DOE/ID/12584-98

1991 Annual Prelicensing Inspection of the Green River, Utah, UMTRA Project Disposal Site

September 1992

U. S. Department of Energy
Albuquerque Field Office
Grand Junction Projects Office
Grand Junction, Colorado

DOE/ID/12584-98

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September 1992

Prepared for
U.S. Department of Energy

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Under DOE Contract No. DE-AC04-86ID12584
U. S. Department of Energy
Grand Junction Projects Office
Grand Junction, Colorado

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Signature Page

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(in pocket in back)

1.0 Introduction

1.1 Purpose

This report presents the results of the U.S. Department of Energy's (DOE's) Uranium Mill Tailings Remedial Action (UMTRA) Project Office post-stabilization Annual Prelicensing Inspection (API) of the Green River, Utah, disposal site. This inspection was conducted on July 15 and 16, 1991, by M.P. Plessinger, Chief Inspector, and C.S. Goodknight and C.A. Jones, Assistant Inspectors, of Chem-Nuclear Geotech, Inc., contractor at the DOE Grand Junction Projects Office (GJPO). Also present in oversight and consulting capacities were R. Edge and C.H. Persson-Reeves of the Jacobs/Weston Technical Assistance Contractor (TAC) at the DOE UMTRA Project Office.

This inspection was the first post-stabilization API at the Green River disposal site. The inspection also fulfilled DOE requirements for the Verification and Orientation (V&O) inspection. Requirements of the V&O inspection are to (1) verify as-built and other features observed at the site and (2) orient the GJPO to the layout of the site and the location of long-term surveillance and maintenance features at the site. Both objectives of the V&O inspection were satisfied during this API.

The procedures and specifications for this API are based on guidance provided in *Guidance for UMTRA Project Surveillance and Maintenance* (DOE, 1986) and the draft *Surveillance and Maintenance Plan for the Green River, Utah, Disposal Site* (DOE, 1990). The results of recent post-stabilization groundwater quality sampling will be provided in a separate annual report prepared by the UMTRA Project Office.

1.2 Site Description

The Green River disposal site is in Grand County, Utah, Township 21 south, Range 16 east, Section 22, Salt Lake meridian, about 1.5 miles southeast of the city of Green River, in east central Utah (Figures 1–1 and 1–2). The mainline track of the Denver and Rio Grande Western (D&RGW) Railroad and Interstate 70 are north and south of the site area, respectively. Brown's Wash, an intermittent stream, lies between the railroad tracks and the disposal site and joins the Green River west of the site. The site is in the Gunnison Valley; this valley is bordered on the north by the Bookcliffs and on the south by the San Rafael Valley. The area contains flat to hilly terrain, cliffs, mesas, and the Gray Canyon of the Green River. The climate of the area is arid with an average annual precipitation of 6 inches. Vegetation in the immediate site area consists of species common to the arid desert environment (e.g., Greasewood, Saltbrush, Rabbit Brush, Indian Ricegrass, and Galleta Grass) (DOE, 1988).

The site lies at an elevation of approximately 4,100 feet. The Green River is approximately 3,000 feet west of the disposal site. The physiography of the immediate area is described as Mancos Shale Lowland and Green River Desert (DOE, 1988).

The land imediately surrounding the disposal site is owned by the State of Utah. Much of the land adjacent to the State land is leased by the Federal Government for the White Sands Missile Range (WSMR) test complex. Access to this land is restricted. Most of the remaining land within 0.5 mile of the site is privately owned. The nearest residence is about 0.5 mile west of the site. Other State and Federal lands in the general area are allotted for winter grazing (DOE, 1990).

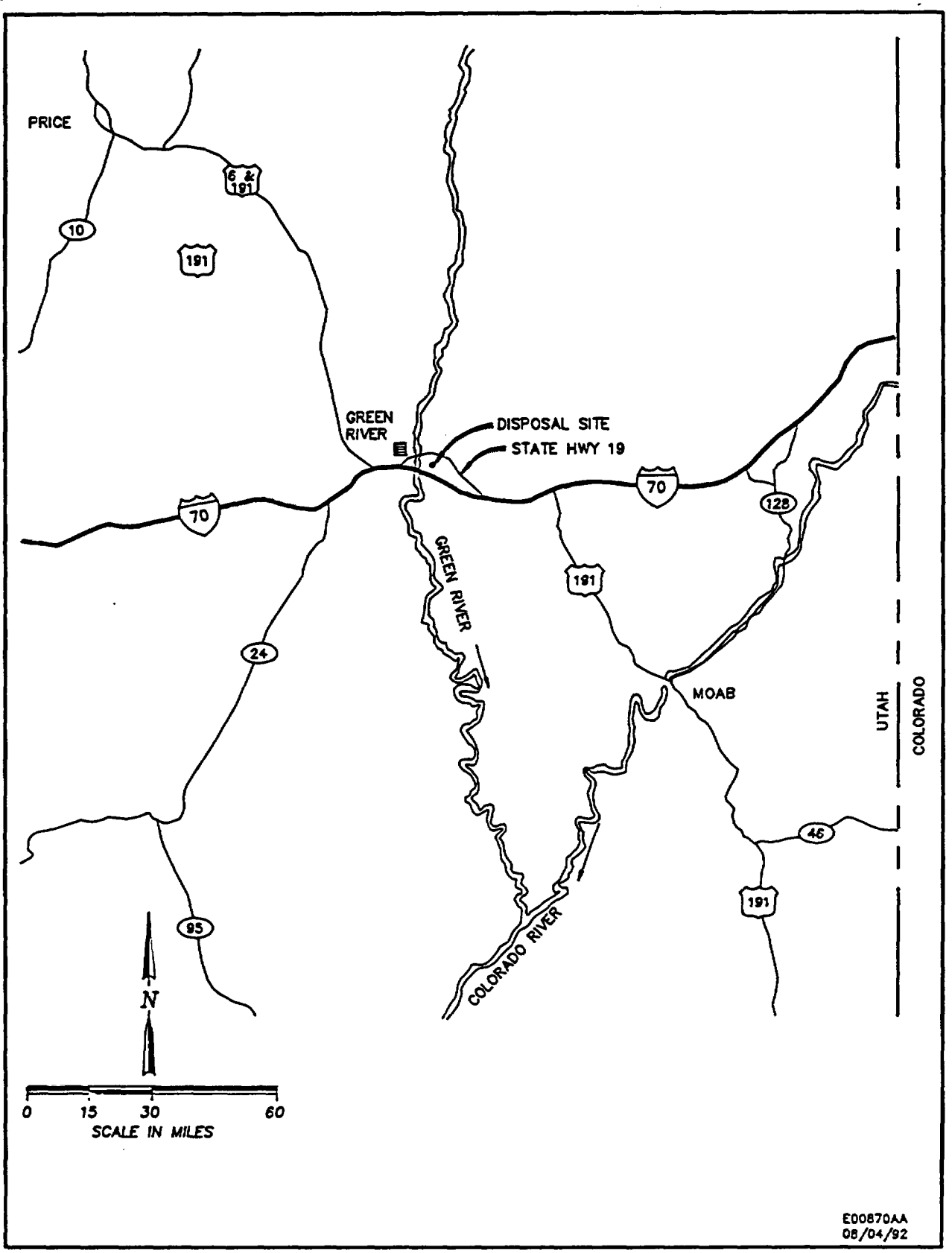

Figure 1–1. Location of the Green River, Utah, Disposal Site

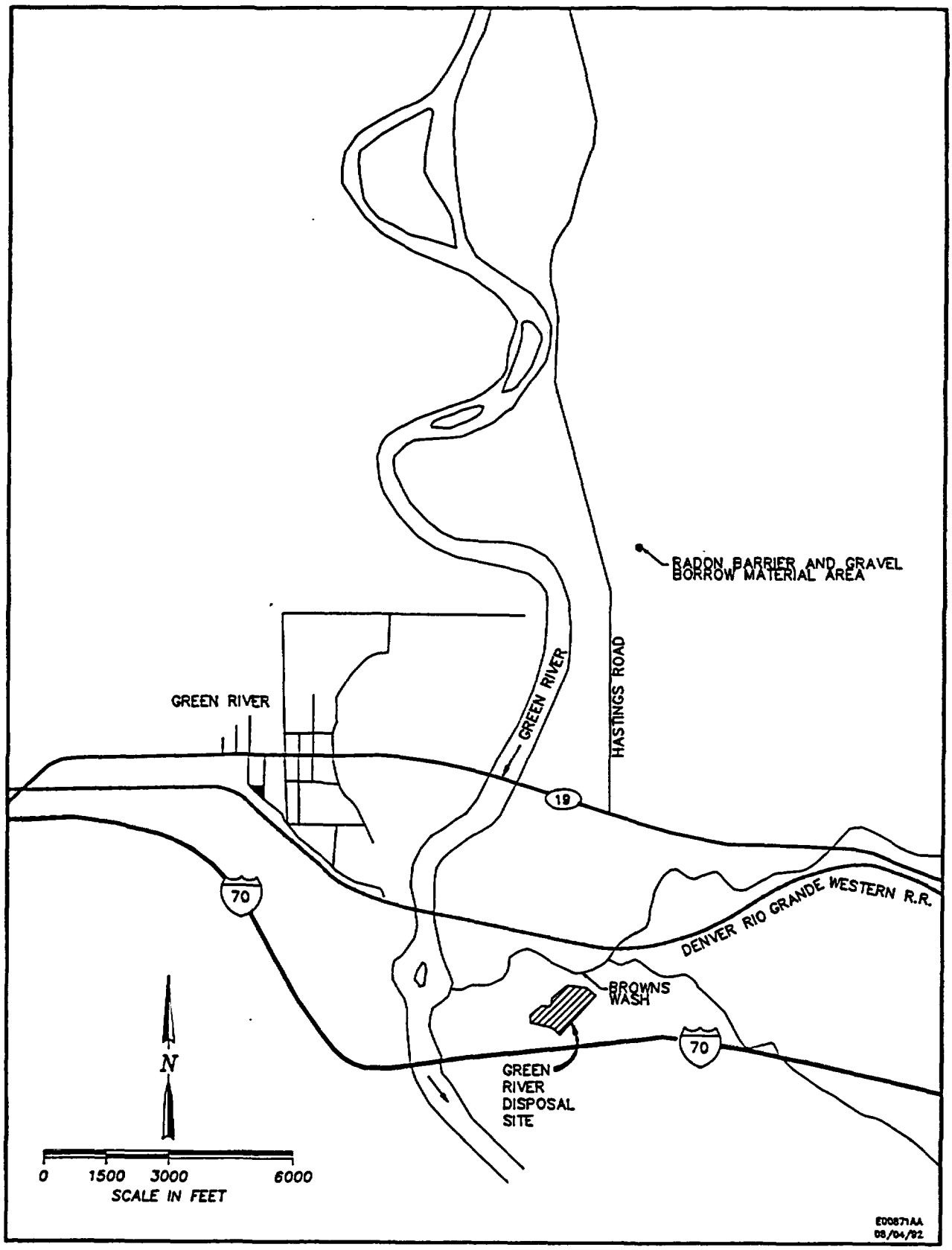

Figure 1–2. Vicinity of the Green River, Utah, Disposal Site

.1.3 Site History

The mill at the Green River site was built in 1957 by Union Carbide Corporation and operated from March 1958 through January 1961. During its 3 years of operation, the mill processed 183,000 tons of ore averaging 0.29 percent uranium oxide, producing an ore concentrate that was shipped by rail to the company's processing plant in Rifle, Colorado (DOE, 1988).

The disposal cell covers 6 acres, contains 339,377 in-place cubic yards of contaminated materials, and rises to a maximum height of 41 feet above land surface (DOE, 1990).

The Green River site is currently in post-stabilization, prelicensing status. The site is expected to remain in this status until licensed by the U.S. Nuclear Regulatory Commission under provisions of U.S. Code of Federal Regulations, 10 CFR 40, for long-term surveillance and maintenance.

1.4 Site Access

The route from Green River, Utah, to the access gate at the south end of the site is as follows:

Mile

0.0 East end of the bridge on State Highway 19 across the Green River. Proceed east on State Highway 19.

1.0 Highway crosses over Browns Wash.

1.2 Highway overpass crosses Denver and Rio Grande Western Railroad tracks.

1.8 Highway crosses over Interstate 70.

1.9 Junction; turn right onto frontage road that winds its way westward.

2.8 Junction; turn right and proceed through underpass below Interstate 70.

3.0 Turn right off road and park in front of the access gate at the State-owned stock fence at the south end of the site.

2.0 Annual Prelicensing Inspection

Inspection methods and results are described under appropriate headings that follow. Supporting information is provided in Appendix A, Inspection Photograph Log and Photographs; and Plate 1, Inspection Drawing.

2.1 Methods

The inspection was conducted by walking several transects across the site and one transect around the perimeter on the property boundary. Outlying groundwater monitoring wells were also inspected. Monuments, site markers, monitoring wells, neutron access holes, as well as other site features, were inspected and photographed. The locations of specific features discussed below are shown on the inspection drawing (Plate 1). Specific site surveillance features are listed in Table 2–1.

Equipment used during the inspection included a 35-mm camera, 2-foot scale with north arrow for showing scale and orientation of photographs, measuring tapes, Brunton compass, and notebook and forms for recording observations and photographs. Photographs were taken without filtration on color-negative film (Kodacolor ISO 100). Photographs are identified in the text of this report, in Appendix A, and on Plate 1 by Photo location (PL) number. A total of 69 inspection photographs are included in Appendix A of this report.

2.2 Transects

In order to ensure that the site is thoroughly and efficiently inspected, the site is divided into small manageable units referred to as transects. Transects are areas of various sizes and shapes. Within each transect, inspectors examine all as-built features, as well as other features of note or interest. Normally, the inspection of one transect is completed before proceeding to the next. Transects used during the inspection of the Green River disposal site are listed in Table 2–2 and shown in Figure 2–1.

There are 21 monitoring wells at the Green River site. Some are located within the confines of the site and some are outside the site boundaries. Those monitoring wells within the site boundary are inspected as part of a site transect. Those monitoring wells beyond the site boundary are also inspected, although they are not conventional transects.

2.3 Results

Results of the 1991 inspection are reported under two main headings: specific site surveillance features and transects. Although most specific features are within a transect, they are reported separately, by category, because (1) they are an important focus of the inspection, and (2) reporting by category allows the performance of each kind of as-built feature to be evaluated separately as a group. Specific features are discussed first, followed by a description of the condition of each transect.

Observations may include reference to specific photographs provided in Appendix A. Photographs are identified in the text, in Appendix A, and on Plate 1 by photograph location (PL) number. When more than one photograph was taken from a specific photograph location, photographs are identified by a letter suffix, (e.g., 3A, 3B).

Table 2–1. Specific Site Surveillance Features

Identifier	Feature	Photo Location
–	Entrance Sign	1
–	Perimeter Signs, 17 Total	–
SMK–1	Site Marker 1	2
SMK–2	Site Marker 2	3
SM–1	Survey Monument 1	4
SM–2	Survey Monument 2	5
SM–3	Survey Monument 3	6
BM–1	Boundary Monument 1	7
BM–2	Boundary Monument 2	8
BM–3	Boundary Monument 3	9
BM–4	Boundary Monument 4	10
BM–5	Boundary Monument 5	11
BM–6	Boundary Monument 6	12
BM–7	Boundary Monument 7	13
BM–8	Boundary Monument 8	14
NA–1	Neutron Access Hole 1	15
NA–2	Neutron Access Hole 2	16
NA–3	Neutron Access Hole 3	17
NA–4	Neutron Access Hole 4	18
MW–171	Monitoring Well 171	19
MW–172	Monitoring Well 172	20
MW–173	Monitoring Well 173	21
MW–174	Monitoring Well 174	22
MW–175	Monitoring Well 175	23
MW–176	Monitoring Well 176	24
MW–177	Monitoring Well 177	25
MW–178	Monitoring Well 178	26
MW–179	Monitoring Well 179	27
MW–180	Monitoring Well 180	28
MW–582	Monitoring Well 582	29
MW–583	Monitoring Well 583	30
MW–584	Monitoring Well 584	31
MW–585	Monitoring Well 585	32
MW–588	Monitoring Well 588	33
MW–707	Monitoring Well 707	34
MW–806	Monitoring Well 806	35
MW–810	Monitoring Well 810	36
MW–811	Monitoring Well 811	37
MW–813	Monitoring Well 813	38
MW–817	Monitoring Well 817	39

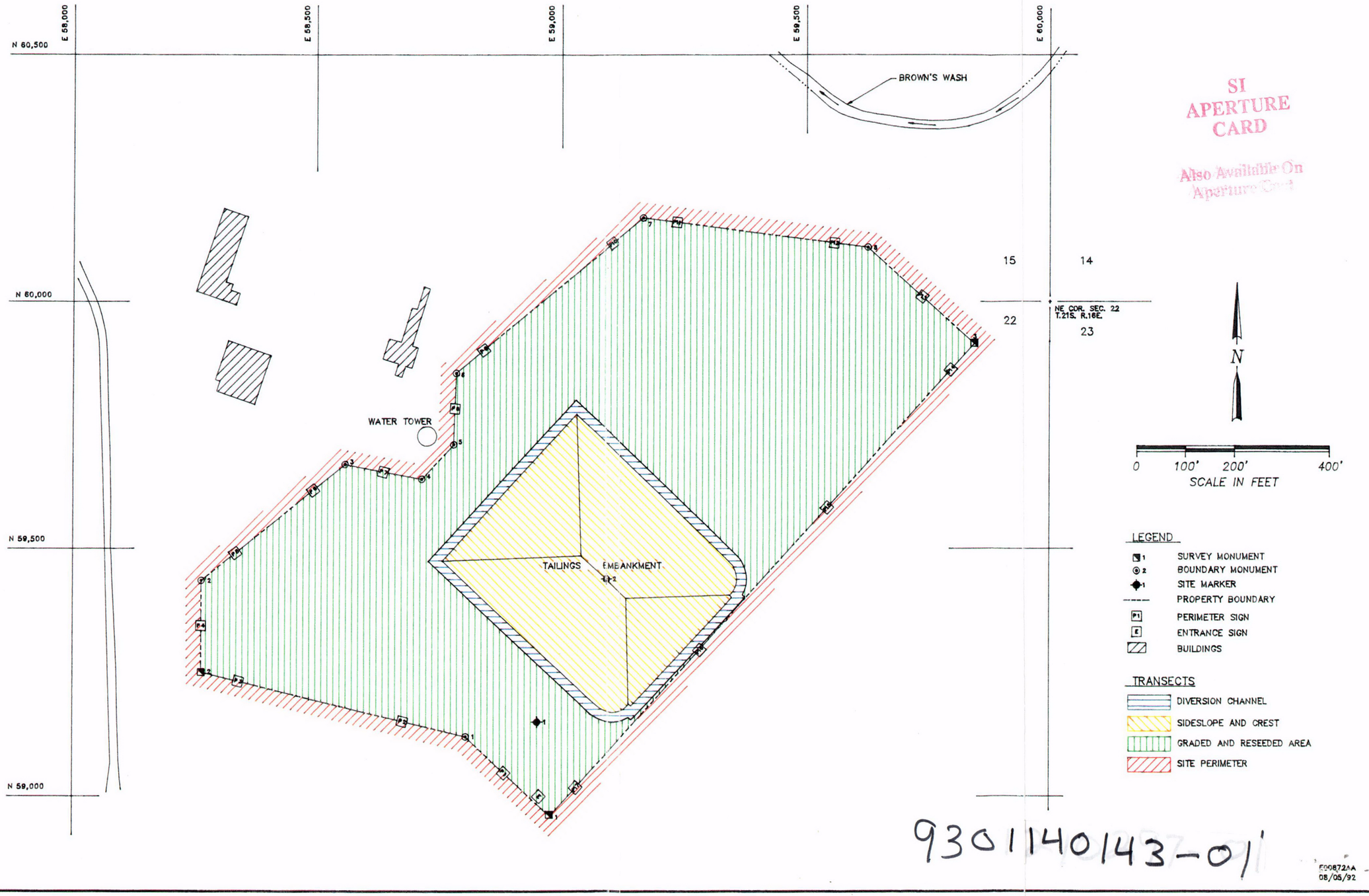

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Figure 2–1. Map of Transects

Table 2–2. Transects Used During the Inspection of the Green River Disposal Site

Transect	Explanation
Diversion Channel	The diversion channel follows the perimeter of the tailings embankment.
Sideslopes and Crest	Because of the small size (6 acres) of the tailings embankment, all four sideslopes and the crest are included in the same transect.
Site Perimeter (boundary)	This transect included all survey and boundary monuments and the entrance and perimeter signs.
Graded and Reseeded Areas	This transect covered the area between the diversion channel and the site boundary and all monitoring wells in that area.
Monitoring Wells	This includes outlying monitoring wells (i.e., those not within the site boundary). This is not a transect in the conventional sense, but the area around each well or well cluster is also inspected.

2.3.1 Specific Site Surveillance Features

Specific features are discussed in the order presented in Table 2–1.

Entrance and Perimeter Signs

The Green River site has one entrance sign and 17 perimeter signs. The entrance sign is in place and it is not damaged (PL–1). All 17 perimeter signs are in their designated locations; none of the signs are damaged. The locations of the signs are shown on Plate 1, the inspection drawing. The entrance sign is designated with an "E." The perimeter signs are designated by a "P" followed by a number, such as P7. The perimeter signs were numbered to provide useful reference points for observations and to allow the inspector to specify a particular sign requiring replacement, should that situation arise.

Site Markers

There are two site markers at the Green River disposal site: SMK–1 and SMK–2. SMK–1 (PL–2) is located at the official entrance to the site near the entrance sign; SMK–2 is centrally located on the crest of the tailings embankment (PL–3). Both site markers are in excellent condition and show no sign of deterioration.

Survey Monuments and Boundary Monuments

There are eight boundary monuments plus three survey/boundary monuments at the Green River disposal site. (At the Green River disposal site the survey monuments are located on the property boundary, and, as such, also serve as boundary monuments.) All monuments were easily located and were undisturbed and in good condition (PL–4 through PL–14).

In addition to the site survey and boundary monuments, the project survey control point was also inspected and photographed (PL–40). This monument is a U.S. Geological Survey (USGS) section corner monument located at the northeast corner of Section 22, Township 21 south, Range 16 east, Salt Lake base and meridian.

Neutron Access Holes

There are four neutron access holes located on the tailings embankment. The casings were inspected and photographed (PL–15, PL–16, PL–17, and PL–18). The casings are similar to monitoring well casings of the cap and pin style. All caps were secured with padlocks. No

deterioration or evidence of tampering was observed. The positions of the neutron access holes are shown on Plate 1, the inspection drawing.

Monitoring Wells

Twenty-one monitoring wells were inspected and photographed (PL–19 through PL–39). The positions of the wells are shown on Plate 1, the inspection drawing. Monitoring well 817 (MW–817) was found unlocked (PL–39). All other wells were locked and in good condition. All well casings are of the cap and pin variety. MW–582 was found to have a small artesian flow (PL–29). Two holes had been drilled in the casing of this well to allow the water to escape. A list of all wells and padlock key numbers is included as Table 2–3.

Table 2–3. Inventory of Monitoring Wells

Well Identifier	Locking System	Padlock Key Number
MW–171	Cap and Pin	Not legible
MW–172	Cap and Pin	3359
MW–173	Cap and Pin	Not legible
MW–174	Cap and Pin	Not legible
MW–175	Cap and Pin	Not legible
MW–176	Cap and Pin	Not legible
MW–177	Cap and Pin	Not legible
MW–178	Cap and Pin	Not legible
MW–179	Cap and Pin	Not legible
MW–180	Cap and Pin	Not legible
MW–582	Cap and Pin	Not legible
MW–583	Cap and Pin	Two locks, both 3359
MW–584	Cap and Pin	3359
MW–585	Cap and Pin	Two locks, both 3359
MW–588	Cap and Pin	Two locks, both 3359
MW–707	Cap and Pin	Not legible
MW–806	Cap and Pin	Not legible
MW–810	Cap and Pin	3359
MW–811	Cap and Pin	Not legible
MW–813	Cap and Pin	Not legible
MW–817	Cap and Pin	Not legible

2.3.2 Transects

Transects are listed in Table 2–2 and shown in Figure 2–1.

Diversion Channels

The diversion channel at the Green River site is a continuous channel that lies at the toe of the tailings embankment on all sides. The channel is in excellent condition (PL–41 through PL–44). There is no evidence of plant growth, ponding, or soil accumulation at this time. The riprap is in good condition and the riprap placement and size distribution are excellent.

Sideslopes and Crest

The sideslopes and the crest of the Green River tailings embankment are in excellent condition (PL–45 through PL–50). The riprap is in fine condition and the riprap placement and size distribution are excellent. There are two instances of plant growth on the southwest and

northeast sideslopes (PL–51 and PL–52). In each case, single Russian thistle plants were removed after noting their positions. Plant growth on the tailings embankment will continue to be monitored.

Site Perimeter

The site boundary is not fenced. Ordinary stock fence encloses the State land surrounding the site. This fence is well outside the site boundary and did not receive more than a cursory inspection. Three areas of erosion were encountered in this transect; only one area is within the site boundary. All signs and boundary monuments are in excellent condition as stated in Section 2.3.1.

On-Site Erosion—The on-site erosion consists of minor rill erosion (PL–58) on the north-facing hillslope south of boundary monuments 7 and 8 (also noted on Plate 1). Near BM–7, rill depth is as great as 18 inches. Near BM–8, where the slope is less steep, 4-inch deep rills were noted. This area will be a subject of continued monitoring during future site inspections. This erosion condition is expected to abate as the vegetation on the hillslope becomes better established.

Off-Site Erosion—The two noted off-site erosion areas are more significant than the on-site erosion. The most severe erosion is north of the water tower (PL–55, PL–56, and PL–57). The cause is believed to be water-purging operations associated with the water tower. At the present time it poses no threat to the integrity of the disposal site; however, this area will be closely monitored during future site inspections.

The other off-site area subject to erosion is roughly parallel to the site boundary in the vicinity of perimeter signs P2 and P3 and is noted on Plate 1, the inspection drawing. This area (PL–53 and PL–54) is a natural drainage created by the contour of the immediate area. This erosion presently is not a threat to the site integrity but will be observed in future annual inspections.

Graded and Reseeded Areas

The area around the tailings embankment is graded to the north so that runoff will flow toward Brown's Wash. Graded areas were reseeded with drought-tolerant plants. The health of the plants and success of the reseeding is hard to evaluate; some areas are rather bare where only scattered seeds appear to have germinated.

It is recognized that 1991 was the first growing season after reseeding, and the success of the reseeding will depend upon how well the vegetation propagates during the coming years. Given the scarce and sporadic nature of rainfall in the area, success of the reseeding will have to be monitored during future inspections.

2.3.3 Area Adjacent to the Site

The area adjacent to the site was examined for signs of erosion, development, or other disturbance that may affect the site. Erosion near the site perimeter is discussed in Section 2.3.2 under the heading "Site Perimeter." Much of the surrounding area is leased by the Federal government for the White Sands Missile Range test complex. So far, this seems be a low-impact activity as far as site security and integrity are concerned. Activities associated with the water tower bear continued monitoring because of erosional impacts, as discussed above under Site Perimeter. No other adjacent off-site activities that might affect the site were observed.

3.0 Conclusions and Recommendations

3.1 Conclusion

The Green River disposal site is in excellent condition at this time. The FY 1991 inspection was the first annual prelicensing inspection of this site, so there were no observations from previous inspections to be re-inspected and evaluated. The report of the 1991 inspection provides baseline information on site conditions for future inspections.

3.2 Observations and Recommendations

All site features are in excellent condition. Documentation (site drawings) provided by the UMTRA Project Office is consistent with final site conditions.

There are three recommendations for future observation.

1. Reseeded areas should be monitored for future progress in establishing vegetation, especially on the steeper, north slope of the site.
2. Off-site water tower operations and their erosional impact should continue to be monitored.
3. Erosion along the southwestern site boundary in the existing drainage contour should continue to be monitored.
4. Observe/monitor rill development along the north perimeter slope.

3.3 Site Maintenance

No site maintenance is recommended at this time.

3.4 Contingency Plans

As indicated in the draft *Surveillance and Maintenance Plan* (DOE, 1990), the DOE shall establish notification procedures with the National Weather Service; Earthquake Information Center; Green River Police Department; and the State of Utah Department of Health, Bureau of Radiation Protection. These agencies will contact the DOE should any unusual event come to their attention that might affect the security or integrity of the Green River site.

4.0 References

DOE (U.S. Department of Energy), 1986. *Guidance for UMTRA Project Surveillance and Maintenance*, UMTRA–DOE/AL–350124.0000, DOE UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1988. *Environmental Assessment of Remedial Action at the Green River Uranium Mill Tailings Site, Green River, Utah*, DOE/EA–0343, DOE UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1990. *Surveillance and Maintenance Plan, Green River, Utah*, draft, UMTRA–DOE/AL–350206.0000, DOE UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

10 CFR 40.27. *Custody and Long-Term Care of Uranium and Thorium Mill Tailings Disposal Sites*, October 30, 1990.

Appendix A
Inspection Photograph Log and Photographs

Inspection Photo Log

Explanation

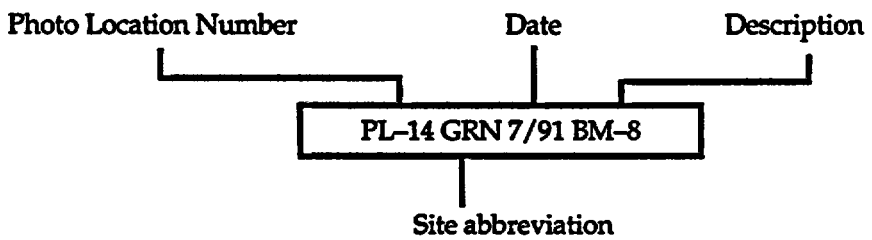
Appendix A includes all photographs referred to in the text of this report, along with a complete listing of these photographs. Photographs are identified by photograph location (PL) number. PL numbers also appear on the Inspection Drawing (Plate 1).

Specifications

All photographs were taken on Kodacolor 135 film, ISO 100, with a variable focal length (zoom) lens. Focal lengths vary between 35 mm and 105 mm. All photographs were exposed with daylight illumination and without filtration.

Photograph Labels

When more than one photograph was taken at a given photograph location, different photographs are identified by a letter suffix, e.g. (3A, 3B).



Abbreviations

The following abbreviations are used in the photograph log:

N	North	NA	Neutron access port
NE	Northeast	NW	Northwest
E	East	SE	Southeast
S	South	SW	Southwest
W	West	MW	Monitoring well
SM	Survey monument	BM	Boundary monument
SMK	Site marker	in	inches
ft	feet	Az	Azimuth
USGS	U.S. Geological Survey		

Inspection Photo Log

Site: Green River, Utah
Date of Inspection: July 15 and 16, 1991

Photographer's Location No.	Azimuth[b]	Photo Description/Remarks
1	030	Entrance sign
2		Site marker, SMK–1, near entrance
3		Site marker, SMK–2, on top of tailings embankment
4A	000	Survey monument, SM–1
4B		SM–1 detail
5A	010	Survey monument, SM–2
5B		SM–2 detail
6A	030	Survey monument, SM–3
6B		SM–3 detail
7	040	Boundary monument, BM–1
8		Boundary monument, BM–2
9		Boundary monument, BM–3
10	040	Boundary monument, BM–4
11	040	Boundary monument, BM–5
12	020	Boundary monument, BM–6
13	040	Boundary monument, BM–7
14	045	Boundary monument, BM–8
15		Neutron access port 1, Masterlock, key number not legible
16		Neutron access port 2, Masterlock, key number not legible
17		Neutron access port 3, Masterlock, key number not legible
18		Neutron access port 4, Masterlock, key number not legible
19		Monitoring well, MW–171, Masterlock, key number not legible
20		Monitoring well, MW–172, Masterlock, key number 3359
21		Monitoring well, MW–173, Masterlock, key number not legible
22		Monitoring well, MW–174, Masterlock, key number not legible
23		Monitoring well, MW–175, Masterlock, key number not legible
24		Monitoring well, MW–176, Masterlock, key number not legible
25	285	Monitoring well, MW–177, Masterlock, key number not legible
26		Monitoring well, MW–178, Masterlock, key number not legible
27		Monitoring well, MW–179, Masterlock, key number not legible
28		Monitoring well, MW–180, Masterlock, key number not legible
29		Monitoring well, MW–582, Masterlock, key number not legible, holes in NW and SE sides of well casing draining artesian flow of water.
30		Monitoring well, MW–583, two Masterlocks, both key number 3359
31		Monitoring well, MW–584, Masterlock, key number 3359
32		Monitoring well, MW–585, two Masterlocks, both key number 3359
33		Monitoring well, MW–588, two Masterlocks, both key number 3359.
34		Monitoring well, MW–707, Masterlock, key number not legible
35		Monitoring well, MW–806, Masterlock, key number not legible

[a]Photo location number. See Plate 1 for map of photo locations.
[b]Azimuth measured using a declanation angle of 13°E.

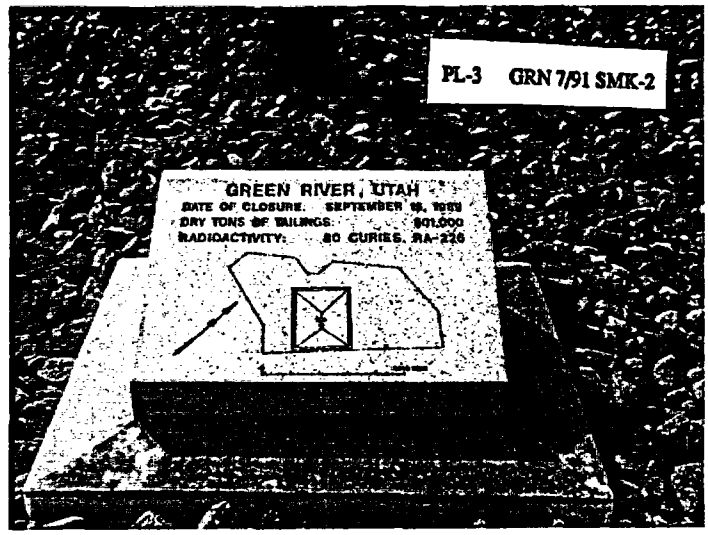
Inspection Photo Log

Site: Green River, Utah
Date of Inspection: July 15, 1991

Photographer's Location No.[a]	Azimuth[b]	Photo Description/Remarks
36		Monitoring well, MW–810, Masterlock, key number 3359
37		Monitoring well, MW–811, Masterlock, key number not legible
38		Monitoring well, MW–813, Masterlock, key number not legible
39		Monitoring well, MW–817, Masterlock, key number not legible, cap was found in unlocked condition.
40		USGS section corner monument, project survey control point, NE corner of Section 22, Township 21S, Range 16E
41A	055	SE diversion channel
41B	315	SW diversion channel
42A	145	SW diversion channel
42B	055	NW diversion channel
43A	230	NW diversion channel
43B	140	NE diversion channel
44A	330	NE diversion channel
44B	230	SE diversion channel
45A	060	SE slope of tailings embankment
45B	325	SW slope of tailings embankment
46A	145	SW slope of tailings embankment
46B	055	NW slope of tailings embankment
47A	235	NW slope of tailings embankment
47B	150	NE slope of tailings embankment
48A	330	NE slope of tailings embankment
48B	225	SE slope of tailings embankment
49	135	Top of tailings embankment, looking SE
50	310	Top of tailings embankment, looking NW
51		Plant on SW slope of tailings embankment, Az 050 from plant to SMK–2.
52		Plants on NE slope of tailings embankment, Az 240 from plants to SMK–2.
53	060	Erosion—perimeter sign P2 in background, 24-inch white lath for scale
54	040	Erosion—perimeter sign P3 in background, 24-inch white lath for scale
55		Erosion, north of water tower
56		Erosion, north of water tower
57		Erosion, north of water tower
58	225	Rill erosion on hillslope, looking from BM–7 toward perimeter sign P10

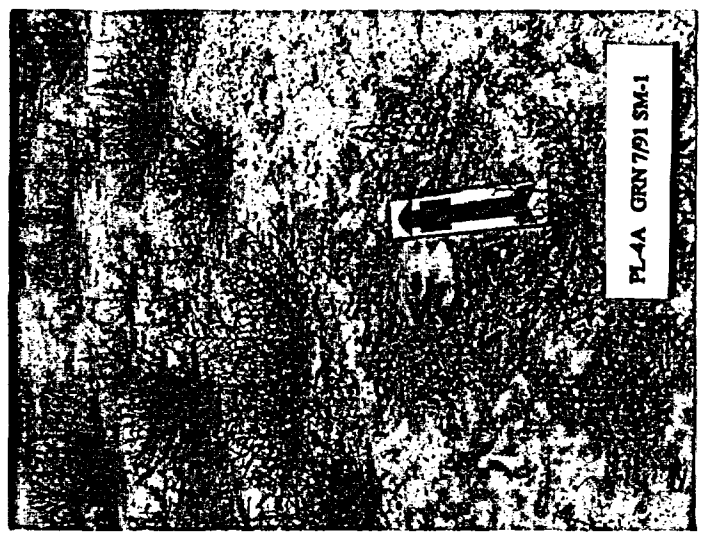
[a]Photo location number. See Plate 1 for map of photo locations.
[b]Azimuth measured using a declanation angle of 13° E.

PL-1 GRN 7/91 Entrance Sign



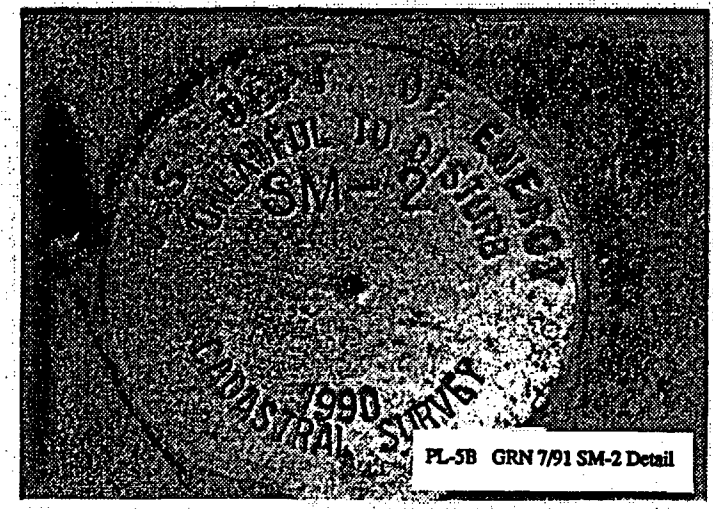
PL-3 GRN 7/91 SMK-2

PL-2 GRN 7/91 SMK-1

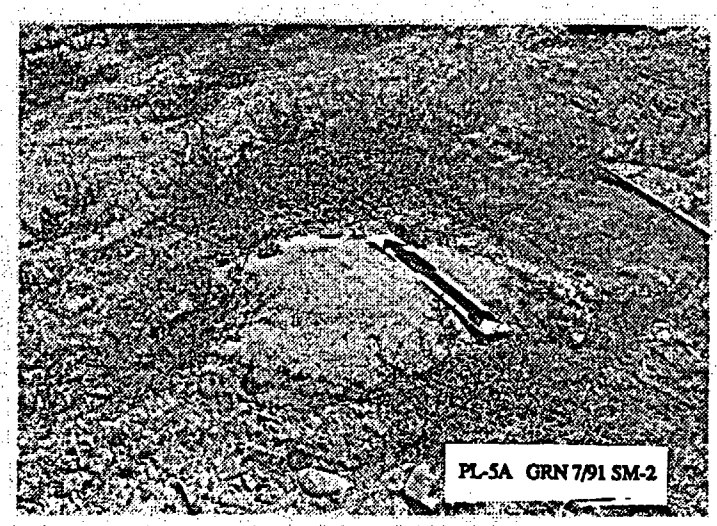


PL-4A GRN 7/91 SM-1

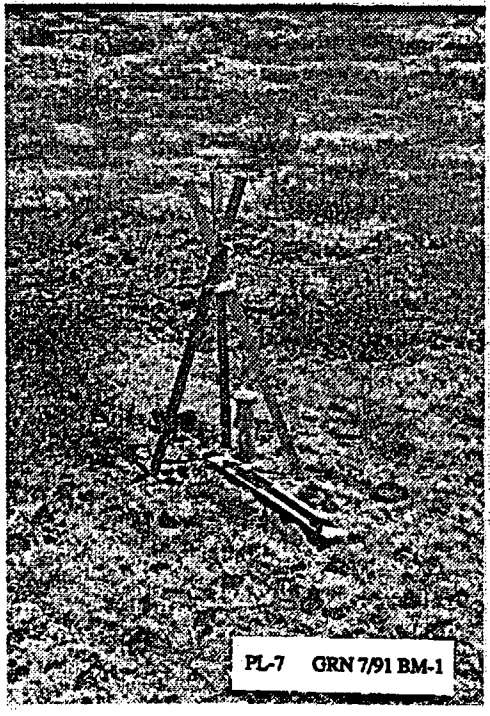
PL-4B GRN 7/91 SM-1 Detail



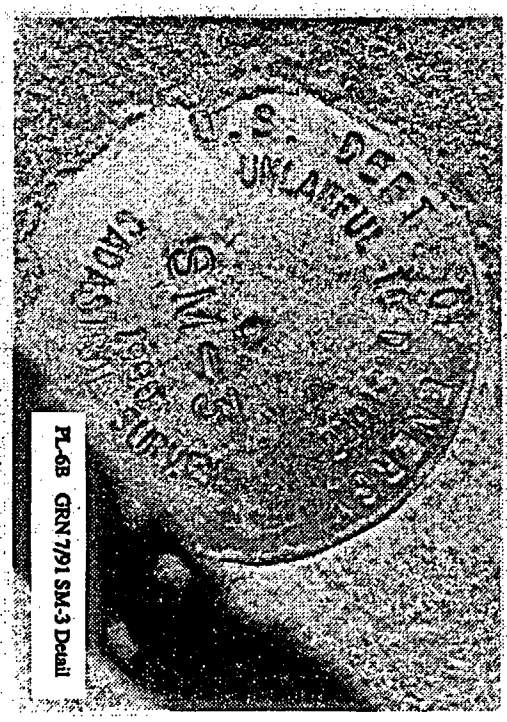
PL-5B GRN 7/91 SM-2 Detail



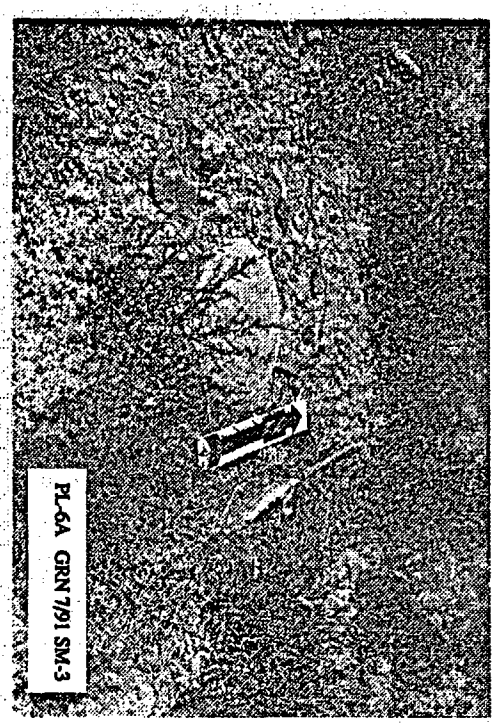
PL-5A GRN 7/91 SM-2



PL-7 GRN 7/91 BM-1

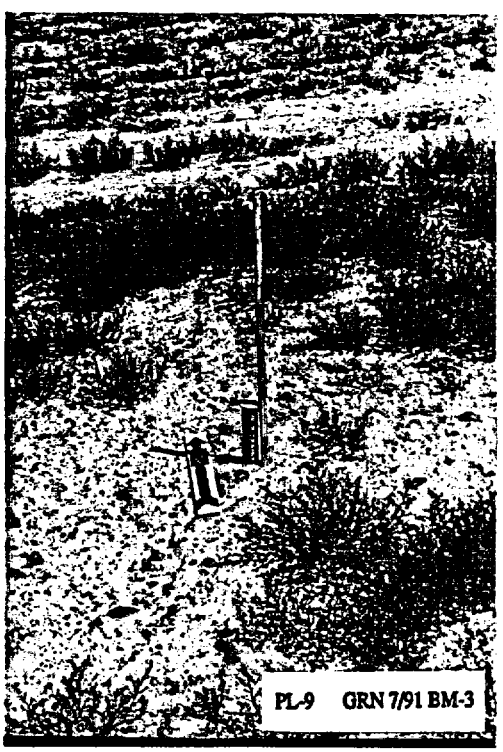


PL-6B GRN 7/91 SM-3 Detail

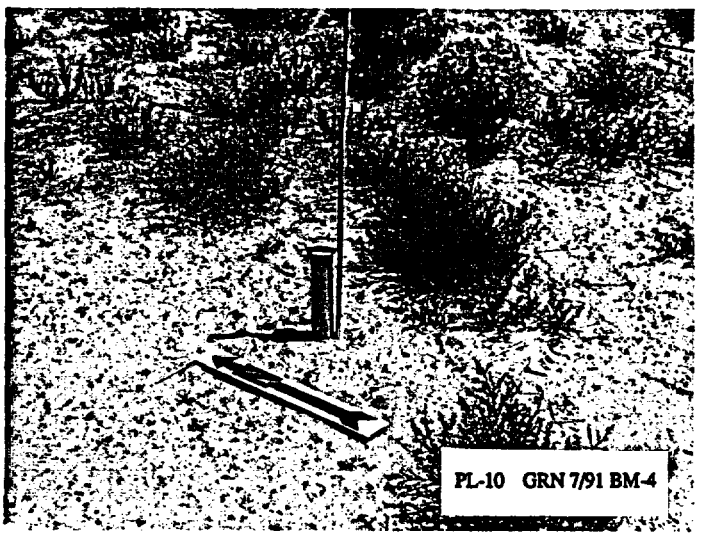


PL-6A GRN 7/91 SM-3

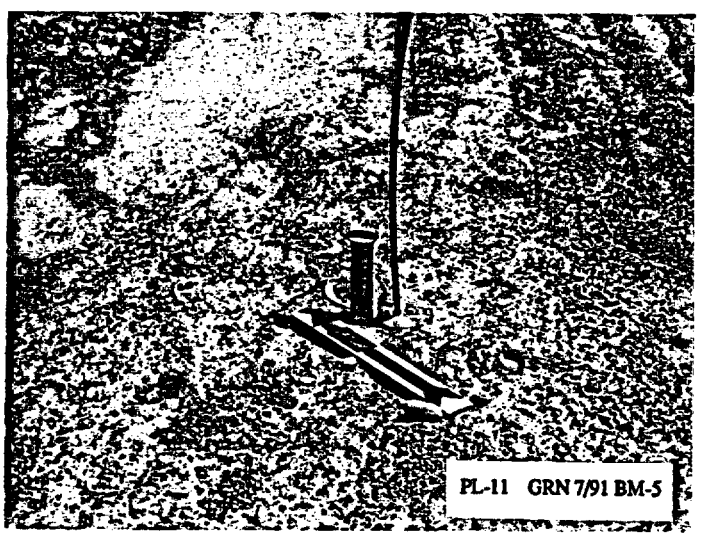
PL-8 GRN 7/91 BM-2



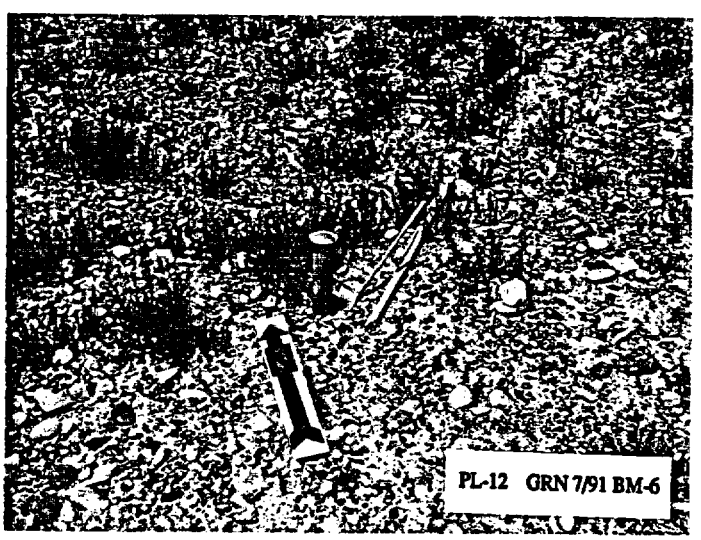
PL-9 GRN 7/91 BM-3



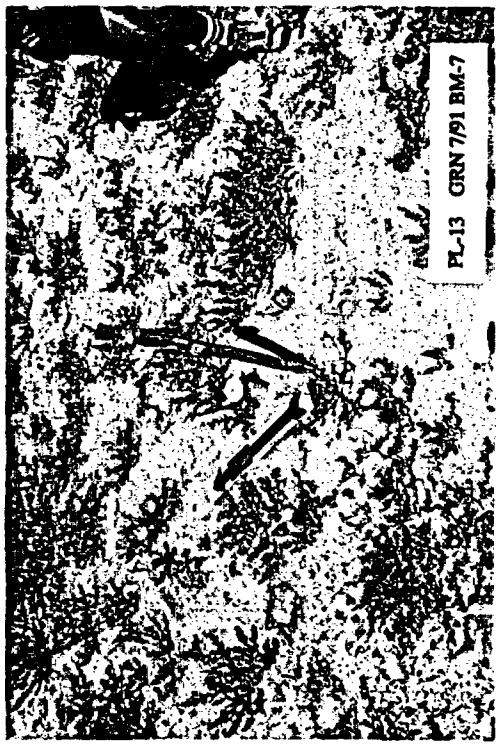
PL-10 GRN 7/91 BM-4



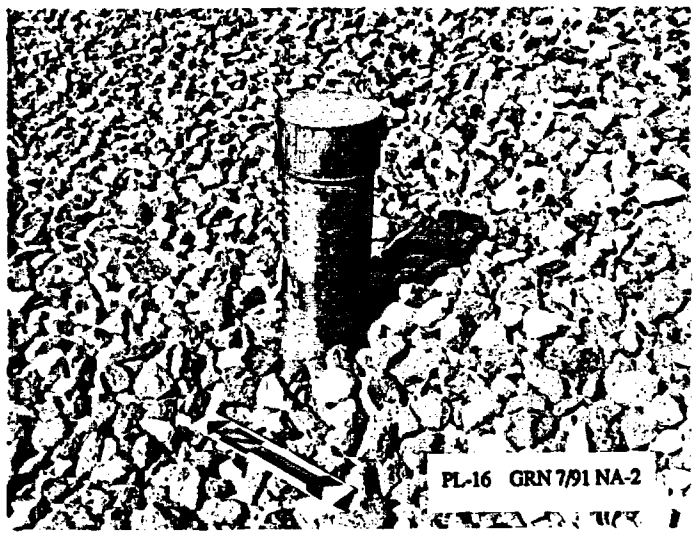
PL-11 GRN 7/91 BM-5

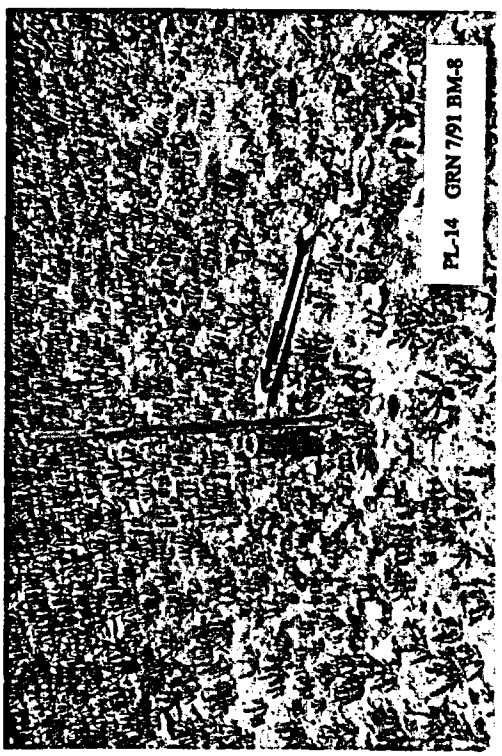


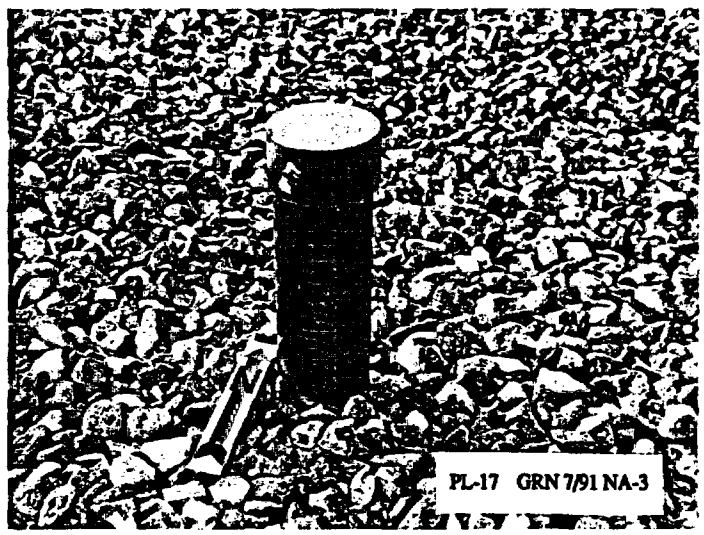
PL-12 GRN 7/91 BM-6

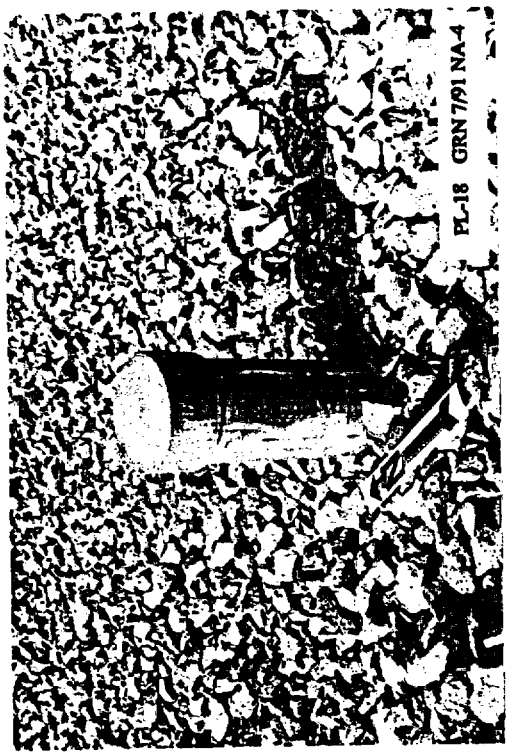

PL-13 GRN 7/91 BM-7


PL-15 GRN 7/91 NA-1

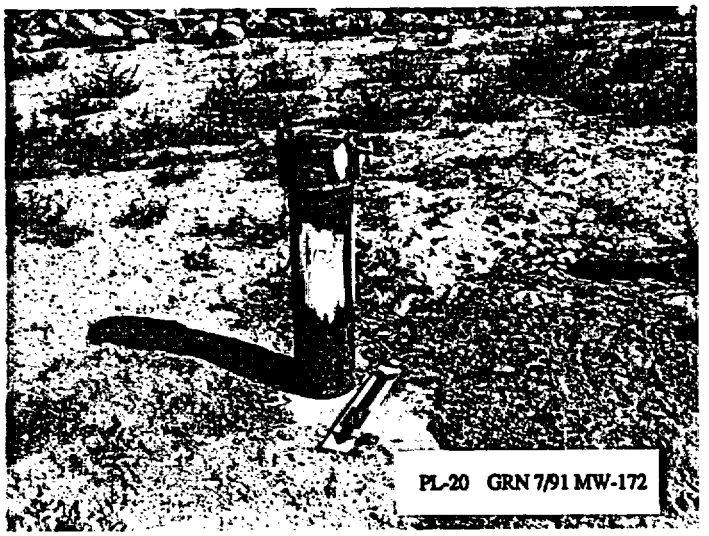

PL-16 GRN 7/91 NA-2


PL-14 GRN 7/91 BM-8

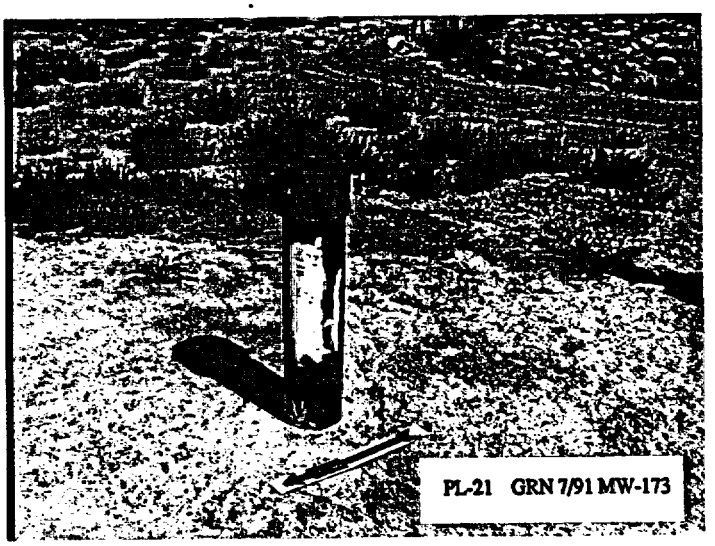

PL-17 GRN 7/91 NA-3



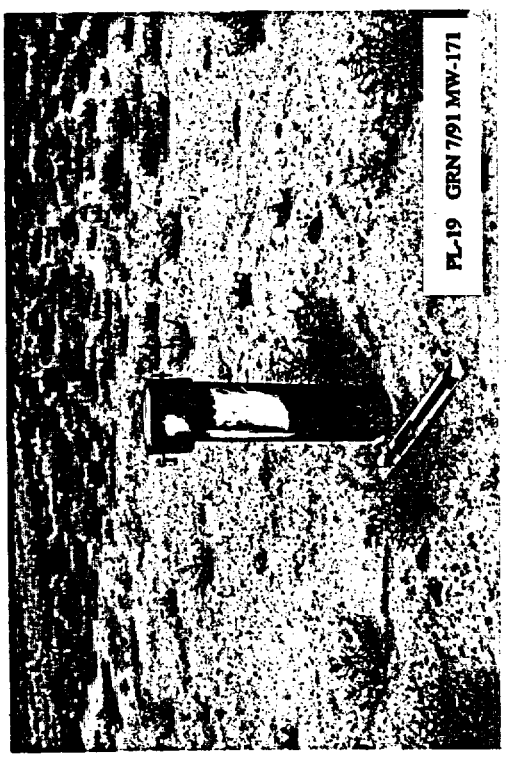
PL-18 GRN 7/91 NA-4



PL-20 GRN 7/91 MW-172

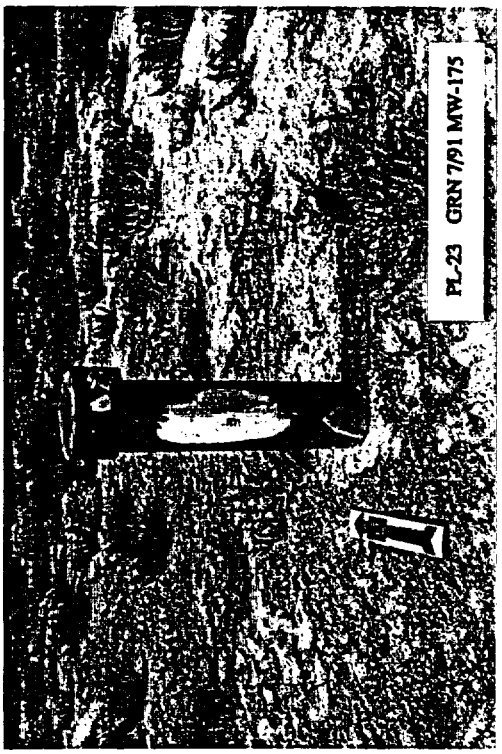


PL-21 GRN 7/91 MW-173

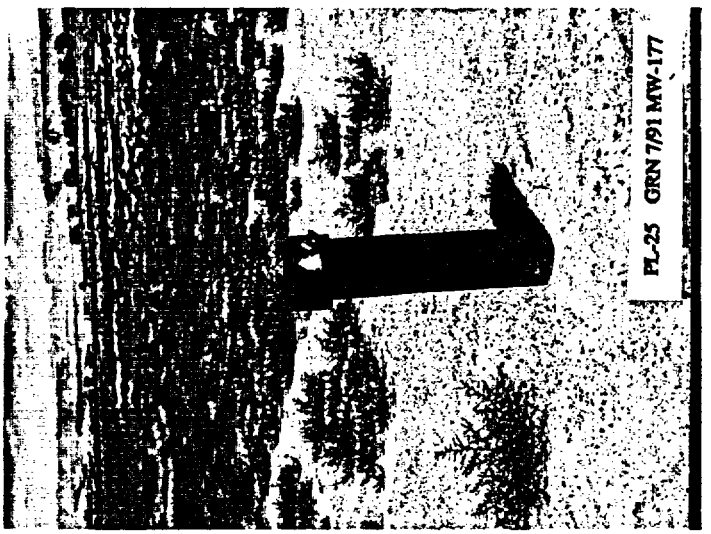


PL-19 GRN 7/91 MW-171

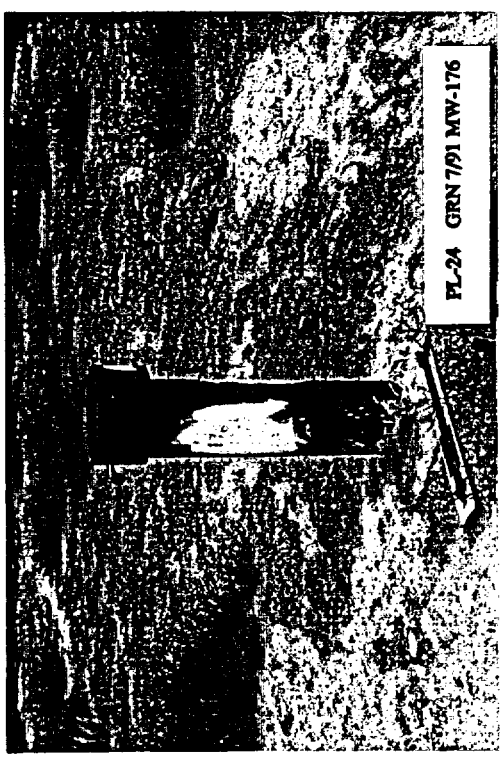
PL-22 GRN 7/91 MW-174



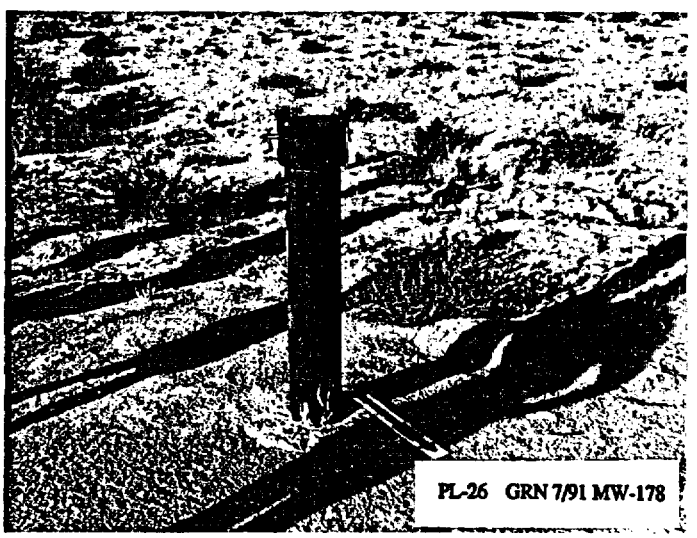
PL-23 GRN 7/91 MW-175



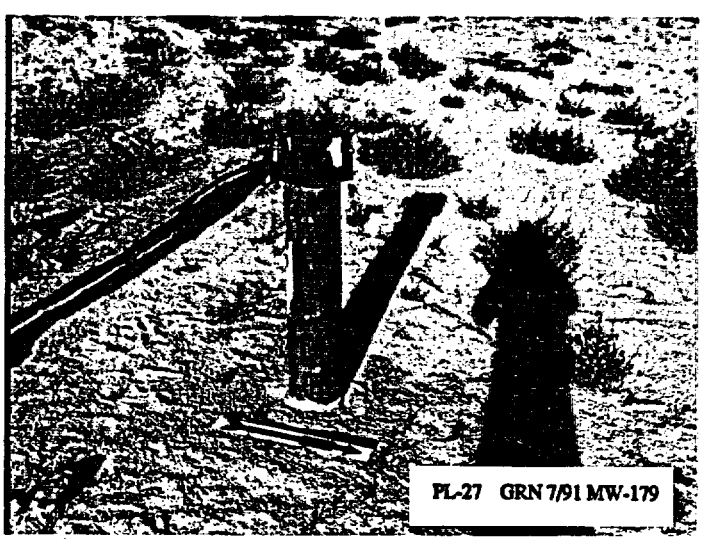
PL-25 GRN 7/91 MW-177



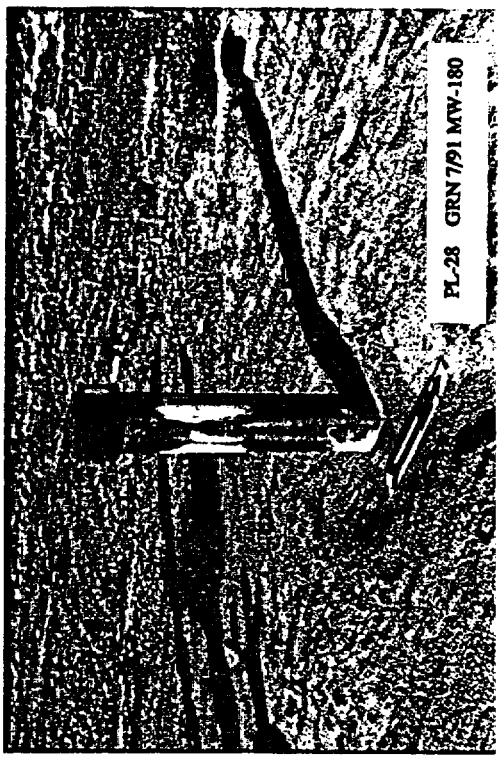
PL-24 GRN 7/91 MW-176



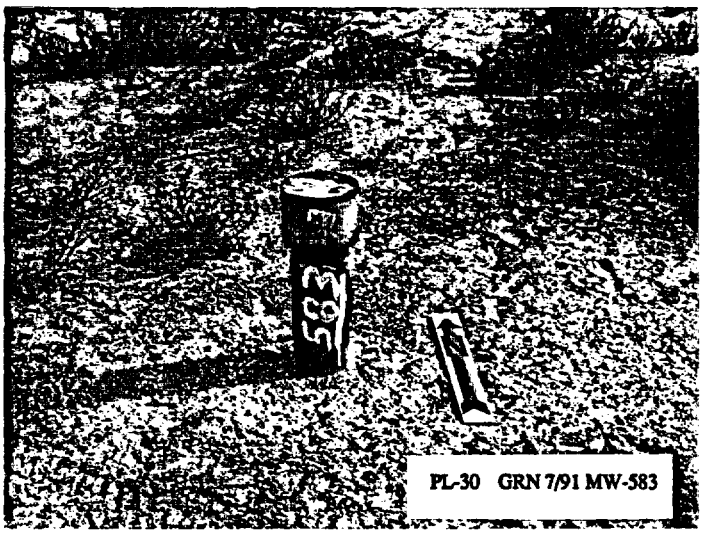
PL-26 GRN 7/91 MW-178



PL-27 GRN 7/91 MW-179

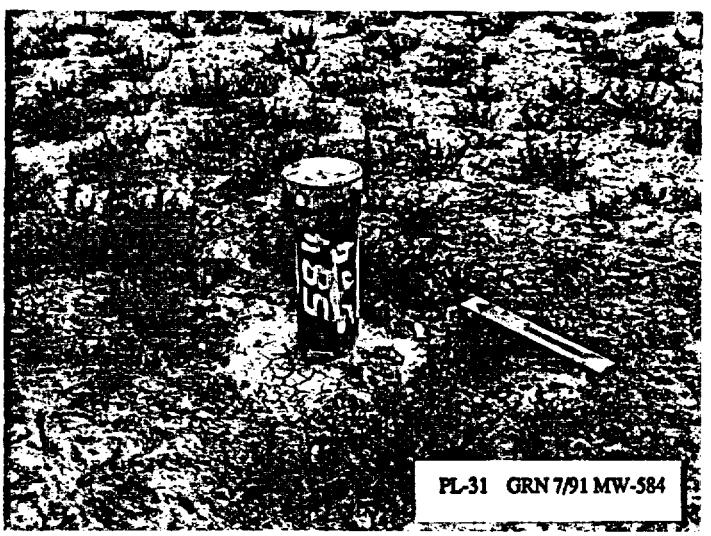


PL-28 GRN 7/91 MW-180

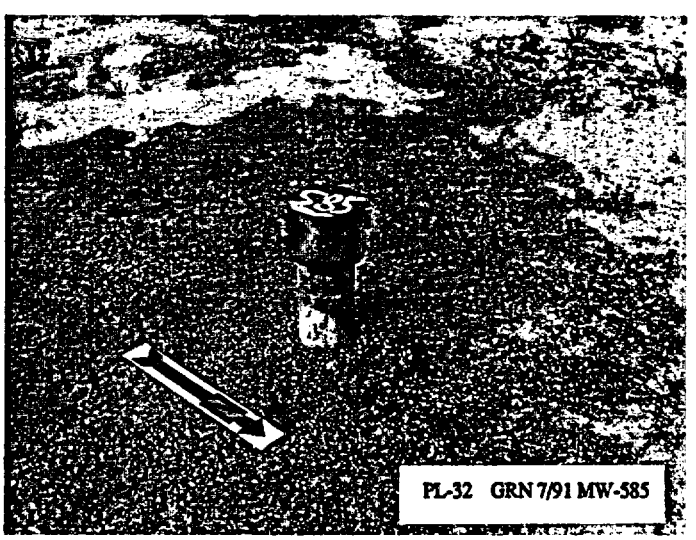


PL-30 GRN 7/91 MW-583

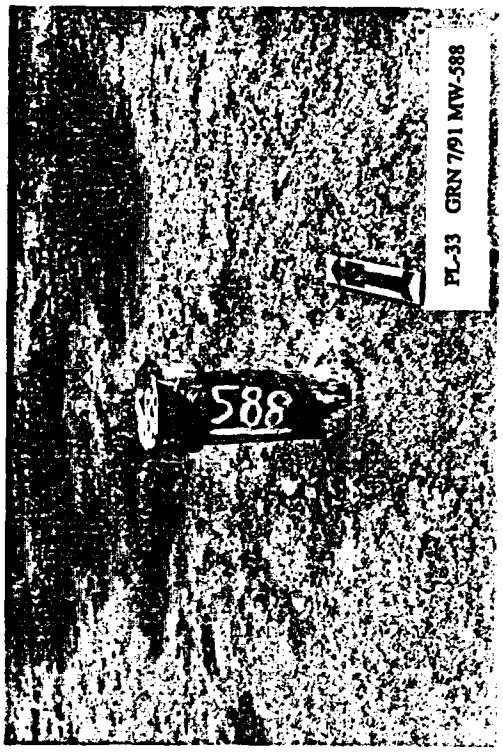
PL-29 GRN 7/91 MW-582



PL-31 GRN 7/91 MW-584



PL-32 GRN 7/91 MW-585



PL-33 GRN 7/91 MW-588

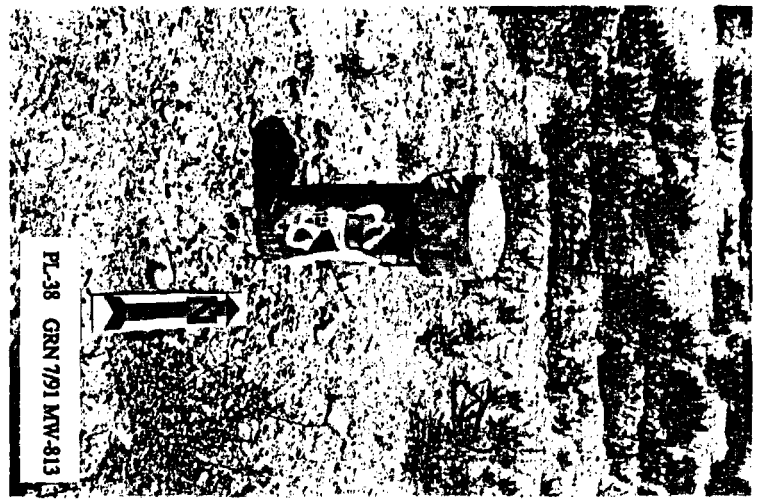
PL-35 GRN 7/91 MW-806

PL-36 GRN 7/91 MW-810

PL-34 GRN 7/91 MW-707

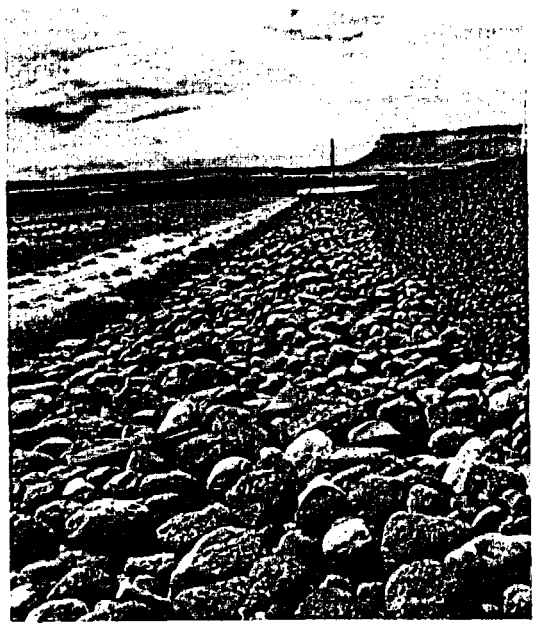
PL-37 GRN 7/91 MW-811

PL-39 GRN 7/91 MW-817

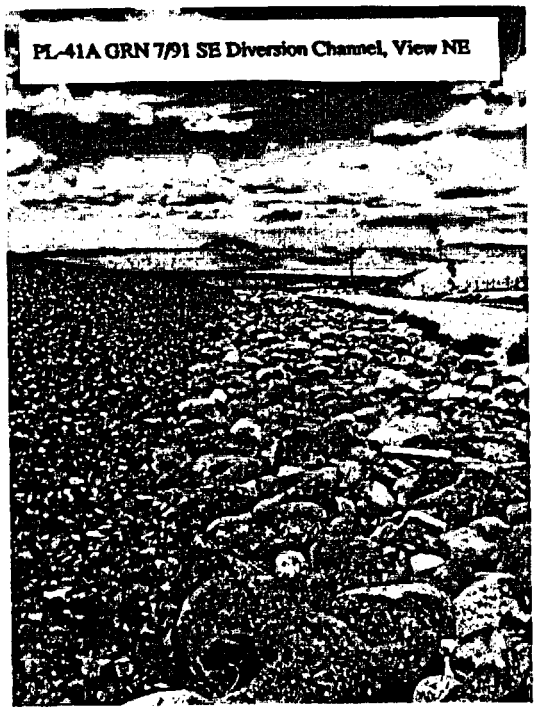


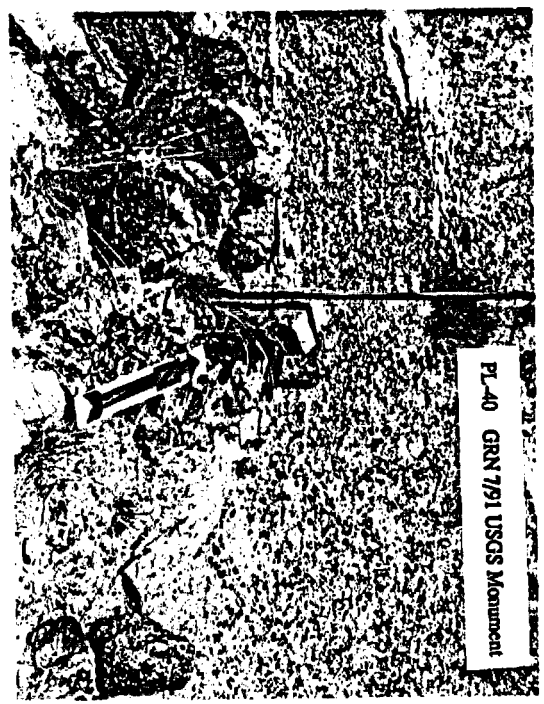
PL-38 GRN 7/91 MW-813

PL-41B GRN 7/91 SW Diversion Channel, View NW



PL-41A GRN 7/91 SE Diversion Channel, View NE

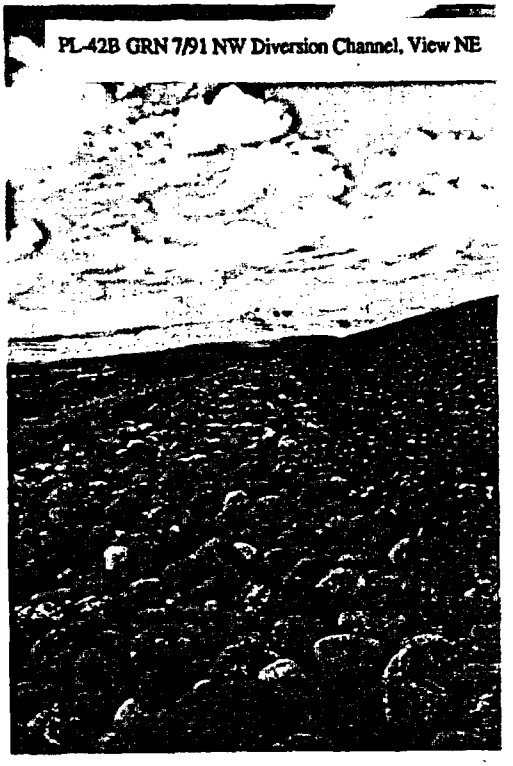




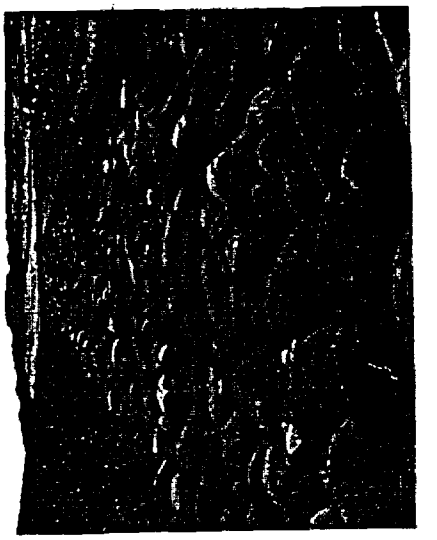
PL-40 GRN 7/91 USGS Monument

PL-42A GRN 7/91 SW Diversion Channel, View SE

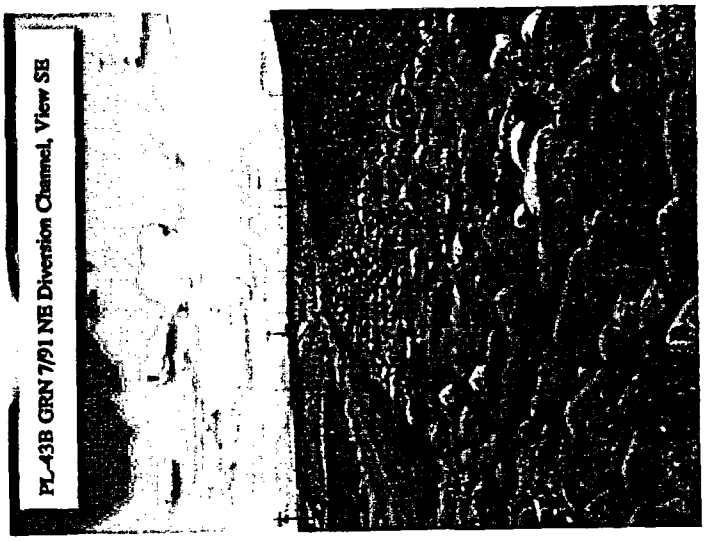
PL-42B GRN 7/91 NW Diversion Channel, View NE



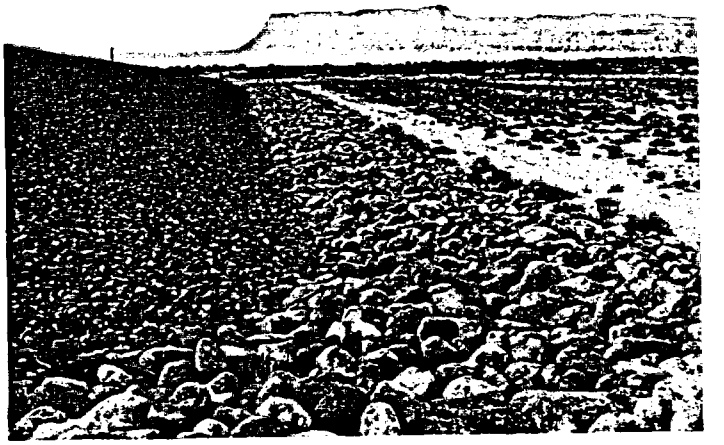
PL-43A GRN 7/91 NW Diversion Channel, View SW



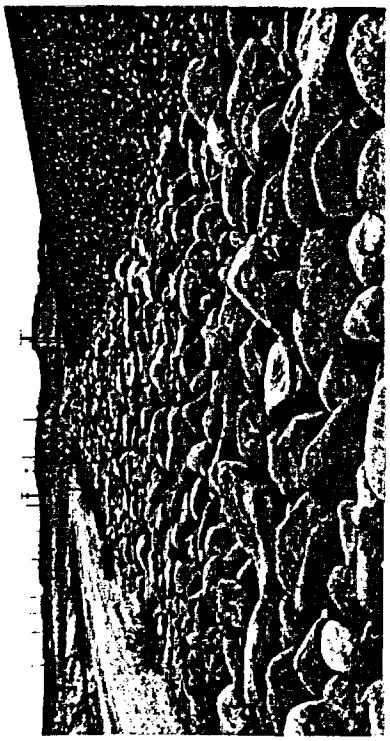
PL-43B GRN 7/91 NE Diversion Channel, View SE



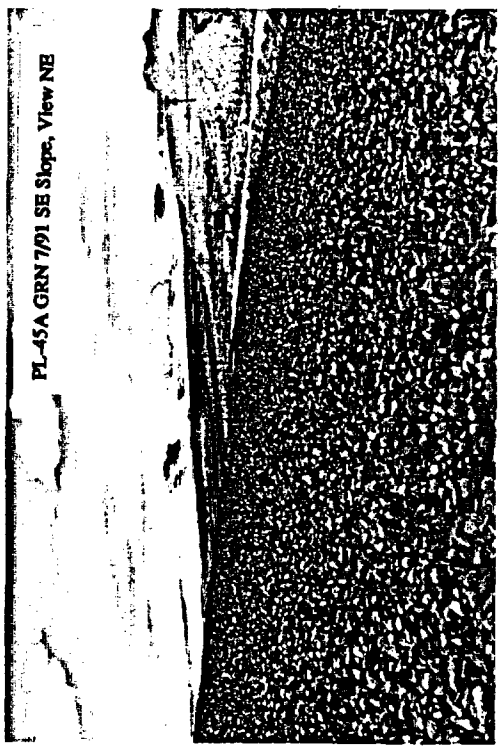
PL-44A GRN 7/91 NE Diversion Channel, View NW



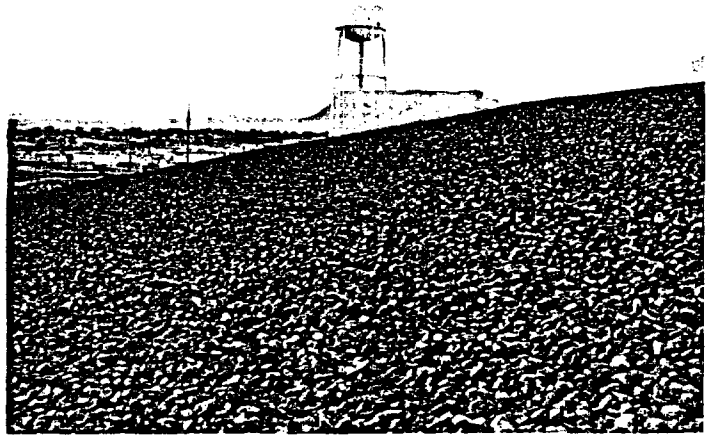
PL-44B GRN 7/91 SE Diversion Channel, View SW



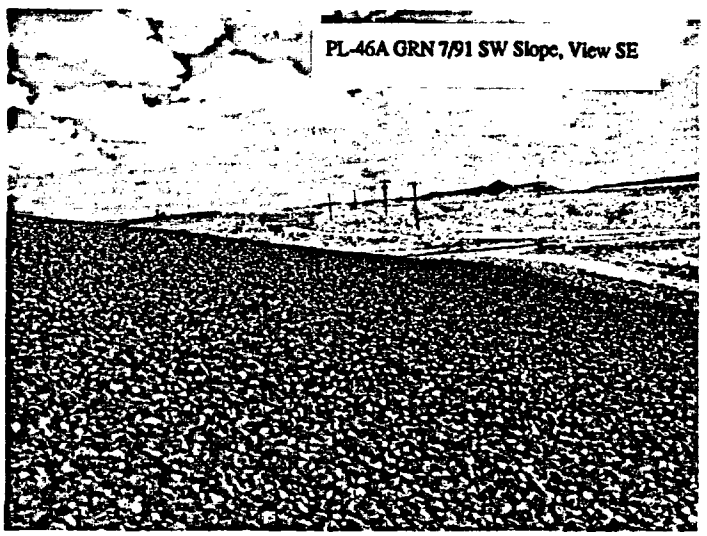
PL-45A GRN 7/91 SE Slope, View NE



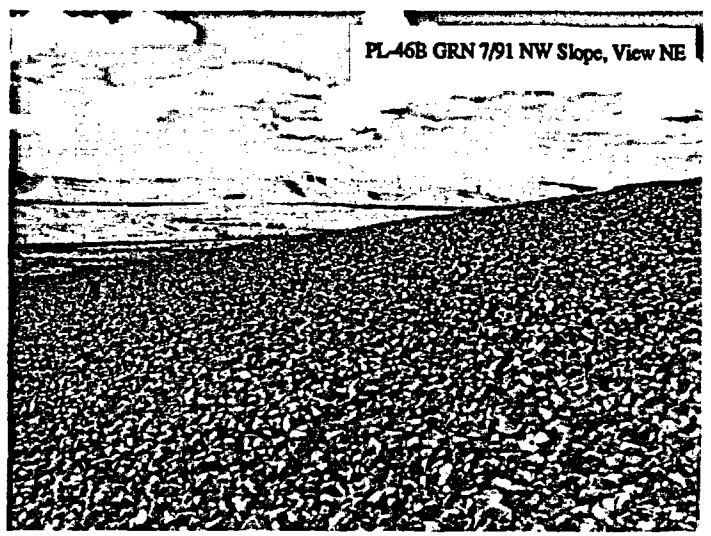
PL-45B GRN 7/91 SW Slope, View NW



PL-46A GRN 7/91 SW Slope, View SE



PL-46B GRN 7/91 NW Slope, View NE

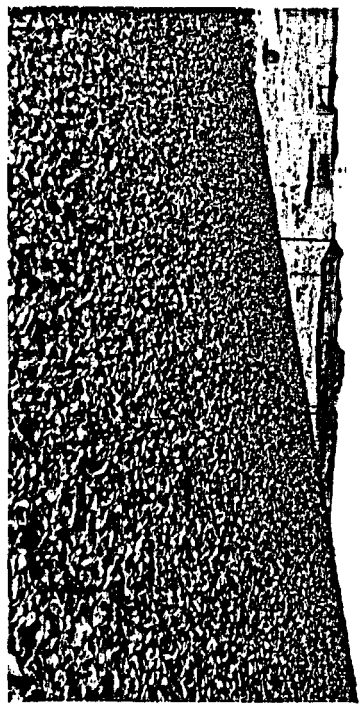


PL-47B GRN 7/91 NE Slope, View SE

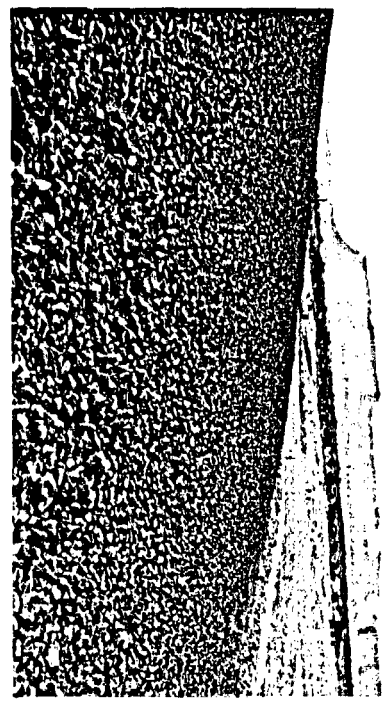
PL-47A GRN 7/91 NW Slope, View SW

PL-49 GRN 7/91 Top of Embankment, View SE

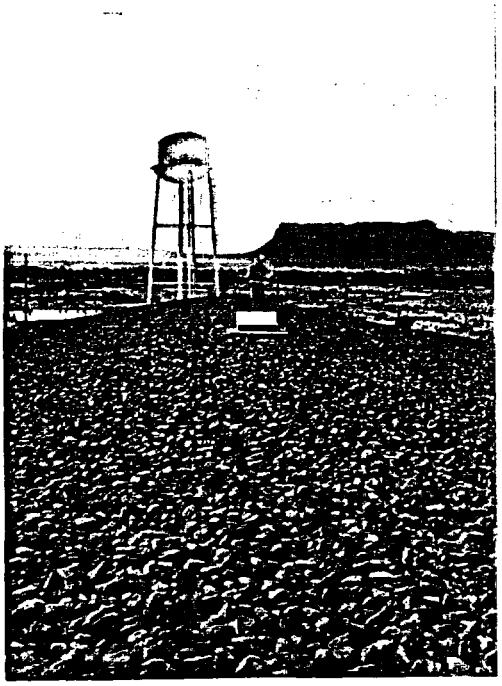
PL-48B GRN 7/91 SE Slope, View SW

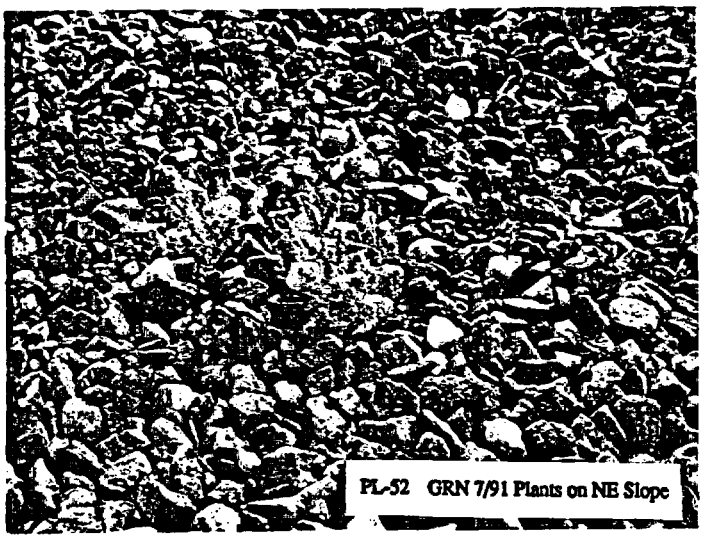


PL-48A GRN 7/91 NE Slope, View NW

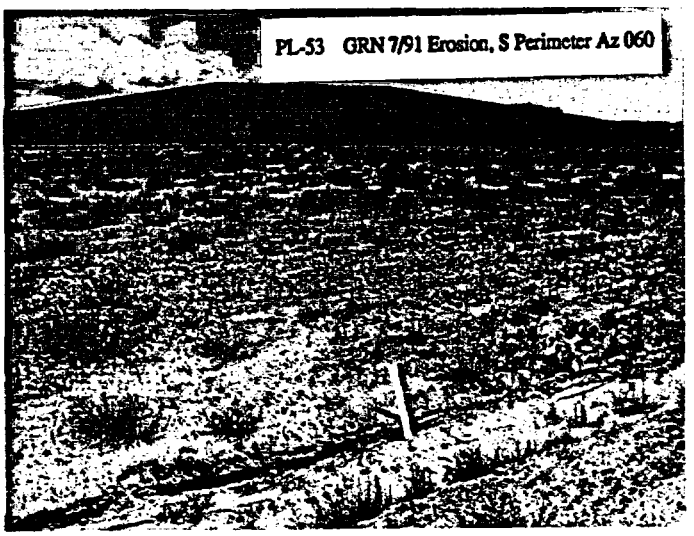


PL-50 GRN 7/91 Top of Embankment, View NW

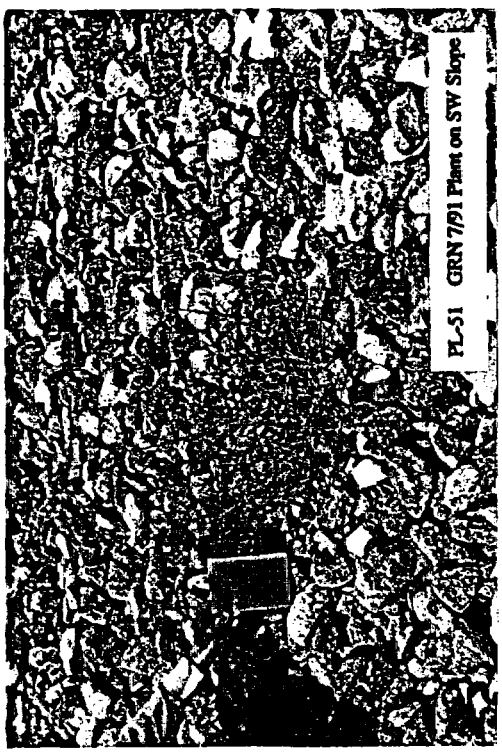




PL-52 GRN 7/91 Plants on NE Slope

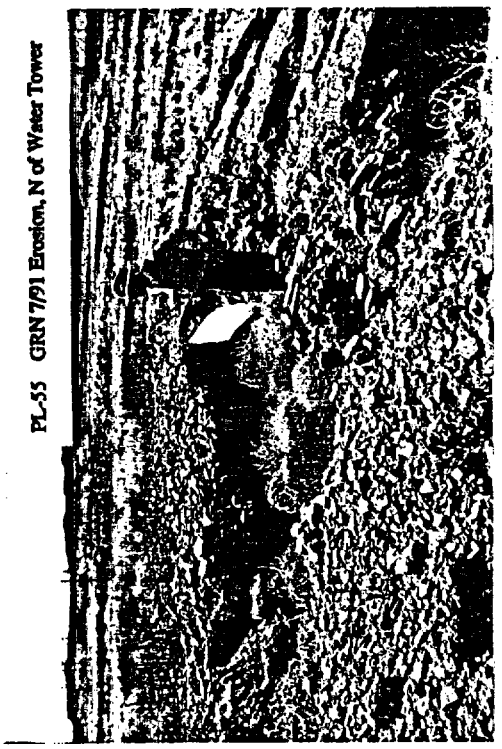


PL-53 GRN 7/91 Erosion, S Perimeter Az 060

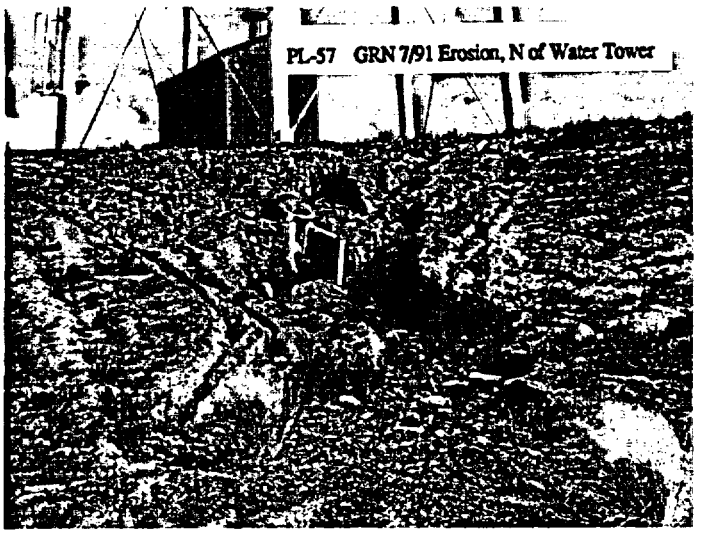


PL-51 GRN 7/91 Plant on SW Slope

PL-54 GRN 7/91 Erosion, S Perimeter Az 040



PL-55 GRN 7/91 Erosion, N of Water Tower



PL-57 GRN 7/91 Erosion, N of Water Tower

PL-58 GRN 7/91 Rill Erosion Az 225

PL-56 GRN 7/91 Erosion, N of Water Tower

Appendix B
Résumés of Inspectors

Charles A. Jones

Fields of Competence

- Geologic site characterization
- Regulatory compliance
- Mineral resource assessment
- Environmental impact analysis
- NEPA compliance

Experience Summary

Five years experience in uranium exploration and uranium resource evaluation. Nine years experience in management of site characterization studies at proposed high-level waste disposal sites.

Two years experience in implementation and management of surveillance and maintenance activities at DOE disposal sites.

Credentials

B.A., Geology, University of California, Berkeley, California

Ph.D., Geology, University of Oregon, Eugene, Oregon

Geological Society of America

Society of Economic Paleontologists and Mineralogists

Sigma Xi

Employment History

1972–75	Assistant Professor, Chadron State College, Chadron, Nebraska
1975–86	Geologist and Program/Project Manager, Bendix Field Engineering Corporation
1986–90	Program/Project Manager, UNC Geotech
1990–Present	Program Manager, Chem-Nuclear Geotech, Inc.

Key Projects

DOE National Uranium Resource Evaluation (NURE) program: uranium resource evaluation in Texas and Utah; publications in uranium resource evaluation; managed field operations at five district offices.

DOE Office of Nuclear Waste Isolation (ONWI): managed geochemical and mineralogical research projects, isotopic dating of host rock and formation waters, and established sample archival system in support of site characterization projects in Texas and Washington.

DOE Long-Term Surveillance and Maintenance (LTSM) Program: responsible for implementation and management of new surveillance and maintenance program for long-term custody of remote DOE disposal sites, primarily those decontaminated and stabilized by DOE remedial action programs and projects.

Mark P. Plessinger

Fields of Competence

Hazardous waste site remediation technologies; feasibility studies under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); underground storage tank site remediation; environmental regulatory considerations; nuclear engineering and radioactive waste handling; heat transfer/fluid mechanics experimental research.

Experience Summary

Ten years of varied professional experience including four years of CERCLA remedial investigation/ feasibility study-related work. Underground storage tank site remedial actions, transuranic radioactive and mixed-waste handling studies, management of design group performing feasibility studies and site remedial action designs. Also experienced with nuclear reactor operations and experimental research in nuclear reactor thermal hydraulics.

Credentials

B.S., Mechanical Engineering, Colorado State University, Fort Collins, Colorado

M.S., Mechanical Engineering, University of Idaho, Moscow, Idaho

Registered Professional Engineer, Colorado and Idaho

Member, American Society of Mechanical Engineers

Member, American Nuclear Society

Author or co-author of six technical publications.

Employment History

1989–Present Chem-Nuclear Geotech, Inc., Grand Junction, Colorado

1981–1989 EG&G Idaho, Inc., Idaho National Engineering Laboratory, Idaho Falls, Idaho

Key Projects

Managerial responsibility for a feasibility study under CERCLA for a federal facility in Texas. The site has a variety of hazardous waste problems including soil and groundwater contamination.

Managerial responsibility for a feasibility study under CERCLA for a U. S. Air Force base in Illinois. The site had a variety of hazardous waste problems.

Primary author of a feasibility study under CERCLA for a U. S. Air Force base in Massachusetts. The site had a variety of hazardous waste problems, including groundwater contamination, fuel spill areas, and landfills.

Design oversight for a number of underground storage tank removals at federal facilities in Colorado and Hawaii.

Conducted studies for the characterization of transuranic (TRU) and mixed radioactive wastes to determine waste volumes and packaging requirements to enable final waste disposal.

Numerous experiments and several publications related to nuclear reactor thermal hydraulics and associated instrumentation.

Craig S. Goodknight

Fields of Competence

- Mineral resource assessment
- Geologic and geohydrologic characterization of hazardous and/or radiologic sites
- Environmental Assessment/Environmental Impact Statement process
- Geologic mapping
- Project management
- CERCLA RI/FS process

Experience Summary

Eighteen years of varied professional experience including 7 years in uranium exploration and uranium resource evaluation, 2 years of supervision and planning for conducting UMTRA assessment and verification surveys, 3 years of evaluation and management of geologic and mineral resources on Federal lands, and 6 years of radiologic and hazardous waste site (CERCLA RI/FS-related) investigations and geologic feasibility and characterization studies.

Credentials

B.S., Geology, University of Tulsa (1971)

M.S., Geology, University of New Mexico (1973)

Member, Geological Society of America

Member, Association of Engineering Geologists

Member, Rocky Mountain Association of Geologists

Employment History

1974-77	District Geologist, U.S. Bureau of Land Management, Utah and Colorado
1977-86	Geologist and Department Supervisor, Bendix Field Engineering Corp.
1986-90	Principal Scientist and Project Manager, UNC Geotech
1990-Present	Principal Scientist/Geologist, Chem-Nuclear Geotech, Inc.

Key Projects

Project Manager for characterization of two Operable Units of the Denver Radium (Superfund) site, which contained radium and thorium contamination commingled with base metals.

Principal Investigator for evaluation of areas favorable for uranium deposits in Colorado, New Mexico, Wyoming, and Nevada for the DOE Uranium Resource Evaluation (NURE) Program; numerous (NURE) publications resulted from this work.

Conducted for the Environmental Protection Agency (EPA) Regions 3 and 4 a study that identified areas that have potential for high indoor radon concentrations based on screening of NURE data and geologic characteristics.

Supervisor of the Bendix Field Engineering Radiologic Support Department which assessed or characterized uranium mill tailings contamination at properties in Grand Junction, Colorado, Edgemont, South Dakota, and Monticello, Utah. Department responsibilities also included verification surveys that confirmed that the tailings-related contamination had been removed to EPA standards.

Conducted geologic investigations/characterizations for hazardous waste sites in Colorado, Texas, and Ohio and for support in geophysical detection of tunnels constructed by the North Koreans along the Demilitarized Zone in South Korea.