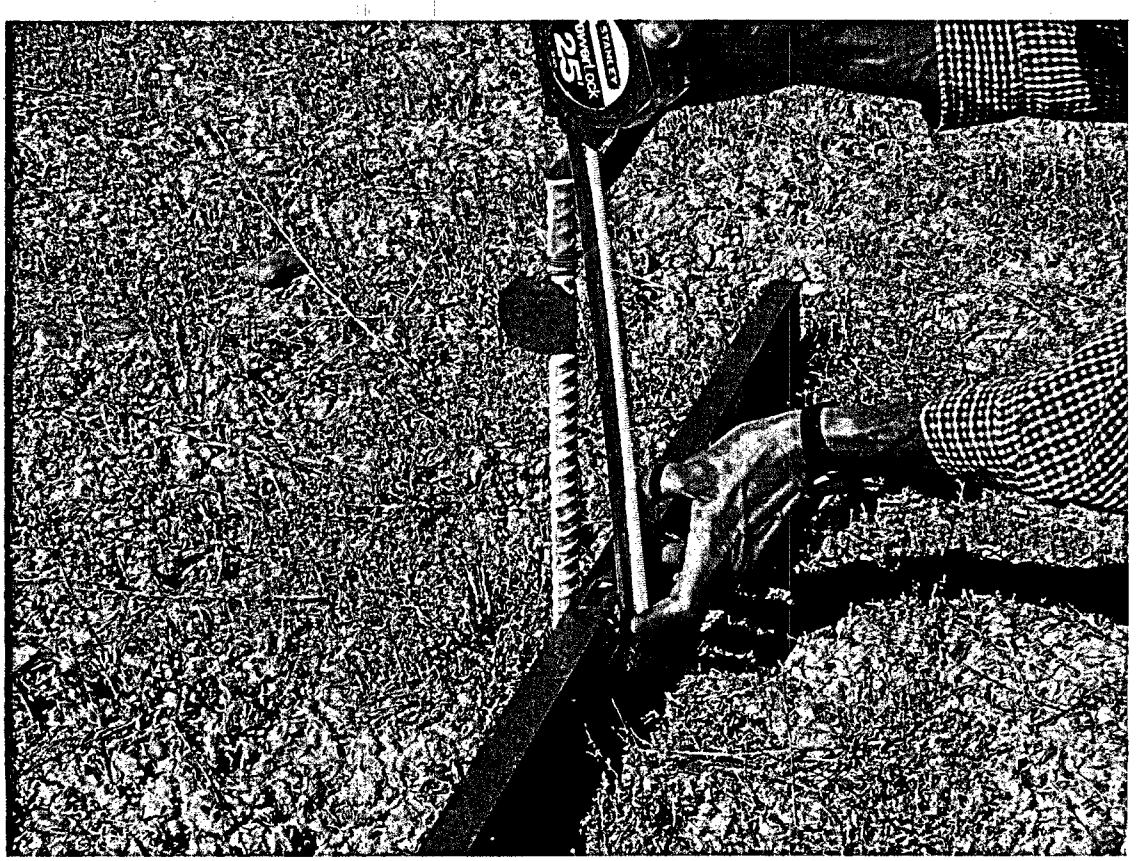


BAR 9/2005. PL–13. Erosion on the south-facing slope of the North Channel.

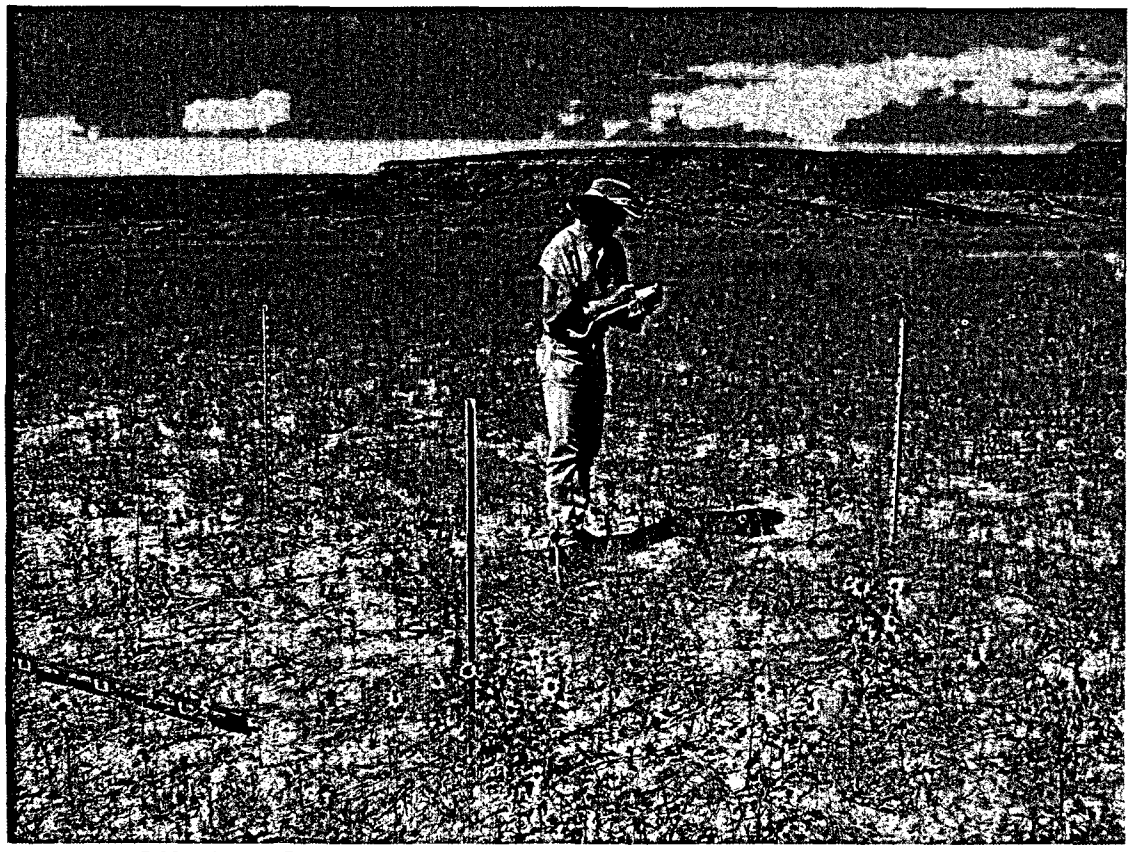
BAR 9/2005. PL–14. Erosion protection apron on the north-facing slope of the South Channel.



BAR 9/2005. PL–15. Erosion monitoring point B3.



BAR 9/2005. PL–16. Measuring height of rebar at erosion monitoring point B3.



BAR 9/2005. PL–17. Erosion monitoring point and vegetation monitoring plot D2.

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 June 27 and 28, 2005, 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.

4.3 Compliance Review

4.3.1 Annual Inspection and Report

The site, located near Wellpinit, Washington, was inspected on June 27 and 28, 2005. 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.

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; however, the scale representing the site dimensions has an incorrect number engraved into the granite and will be corrected.

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.

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.

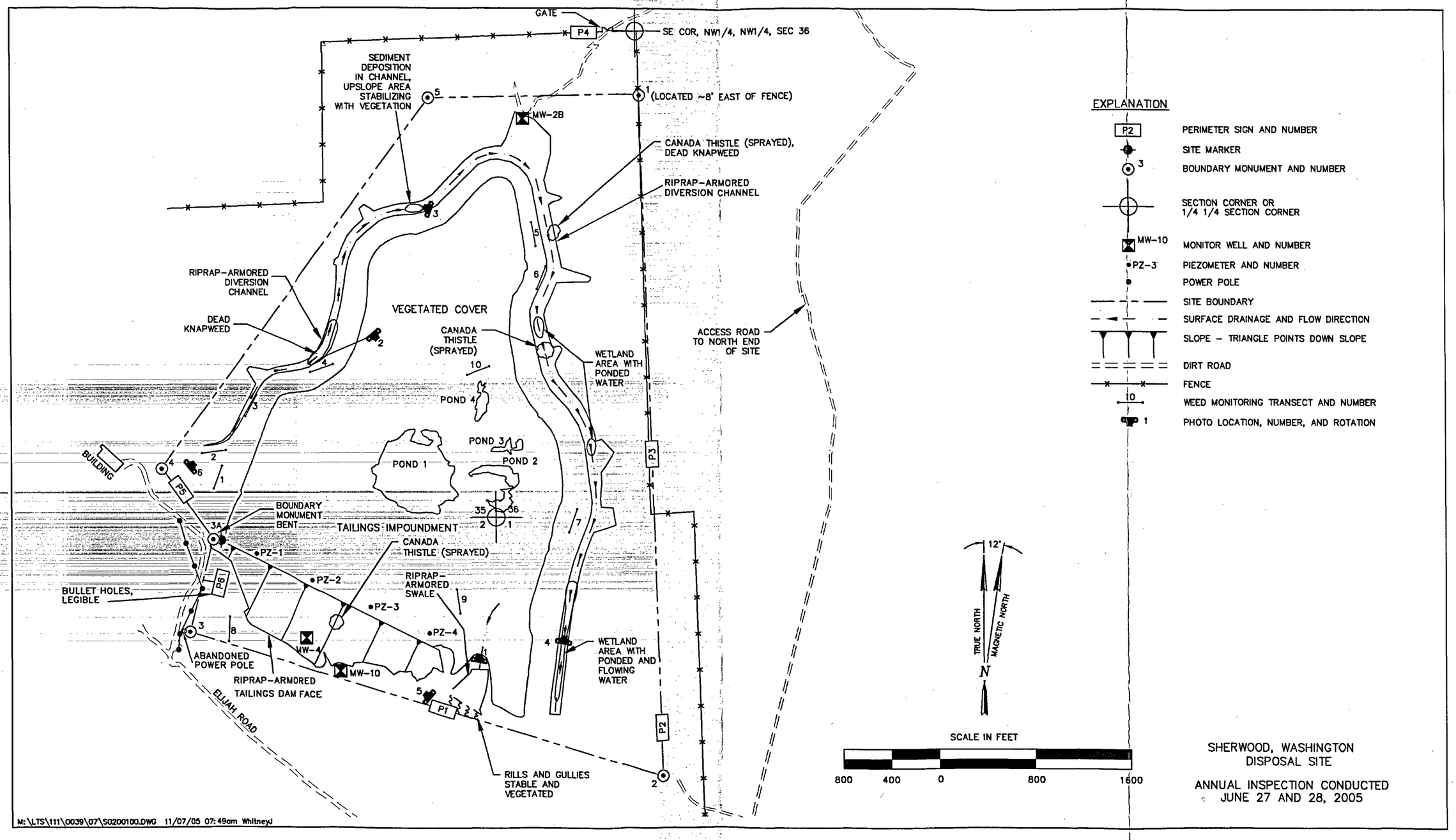


Figure 4–1. 2005 Annual Compliance Drawing for the Sherwood, Washington, Disposal Site

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 (PL–1). 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 (area measured by global positioning system equipment in 2004). 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 appear to provide an important water source for larger mammals such as deer and elk, whose sign was abundant in this area. A buffalo herd that roams the region was on the disposal cell and at Pond 1 during the time of the inspection (PL–2).

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. State representatives present during the inspection confirmed that the channel was designed to allow trees to grow and stabilize the surfaces, and that their presence in the channel would not 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 (PL–3), but does not interfere with the channel's design function; upslope areas that have contributed to the sedimentation are becoming stabilized with vegetation. At times, standing water has been observed in the channel along the east side of the impoundment; several locations of standing water were noted during the 2005 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.

4A 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. Extensive vegetative cover, including small Ponderosa pine trees, was observed on the face (PL–5). Much of the vegetation is undesirable weeds, but seeding with desirable species of native grasses, forbs, and shrubs occurred in fall 2004 in a effort to out-compete the weeds.

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 2005 are presented in Table 4–2. Standing water levels in 2005 were consistent with previous years, with no water in piezometers PZ–1, PZ–2, and PZ–4, and 0.91 foot of water in PZ–2. 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

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.

A representative of the tribe met with the inspectors and DOE personnel at the site to discuss planned logging operations in the surrounding forest. In a follow-up letter to DOE, 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, 4B and would be used only for logging operations planned for late summer and fall 2005. BIA would reclaim the road after logging is completed. DOE subsequently responded in favor of the proposed construction and reclamation.

4.3.1.3 Noxious Weeds

4C 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 July 2005.

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. No more applications of insects by DOE are planned.

4D 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 (PL–6). 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 2005 monitoring data indicate that weed populations along the transects increased, decreased, or remained about the same (depending upon the transect) since 2004. Weevils were found on most of the diffuse knapweed plants that were inspected, and many distressed Dalmatian toadflax plants were observed. Several areas that had previously been infested with knapweed plants contained only the skeletal remains of the plants; it appeared that the released insects were responsible for this damage. It is expected to take several years for the insects to control noxious weeds at the site, so 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 2005.

4.3.3 Routine Maintenance and Emergency Measures

Patches of Canada thistle were sprayed with herbicide in 2005. 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 2005.

4.3.4 Environmental Monitoring

4E 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 23, 2005. Analytical results for annual ground water samples collected from 2001 thru 2005 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

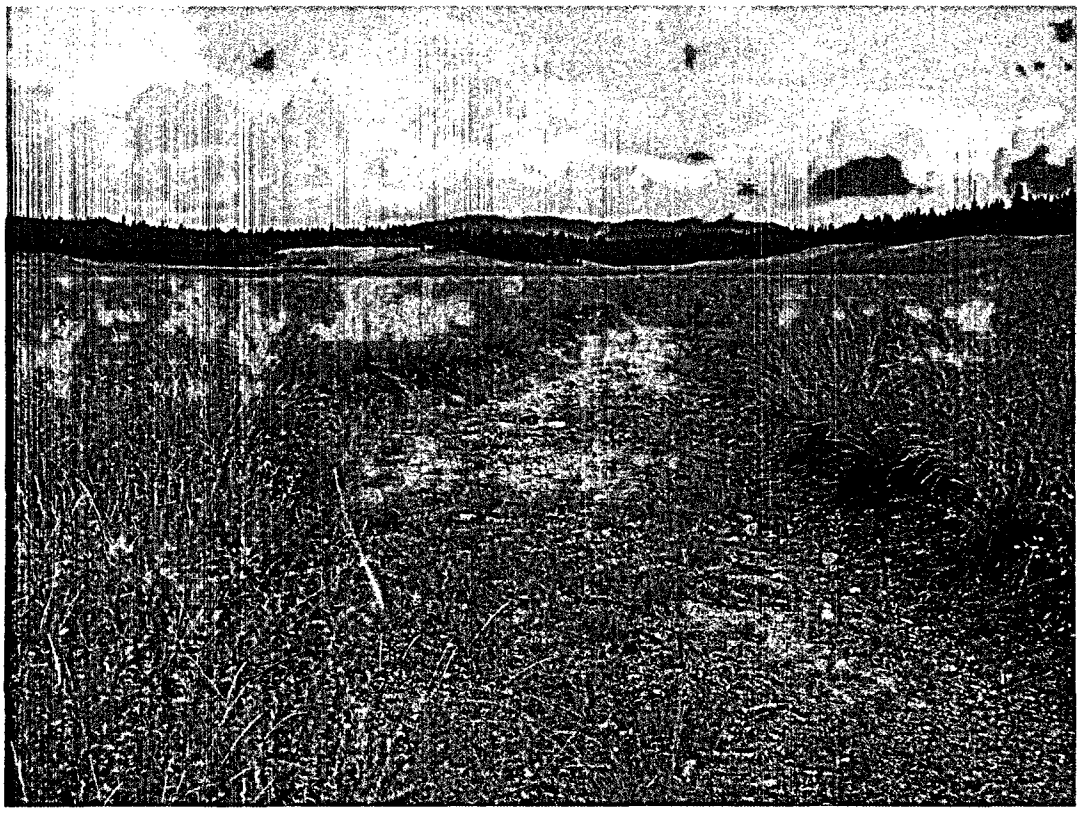
Constituent	Water Quality Criterion	Year	Background Well MW–2B	POC Well MW–4	POC Well MW–10
Chloride, mg/L	250	2001	1.46	6.29	2.35
		2002	1.79	3.10	2.63
		2003	1.33	5.26	2.19
		2004	1.3	2.1	2.5
		2005	1.6	1.8	2.5
Sulfate, mg/L	250	2001	3.04	27.50	25.50
		2002	3.17	20.90	27.50
		2003	3.50	27.40	28.10
		2004	3.4	22	28
		2005	3.3	21	30
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

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	10	Channel developed by cell cover runoff.
PL–2	140	Buffalo at Pond 1.
PL–3	290	Sediment in the diversion channel near the north end of the site.
PL–4	10	Ponded water and wetland vegetation in the diversion channel.
PL–5	310	Vegetation on the tailings dam face.
PL–6	50	Weed monitoring transect WM–2.



SHE 6/2005. PL–1. Channel developed by cell cover runoff.

SHE 6/2005. PL–2. Buffalo at Pond 1.

SHE 6/2005. PL–3. Sediment in the diversion channel near the north end of the site.

SHE 6/2005. PL–4. Ponded water and wetland vegetation in the diversion channel.

SHE 6/2005. PL–5. Vegetation on the tailings dam face.

SHE 6/2005. PL–6. Weed monitoring transect WM–2.

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

Date of Inspection: June 28, 2005

Inspector	Organization
R. K. Johnson	S.M. Stoller Corp.

Piezometer PZ-1 current year water depth: (Previous year depth: dry)	Dry
Piezometer PZ-2 current year water depth: (Previous year depth: 2.00')	0.91'
Piezometer PZ-3 current year water depth: (Previous year depth: dry)	Dry
Piezometer PZ-4 current year water depth: (Previous year depth: dry)	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? If yes immediately contact the following:	No

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 23, 2005.

Inspector Signature: Richard K Johnson Date: 8/3/05

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 was inspected on June 15, 2005. The site was accepted under the
5A U.S. Nuclear Regulatory Commission general license on June 8, 2005, and this was the first annual inspection conducted by the U.S. Department of Energy (DOE). The site was in excellent condition with no maintenance needs identified. The first annual ground water sampling event indicated that two constituents exceeded their respective alternate concentration limit; confirmatory sampling was conducted in November and the results are pending. 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. 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 15, 2005. 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 (PL–1); 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. The inspectors drove along the site perimeter to inspect the integrity of the fence and the boundary monuments. Except for an area along the north boundary, the fence is in excellent condition. Three 50-foot sections immediately west of boundary monument BM-23A were open to allow approved access by equipment of the Pathfinder Mines Corporation (Pathfinder) to Topsoil Stockpile No. 1 on the DOE site (PL–2). However, the Pathfinder property is secure, so the open fence is not adversely affecting the security of the 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 (PL–3), and another 9 signs are located along the site perimeter at potential points of access. All of the signs were in excellent condition.

Site Marker and Boundary Monuments—The granite site marker, located at the site entrance, was in excellent condition (PL–4). All 27 boundary monuments delineating DOE property were located and found to be in excellent condition.

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 (PL–5). 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–6). The eastern (upper) surface is contoured to drain into a basin east of the cover (PL–7) and west over a riprap-protected slope to the western (lower) surface. The lower surface drains to the north and south toward riprap-protected discharge points (PL–8). The grass was well established and had been mowed by a local rancher in 2004. There were no indications of erosion, settlement, or other modifying processes that might affect the integrity of the cell.

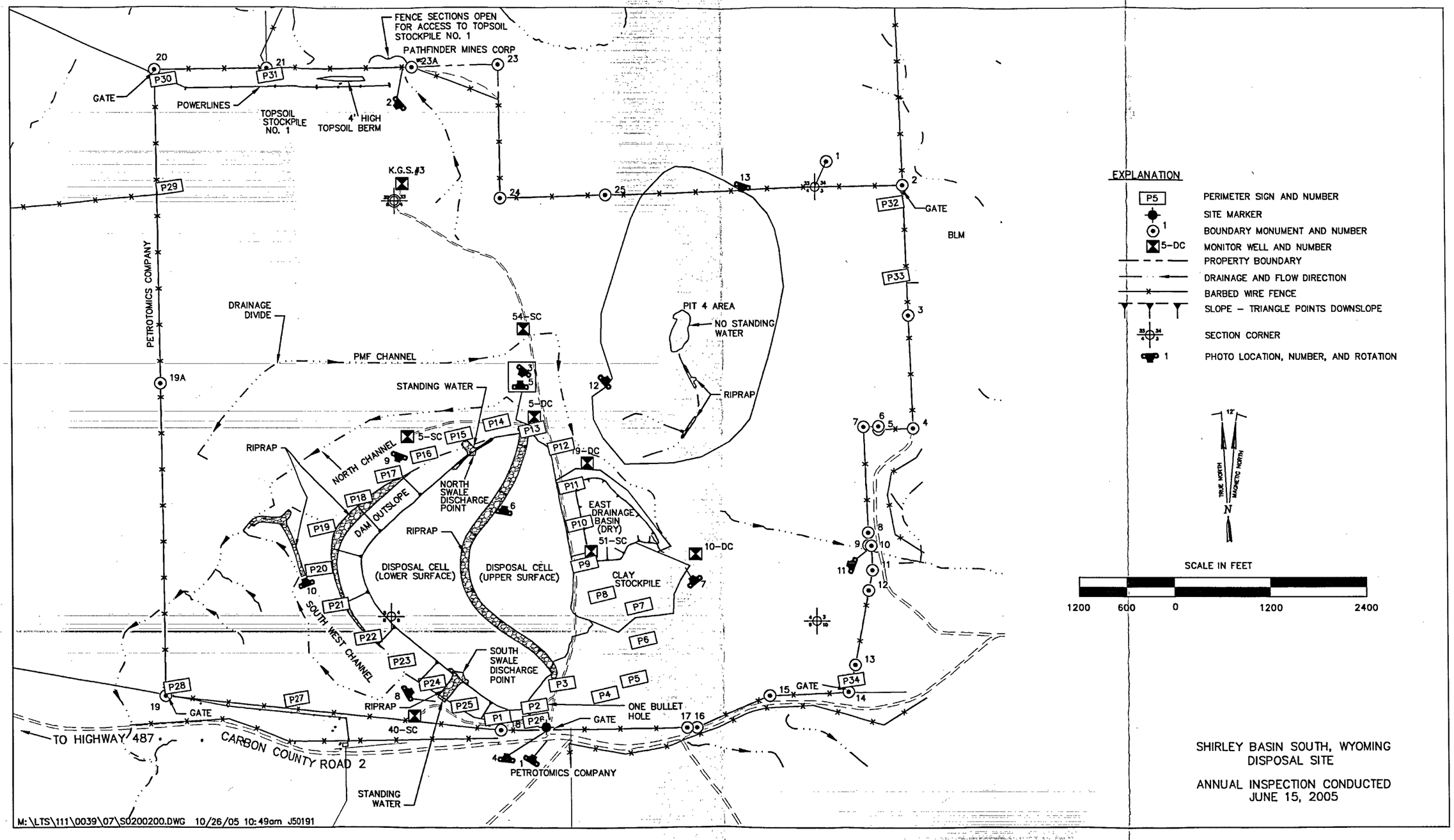


Figure 5–1. 2005 Annual Compliance Drawing for the Shirley Basin South, Wyoming, Disposal Site

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, with the north and south swale discharge points and the steeper sections (5:1 slope) of the dam protected by riprap (PL–9). There were no indications of erosion, settlement, or other modifying processes that might affect the integrity of the dam. Vegetation is encroaching on the riprap surfaces but does not affect the function of the erosion protection features.

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–10 and PL–11). 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 and discharges into the East Drainage Basin (PL–7). These closed drainage basins are large enough to accommodate the PMF water volumes. The diversion channels were in excellent condition and indicated no signs of active erosion.

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–12). 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 (PL–13). 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
5B 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. Because activities are occurring on DOE property, DOE will contact Pathfinder and WDEQ to clarify responsibilities, work scope and duration, and liabilities.

5C A local rancher met with the inspectors to discuss possible use of the site. The rancher grazes cattle on surrounding land, cut the grass on top of the disposal cell for hay in 2004, and has made repairs to the fence that borders the north side of the site. He expressed the desire to continue cutting the disposal cell cover grass and to graze a small herd of cattle on the site. Because surface water is not available on the site, the rancher proposed using one or more DOE monitor wells as water supply wells for his cattle. One well, MW–K.G.S. #3, is completed in the uncontaminated Lower Sand Aquifer and was the former water supply well for a mine shop. This is the only well that potentially could be used for water supply, but it is currently permitted only for monitoring purposes. The proposed uses of the site will be discussed further with the rancher. Grazing is a favorable use of the site to manage the vegetation. If it is determined that the use of MW–K.G.S. #3 would not affect ground water contamination or monitoring at the site, a written

request to and approval by the Wyoming State Water Board would be required to change the well status from monitoring to productive use.

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 2005.

5.3.3 Routine Maintenance and Emergency Measures

No maintenance was required during 2005. 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 2005.

5.3.4 Environmental Monitoring

Ground water monitoring is required at the Shirley Basin South site. The monitoring network
5D 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
MW–40–SC	Upgradient well; Upper Sand Aquifer
MW–5–SC	POC well; Upper Sand Aquifer
MW–51–SC	POC well; Upper Sand Aquifer
MW–54–SC	Upper Sand Aquifer
MW–10–DC	Main Sand Aquifer
MW–5–DC	POC well; Main Sand Aquifer
MW–19–DC	POC well; Main Sand Aquifer
MW–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[a]
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

[a]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.

Annual ground water monitoring in accordance with the LTSP commenced in July 2005. Analytical results, validated in October 2005, are provided Table 5–4.

The results for cadmium in POC well MW–5–SC and radium-228 in POC well MW–5–DC
5E exceeded their respective ACL. Therefore, confirmatory sampling and analysis for cadmium and radium-228 at the two POC wells was conducted in November and analytical results are pending. When compared with historical results provided by the previous site owner, the July 2005 result for cadmium in MW–5–SC was within the range of historical measurements with no apparent upward or downward trend. The 2005 result for radium-228 in MW–5–DC was substantially above historical measurements.

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, MW–51–SC, MW–54–SC, and MW–5–DC. When compared with historical results provided by the previous site owner, the 2005 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.

Table 5–4. 2005 Ground Water Monitoring Results at the Shirley Basin South, Wyoming, Disposal Site

Analyte (Limit or Standard)	Monitor 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)	0.093	0.00023	0.058	0.054	0.015	0.00014	0.00023	0.00015
Chloride (2,000 mg/L)	320	150	370	340	340	62	89	8.2
Chromium (1.83 mg/L)	0.037	0.0014	0.28	0.24	0.032	0.00068	0.0014	0.00068
Lead (0.05 mg/L)	0.00024	0.00022	0.00029	0.00041	0.00029	0.00023	0.00022	0.00022
Nickel (6.15 mg/L)	2.8	0.019	2	3.2	0.76	0.0023	0.18	0.0012
Nitrate (mg/L)	20	0.47	20	20	10	1	5	0.01
Radium-226 (91.3 pCi/L)	0.11	0.881	0.811	18.4	12	18.9	6.65	ND
Radium-228 (25.7 pCi/L)	1.83	1.08	0.456	79.4	40.5	7.25	6.73	0.652
Selenium (0.12 mg/L)	0.028	0.0058	0.00033	0.00022	0.00016	0.00004	0.00005	0.00004
Sulfate (3,000 mg/L)	14,000	2,400	12,000	7,700	5,500	1,100	2,700	230
Thorium-230 (2,409 pCi/L)	596	ND	3.98	5.71	1	ND	ND	ND
TDS (5,000 mg/L)	19,000	3,900	18,000	12,000	8,200	1,800	4,300	450
Uranium (9.2 mg/L)	4.3	0.00034	0.013	0.065	0.15	0.011	0.00017	0.000059
Water Elev. (feet)	7000.32	7049.32	6993.90	6950.71	6937.31	6939.43	6938.40	6944.23

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

Analytical results from 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 to develop contour maps of the contaminant plumes. Instead, 2005 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 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 2005 data in combination with historical measurements obtained from a much larger well network that existed prior to transfer of the site to DOE.

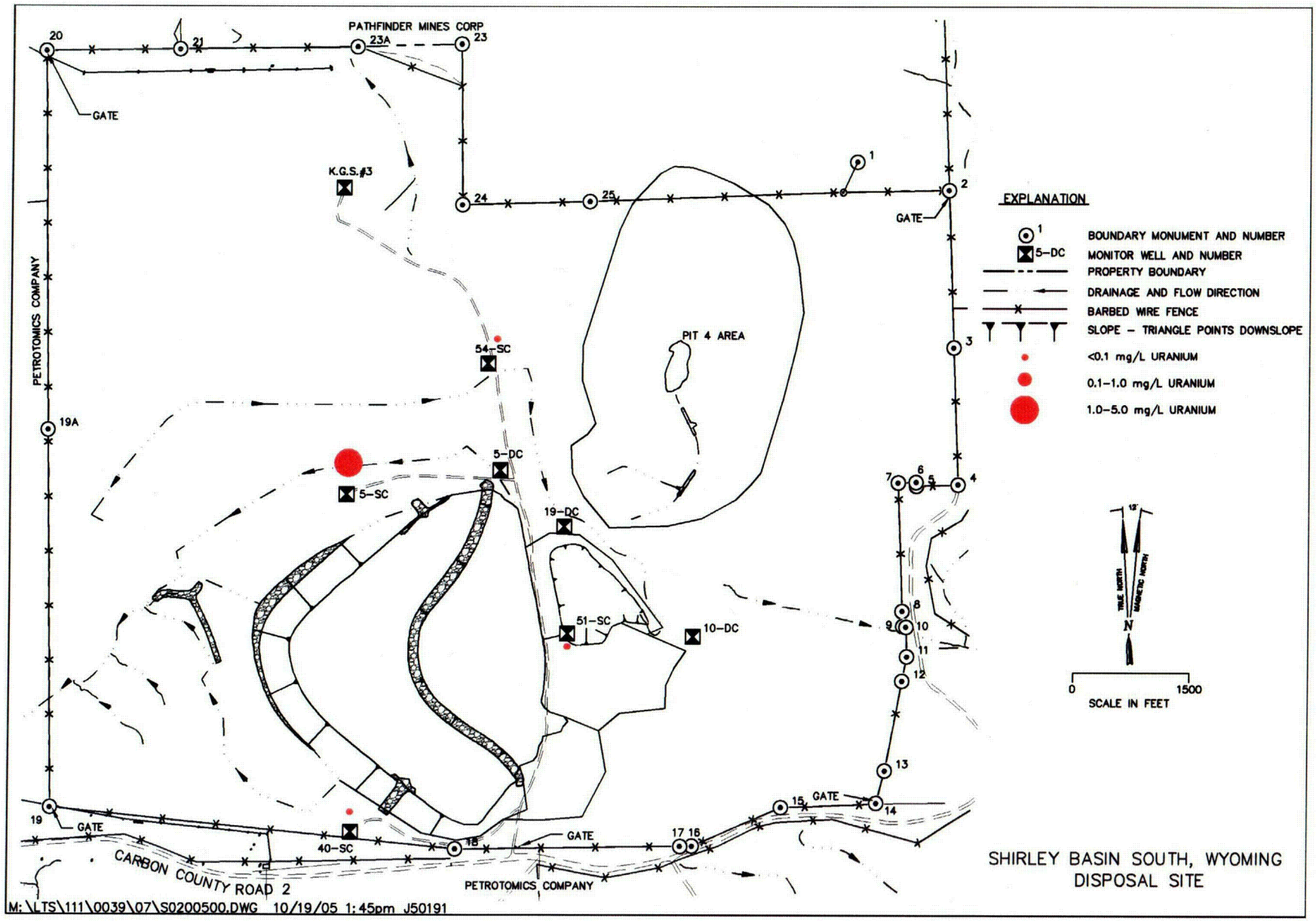


Figure 5–2. July 2005 Uranium Concentrations in the Upper Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

C01

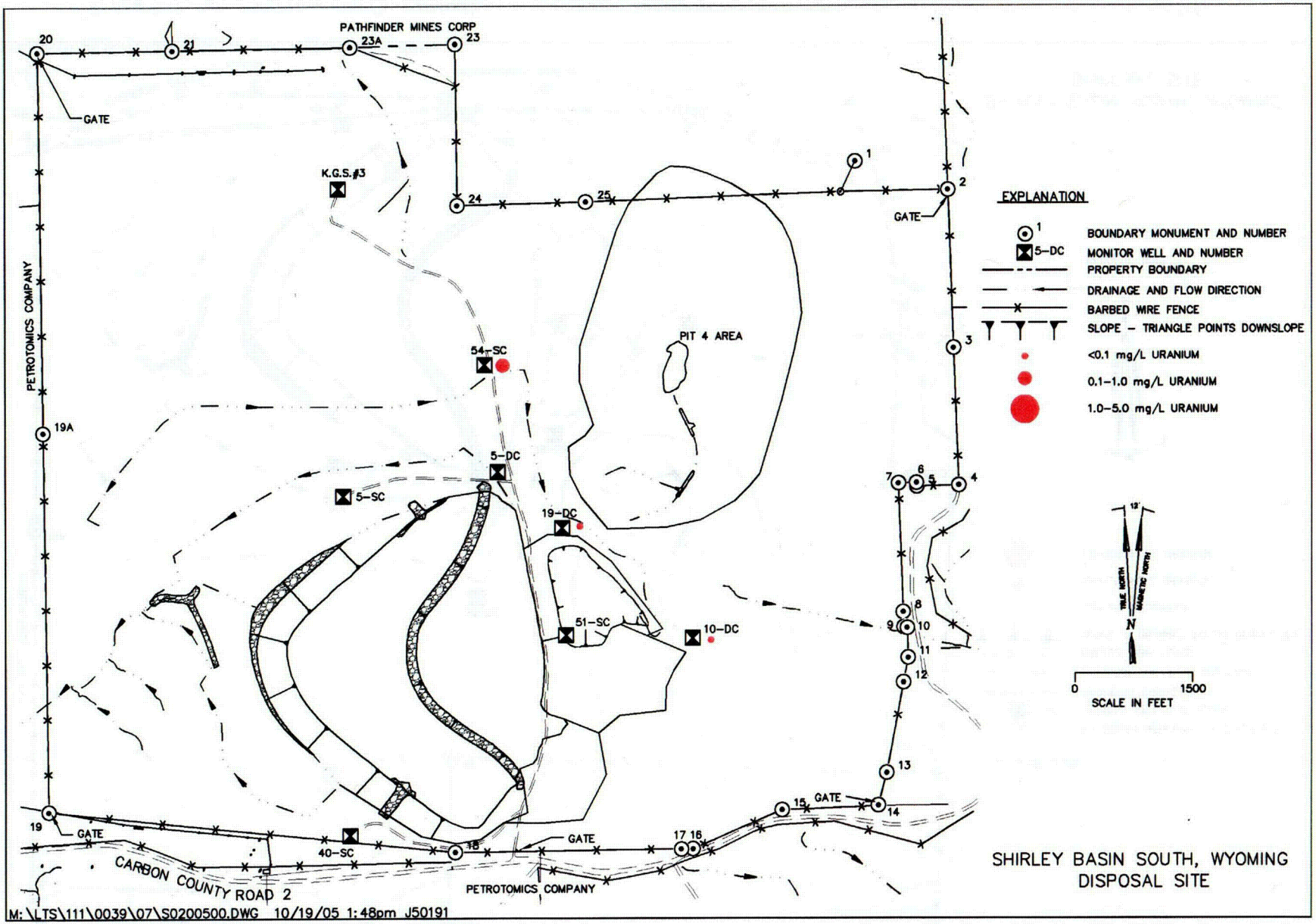


Figure 5–3. July 2005 Uranium Concentrations in the Main Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

C02

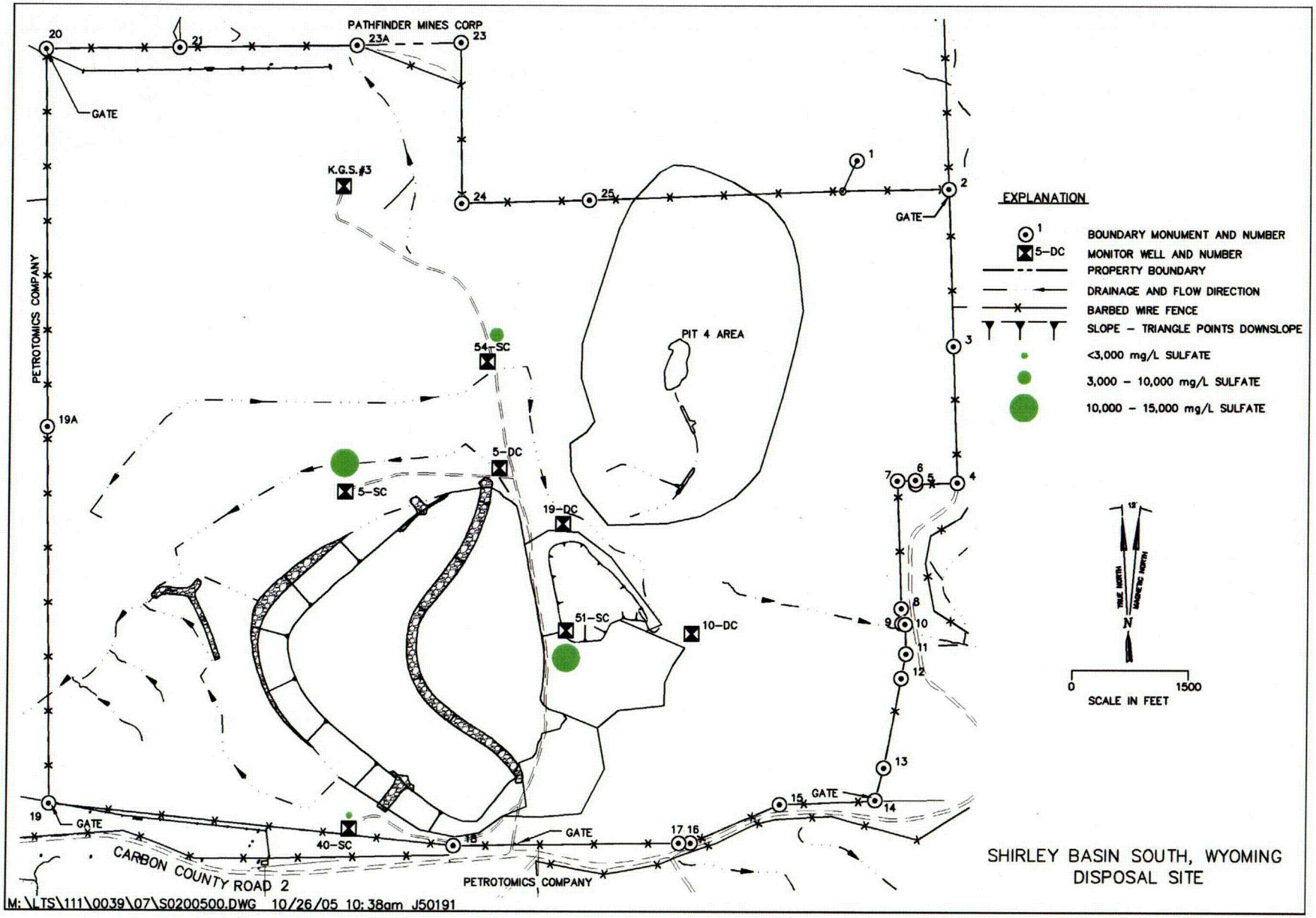


Figure 5–4. July 2005 Sulfate Concentrations in the Upper Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

C03

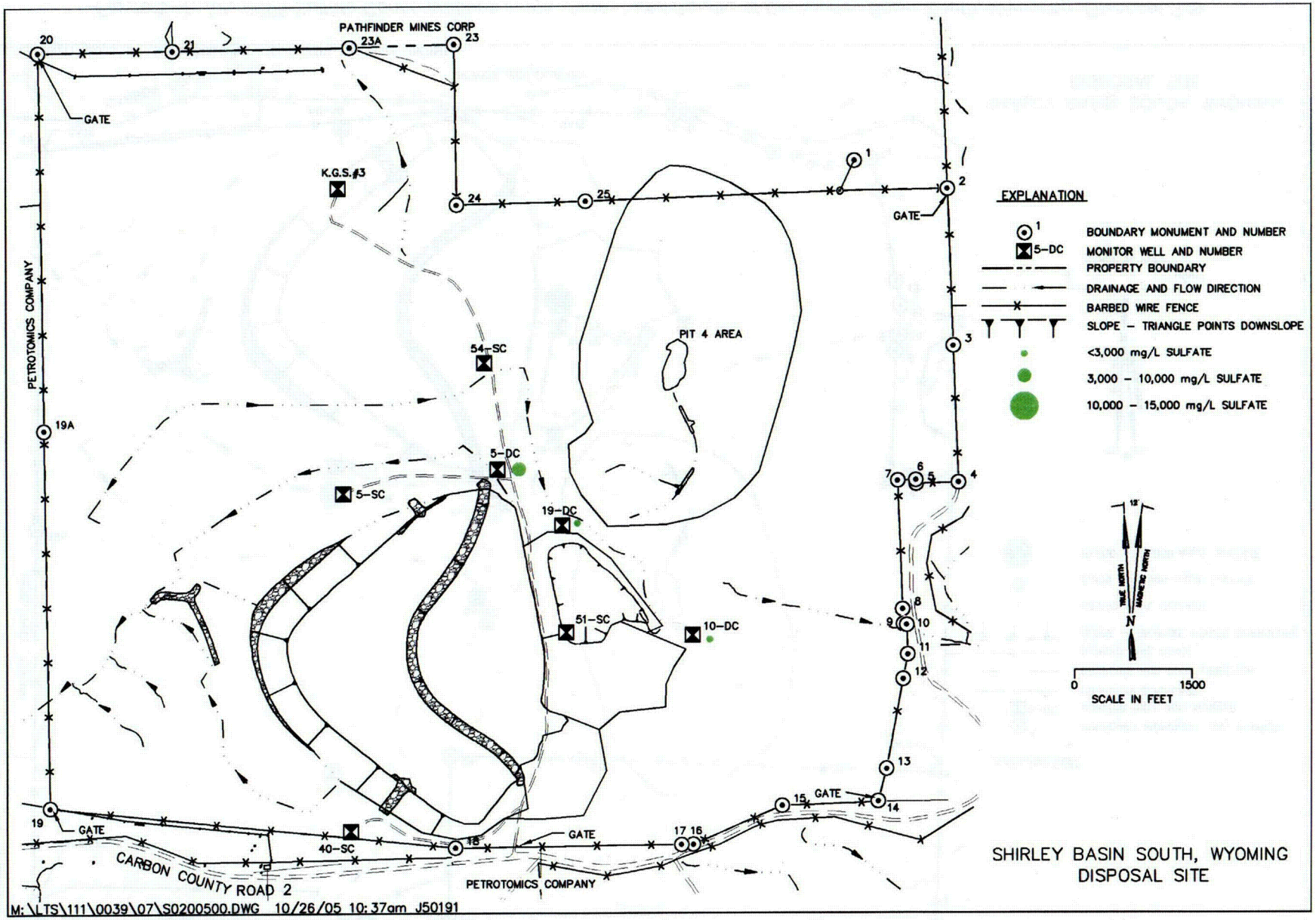


Figure 5–5. July 2005 Sulfate Concentrations in the Main Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

C04

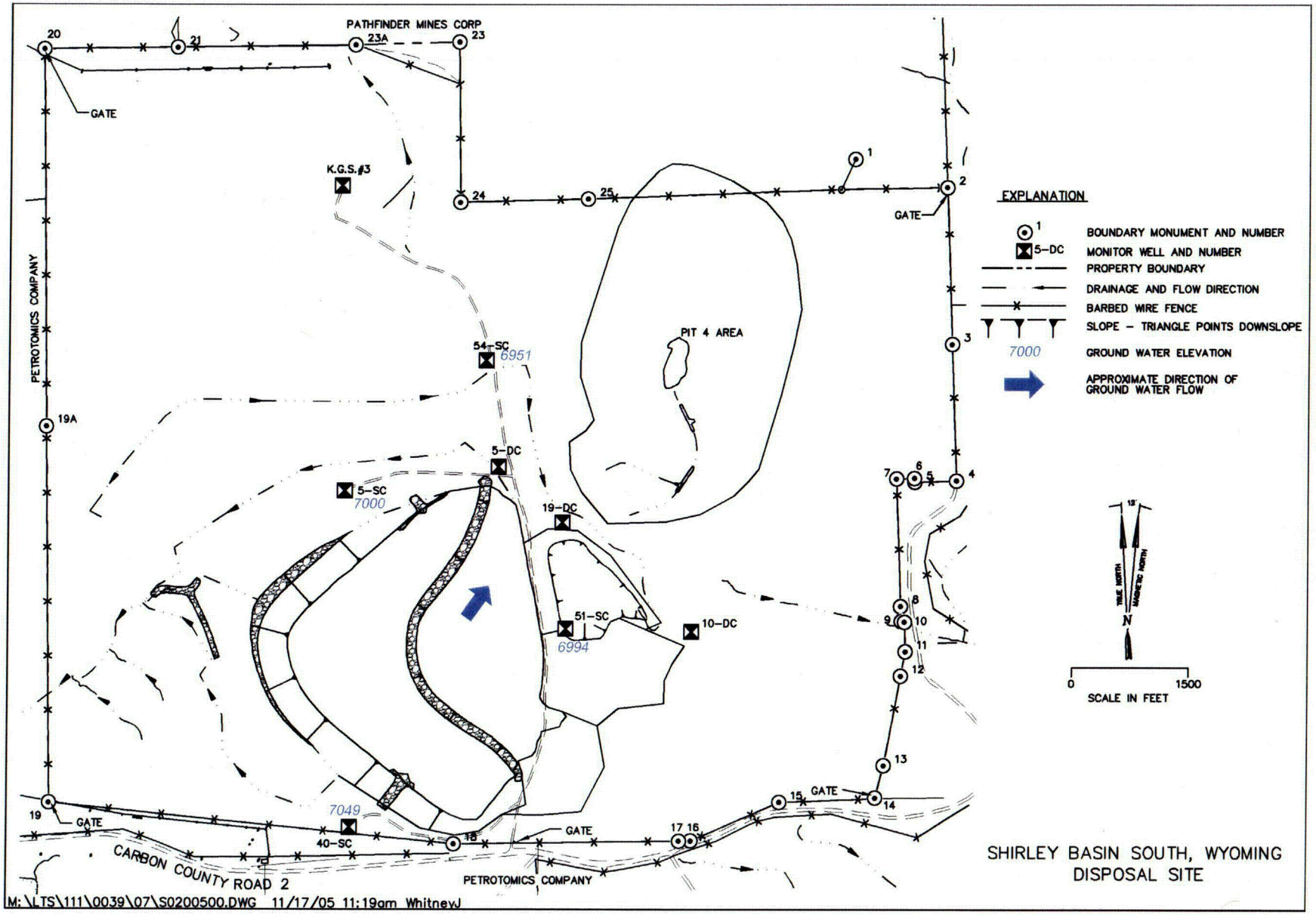


Figure 5–6. Ground Water Flow in the Upper Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

C05

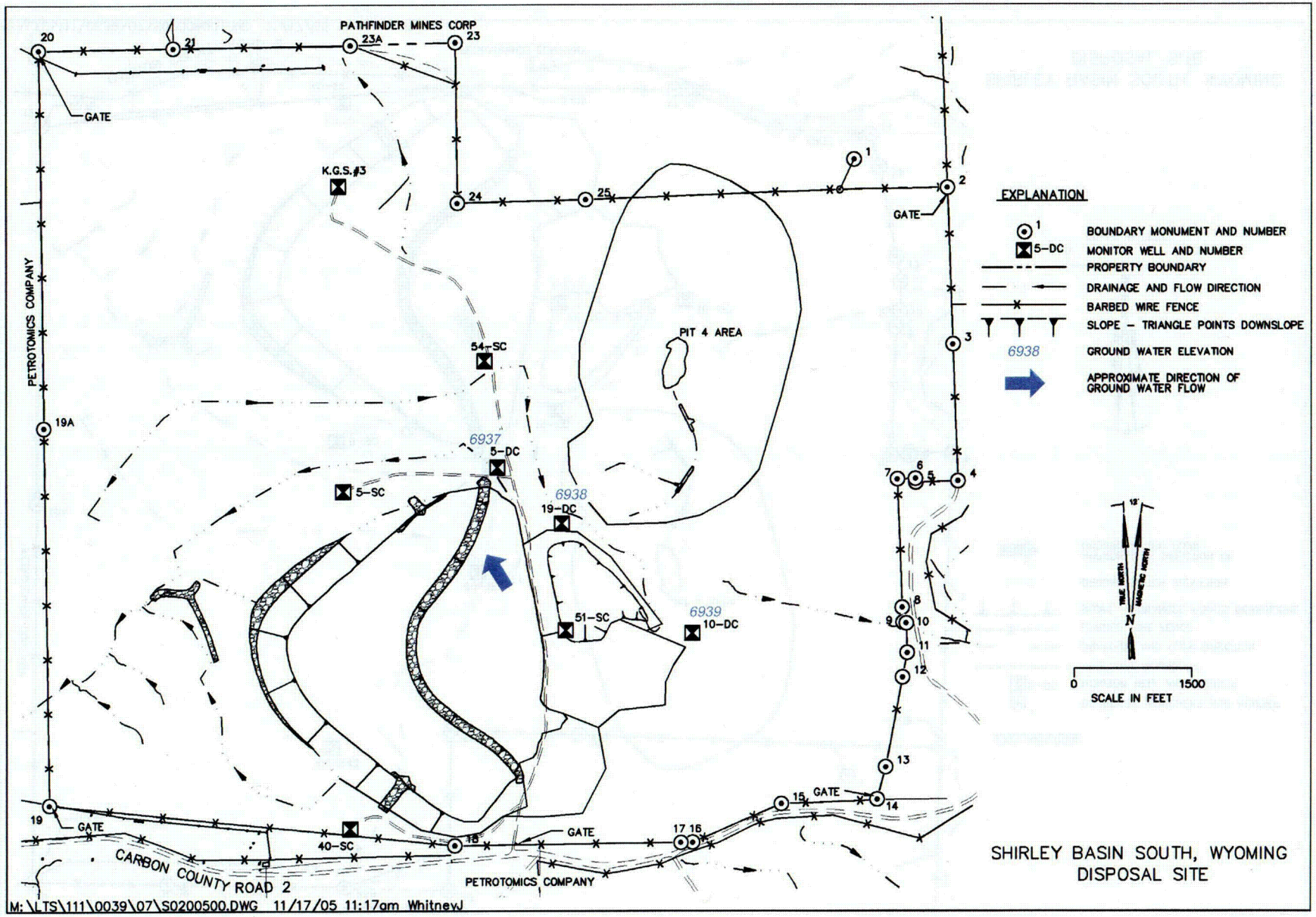


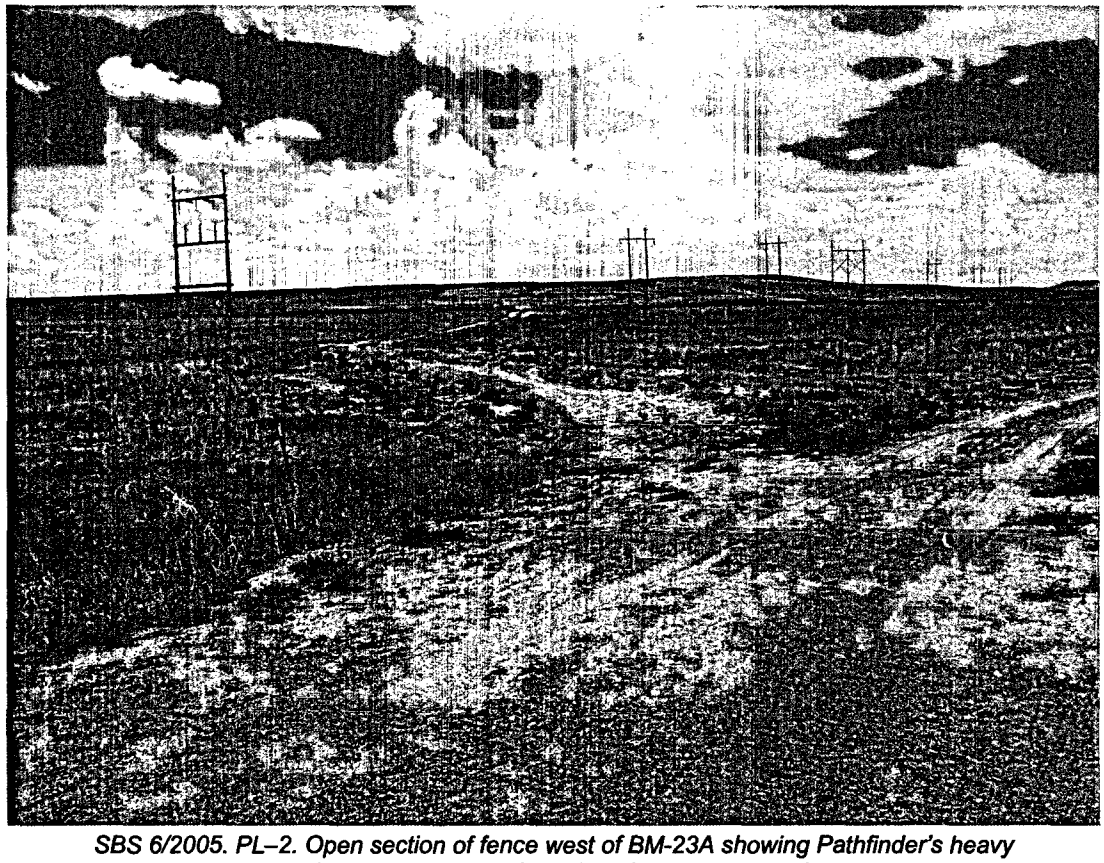
Figure 5–7. Ground Water Flow in the Main Sand Aquifer at the Shirley Basin South, Wyoming, Disposal Site

C06

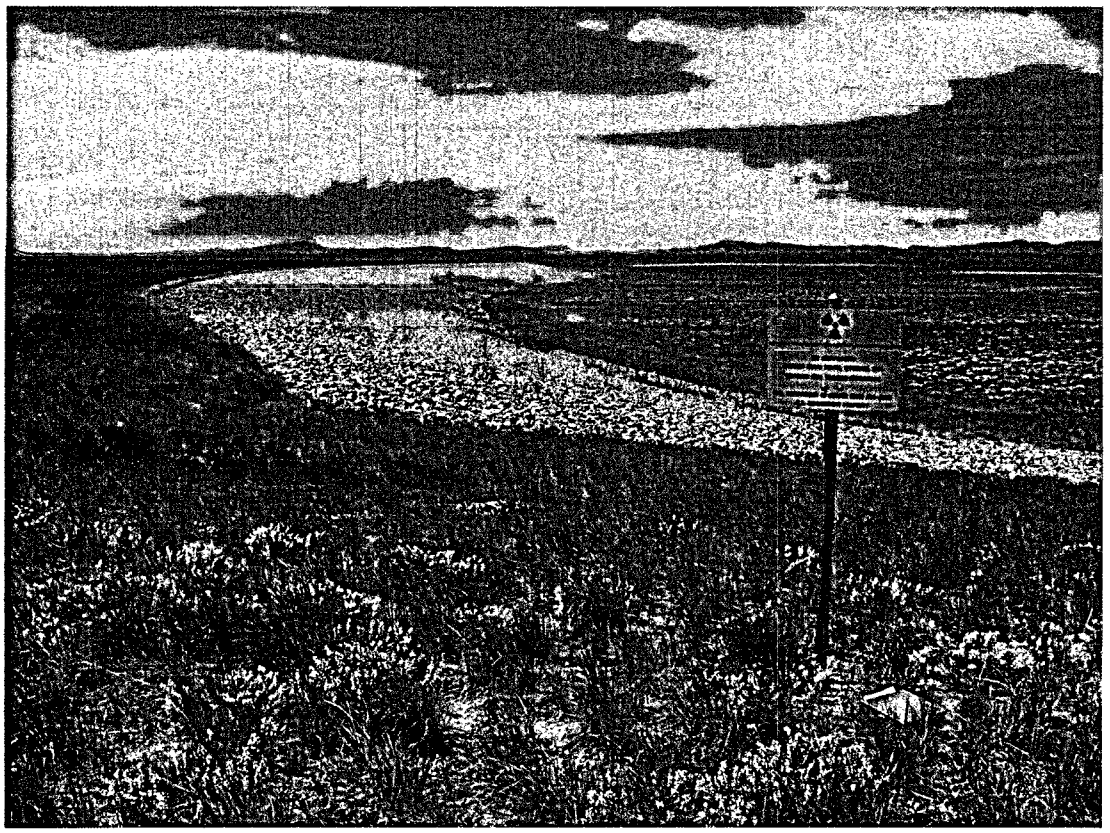
5.3.5 Photographs

Photograph Location Number	Azimuth	Description
PL–1	30	The site entrance viewed from Carbon County Road 2.
PL–2	230	Open section of fence west of BM-23A showing Pathfinder's heavy equipment access road used to obtain topsoil onsite.
PL–3	220	Perimeter sign P13 and the riprap-covered slope between the upper and lower surfaces of the disposal cell.
PL–4	5	The site marker located at the site entrance.
PL–5	NA	Monitor well 5-DC.
PL–6	10	Riprap-covered slope between the upper and lower surfaces of the disposal cell.
PL–7	320	View towards the East Drainage Basin.
PL–8	60	The south swale discharge point.
PL–9	200	The riprap cover protecting the steep slope of the containment dam.
PL–10	340	View from the head of the riprap-protected drainage channel on the west side of the disposal cell.
PL–11	290	Erosion control features (rock breaks) within a drainage swale on the east side of the site.
PL–12	50	The bottom of Pit 4.
PL–13	200	Riprap-protected areas on the south end slope of Pit 4.

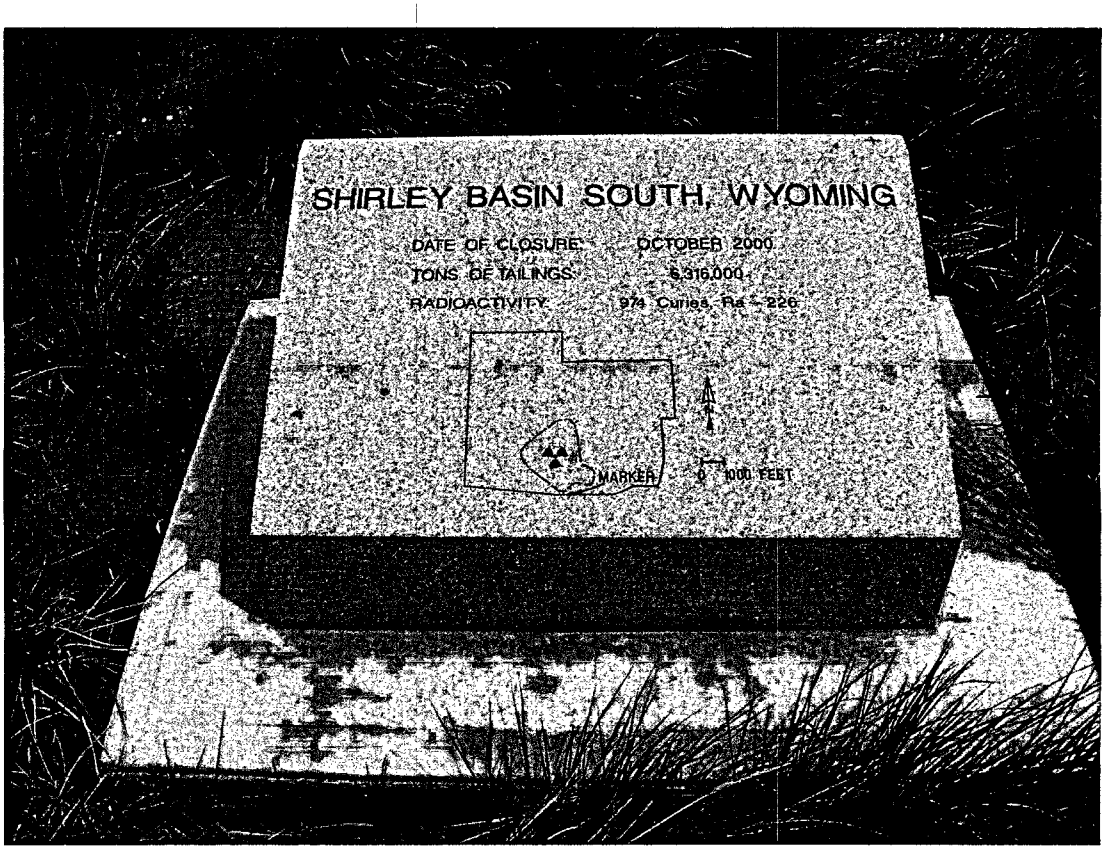
SBS 6/2005. PL–1. The site entrance viewed from Carbon County Road 2.



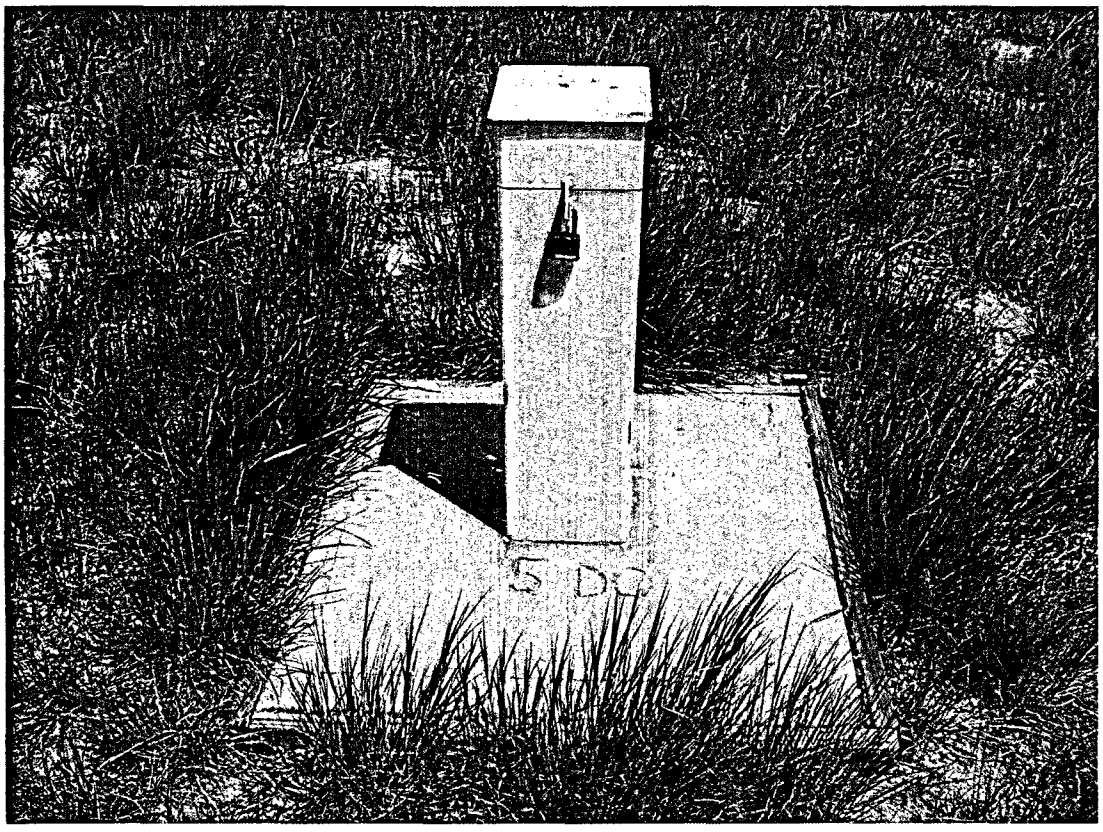
SBS 6/2005. PL–2. Open section of fence west of BM-23A showing Pathfinder's heavy equipment access road used to obtain topsoil onsite.



SBS 6/2005. PL–3. Perimeter sign P13 and the riprap-covered slope between the upper and lower surfaces of the disposal cell.

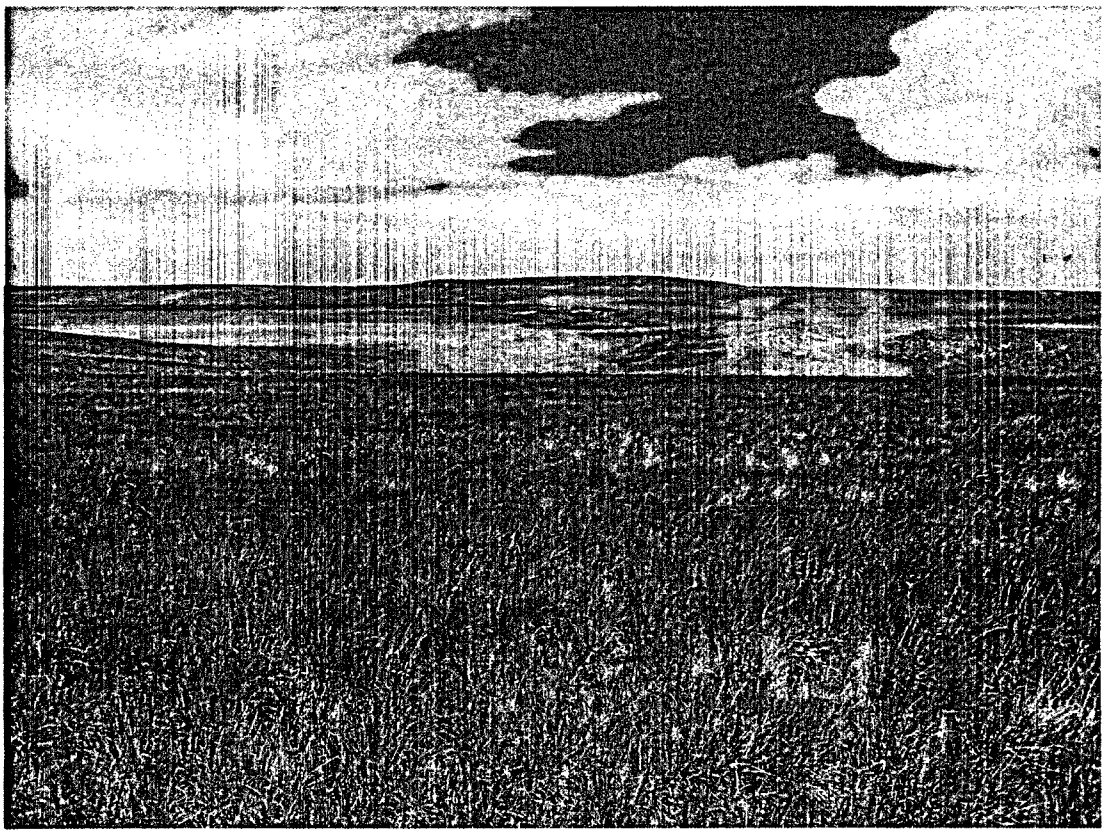


SBS 6/2005. PL–4. The site marker located at the site entrance.

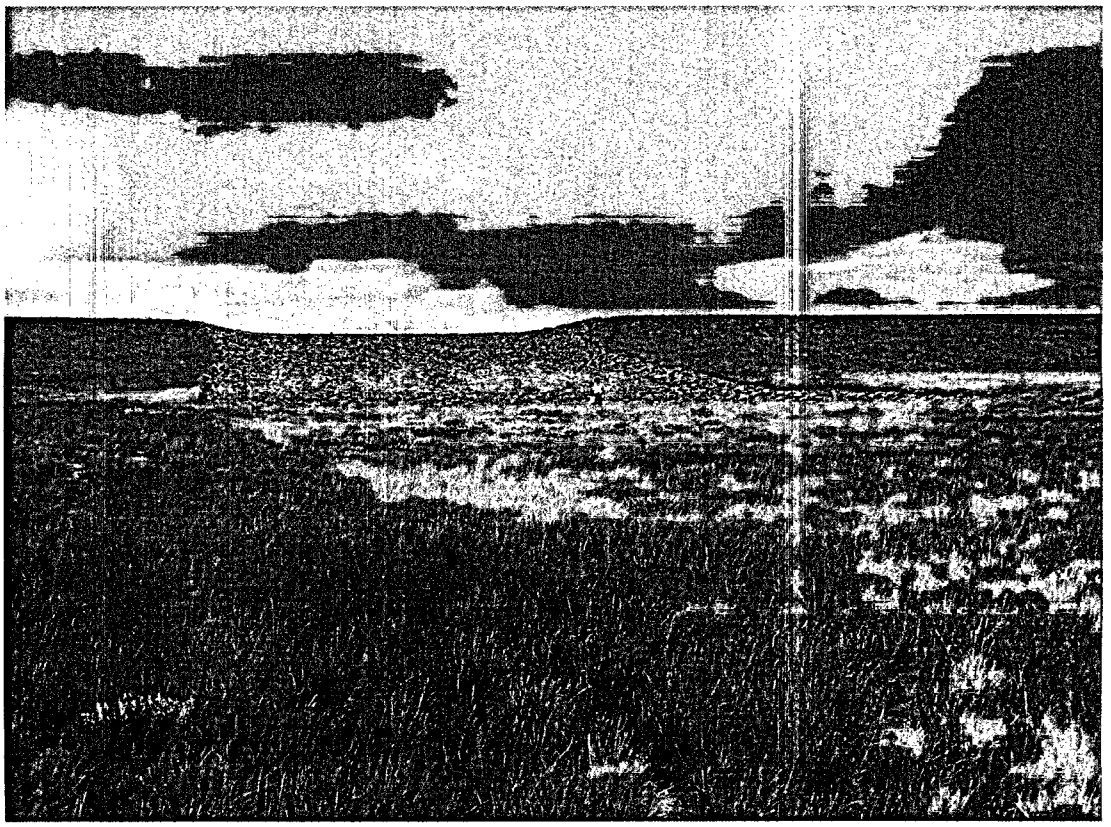


SBS 6/2005. PL–5. Monitor well 5-DC.

SBS 6/2005. PL–6. Riprap-covered slope between the upper and lower surfaces of the disposal cell.

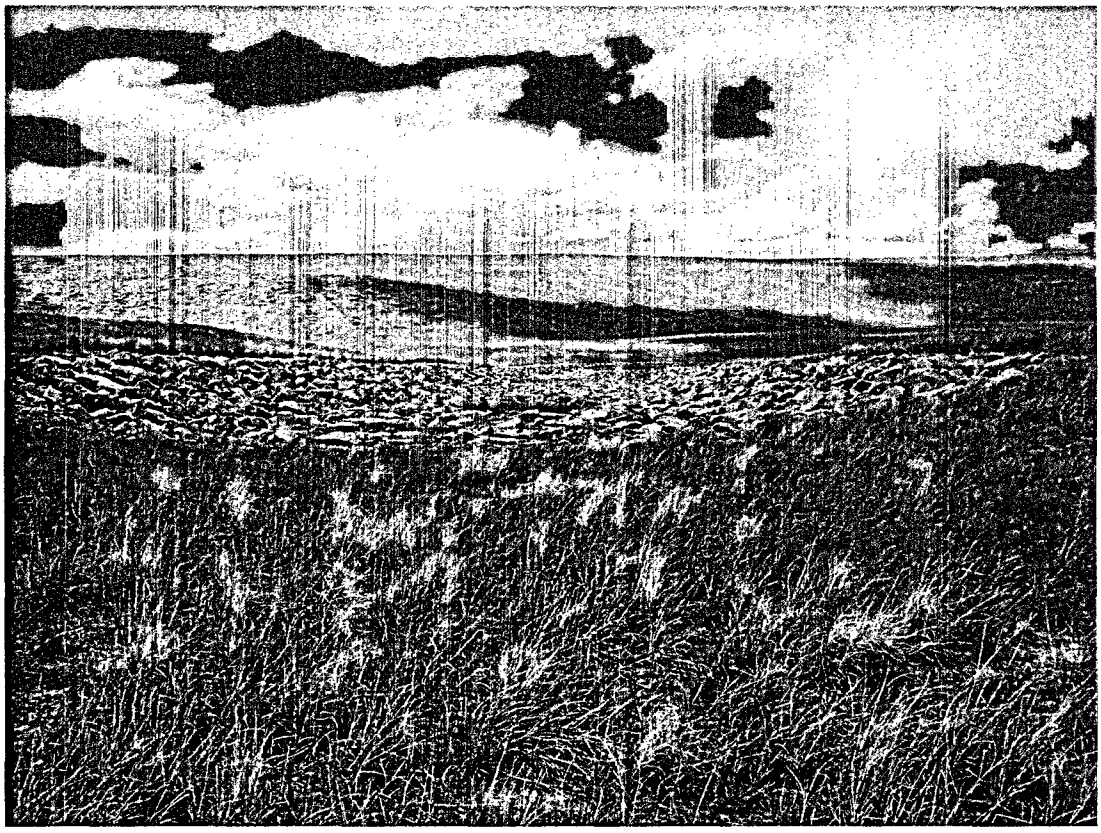


SBS 6/2005. PL–7. View towards the East Drainage Basin.



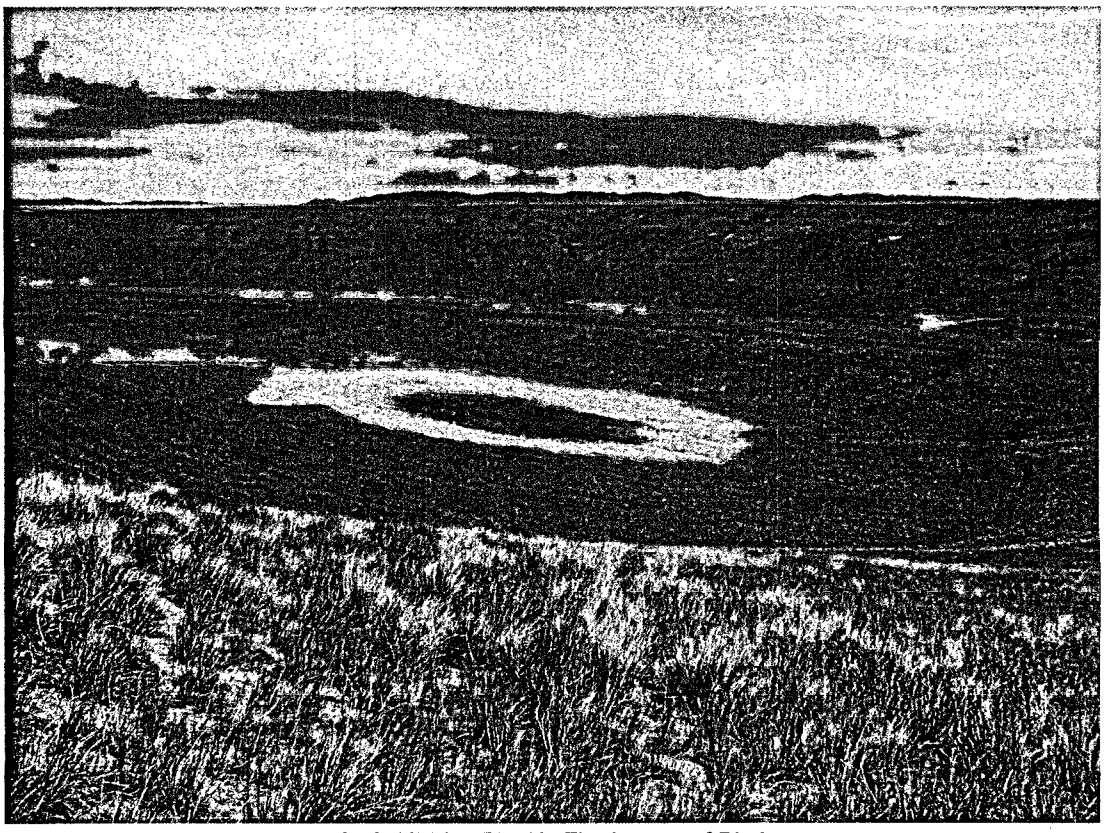
SBS 6/2005. PL–8. The south swale discharge point.

SBS 6/2005. PL–9. The riprap cover protecting the steep slope of the containment dam.

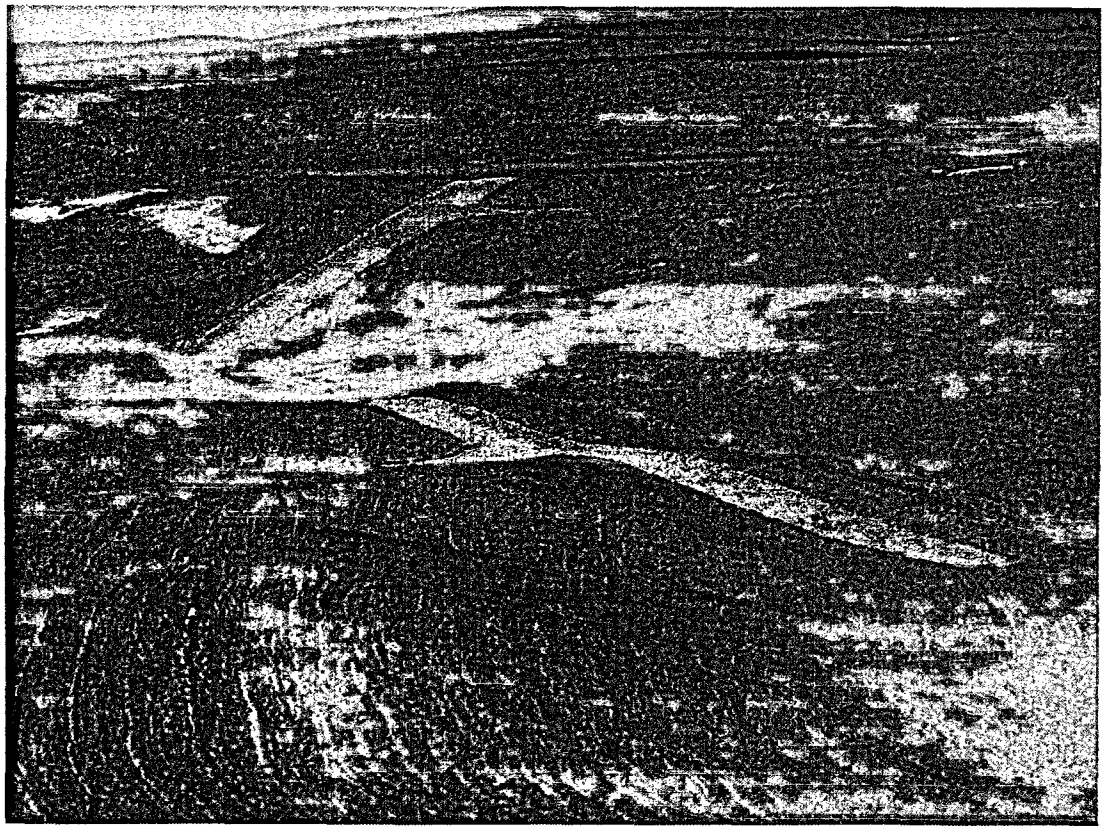


SBS 6/2005. PL–10. View from the head of the riprap-protected drainage channel on the west side of the disposal cell.

SBS 6/2005. PL–11. Erosion control features (rock breaks) within a drainage swale on the east side of the site.



SBS 6/2005. PL–12. The bottom of Pit 4.



SBS 6/2005. PL–13. Riprap-protected areas on the south end slope of Pit 4.