Long-Term Surveillance and Maintenance Program

Long-Term Surveillance Plan

for the

DOE
Sherwood Project (UMTRCA Title II) Reclamation Cell
Wellpinit, Washington

February 2001

Prepared by
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Grand Junction Office
Grand Junction, Colorado

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Contents

1.0 Introduction 1-1
1.1 Purpose 1-1
1.2 Legal and Regulatory Requirements 1-1
1.3 Role of the Department of Energy 1-2
1.4 Long-Term Surveillance and Maintenance Agreement and Right of Access to the Sherwood Site 1-2
2.0 Final Site Conditions 2-1
2.1 Site History 2-1
2.2 General Description of the Reclamation Cell Vicinity 2-1
2.3 Reclamation Cell Description 2-4
2.3.1 Site Ownership 2-4
2.3.2 Directions to the Disposal Site 2-4
2.3.3 Description of Surface Conditions 2-5
2.3.4 Permanent Site Surveillance Features 2-5
2.3.5 Site Hydrogeology 2-5
2.4 Reclamation Cell Design 2-9
2.4.1 Encapsulation Design 2-14
2.4.2 Perimeter Drainage Design 2-17
2.5 Ground Water Conditions 2-17
3.0 Long-Term Surveillance Program 3-1
3.1 General License for Long-Term Custody 3-1
3.2 Requirements of the General License 3-1
3.3 Annual Site Inspections 3-2
3.3.1 Frequency of Inspections 3-2
3.3.2 Inspection Procedure 3-2
3.3.3 Inspection Checklist 3-4
3.3.4 Personnel 3-4
3.4 Annual Inspection Reports 3-4
3.5 Follow-up Inspections 3-4
3.5.1 Criteria 3-5
3.5.2 Personnel 3-6
3.5.3 Reports of Follow-up Inspections 3-6
3.6 Routine Site Maintenance and Emergency Measures 3-6
3.6.1 Routine Site Maintenance 3-6
3.6.2 Emergency Measures 3-6
3.6.3 Criteria for Routine Site Maintenance and Emergency Measures 3-7
3.6.4 Reporting Maintenance and Emergency Measures 3-7
3.7 Environmental Monitoring 3-8
3.7.1 Ground-Water Monitoring 3-8
3.7.2 Vegetation Monitoring 3-8
3.8 Records 3-9
3.9 Quality Assurance 3-9
3.10 Health and Safety 3-9
4.0 References 4-1

Tables

Table 1-1. Requirements of the LTSP and for the Long-Term Custodian (DOE) of Sherwood Site 1-2
Table 3-1. Transects Used During First Inspection of Sherwood Site 3-2
Table 3-2. DOE Criteria for Maintenance and Emergency Measure[a] 3-7

Figures

Figure 2-1. General Location Map of Sherwood Disposal Site 2-2
Figure 2-2. Location of Stevens County, Washington, for Sherwood Disposal Site 2-3
Figure 2-3. Sherwood Disposal Cell Site Location Map, Stevens County, Washington 2-6
Figure 2-4. Site Marker at Sherwood, Washington, Disposal Cell Site 2-7
Figure 2-5. Warning Sign at Sherwood, Washington, Disposal Cell Site 2-8
Figure 2-6. Typical Geological Section of Sherwood, Washington, Disposal Cell Site 2-10
Figure 2-7. Tailings Impoundment Drainage Basin at Sherwood, Washington, Disposal Cell Site 2-11
Figure 2-8. Hydrogeologic Cross-Section of Point of Compliance (POC) at Sherwood Washington, Disposal Cell Site 2-12
Figure 2-9. Hydrogeologic Cross-Section of Tailings Impoundment Drainage Basin at Sherwood, Washington, Disposal Cell Site 2-13
Figure 2-10. Typical Disposal Cell Cross-Section 2-15
Figure 2-11. Tailings Cover Elevations After Final Settlement 2-16
Figure 3-1. Map of Inspection Transects for Sherwood, Washington, Disposal Cell 3-3

Appendices

Appendix A–Custody and Access Agreement

Appendix B–Sample Field Photograph Log

Appendix C–Initial Site Inspection Checklist and Job Safety Analysis

Appendix D–Dam Safety Inspection, Background and Requirements

Plates

Plate 1–Disposal Site Map
Plate 2–Disposal Site Final Topography

1.0 Introduction

1.1 Purpose

This Long-Term Surveillance Plan (LTSP) explains how the U.S. Department of Energy (DOE) will fulfill general license requirements of Title 10 *Code of Federal Regulations* Part 40.28 (10 CFR 40.28) as the long-term custodian of the former Western Nuclear, Inc. (WNI) uranium mill tailings Reclamation Cell near Wellpinit, Washington.

1.2 Legal and Regulatory Requirements

The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (42 USC § 7901) as amended, provides for the remediation (or reclamation) and regulation of uranium mill tailings at two categories of mill tailings sites, Title I and Title II. Title I includes former uranium mill sites that were unlicensed as of January 1, 1978, and essentially abandoned. Title II includes uranium milling sites under specific license as of January 1, 1978. In both cases, the licensing agency is the U.S. Nuclear Regulatory Commission (NRC), or in the case of certain Title II disposal sites, an Agreement State. The former WNI Sherwood site is a Title II site under UMTRCA. The State of Washington is an Agreement State.

Federal regulations at 10 CFR 40.28 provide for the licensing, custody, and long-term care of uranium and thorium mill tailings sites closed (reclaimed) under Title II of UMTRCA.

A general license is issued by the NRC for the custody and long-term care, including monitoring, maintenance, and emergency measures necessary to ensure that uranium and thorium mill tailings disposal sites will be cared for in such a manner as to protect the public health, safety, and the environment after closure (completion of reclamation activities).

The general (long-term custody) license becomes effective when the current specific license is terminated by the NRC or an Agreement State, and when a site-specific LTSP, this document, is accepted by the NRC.

Requirements of the LTSP and general requirements for the long-term custody of the Sherwood site are addressed in various sections of the LTSP (Table 1-1).

Table 1-1. Requirements of the LTSP and for the Long-Term Custodian (DOE) of Sherwood Site

Requirements of LTSP		
	Requirement	*Location*
1.	Description of final site conditions	Section 2.0
2.	Legal description of site	Appendix A
3.	Description of the long-term surveillance program	Section 3.0
4.	Criteria for follow-up inspections	Section 3.5.1
5.	Criteria for maintenance and emergency measures	Section 3.6.3
Requirements for the Long-Term Custodian (DOE)		
	Requirement	*Location*
1.	Notification to NRC of changes to the LTSP	Section 3.1
2.	NRC permanent right-of-entry	Section 3.1
3.	Notification to NRC of significant construction, actions or repairs at the site.	Section 3.5 and 3.6

1.3 Role of the Department of Energy

In 1988, the DOE designated the Grand Junction Office (GJO) to be the program office for long-term surveillance and maintenance of all DOE remedial action project disposal sites, as well as other sites (including Title II sites) as assigned, and to establish a common office for the security, surveillance, monitoring, and maintenance of these sites. The DOE established the Long-Term Surveillance and Maintenance (LTSM) Program at the GJO to carry out this responsibility.

The LTSM Program is responsible for the preparation, revision, and implementation of this LTSP, which includes site inspection, monitoring, and maintenance. The LTSM Program is responsible for annual and other reporting requirements and for maintaining records pertaining to the site.

1.4 Long-Term Surveillance and Maintenance Agreement and Right of Access to the Sherwood Site

In accordance with the provisions of section 83(b)(8) of the Atomic Energy Act, as amended, and recognizing the Federal trust responsibility to the Spokane Tribe of Indians (the Tribe), the DOE and the Tribe have executed an agreement that provides the DOE with the necessary rights of site access to enable the DOE to carry out its custodial responsibilities as stipulated by the NRC general license. The agreement, entitled "Long-Term Surveillance and Maintenance Agreement and Right of Access to the Sherwood Site," is included in this document as Appendix A.

2.0 Final Site Conditions

Reclamation at the WNI mill facility near Wellpinit, Washington, consisted of demolishing site structures, excavating, and relocating the contaminated structural materials and contaminated mill site soils to the Sherwood disposal site, approximately one-half mile east-northeast of the mill site (WNI 1997a). The mill site property was then reclaimed and released.

The Sherwood disposal cell was reclaimed and revegetated with native species. This reclamation cell is not fenced, allowing for land use to return to pre-operational use, that of grazing and wildlife habitat.

2.1 Site History

The mill construction was completed in 1978 and was operated from 1978 to 1984 by Western Nuclear, Inc., of Denver, Colorado. Nominal milling capacity was 2,100 tons of ore per day, with an average design ore grade of 0.088 percent U_3O_8 (BIA 1976). The ore processed through the mill was mined by the company from an open pit mine located approximately one-half mile west of the Sherwood mill (BIA 1976). The mill ceased operations prior to reaching the major portion of the ore-body; so, the design ore grade was never realized. Acid-leached tailings were neutralized with lime prior to placement in the synthetically lined, Sherwood disposal cell (BIA 1976; WNI 1994a). Approximately 2.9 million tons of tailings were placed in the repository from milling operations (WNI 1994b). The estimated radioactivity in the repository is 470 Curies of radium-226 (WNI 1994b).

Continued poor uranium market conditions forced the Sherwood mill to be placed on a stand-by operational status in 1984 and to commence mill decommissioning and reclamation activities in 1992.

Mill decommissioning activities began in 1992 and were completed in 1995 (WNI 1997a). Approximately 350,000 cubic yards (yd^3) of contaminated mill site soils, building equipment, and debris were removed from the Sherwood processing site and placed in the repository one-half mile away (WNI 1997a). The mill burial area is situated in the northern portion of the tailings impoundment. All mill debris placed in the repository was encapsulated within a compacted clay liner and cover, placed within the synthetically lined tailings impoundment prior to final reclamation of the tailings repository.

2.2 General Description of the Reclamation Cell Vicinity

The Sherwood reclamation cell is located approximately 7.5 miles southwest of the town of Wellpinit in Stevens County, as shown in Figures 2-1 and 2-2. The site is approximately 35 miles northwest of Spokane. The reclamation cell is situated in sections 35 and 36, of Township 28 North, Range 37 East and sections 1 and 2 of Township 27 North, Range 37 East.

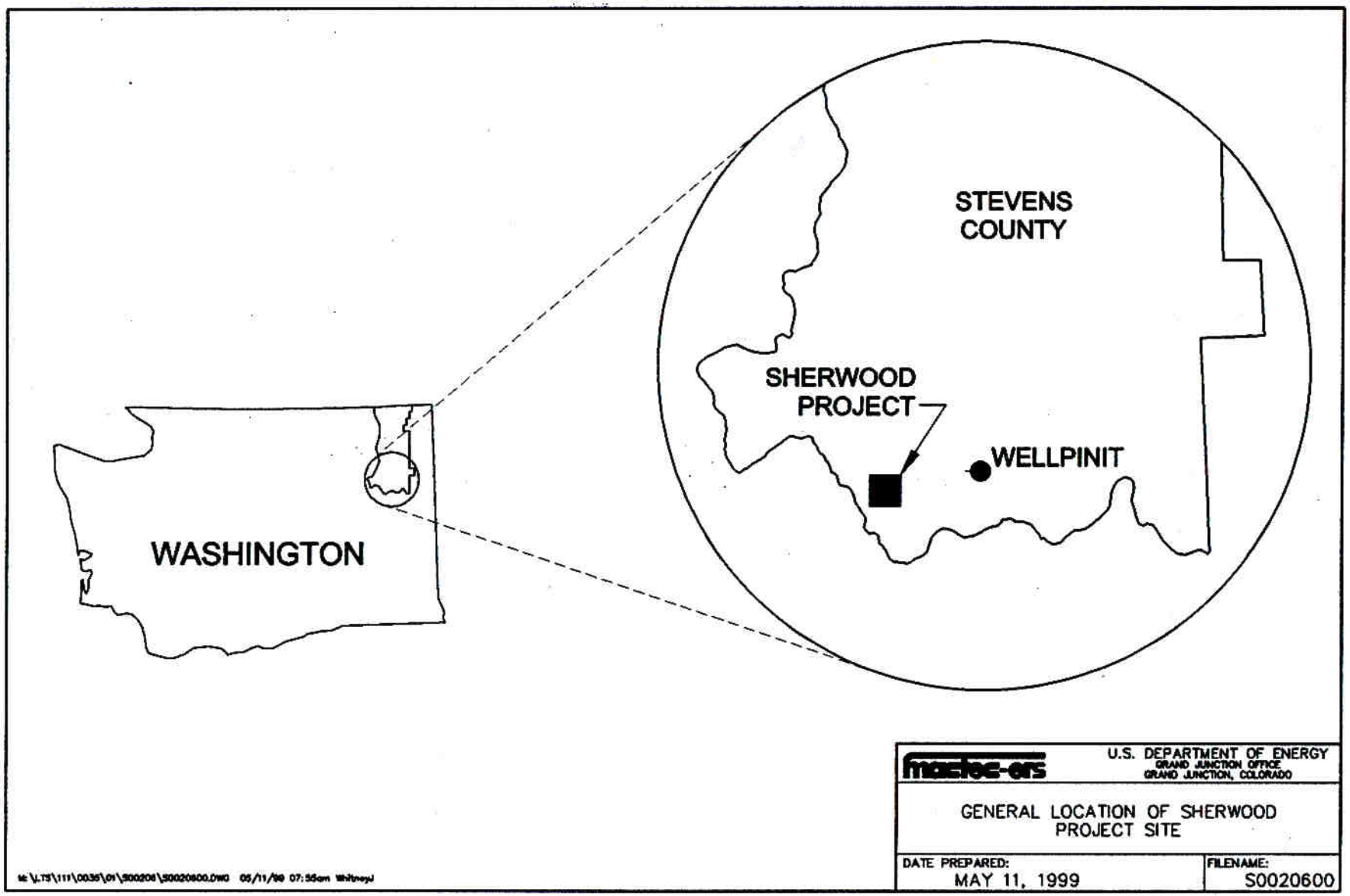


Figure 2-1. General Location Map of Sherwood Disposal Site

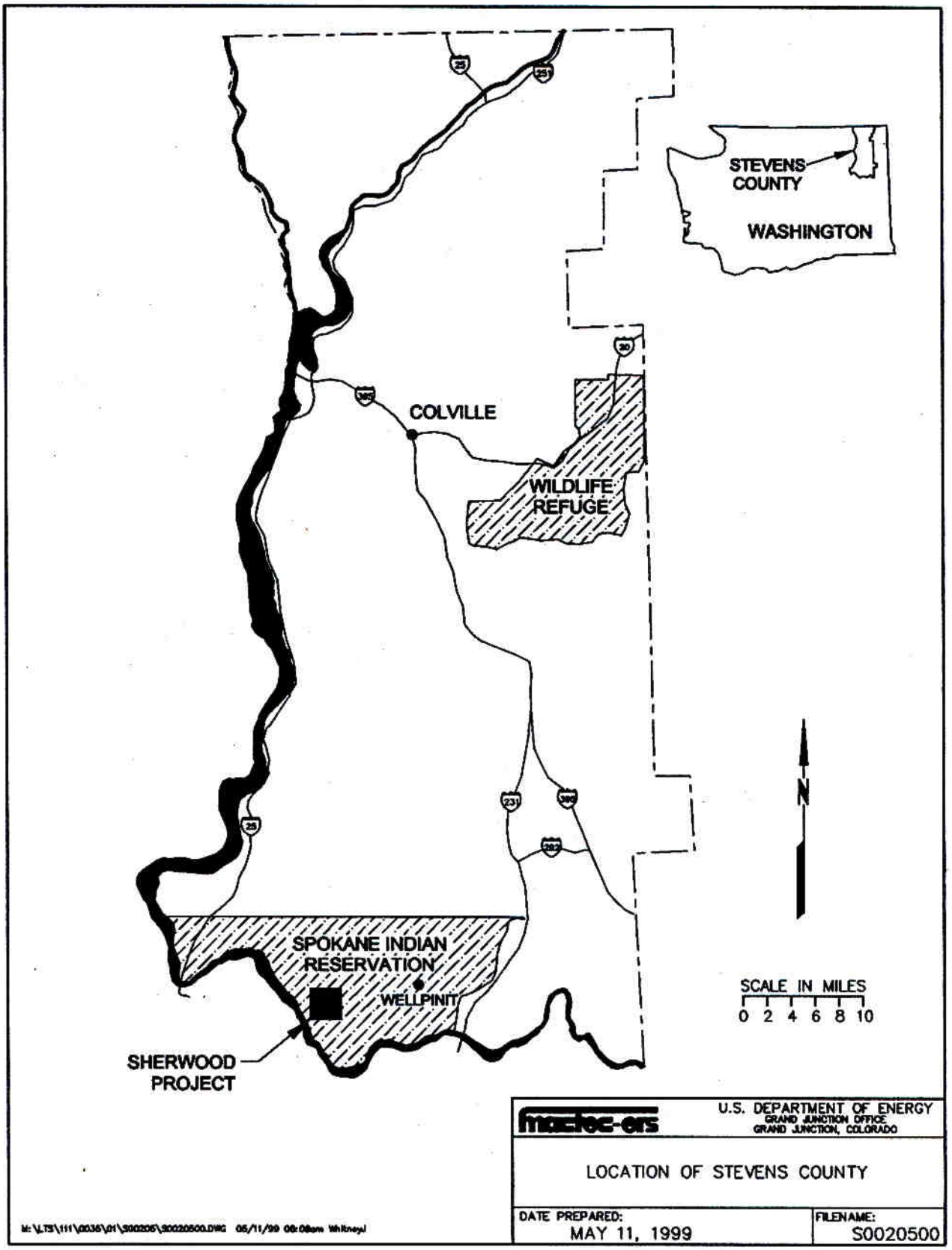


Figure 2-2. Location of Stevens County, Washington, for Sherwood Disposal Site

The eastern Washington climate experiences major daily and seasonal fluctuations in temperature, with average annual precipitation from 17 inches near Spokane to 28 inches in the northeastern corner of the state (BIA 1976). The general climate of the area is characterized as mild and arid during the summer, yet cold and humid during the winter (BIA 1976). Approximately 70 percent of the total annual precipitation, of which half is snow, falls between October 1st and March 31st (BIA 1976). Average winter temperatures range from -15 ºF to 30 ºF, with average summer temperatures ranging between 45 ºF and 90 ºF (BIA 1976). The average annual precipitation is 16 to 18 inches (BIA 1976; WNI 1995a). The highest monthly precipitation usually occurs during November, December, and January (BIA 1976).

The reclamation cell is located about 1 mile northeast of the Spokane River arm of Franklin D. Roosevelt Lake. The reclamation cell lies within an ephemeral drainage, with site elevations ranging from about 1,850 feet above mean sea level (MSL) at the southern boundary to about 2,330 feet above MSL at the northern boundary (BIA 1976). The topography of the reclamation site and immediate vicinity consists of gently sloping hills and valleys that drain to the south and southwest. The area approximately one-half mile south of the reclamation cell is characterized by steeper slopes which trend west to southwest, with slopes ranging in steepness from 1v:5h to 1v:1h (WNI 1994a).

The primary land use in the immediate surrounding vicinity is timbering, livestock grazing, and wildlife habitat (BIA 1976). The construction of ground water supply wells and residences on the disposal site property must be precluded in perpetuity. However, the long-term land use of the reclamation cell will be consistent with the preoperational land use (WNI 1995a).

2.3 Reclamation Cell Description

2.3.1 Site Ownership

The United States Government, in trust for the Spokane Tribe of Indians, owns the Sherwood reclamation site property.

The 382.38-acre property is illustrated in Plate 1. Since the reclamation cell is situated on the Spokane Indian Reservation, no agreement of transfer is necessary for conveying the property rights to the federal government entity, DOE. However, an access agreement including an explicit legal description of the reclamation cell has been executed between the Spokane Tribe of Indians and the DOE. This agreement is provided in Appendix A.

2.3.2 Directions to the Disposal Site

From Spokane, take Highway 2 west to Reardan (approximately 22 miles). In Reardan, turn right (north) onto Highway 231; travel north approximately 12 miles to the Little Falls Road intersection. Turn left (west) onto Little Falls Road and travel west for 2.5 miles to Little Falls Dam and the entrance to the Spokane Indian Reservation. At Little Falls Dam, the Spokane River is bridged and BIA Road No. 27 (Little Falls Road) begins. Continue on Road No. 27 for 5 miles; then turn left (west) onto Road No. 25 (Elijah Road). Stay on Road No. 25 for approximately 4 miles. Continue west on Road No. 38 (Sherwood Mine Road) for an additional 3.5 miles until the Sherwood site is reached, as shown in Figure 2-3.

2.3.3 Description of Surface Conditions

The surface has been revegetated with native species, including Ponderosa Pine. A rock-armored diversion channel circumvents the western, northern, and eastern sides of the reclamation repository area, and diverts surface water runoff from the surrounding watershed around the reclaimed cell. The reclaimed diversion channel embankment is covered with rock mulch. The reclamation site will not be fenced to allow open access for cattle grazing and wildlife habitat. The final site topography is shown on Plate 2.

The 382.38-acre reclamation area that the DOE is responsible for includes the 94-acre tailings repository, the ground water monitoring network, and the diversion channel.

2.3.4 Permanent Site Surveillance Features

Boundary monuments, a site marker, and six warning signs will be the permanent long-term surveillance features at the Sherwood reclamation cell. These features will be inspected and maintained as necessary as part of the passive institutional controls for the site.

Six boundary monuments are placed on the final site boundary, one at each corner of the 382.38-acre reclamation cell site.

One unpolished granite marker with an incised message identifying the site of the Sherwood reclamation cell is placed on site property just inside the official site (unfenced) boundary (Figure 2-4).

The warning signs display both the DOE 24-hour telephone number and the local emergency dispatch 24-hour telephone number (Figure 2-5).

The positions of the permanent site surveillance features are shown on Plate 1.

2.3.5 Site Hydrogeology

The oldest and most widespread bedrock unit is porphyritic quartz monzonite of the Cretaceous Loon Lake granite formation (BIA 1976). Overlying the quartz monzonite is a variable thickness of glacial outwash (BIA 1976). See Figure 2-6 for typical geologic section. Variability in soil depth is attributable to the intermittent distribution of shallow bedrock and changes in slope (BIA 1976). Soil depths vary from zero at the northern extreme of the reclamation cell to approximately 200 feet at the ground water monitor wells immediately downgradient of the repository.

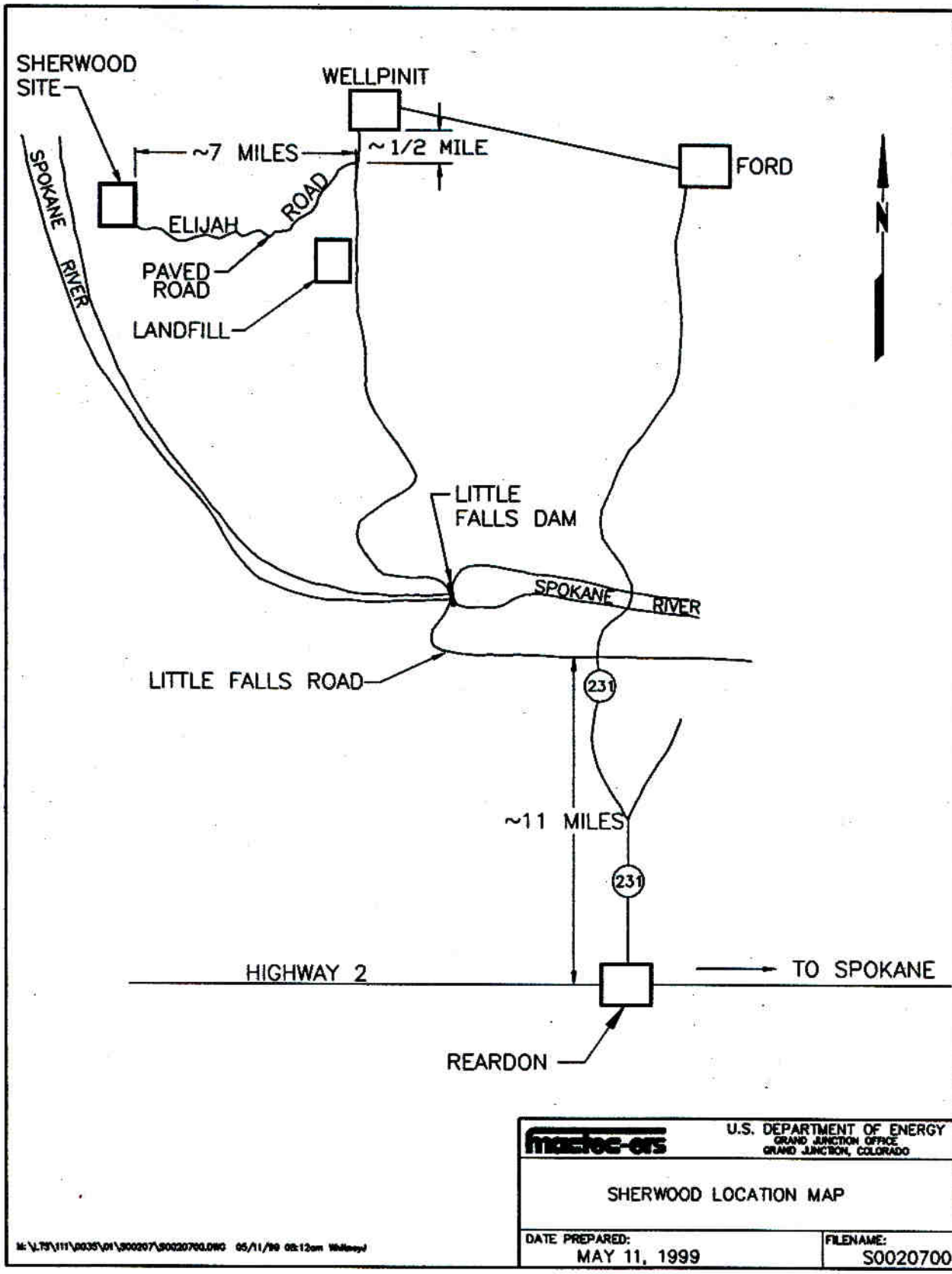


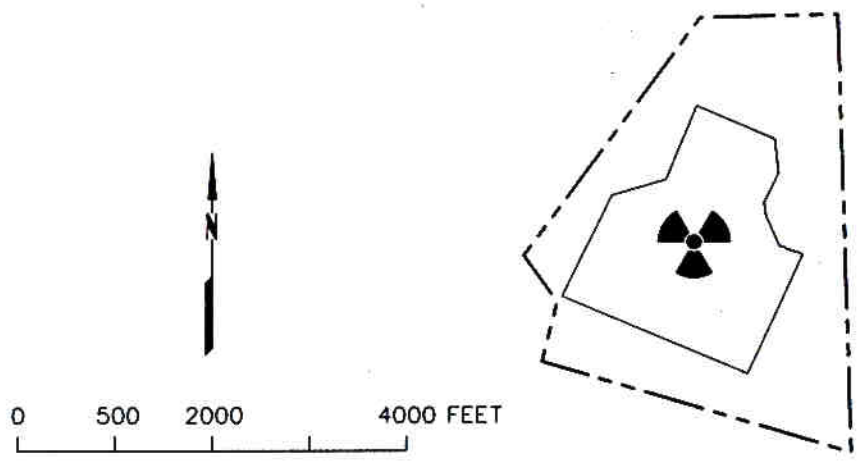
Figure 2-3. Sherwood Disposal Cell Site Location Map, Stevens County, Washington

SHERWOOD, WASHINGTON

DATE OF CLOSURE: DECEMBER 1996

TONS OF TAILINGS: 2,900,000

RADIOACTIVITY: 470 CURIES, RA-226



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macTec-ers	U.S. DEPARTMENT OF ENERGY GRAND JUNCTION OFFICE GRAND JUNCTION, COLORADO
SITE MARKER AT SHERWOOD, WASHINGTON SITE	
DATE PREPARED: JANUARY 27, 2000	FILENAME: S0020800

Figure 2-4. Site Marker at Sherwood, Washington, Disposal Cell Site

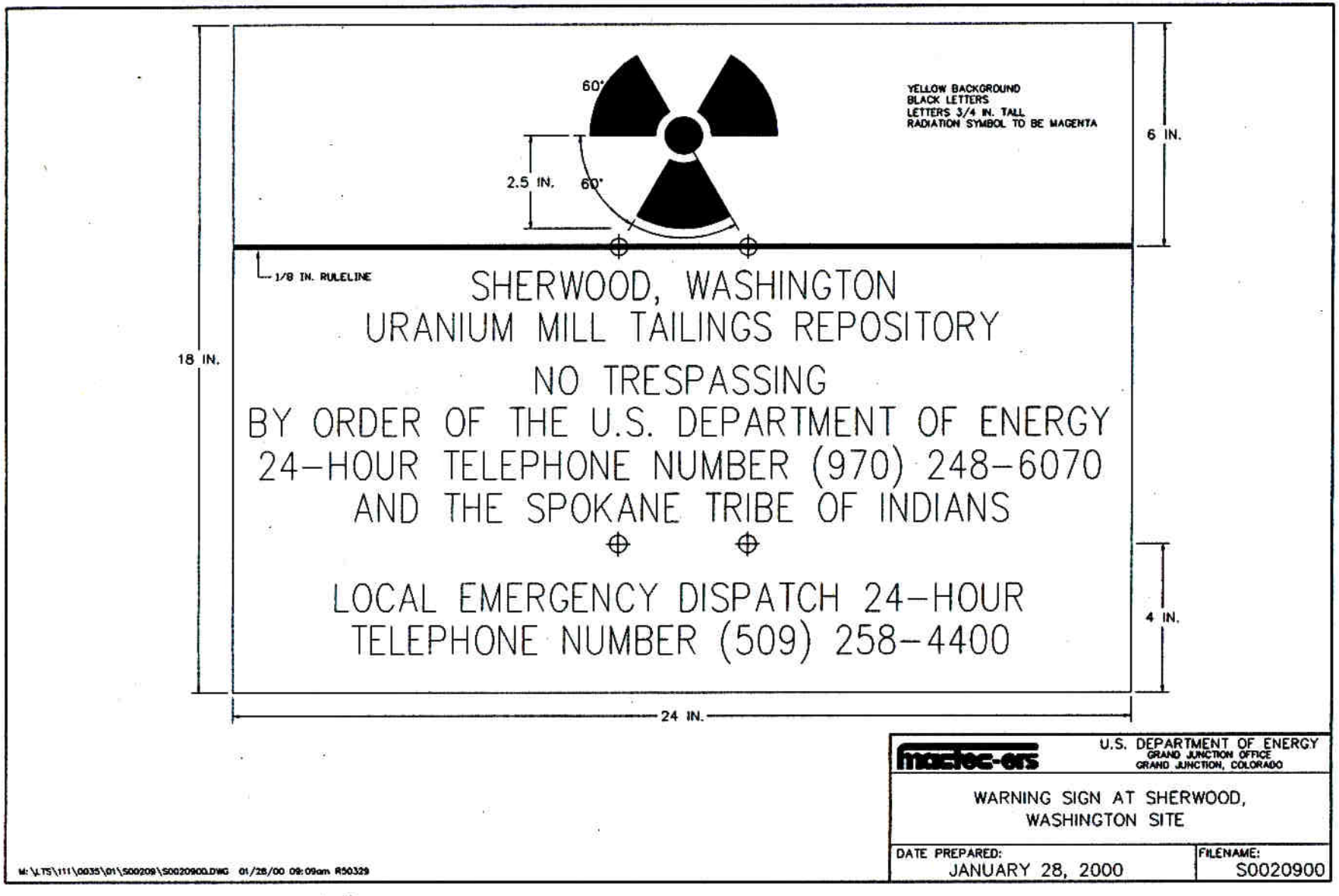

Figure 2-5. Warning Sign at Sherwood, Washington, Disposal Cell Site

The reclamation cell is situated in approximately the center of a 730-acre drainage basin (BIA 1976). The basin, which is closed to the north, east, and west sides by high bedrock, drains to the south (see Figure 2-7) (WNI 1994a). Local relief is approximately 300 feet, and the drainage basin has low erosion potential due to vegetative or rock armor cover (BIA 1976; WNI 1997b). The reclamation cell is underlain by sandy alluvial outwash soils ranging in depth from zero (an interface with bedrock) to approximately 200 feet (WNI 1994a).

Infiltrating waters percolate vertically through the basin soils (alluvium) until bedrock is encountered (WNI 1994a; WNI 1995b). The ground water then flows in the two hydro-stratigraphic units: (1) the alluvium, which lies on top of the bedrock surface; and (2) the conductive bedrock zone (see Figure 2-8) (WNI 1994a; WNI 1995b).

Ground water in the alluvium flows parallel to the bedrock surface and toward the south (WNI 1994a). Ground water in the conductive bedrock zone, which is the upper 50 feet of bedrock consisting of hydraulically conductive weathered and fractured bedrock, also flows parallel to the bedrock surface and toward the south (WNI 1994a). Flow in the conductive bedrock zone occurs at a slower rate due to the lower hydraulic conductivity of this bedrock unit (WNI 1994a).

Ground water in these two hydro-stratigraphic units flows to the south through a narrow bedrock valley located approximately 200 feet beneath the toe of the impoundment dam (see Figures 2-8, and 2-9) (WNI 1994a).

2.4 Reclamation Cell Design

Washington Department of Health regulations require the nonproliferation of small repository sites. Therefore, contaminated materials produced during milling operations and removed from the Sherwood mill site during decommissioning were permanently disposed of in an engineered repository. The design approach endorsed by the Final Environmental Statement (FES) (BIA 1976) was a "partially below-grade" disposal and "encapsulation" of the wastes. The location of the disposal site within an ephemeral drainage required construction of a containment dam at the downgradient face of the repository to enclose the repository basin.

The reclamation area includes a 94-acre, synthetically lined tailings repository. The containment dam was constructed from compacted sandy/silty soils and has a base width of 660 feet and a top width of 25 feet, with drainage provided by an internal blanket drain. The downslope face of the embankment has been stabilized by using a 6-inch thick layer of 3-inch D_{50} rock riprap (WNI 1997b). The structural integrity of the 94-acre repository was enhanced with placement of a synthetic liner over the bottom and sides of the repository (WNI 1994a).

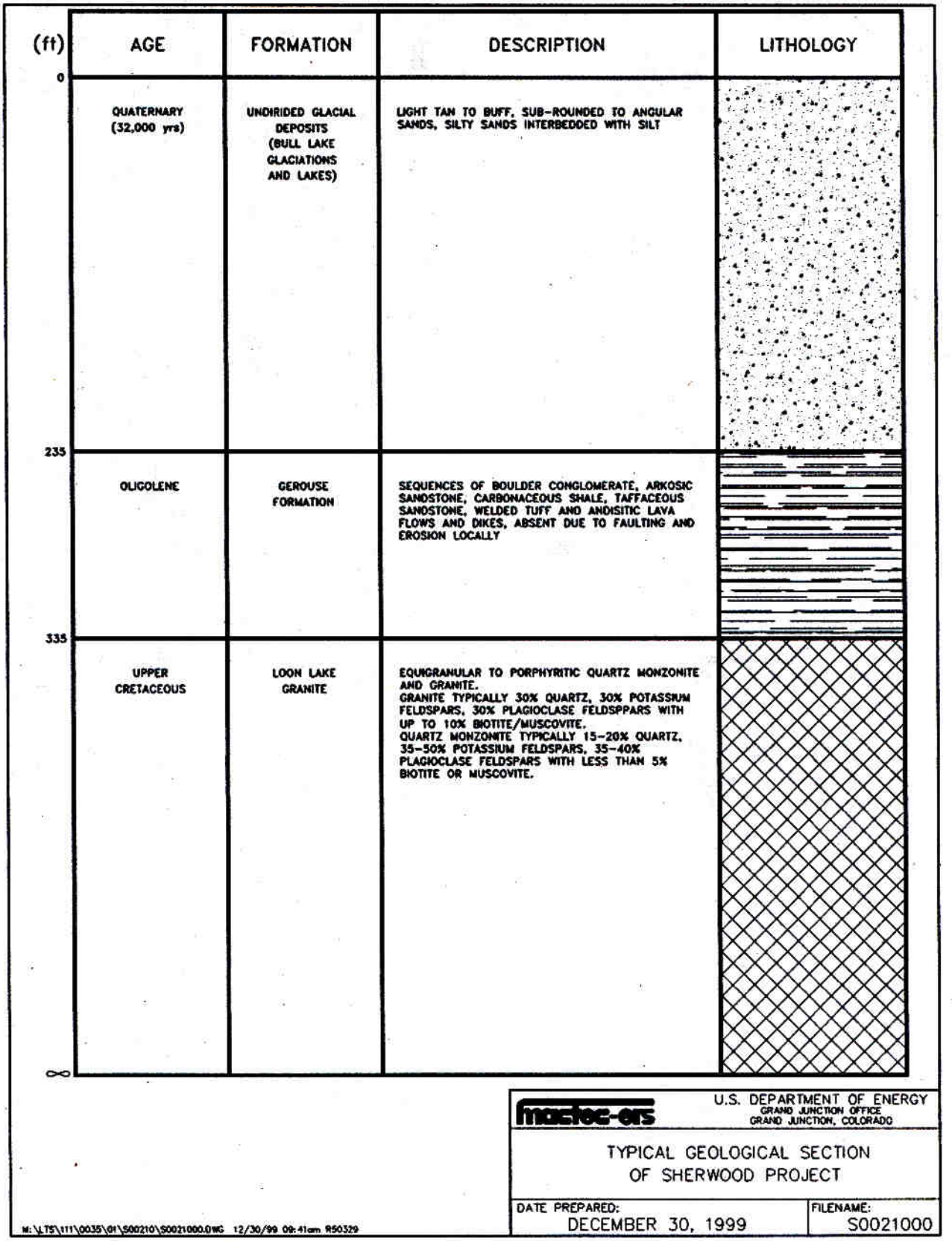

Figure 2-6. Typical Geological Section of Sherwood, Washington, Disposal Cell Site

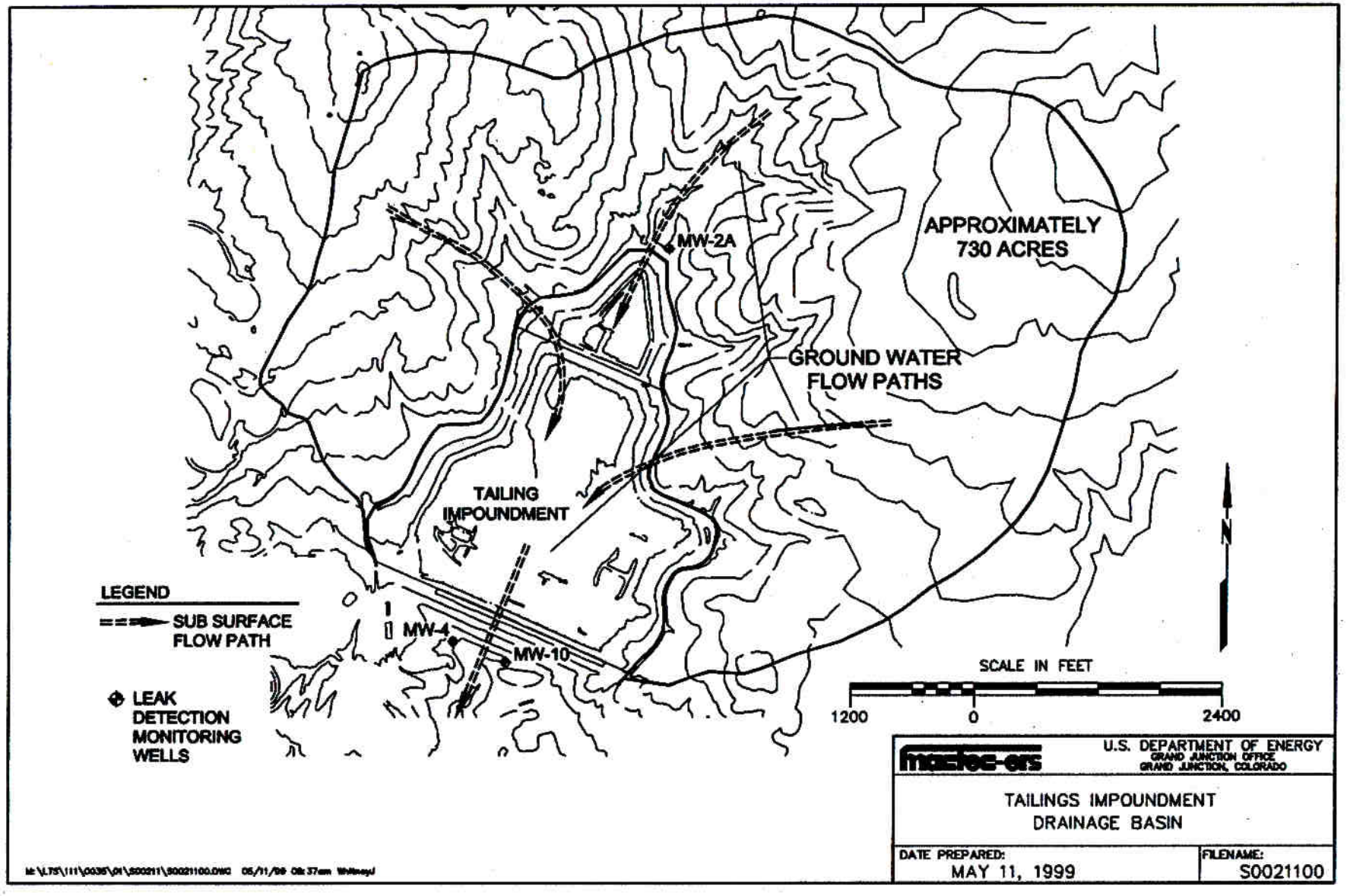

Figure 2-7. Tailings Impoundment Drainage Basin at Sherwood, Washington, Disposal Cell Site

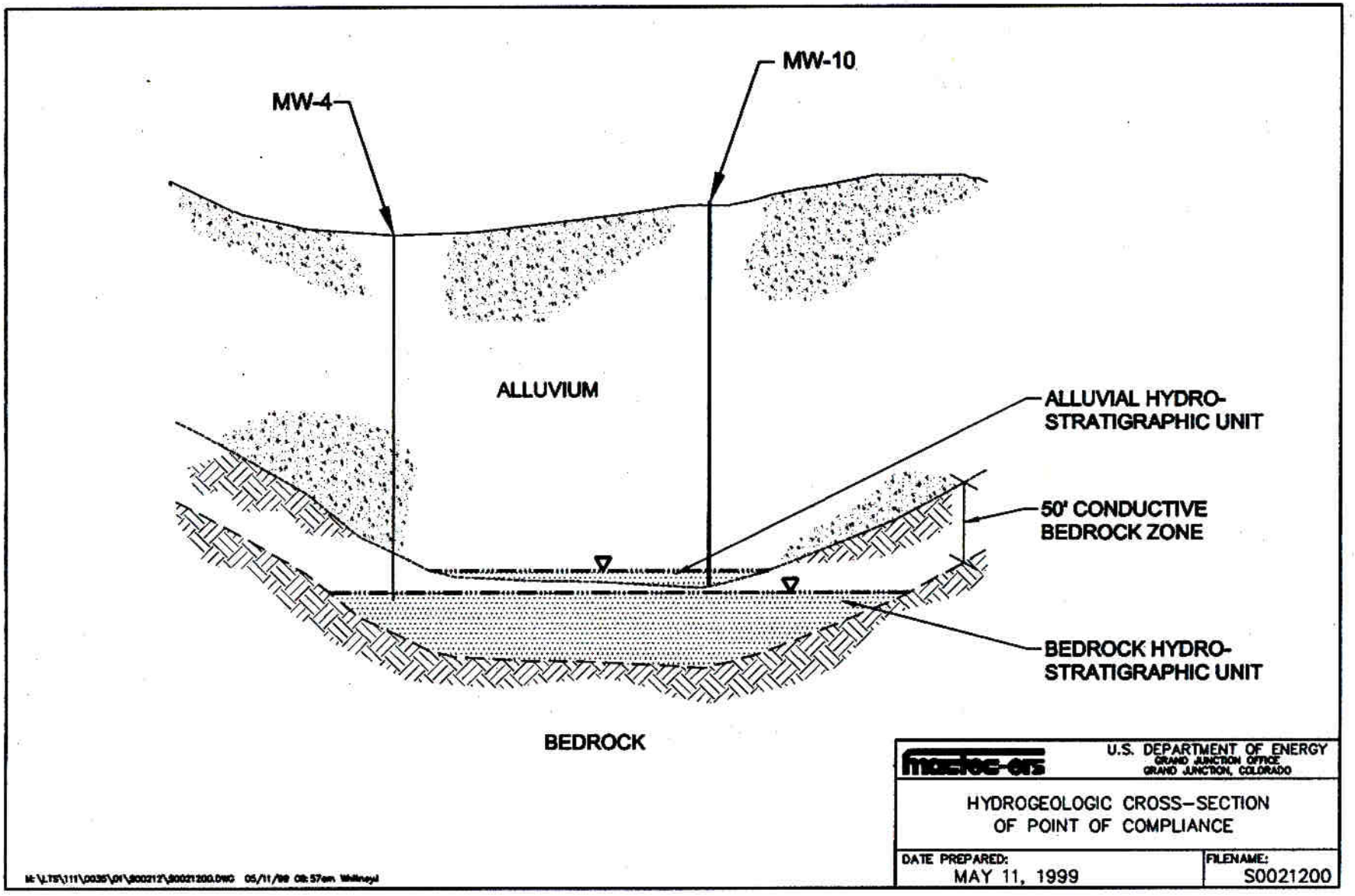

Figure 2-8. Hydrogeologic Cross-Section of Point of Compliance (POC) at Sherwood Washington, Disposal Cell Site

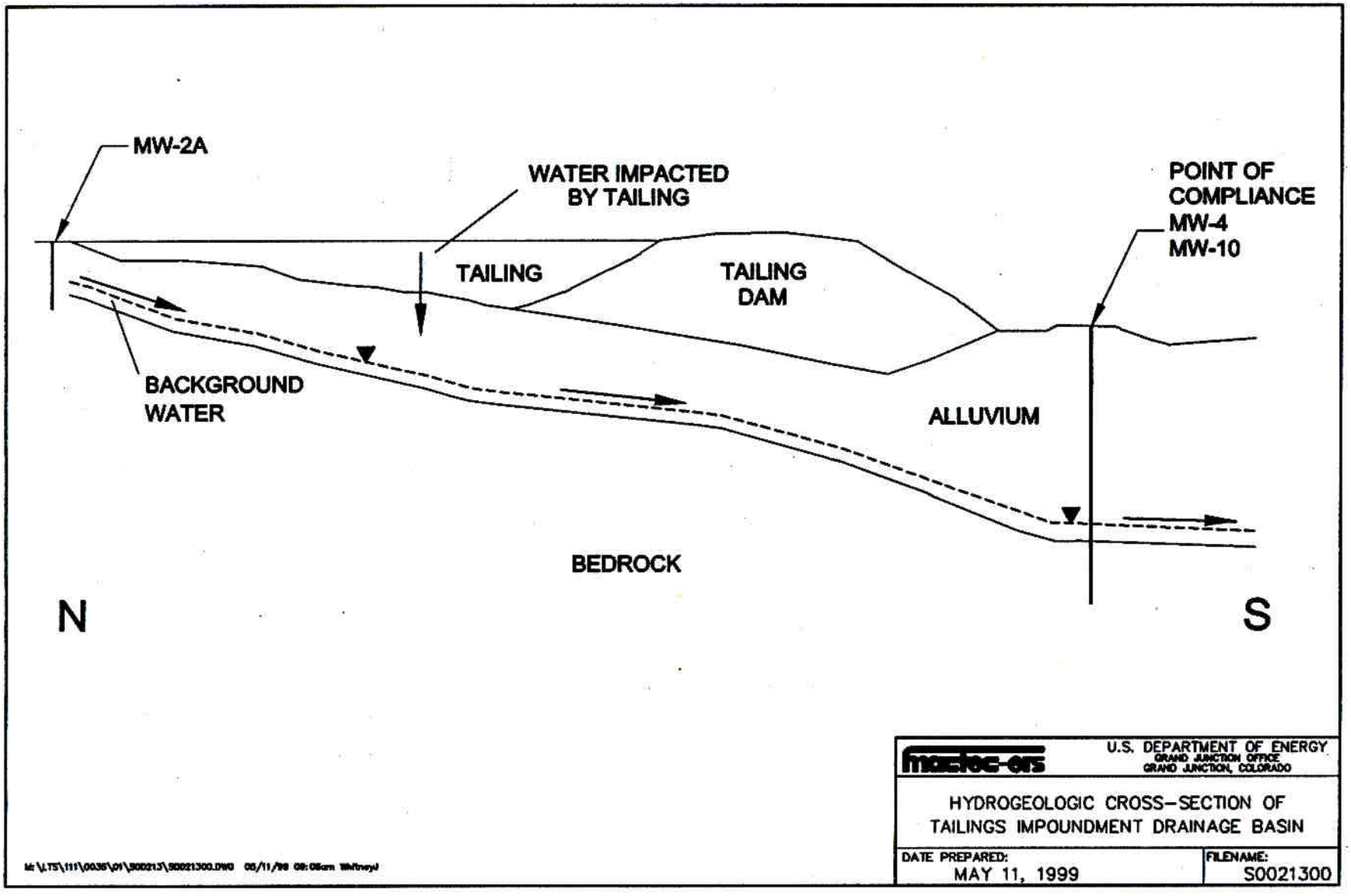

Figure 2-9. Hydrogeologic Cross-Section of Tailings Impoundment Drainage Basin at Sherwood, Washington, Disposal Cell Site

2.4.1 Encapsulation Design

Physical encapsulation of the wastes was accomplished with installation of a synthetic liner throughout the bottom and sides of the repository (WNI 1995b). The liner was designed to provide physical separation of the wastes from the surrounding strata and the ground-water flow path that exists along the interface between the sandy alluvial outwash and the quartz monzonite bedrock.

A reclamation cover system, consisting of uncompacted local sandy to clayey-sandy soils and of vegetation, was placed over the wastes to control radon flux and infiltration into the repository (WNI 1995a). The cover consists of 12.6 to 20 feet of uncompacted local soils (WNI 1997b). The reclamation cover, which includes a minimum of 0.5 foot of topsoil, was revegetated with native grass, forbs, shrub and tree species (WNI 1997b). The vegetation is self-sustaining and natural succession caused by fire and other natural mechanisms has been anticipated (WNI 1995a). The range of vegetation communities that will occur over time will provide the necessary protection and evapotranspiration. A typical disposal cell cross-section is shown in Figure 2-10. The uncompacted cover was designed to be "self-healing" with regard to impacts from freeze-thaw, bio-intrusion, and settlement (WNI 1995a).

Erosional stability analyses assumed worst case conditions, i.e., that under a Probable Maximum Precipitation (PMP) event, the reclamation cover would remain erosionally stable in areas where the cover might be steepest due to differential settlement (WNI 1995a). The uncompacted reclamation soil cover system is designed to withstand up to 10 feet of settlement (see Figure 2-11) with no adverse impact on the performance of the reclamation system relative to erosional stability, radon attenuation or ground water protection (WNI 1994b).

Although the reclamation cell cover design predicted that up to 10 feet of settlement could potentially occur, a significant portion of the projected settlement occurred during placement of the reclamation cover (WNI 1995a). Short-lived, localized, wetter areas will develop; however, adverse impacts on the performance of the vegetated reclamation cell are not anticipated (WNI 1995a). Wetter areas will lead to a different density or type of vegetation (WNI 1995a).

Seismic stability evaluations, specifically related to the potential for embankment instability, rafting, and sand boiling, indicate that the reclamation cell will be stable under the largest probable seismic event (WNI 1995a).

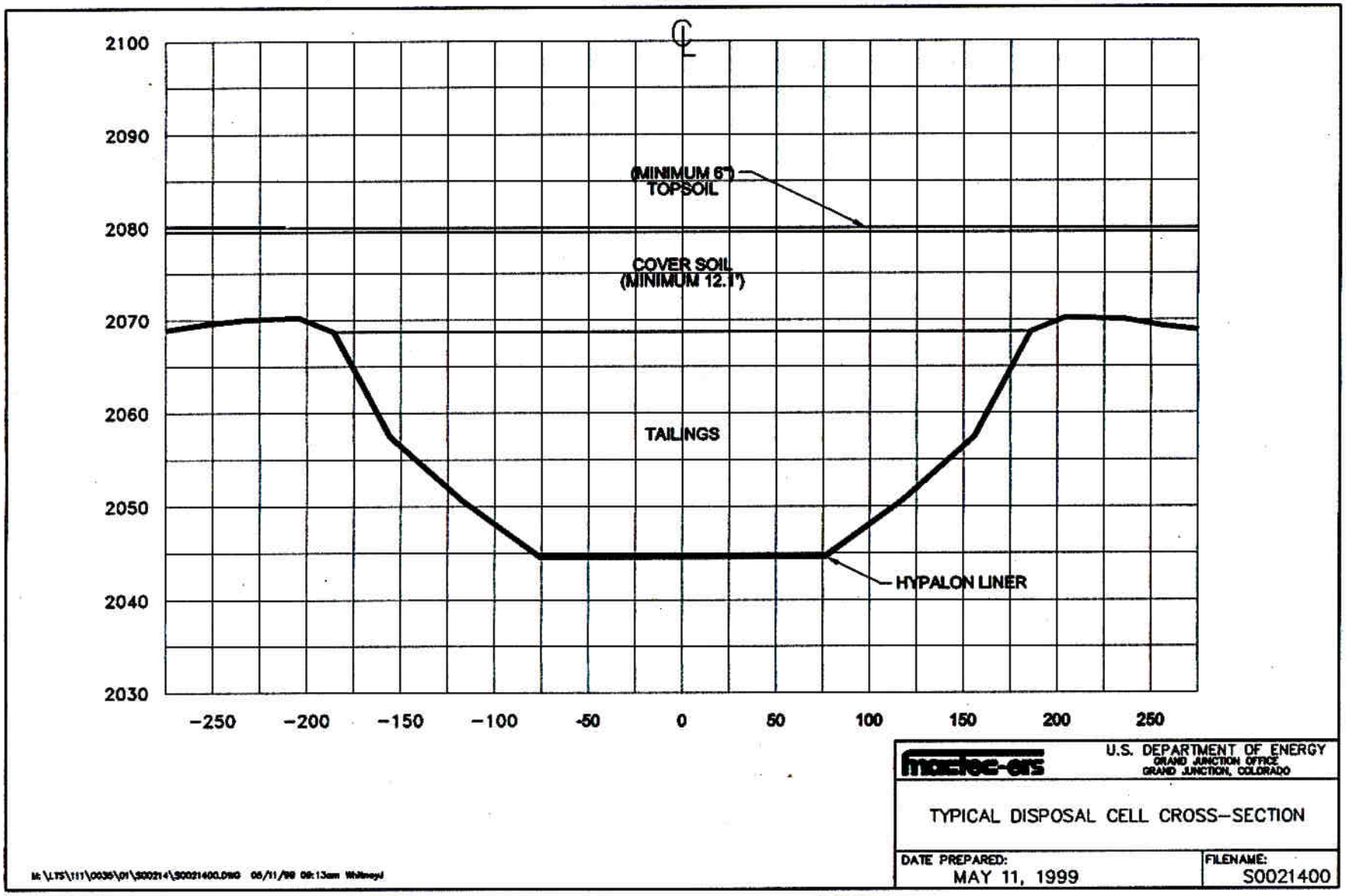

Figure 2-10. Typical Disposal Cell Cross-Section

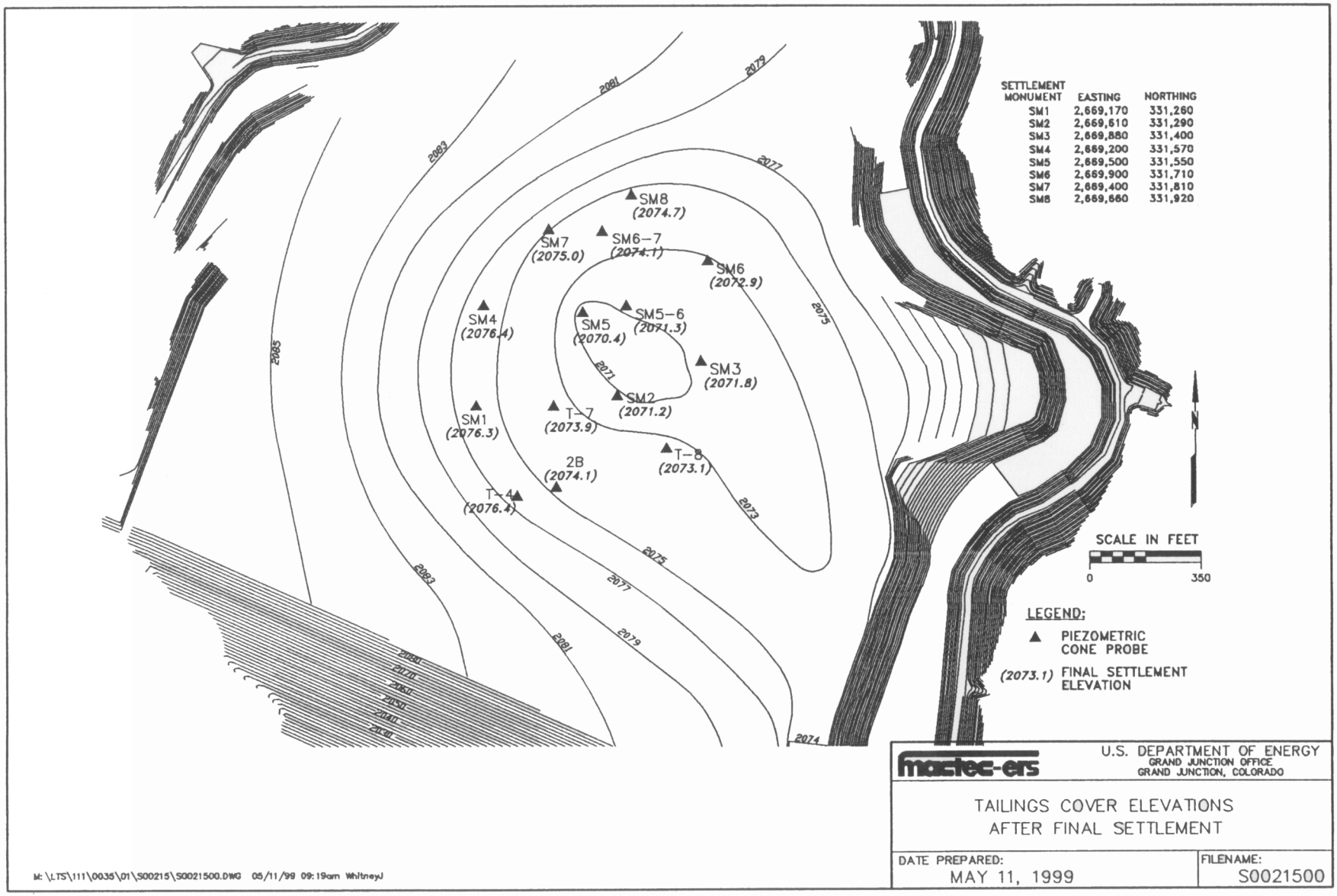

Figure 2-11. Tailings Cover Elevations After Final Settlement

2.4.2 Perimeter Drainage Design

The perimeter drainage system consists of one channel along the perimeter of the disposal site to intercept overland flow and convey storm water around and away from the reclamation cell (WNI 1997b). The channel was designed with a maximum gradient of 0.75 percent and sufficient hydraulic capacity to convey the flow from the PMP event, while accommodating anticipated sediment and debris accumulation within the channel (WNI 1997b). The channel has been stabilized against erosional forces using riprap with an average diameter size ranging from 3 inches to 18 inches (WNI 1997b).

The perimeter drainage channel discharges into the natural drainage area to the southeast and southwest of the reclamation cell. The design of riprap protection in the channel outlets was based on NRC guidance (NRC 1990).

2.5 Ground Water Conditions

Repository design elements that provided ground water protection included tailings neutralization; the stratigraphy of tailings materials deposited within the repository; placement of a synthetic bottom liner (WNI 1995b); and the control of infiltration through the reclamation cover system by vegetation comprised of indigenous species. As a result of tailings neutralization, very few hazardous constituents, i.e., arsenic, nickel, thallium, radium 226, radium 228, and uranium, have been identified in the tailings fluid at concentrations exceeding state or federal ground water standards or background ground water concentrations (WNI 1995b). Many of these constituents are at levels only slightly greater than applicable standards. Tailings dewatering was rejected as a potential closure option because dewatering would cause a decrease in tailings fluid pH and would increase hazardous constituent concentrations by one to three orders of magnitude (WNI 1995b).

Infiltration is minimized through removal of precipitation via evaporation and transpiration by reclamation cell vegetation; under normal conditions, little or no infiltration will occur. The available precipitation will be utilized by the plant communities (WNI 1995a; WNI 1995a).

Long-term impacts to the ground-water system were assumed to occur through two mechanisms: (1) leakage through the impoundment liner, and (2) overtopping of the liner resulting from infiltration through the reclamation soil cover (WNI 1995b). Prediction of ground-water quality for the hypothetical worst-case environmental impact scenario indicated that hazardous constituents would remain below state or federal ground water standards at the POC that is situated immediately downgradient of the reclamation cell (WNI 1995b).

The hydrogeographic system directs ground water flow through two hydro-stratigraphic units and along the bedrock/alluvial soil interface, to the south through a narrow bedrock valley located approximately 200 feet beneath the toe of the impoundment dam (see Figures 2-8 and 2-9) (WNI 1994a). Well MW-4, which is screened in the conductive bedrock zone, and MW-10, which is screened in the alluvium, monitor these two hydro-stratigraphic units at the POC.

End of Current Text

3.0 Long-Term Surveillance Program

3.1 General License for Long-Term Custody

States have right of first refusal for long-term custody of Title II disposal sites (UMTRCA, Section 202 [a]), except where those sites lie on Indian Reservations. For sites situated on Indian Reservations, e.g., the Sherwood reclamation cell, the federal government already owns the land. For the Sherwood site, which is owned by the federal government and held in trust for the Spokane Tribe of Indians, the DOE assumes responsibility for long-term custody of the reclamation cell.

When the NRC accepts this LTSP and the Washington Department of Health terminates WNI's radioactive (source) materials license, WN-I0133-1, the site will be included under the NRC's general license for long-term custody (10 CFR 40.28 [b]).

Although sites are designed to "be effective for up to one thousand years, to the extent reasonably achievable, and, in any case, for at least 200 years" [40 CFR 192, Subpart A, 192.02 (a)], there is no termination of the general license for the DOE's long-term custody of the site (10 CFR 40.28 [b]).

Should changes to this LTSP be necessary, the NRC must be notified of the changes, and the changes may not conflict with the requirements of the general license. Additionally, representatives of the NRC must be guaranteed permanent right-of-entry for the purpose of periodic site inspections. To assure permanent access to the Sherwood site, DOE and the Spokane Tribe of Indians have entered into an access agreement (see Appendix A).

3.2 Requirements of the General License

To meet the requirements of the NRC's license at 10 CFR 40, Section 28, and Appendix A Criterion 12, the long-term custodian must, at a minimum, fulfill the following requirements. The section in the LTSP in which each requirement is addressed is given in parentheses.

1. Annual site inspection. (Section 3.3)

2. Annual inspection report. (Section 3.4)

3. Follow-up inspections and inspection reports, as necessary. (Section 3.5)

4. Site maintenance, as necessary. (Section 3.6)

5. Emergency measures in the event of catastrophe. (Section 3.6)

6. (Environmental) monitoring, if required. (Section 3.7)

3.3 Annual Site Inspections

3.3.1 Frequency of Inspections

At a minimum, sites must be inspected annually to confirm the integrity of visible features at the site and to determine the need, if any, for maintenance, additional inspections, or monitoring (10 CFR 40, Appendix A, Criterion 12).

To meet this requirement, the DOE will inspect the Sherwood reclamation cell once each calendar year. The date of the inspection may vary from year to year, but the DOE will endeavor to inspect the site approximately once every 12 months unless circumstances warrant variance. The variance will be explained in the inspection report. At least 30 days in advance of the scheduled inspection date, the DOE will notify the NRC and the Spokane Tribe of Indians of the inspection schedule.

Additionally, the DOE will conduct an inspection of the impoundment dam to meet federal obligations under the requirements of the National Dam Safety Program Act.

3.3.2 Inspection Procedure

For the purposes of inspection, the Sherwood site will be divided into sections, called transects. Each transect will be individually inspected. Proposed transects for the first inspection of the Sherwood site are listed in Table 3-1 and shown in Figure 3-1. Appendix D contains the inspection procedure for the dam inspection.

Table 3-1. Transects Used During First Inspection of Sherwood Site

Transect	Description
Site Perimeter, Outlying Areas, and Balance of Site	Site perimeter and surrounding watershed basin, which includes the site entrance, boundary monuments, entrance sign, and site marker.
Cover of Reclamation Cell	Repository impoundment cover.
Containment Dam and Diversion Channel	Riprap placement and integrity.

Annual inspections will be a visual walk-through. The primary purpose of the inspection will be for evidence of cover cracking, wind or water erosion, structural discontinuity of the containment dam, maintenance of vegetation, and animal or human intrusions that could result in adverse impacts.

In addition to inspection of the site itself, inspectors will note changes and developments in the area surrounding the site, especially changes within the surrounding watershed basin. Significant changes within this area could include development or expansion of human habitation, erosion, road building, or other change in land use.

It may be necessary to document certain observations with photographs. Such observations may be evidence of vandalism or a slow modifying process, such as rill erosion, that should be monitored more closely during general site inspections. A sample Field Photograph Log is included in Appendix B.

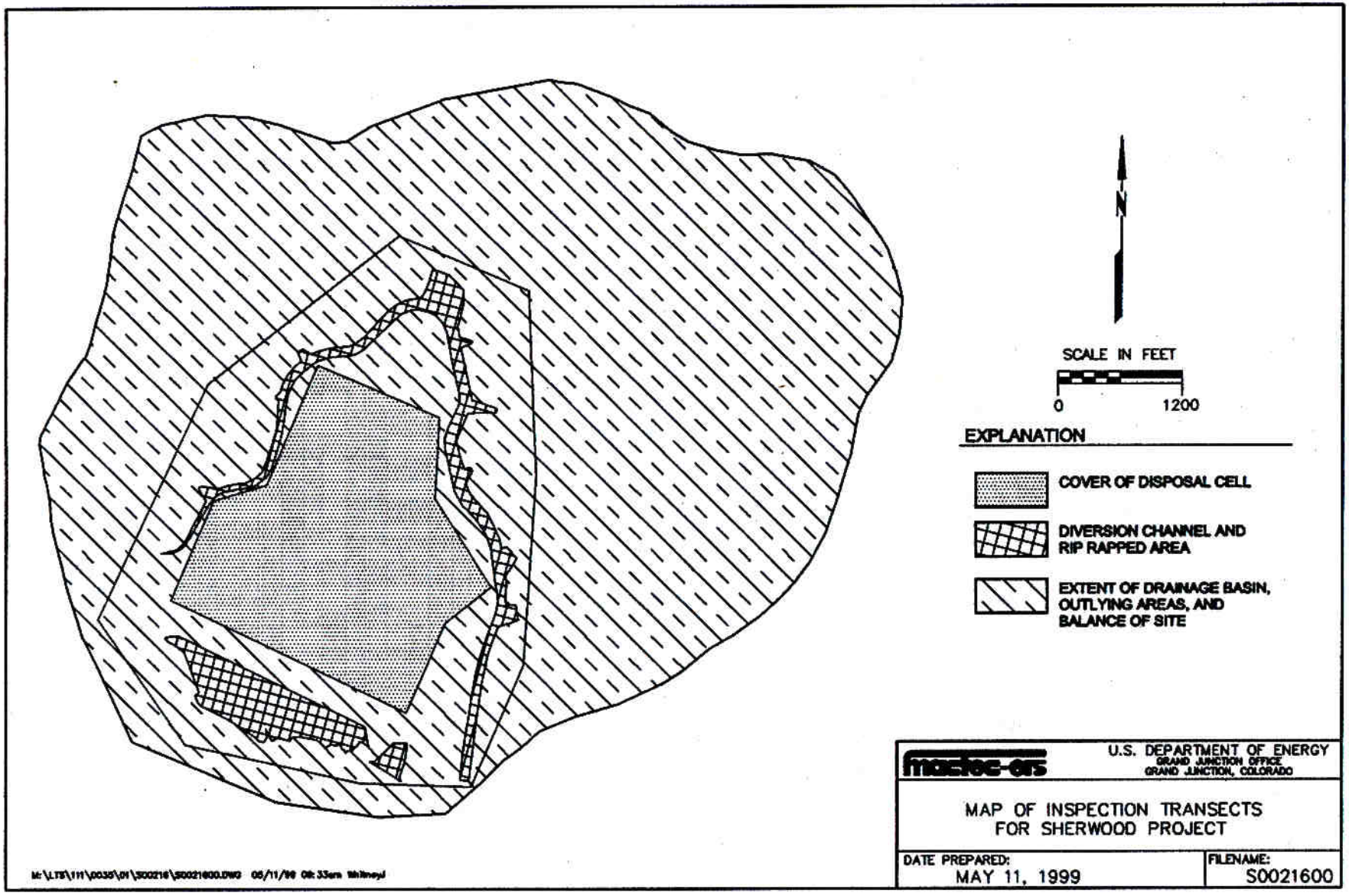

Figure 3-1. Map of Inspection Transects for Sherwood, Washington, Disposal Cell

3.3.3 Inspection Checklist

The inspection checklist guides the inspection. The initial site-specific inspection checklist for the Sherwood site is presented in Appendix C. Appendix D contains the inspection checklist for the dam inspection.

Included in the inspection checklist is a discussion on the preparation for the inspection, health and safety concerns, and the performance of the inspection itself.

The checklist is subject to revision. At the conclusion of an annual site inspection, inspectors will revise the checklist, if necessary, in anticipation of the next annual site inspection. Revisions to the checklist will include such items as new discoveries or changes in site conditions that must be inspected and evaluated during the next annual inspection. Other revisions will include updating telephone numbers and directions to local medical facilities as part of the health and safety precautions noted in the checklist.

3.3.4 Personnel

Annual inspections will normally be performed by a minimum of two inspectors. Inspectors will be experienced engineers or scientists who have been specifically trained for the purpose through participation in previous site inspections.

Engineers will typically be civil, geotechnical, or geological engineers. Scientists will include geologists, hydrologists, biologists, and environmental scientists representing various fields (e.g., ecology, soils, range management). If serious or unique problems develop at the site, more than two inspectors may be assigned to the inspection. Inspectors specialized in specific fields may be assigned to the inspection to evaluate serious or unusual problems and make recommendations.

3.4 Annual Inspection Reports

Results of annual site inspections will be reported to the NRC within 90 days of the last site inspection of that calendar year (10 CFR 40, Appendix A, Criterion 12). In the event that the annual report cannot be submitted within 90 days, the DOE will notify the NRC of the circumstances. Annual inspection reports will also be distributed to the Tribe and the Bureau of Indian Affairs (BIA).

3.5 Follow-up Inspections

Follow-up inspections are unscheduled inspections that may be required (1) as a result of discoveries made during a previous annual site inspection, or (2) as a result of changed site conditions reported by a citizen or outside agency.

3.5.1 Criteria

Criteria necessitating follow-up inspections are required by 10 CFR 40.28 (b)(4). The DOE will conduct follow-up inspections should the following occur.

1. A condition is identified during the annual site inspection, or other site visit that requires personnel, perhaps personnel with specific expertise, to return to the site to evaluate the condition.

2. The DOE is notified by a citizen or outside agency that conditions at the site are substantially changed.

Once a condition or concern is identified at the site, the DOE will evaluate the information and, on the basis of this evaluation, decide whether or not to respond with a follow-up inspection. Conditions that may require a routine follow-up inspection include changes in vegetation, slope stability, new or increased erosion, evidence of casual or low-impact human intrusion, minor vandalism, or the need to revisit the site to evaluate, define, or perform maintenance tasks. Conditions that may require a more immediate (nonroutine) follow-up inspection include extreme weather, seismic events, or disclosure of deliberate human intrusion that threatens the integrity of the disposal cell.

The DOE will act responsibly and exercise flexibility by using a graded approach in scheduling routine follow-up inspections. Urgency of the follow-up inspection will be in proportion to the seriousness of the condition. For example, a follow-up inspection to investigate a vegetation problem may be scheduled for a particular time of year when growing conditions are optimum. A routine follow-up inspection to perform maintenance or to evaluate an erosion problem might be scheduled to avoid snow cover or frozen ground.

In the event of "unusual damage or disruption" (10 CFR 40, Appendix A, Criterion 12) that threatens or compromises site safety, security, or integrity, including the unlikelihood of an actual breach in cover materials, the DOE will notify the NRC, the Tribe, the BIA, begin the DOE occurrence notification process (DOE Order 232.1), respond with an immediate follow-up inspection, and begin emergency measures (Section 3.6) to contain or prevent dispersion of radioactive materials from the reclamation cell. The DOE may request the assistance of local authorities to confirm the seriousness of a condition at the site before scheduling a follow-up inspection or initiating other appropriate action.

The DOE establishes liaison with other government agencies that will notify DOE in the event of human intrusion or unusual-to-catastrophic natural events in the vicinity of the site. Notification agreements will be established with the Spokane Indian Reservation BIA Police and the U.S. Geological Survey National Earthquake Information Center in Denver, Colorado. Information regarding severe weather events will be obtained via the internet, although it is likely that local citizens will have already informed the local authorities in the event of severe weather damage. These agencies will contact the DOE, or provide information upon request, should an event occur that might affect the security or integrity of the Sherwood site.

In addition, the warning signs installed at the site will display a 24-hour DOE telephone number and the local emergency dispatch 24-hour telephone number. The public may use these numbers to request information about the site or to advise the DOE of problems at the site. The DOE may conduct follow-up inspections in response to information provided by the public.

3.5.2 Personnel

Inspectors assigned to follow-up inspections will be selected on the same basis as for the annual site inspection. (See Section 3.3.4.)

3.5.3 Reports of Follow-up Inspections

Results of routine follow-up inspections will be included in the next annual inspection report (Section 3.4). Separate reports will not be prepared unless the DOE determines that it is advisable to notify the NRC or other outside agency of a problem at the site.

If follow-up inspections are required for more serious or emergency reasons, the DOE will submit to the NRC a preliminary report of the follow-up inspection within the required 60 days (10 CFR 40, Appendix A, Criterion 12).

3.6 Routine Site Maintenance and Emergency Measures

3.6.1 Routine Site Maintenance

UMTRCA disposal sites are designed and constructed so that "ongoing active maintenance is not necessary to preserve isolation" of radioactive material (10 CFR 40, Appendix A, Criterion 12). The disposal basin has been designed and constructed to negate the need for routine maintenance. The site has been revegetated with self-sustaining native plant species. After vegetation has been established, no remedial vegetation activities are anticipated.

The cover of the reclamation cell was constructed with slopes from 0.25 percent near the basin crown to a maximum of 0.5 percent leading to the perimeter diversion channel. Because of the vegetation and slopes, adverse wind or water erosion impacts that would require maintenance are not anticipated. The reclamation cell will not be fenced, thereby allowing the land to continue in its preoperational land use, i.e., grazing and wildlife habitat. Although there will be grazing and wildlife utilization of the site, no adverse impacts are expected.

If any inspection of the reclamation cell reveals failure of the as-built condition, then repairs will be conducted to reestablish the as-built condition. The DOE will perform routine site maintenance, where and when needed, based on best management practices. Reports of routine site maintenance will be summarized in the annual site inspection report.

3.6.2 Emergency Measures

Emergency measures are the actions that the DOE will take in response to "unusual damage or disruption" that threaten or compromise site safety, security, or integrity. The DOE will contain or prevent dispersal of radioactive materials in the unlikely event of a breach in cover materials.

3.6.3 Criteria for Routine Site Maintenance and Emergency Measures

Conceptually, there is a continuum in the progression from annual minor routine maintenance to large-scale reconstruction of the reclamation cell following a potential disaster. Criteria, although required by 10 CFR 40.28 (b)(5), for triggering particular DOE responses for each progressively more serious level of intervention, are not easily defined because the nature and scale of all potential problems cannot be foreseen. The information in Table 3-2 will, however, serve as a guide for appropriate DOE responses. The table shows that the difference between routine maintenance and emergency response is primarily one of urgency and degree of threat or risk. The DOE's priority (urgency) in column 1 of Table 3-2 bears an inverse relationship with the DOE's estimate of probability. The highest priority response is also believed to be the least likely to occur.

Table 3-2. DOE Criteria for Maintenance and Emergency Measures[a]

Priority	Description	Example	Response
1	Breach of disposal cell with dispersal of radioactive material.	Failure of containment dam.	Notify NRC, Tribe, and BIA. Immediate follow-up inspection by DOE emergency response team. Emergency actions to prevent further dispersal, recover radioactive materials, and repair breach.
2	Breach without dispersal of radioactive material.	Partial or threatened exposure of radioactive materials.	Notify NRC, Tribe, and BIA. Immediate follow-up inspection by DOE emergency response team. Emergency actions to repair the breach.
3	Breach of site security.	Human intrusion, vandalism.	Restore security; urgency based on assessment of risk.
4	Maintenance of specific site surveillance features.	Deterioration of signs, markers.	Repair at first opportunity.
5	Minor erosion or undesirable changes in vegetation.	Erosion not immediately affecting disposal cell, invasion of undesirable plant species.	Evaluate, assess impact, respond as appropriate to eliminate problem.

[a]Other changes or conditions will be evaluated and treated similarly on the basis of perceived risk.

3.6.4 Reporting Maintenance and Emergency Measures

Routine maintenance completed during the previous 12 months will be summarized in the annual inspection report.

In accordance with 10 CFR 40.60, within 4 hours of discovery of any Priority l or 2 event in Table 3-2, the DOE will notify:

Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission

The phone number for the required 4-hour contact to the NRC Operations Center is in the Inspection Checklist (Appendix C). Additionally, the DOE will notify the Tribe in the event of a Priority 1 or 2 occurrence.

3.7 Environmental Monitoring

3.7.1 Ground-Water Monitoring

As a result of tailings neutralization, very few hazardous constituents, i.e., arsenic, nickel, thallium, radium 226, radium 228, and uranium, have been identified in the tailings fluid at concentrations exceeding state or federal ground-water standards or background ground-water concentrations (WNI 1995b).

The bottom of the repository basin was constructed with a synthetic liner. The synthetic liner lies at least 23 feet under the reclamation cover. Infiltration will be minimized through removal of precipitation via evaporation and transpiration by reclamation cell vegetation (WNI 1995a; WNI 1995b).

Long term impacts to the ground-water system were assumed to occur through two mechanisms: (1) leakage through the impoundment liner, assuming the sudden and complete "disappearance" of the synthetic bottom liner; and (2) overtopping of the liner resulting from infiltration through the reclamation soil cover (WNI 1995b). Prediction of ground-water quality at the immediate downgradient edge of the reclamation cell (i.e., at the POC) for the hypothetical worst-case environmental impact scenario indicated that hazardous constituents would remain below state or federal ground-water standards (WNI 1995b).

Ground water compliance monitoring is not required at the Sherwood site. However, as a best management practice the DOE will conduct limited ground water monitoring for designated indicator parameters. Samples will be collected annually from three monitor wells. The background well, identified as monitor well MW-2B, and the two point of compliance (POC) wells, identified as MW-4 and MW-10. Water levels will be recorded and samples will be analyzed for sulfate, chloride, and total dissolved solids (TDS) concentrations. Sulfate and chloride are the primary indicator parameters. Results will be included in the annual inspection report.

Monitoring results will be evaluated for evidence of ground water impact from the reclamation cell. Should the concentration of sulfate or chloride exceed the Washington water quality criteria value of 250 mg/l for either parameter, the DOE would conduct confirmatory sampling of the POC wells. If the confirmatory sampling verifies the exceedance, the DOE will develop an evaluative monitoring work plan, in consultation with the Tribe and BIA, and submit that plan to the NRC 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.

3.7.2 Vegetation Monitoring

The disposal basin was revegetated in the fall of 1996. Vegetation on the reclamation cell currently satisfies erosional stability criteria and is self-sustaining. Annual visual inspections will be performed by walking along a 200-foot-wide parallel grid. Should reseeding become

necessary, the seed mix is specified in the WNI reclamation construction specifications (WNI 1996).

Natural plant community succession caused by fire or other natural forces is expected and will not adversely impact the performance of the reclamation system. Fires are a natural part of the ecosystem and should be anticipated. The effects of fire will not adversely impact the performance of the reclamation system.

3.8 Records

The LTSM Program maintains site records in a permanent site file at the GJO. These records are available for inspection by government agencies or the public. Records consist of disposal site characterization, design, and construction documents. Annual inspection results are also part of the permanent site file.

LTSM Program records are maintained in compliance with DOE requirements:

1. DOE Order 1324.2A, Records Disposition

2. 36 CFR, Chapter 12, Subchapter B, Parts 1220-1236, Federal Records Management, Laws and Regulations

3.9 Quality Assurance

The long-term care of the Sherwood site and all activities related to the annual surveillance and maintenance of the site will comply with DOE Order 5700.6C, Quality Assurance (QA) and ANSI/ASQC E4-1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs* (American Society for Quality Control 1994).

QA requirements will be transmitted through procurement documents to subcontractors if/when appropriate.

3.10 Health and Safety

Health and safety procedures for LTSM Program activities are consistent with DOE orders, regulations, codes, and standards.

Immediate health and safety concerns are listed in the Inspection Checklist (Section 3.3.3 and Appendix C). Also in the Job Safety Analysis section of the Inspection Checklist are 24-hour emergency phone numbers for fire, hospital and ambulance, and police and sheriff; directions from the site to the nearest medical facility with an emergency room are also in the checklist. The checklist is updated before each inspection to advise on-site personnel of new and continuing health and safety considerations. A Job Safety Analysis is completed before each inspection. At a pre-inspection briefing, on-site personnel review the Job Safety Analysis and are instructed on hazards that may be present at the site and health and safety procedures that must be followed.

Subcontractors (for maintenance) are advised of health and safety requirements through appropriate procurement documents. Subcontractors must submit health and safety plans for all actions subject to Occupational Safety and Health Administration (OSHA) requirements. Subcontractor health and safety plans will be reviewed and approved before the contract is awarded. Proposals from subcontractors without an adequate health and safety plan are rejected.

4.0 References

American Society for Quality Control (ASQC), 1994. *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs*, ANSI/ASQC E4-1994, Energy and Environmental Quality Division, Environmental Issues Group.

BIA (Bureau of Indian Affairs, U. S. Department of the Interior) 1976. *Final Environmental Statement* (FES), *Sherwood Uranium Project, Spokane Indian Reservation*, August 1976.

DOE (U. S. Department of Energy), 1995. *Occurrence Reporting and Processing of Operations Information*, DOE Order 232.1, October 30, 1995.

NRC 1990. Nuclear Regulatory Commission Final Staff Technical Position, *Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites.* August 1990.

WNI (Western Nuclear, Inc.), 1994a. *Sherwood Project Appendix P, Ground Water*.

_____, 1994b. *Sherwood Project TRP Design.* As revised November 15, 1995.

_____, 1995a. *Sherwood Project Revegetation Reclamation System Evaluation*. September 15, 1995.

_____, 1995b. *Sherwood Project Ground Water Protection Plan Technical Integration Report*. December 4, 1995.

_____, 1996. *Sherwood Technical Specifications Revision #4*. November 1996.

_____, 1997a. *Sherwood Project Mill Decommissioning Completion Report.* May 15, 1997.

_____, 1997b. *Sherwood Project Tailings Reclamation Construction Completion Report*. June 27, 1997.

_____, 1997c. *Sherwood Project Tailings Impoundment Monitoring and Stabilization Plan.* September 24, 1997.

End of Current Text

Appendix A

Custody and Access Agreement

Long-Term Surveillance and Maintenance Agreement
and
Right of Access to the Sher wood Site

THIS AGREEMENT is entered into by and among the UNITED STATES OF AMERICA, acting through the United States Department of Energy; the United States Nuclear Regulatory Commission; and the Spokane Tribe of Indians, with the concurrence of the United States Department of Interior, Bureau of Indian Affairs.

WHEREAS, Western Nuclear, Inc., operated a uranium milling operation on the Spokane Tribe of Indians' Reservation, known as the Sherwood Site, resulting in the generation of byproduct and source material; and

WHEREAS, the State of Washington will terminate Western Nuclear's license, after Western Nuclear, Inc., has stabilized and disposed of the byproduct material **from the Sherwood Site into** a disposal cell that meets the requirements of its license and state law; and

WHEREAS, the Nuclear Regulatory Commission has made the determination required by Section 274(C)(4). of the Atomic Energy Act of 1954, as amended, (hereinafter referred to as the "Act") (42 U.S.C. § 2021c.); and

WHEREAS, sections 83(b)(8) and 274(0)(1) of the Act (42 U.S.C. § 2113(b)(8) and 42 U.S.C. § 2021(0)(1) requires Western Nuclear to enter into such arrangements with the Nuclear Regulatory Commission as may be appropriate to assure the long-term maintenance and monitoring of the Sherwood Disposal Cell; and

WHEREAS, the Nuclear Regulatory Commission has determined that it would be appropriate to include the Sherwood Disposal Cell as part of the Department of Energy's general license for the custody of and long-term care of uranium mill tailings disposal sites, including monitoring, maintenance and emergency measures necessary to protect the public health and safety and other actions necessary to comply with 10 CFR § 40.28; and

WHEREAS, the Department of Energy has agreed to provide long-term surveillance and maintenance of the Sherwood Disposal Cell.

NOW THEREFORE, the Parties agree as follows:

I. Long-Term Surveillance and Maintenance

A. The Department of Energy (the Department) is required to perform long-term surveillance and maintenance of the Sherwood Disposal Cell as deemed necessary and proper by the Department to protect public health, safety, and the environment pursuant to its mandate under the general license issued by the Nuclear Regulatory Commission.

B. The Spokane Tribe of Indians shall not designate, use, or empower anyone to perform any act that may be inconsistent with or interfere with the provisions of this Agreement. Any use by any party, including the Department of Energy, for purposes other than those consistent with this Agreement, shall be subject to prior approval by

the Department of Energy, the Nuclear Regulatory Commission, and the Spokane Tribe of Indians.

C. Nothing in this Agreement shall prohibit the future use of the Sherwood Site for activities related to uranium mining and milling, provided that all permits, licenses, or other approvals required by the governmental authorities possessing jurisdiction over such actions are first obtained, and provided that neither the Department of Energy nor the Nuclear Regulatory Commission (including any of their successor agencies) shall incur any costs related to such future use of the Sherwood Site.

II. Right of Access

Pursuant to the provisions of this Agreement, the Spokane Tribe of Indians hereby grants a permanent right of access to the Department of Energy and the Nuclear Regulatory Commission for all purposes and activities deemed necessary and proper by the Department of Energy or the Nuclear Regulatory Commission, in **cooperation with the** Spokane Tribe of Indians, for the Sherwood Disposal Cell's long-term surveillance and maintenance.

111. Legal Description of Sherwood Site

The site is located on the Spokane Indian Reservation in Stevens County, approximately 8 miles southwest of Wellpinit, Washington, and is more specifically described in Attachment A to this Agreement (legal description of site boundary), which is incorporated by reference into this Agreement, and, therefore, is part of this Agreement.

IV. Reservation of Rights

The Department's performance of activities under this Agreement will be consistent with the United States' trust responsibility to the Tribe and with the consultation obligations recognized in the Department's American Indian Policy. Except as stated herein, nothing in this Agreement shall affect the rights or privileges of the Parties or any legal or regulatory duties imposed upon the Department by the Atomic Energy Act and the Nuclear Regulatory Commission, as set forth at 10 CFR 40.28, including the trust status of the lands involved.

V. Disputes

Should any disputes arise between the Department and the Tribe, attempts to resolve these matters will be undertaken through negotiation in good faith at the field level. If resolution is not successful at the field level, the Department and the Tribe will jointly consider other means to settle any dispute.

VI. Signatories

Each signatory for a Party or Concuror to this Agreement certifies that he or she is fully authorized to enter into the Terms and Conditions of this Agreement and to legally bind such Party or Concuror to the provisions of this Agreement.

VII. Effective Date

This Agreement is effective on the date last signed by the signatories to this Agreement.

U.S. Department of Energy

By: Eben Greybourne Date: 11 May 2000

Eben Greybourne, Contracting Officer
Grand Junction Office

Spokane Tribe of Indians

By: Date: 1 June 2000

Bruce Wynne, Chairman

Concurrence:

U.S. Department of Interior
Bureau of Indian Affairs

By: Date: 1/16/01

Stanley Speaks

Nuclear Regulatory Commission

By: for Date: 2/2/01

~~Thomas H. Essig~~
Philip Ting

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Attachment A
Legal Description of Site Boundary

Long-Term Surveillance and Maintenance Agreement
And
Right of Access to the Sherwood Site

The legal description of the 382.38-acre reclamation cell site is:

> That portion of Sections 35 and 36, T.28N.,R.37E.W.M. and Sections 1 and 2, T.27N.,R.37E.W.M. in Stevens County Washington, described as follows:

Commencing at the Section Corner common to Sections 25, 26, 35 and 36, T.28N.,R.37E.W.M.; thence S1º44'20"E along the line common to Sections 35 and 36, a distance of 1,835.20 feet to the Point of Beginning; thence N88º51'21"E a distance of 1,318.59 feet to Boundary Monument #1; thence S1º48'48"E a distance of 3,459.35 feet to a found Brass Cap monument which bears N87º33'35"E a distance of 1,323.11 feet from the Section Corner common to Sections 35 and 36, T.28N.,R.37E.W.M. and Sections 1 and 2, T.27N.,R.37E.W.M.; thence continuing S1º48'48"E a distance of 2,198.00 feet to Boundary Monument #2; thence N73º24'16"W a distance of 4,135.52 feet to Boundary Monument #3; thence N13º59'38"E a distance of 800.74 feet to Boundary Monument #3A; thence N35º55'55"W a distance of 729.62 feet to Boundary Monument #4; thence N36º17'29"E a distance of 3,809.31 feet to Boundary Monument #5; thence N88º51'27"E a distance of 445.82 feet to a point on the line common to Sections 35 and 36 and the Point of Beginning.

Contains 382.38 acres.

Appendix B

Sample Field Photograph Log

Field Photograph Log

Site: _____ Roll No. ___ (of ___)

Date: _____

Frame	Azimuth	Pl-Number	Subject/Description

Remarks:

Inspector/Photographer: _____

Appendix C

Initial Site Inspection Checklist and

Job Safety Analysis

Inspection Checklist
Annual Site Inspection

Site: Wellpinit, Washington, Sherwood Reclamation Cell, Title II Disposal Site

Date Prepared:

Date of Inspection:

Type of Inspection: First Annual Inspection

I. General Instructions

A. This inspection checklist is site specific. It incorporates general and site-specific requirements for annual inspections of the subject site.

This checklist may be revised in response to new requirements, as dictated by results of previous inspections and maintenance requirements, or as new information about the site is received.

B. The purpose of the checklist is to support

- Planning for the inspection,
- Inspection of the site,
- Evaluation of the thoroughness of the inspection before the inspection party leaves the site at the conclusion of the inspection, and
- Preparation of the inspection report.

C. This checklist is provided for the convenience of those planning and conducting the inspection. Other information, materials, or guidance may be used in place of or in addition to the checklist if site conditions or institutional requirements necessitate.

II. Preparation for the Inspection

A. Review inspection guidance documents:

- *Long-Term Surveillance Plan for the DOE Sherwood (UMTRCA Title 11) Reclamation Site, Wellpinit, Washington.*

B. Review previous inspection reports, field notes from previous inspections, maps and drawings of the site, and other documents as necessary to become familiar with site history, current conditions at the site, and the results of recent inspections and maintenance. Obtain copies of maps, plans, and other documents required for the inspection:

- Long-Term Surveillance Plan (LTSP)
- Pertinent documents from the site file, such as the Site Completion Report submitted by Western Nuclear, Inc.
- Review site access procedures and protocols.
- Notify affected agencies. Complete actions required to enter the site.

C. Review specific observations to be made and problems to be studied or resolved during the coming inspection. (See Subsection E of this Section.)

D. Assemble and pack field equipment as required for the inspection of the Sherwood site. Equipment may include the following:

- Camera
- Spare batteries
- Camera accessories
- Film, two rolls of 36-exposure (or equivalent) color print film
- Photograph scale/north arrow
- Brunton compass
- 50-foot tape
- 10- to 20-foot tape
- Covered clipboard
- Canteens or other provision for water in hot weather
- Sun protection
- Field photograph forms
- Hand-held level
- Orange field notebook

- Black, indelible, felt-tip marker with broad point
- Day packs or belt packs (optional but advisable for this site)
- First aid kit

E. General Surveillance

1. Specific Site-Surveillance Features

   - Entrance area
   - Reclamation cell boundaries (unfenced)
   - Boundary monuments, 6
   - Warning signs around the site perimeter, 6
   - Site marker

2. Transects

   - Site perimeter and outlying areas up to 0.25 mile outside the site property
   - Cover of reclamation cell
   - Containment dam and diversion channel

   For all transects:

   - Settlement, slumping, heaving, cracking
   - Erosion
   - Windblown sand accumulation
   - Invasion by plants or animals
   - Intrusion by humans or domestic animals
   - Other

3. Area Within 0.25 mile of the site

   - Change in land use
   - New construction or development
   - Earth movement, erosion, or changes in nearby drainages

4. Specific Tasks and Observations

- (These will vary depending on the condition of the site and on issues or concerns developed from previous inspections.)

5. Maintenance

III. Site Inspection

A. The checklist is not intended to be exhaustive or constraining. The inspection team is free to make other observations as its judgment and site conditions dictate.

B. Before the inspection at the site is completed and before the inspection team leaves the site, the inspection team should satisfy themselves that the site has been fully inspected and evaluated and that sufficient photographs and measurements have been obtained.

C. Health and Safety

The Sherwood site is usually hot and dry in summer and cold and damp in winter. Occasional thunderstorms occur in spring and summer, and snow occurs in winter. Personnel should make provisions for the following seasonal conditions:

Summer:

- Sun protection (a hat is advised).
- Drinking water–personal canteens recommended, 2 quarts per person.
- Rain gear.

Winter:

- Warm clothing, preferably layered.
- Safety shoes are not required at this site. However, the containment dam and the diversion channels are covered with angular, unstable rock, and sturdy boots with high ankle support are recommended. Rattlesnakes inhabit the area and care should be taken to avoid surprising them.

Pertinent 24-hour emergency numbers are as follows:

- Fire: (509) 258-4566
- Hospital/Ambulance: (509) 258-4517
- Police/Sheriff: (509) 258-4400

IV. Inspection Closeout Summary

A. At the end of the inspection and before leaving the site, the inspection team should:

1. Satisfy themselves that they have sufficient information (photographs, notes, measurements, sketches, etc.) to describe and evaluate findings and observations for the site inspection report.

2. Summarize, in the field notes or elsewhere, the following information:

- Serious problems or threatening factors that require immediate attention or follow-up action;

- Actual or potential problems not requiring immediate attention but that require further observation possibly including a follow-up inspection; and

- Changes recommended for this checklist before the next inspection.

B. If serious problems are identified during the inspection, the inspection team should:

1. Immediately notify the DOE-GJO Project Manager and the LTSM Project Manager.

2. Follow GJO procedures for compliance with DOE Order 232.1.

3. In the event of a release (excursion) of radioactive material, reporting requirements in 10 CFR 40.60 will be followed. Initially within 4 hours after discovery, the NRC Operations Center will be contacted at (301) 951-0550.

Site Sherwood, Washington		**JSA Number** SHE-00-1	
Task Initial Site Inspection			
Prepared by M.P. Plessinger	**Date** 5/6/99	**Reviewed by**	**Date**
Site Hazards -Large area of rough, irregular riprap -Rapid changes in weather conditions. Electrical storms. Precipitation possible. Consult forecast. -Wood (and Lyme?) ticks, other bugs possible			
Protective Clothing Required/Suggested -Sturdy boots with ankle support are recommended -Personal clothing appropriate to changeable weather			
Protective Equipment Required/Suggested -Drinking water -Personal items such as sunscreen, sunglasses, insect repellant, hat -First-aid kit			
Medical & Emergency Service Information Police/Sheriff (509) 258-4400 Ambulance/Hospital (509) 258-4517 Fire (509) 258-4566			

Appendix D

Dam Safety Inspection

Background and Requirements

Facility Description

The Sherwood site tailings impoundment represents a portion of the reclaimed former uranium milling facility. The saturated tailings are contained in the lined portion of the tailings impoundment. The surface area of the lined portion of the tailings impoundment is approximately 94 acres. These 94 acres lie within the 382-acre disposal site property that is administered under the general license for long-term custody.

The volume of the lined portion of the tailings impoundment is approximately 3,700,000 cubic yards. The lined volume is filled with tailings materials. The volume of water contained in the lined portion is not precisely known, however it can be estimated by assuming a reasonable interstitial volume available for occupation by water. For this facility it is assumed that 50% of the total lined impoundment volume is occupied by water which results in a water volume of 1,850,000 cubic yards. Table 1 summarizes the impoundment capacity and other related information.

Table 1
Engineering Data

Dike:	Type: Random Fill
	Height: 80 feet
	Crest Length: 2000 feet
	Crest Width: 200 feet
	Crest Elevation: 2083 feet
	Upstream Slope: Not Applicable
	Downstream Slope: 1V: 5H
	Completion Date: Cell Closure in 1996
Spillway:	Type: None
Outlet Works:	Type: None
Cell:	Gross Capacity: 3,700,000 cubic yards
	Volume Placed: 3,700,000 cubic yards
	Liquid Volume: 1,850,000 cubic yards

The tailings material in this impoundment have been described as having a toothpaste-like consistency that is not capable of readily flowing in the event of a catastrophic dam failure. Further, based on the apparent specific yield of water from the tailings material, the actual "drainable" volume of water from the facility is more likely on the order of 370,000 cubic yards.

Estimates of the hydraulic conductivity of the tailings material compared to the hydraulic conductivity of the surrounding soils suggest that in the event of liner failure all flow from the impoundment would occur as unsaturated flow. Consequently the likelihood of dam saturation under any conditions is considered to be vanishingly small.

Seismic Stability

According to the seismic risk map for the locale, the pseudostatic analysis should be performed using a horizontal loading component equivalent to 0.05g (D'Appolonia 1977). A conservative horizontal loading of 0.1g was analyzed. The maximum recorded earthquake in the site area was found to produce a maximum ground acceleration of 0.04g (D'Appolonia 1977).

The pseudostatic analysis performed with horizontal loading factors of 0.05g and 0.1g yielded safety factors near 1.45. A horizontal loading force of approximately 0.25g was necessary to approach a safety factor of 1.0. This analysis was conducted for an embankment with a 2.75 H : 1V out slope and a continuous phreatic surface elevation of 2080 feet (D'Appolonia 1977).

Facility Construction

The final dam configuration is a modification of the original configuration. Since the lined impoundment was never filled to its design capacity, the height of the dam was reduced and the excess dam material was placed on the dam downstream slope thereby reducing the slope from the original design value of 2.75 H : 1V to the current slope of 5 H : 1V. The historic dam stability calculations were based on the original slope therefore additional conservancy has been introduced by the reduction of the dam downstream slope.

Figure 1 is a plan view of the facility that includes the outline of the 94-acre lined portion of the facility. Figure 2 is a cross-sectional view that shows the outline of the original dam, the outline of the dam as currently configured, and the relative position of the lined portion of the tailings impoundment with respect to the dam. The saturated tailings are covered with 12.6 to 20 feet of uncompacted soils. The cover has been revegetated with grasses, forbs, shrubs, and trees that are intended to provide a self-sustaining succession of plant growth consistent with the surrounding local ecosystem. A portion of the cover has differentially settled and a seasonal pond has formed. This low area was planted with wetland vegetation. The downstream face of the impoundment dam is armored with riprap for erosion protection.

Four piezometers have been installed along the alignment of the tailings dam crest to provide the long-term custodian with a direct means of determining dam moisture conditions. The positions of the piezometers are shown in Figure 3 and piezometer completion details are provided in Figure 4.

Dam Inspection Procedure

The Sherwood site impoundment dam will be inspected annually as part of the required annual long-term custodial inspection. There are three areas of focus for the dam inspection.

- The condition of the dam as ascertained through visible inspection.
- The evaluation of degree of dam soil saturation as determined by piezometer measurements.

- The assessment of dam performance based on visual evidence of seepage.

During the scheduled annual site inspection the dam will be inspected for visible evidence of settlement, slumping, erosional instability, excessive vegetation, and detrimental impacts from human or animal activity. Observations will be supported with photographs when appropriate.

Water levels in the piezometers will be checked on an annual basis concurrent with the annual groundwater sampling events. Although piezometer P2 did contain approximately three feet of water at the time of construction, the other piezometers were dry upon completion of installation and are not expected to contain water in the future. Piezometer water levels will be recorded and reported annually. If appropriate, water levels will be plotted to indicate trends over time.

During the scheduled annual site inspection the dam face will be carefully inspected for evidence of seepage. The presence of lush vegetation at discrete locations may be an indicator of seepage. Again, observations will be supported with photographs when appropriate.

Dam inspection observations will be recorded on the attached checklist.

Inspection Results

The dam inspection results will be reported as part of the annual inspection report for the Sherwood facility. This report is submitted to the NRC within 90 days of the final inspection of the calendar year for all sites licensed under 10 CFR 40.28. As required by the general license for long-term custody, if during a scheduled inspection conditions warranting a follow-up inspection are discovered or a condition that presents an immediate threat to the public health and safety or the environment is discovered, then the actions, inspection and reporting protocols as described in section 3.5 of this LTSP shall be executed.

The reported dam inspection results will include labeled photographs if any were taken, piezometer water level measurements if water is present, and water level trend data if a trend exists. A narrative analysis of the dam inspection results will be included in the annual report. This analysis will present conclusions and recommendations based on the inspection results.

Mitigative Measures

Determining if active intervention is necessary to mitigate a threat or potential threat to the public health and safety or the environment will be based on a composite of the inspection observations, knowledge of facility construction, and the degree of risk presented by the situation. For mitigative measures, except in the case of an emergency, DOE will obtain NRC concurrence prior to implementing the actions.

Observations warranting possible mitigative measures include:

- Steadily increasing water levels in the piezometers,
- Evidence of significant seepage on the dam face,
- Evidence of significant slumping or erosional instability along the dam,
- Existence of vegetative growth to a degree that could compromise dam stability.

None of these observations by themselves may warrant active intervention. However the simultaneous occurrence of several of these factors may indicate that action is appropriate. An analysis to determine whether action is necessary will carefully consider all relevant observations. Since the seismic stability analysis assumed a phreatic surface elevation of 2080 feet in the embankment, piezometer water levels below that elevation should indicate a seismically stable condition.

In the event of an emergency the NRC and the Spokane Tribe of Indians will be notified within 4 hours of discovery, as specified in section 3.6.4 of this LTSP, and the DOE will take immediate steps to control the situation.

References

D'Appolonia, 1977. *Earth Dam Design, Tailings Storage Facility*, Western Nuclear Inc. Sherwood Project, Spokane, Washington. July 1977.

Dam Inspection Checklist

Piezometer P1 current year water elevation _____

Piezometer P2 current year water elevation _____

Piezometer P3 current year water elevation _____

Piezometer P4 current year water elevation _____

Was evidence of significant seepage observed on the dam face? _____
If yes discuss in report.

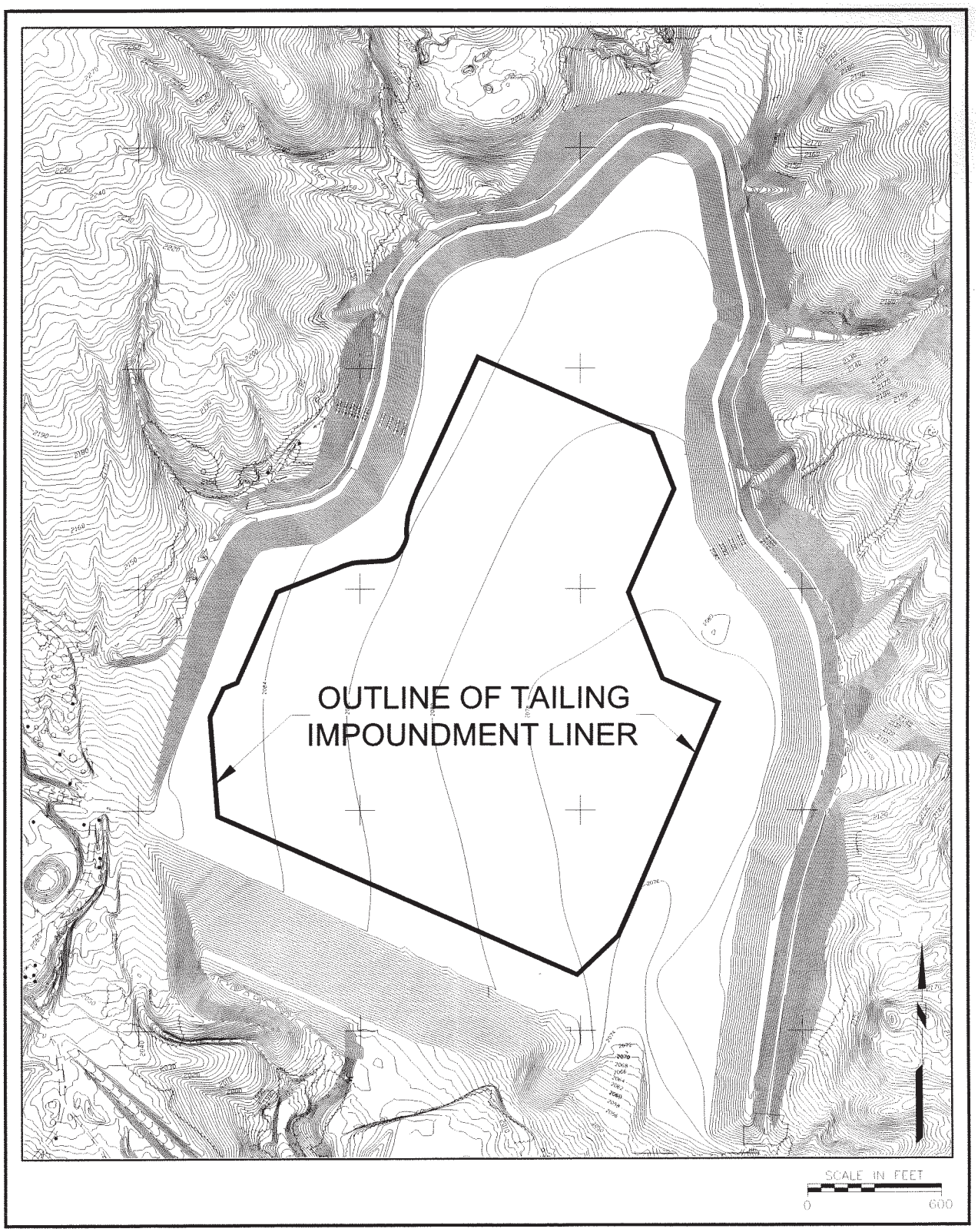
Was evidence of significant slumping observed on the dam? _____
If yes discuss in report.

Was evidence of significant erosion observed on the dam? _____
If yes discuss in report.

Was vegetative growth that could compromise dam stability observed? _____
If yes discuss in report.

Was any condition that presents imminent hazard the public health and safety or the environment observed? _____
If yes immediately contact the following:

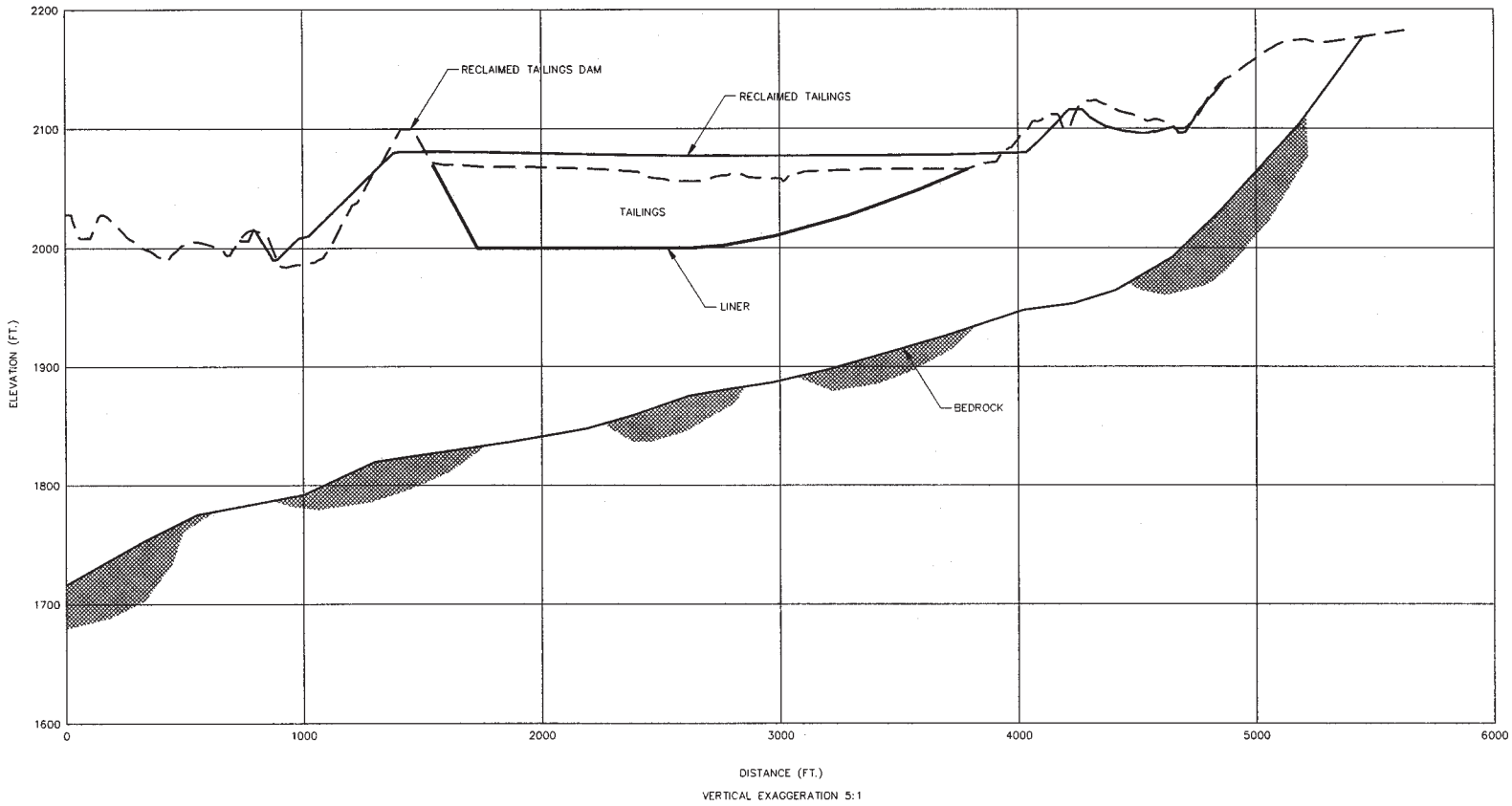
DOE Project Manager (970) 248-6037
NRC Operations Center (301) 951-0550
Spokane Tribal Police/Sheriff (509) 258-4400



SHEPHERD MILLER

FIGURE 1
LOCATION OF LINER
ON RECLAMATION CELL

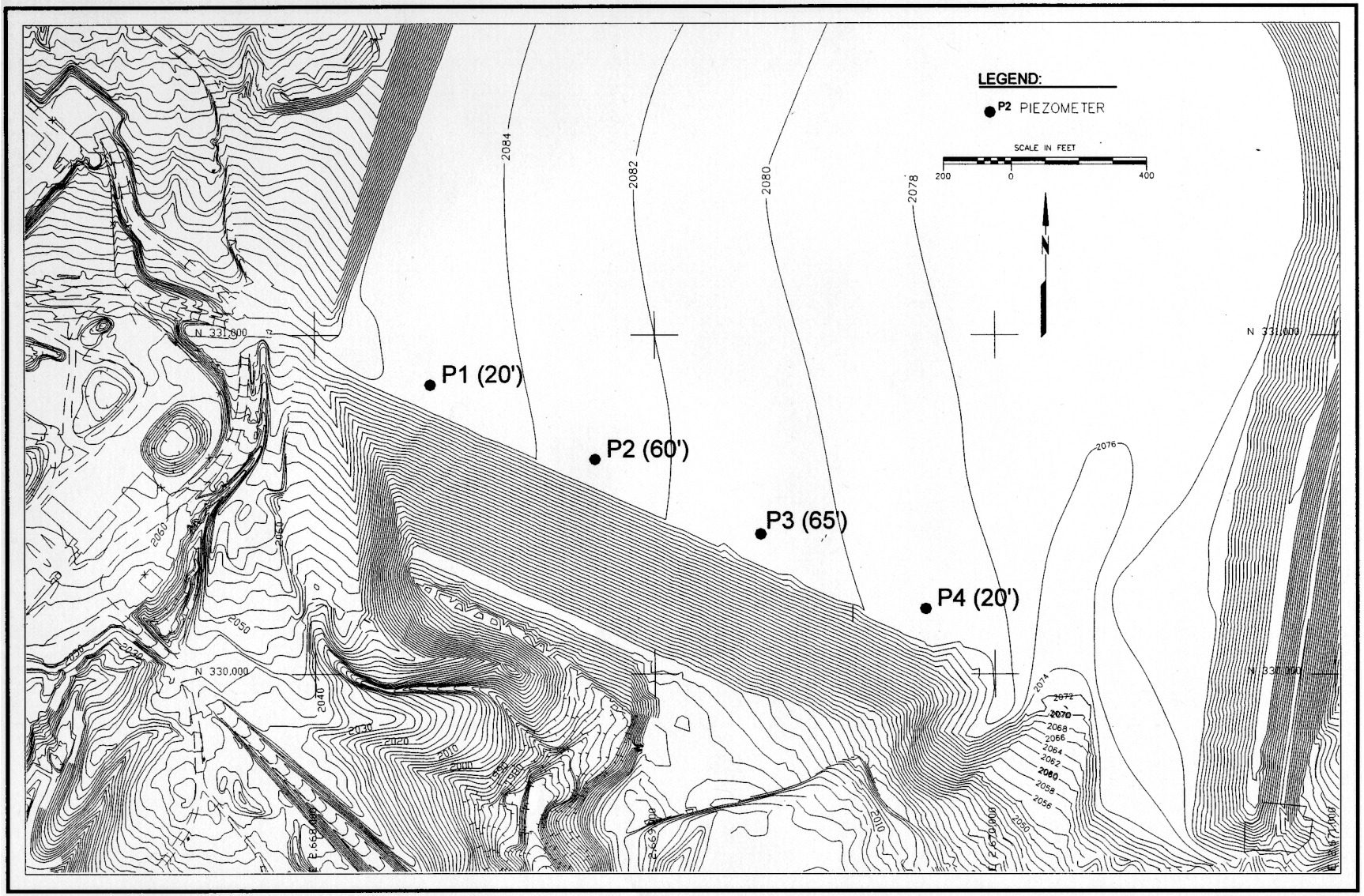
Date:	DECEMBER 2000
Project:	03-317\2000
File:	LINER.DWG



SHEPHERD MILLER

FIGURE 2
CROSS SECTION SHOWING LINED PORTION OF TAILINGS EMBANKMENT DAM AND RECLAMATION CELL

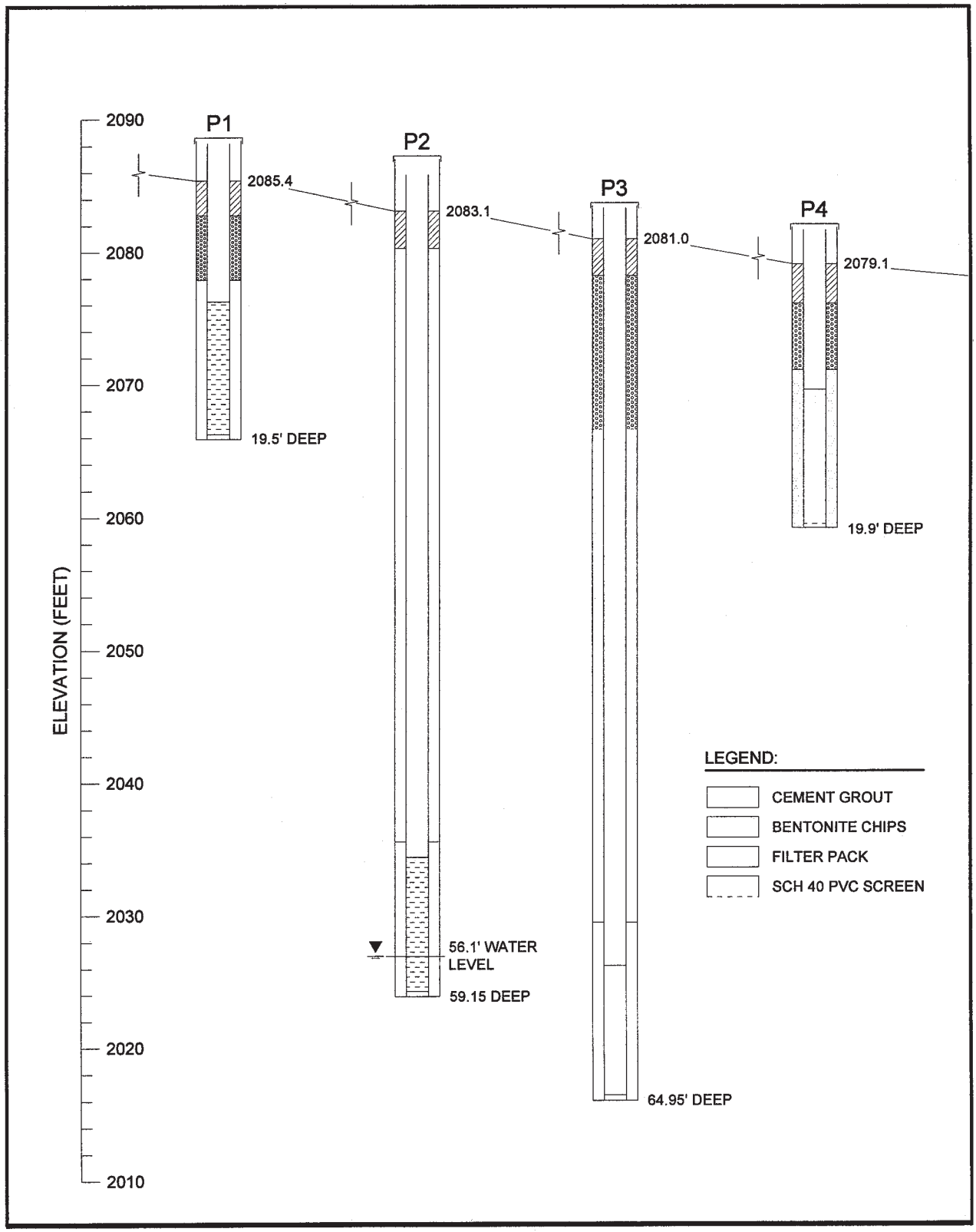
Date:	DECEMBER 2000
Project:	03-317/2000
File:	SITE.DWG



SHEPHERD MILLER
INCORPORATED

FIGURE 3
PIEZOMETER LOCATIONS

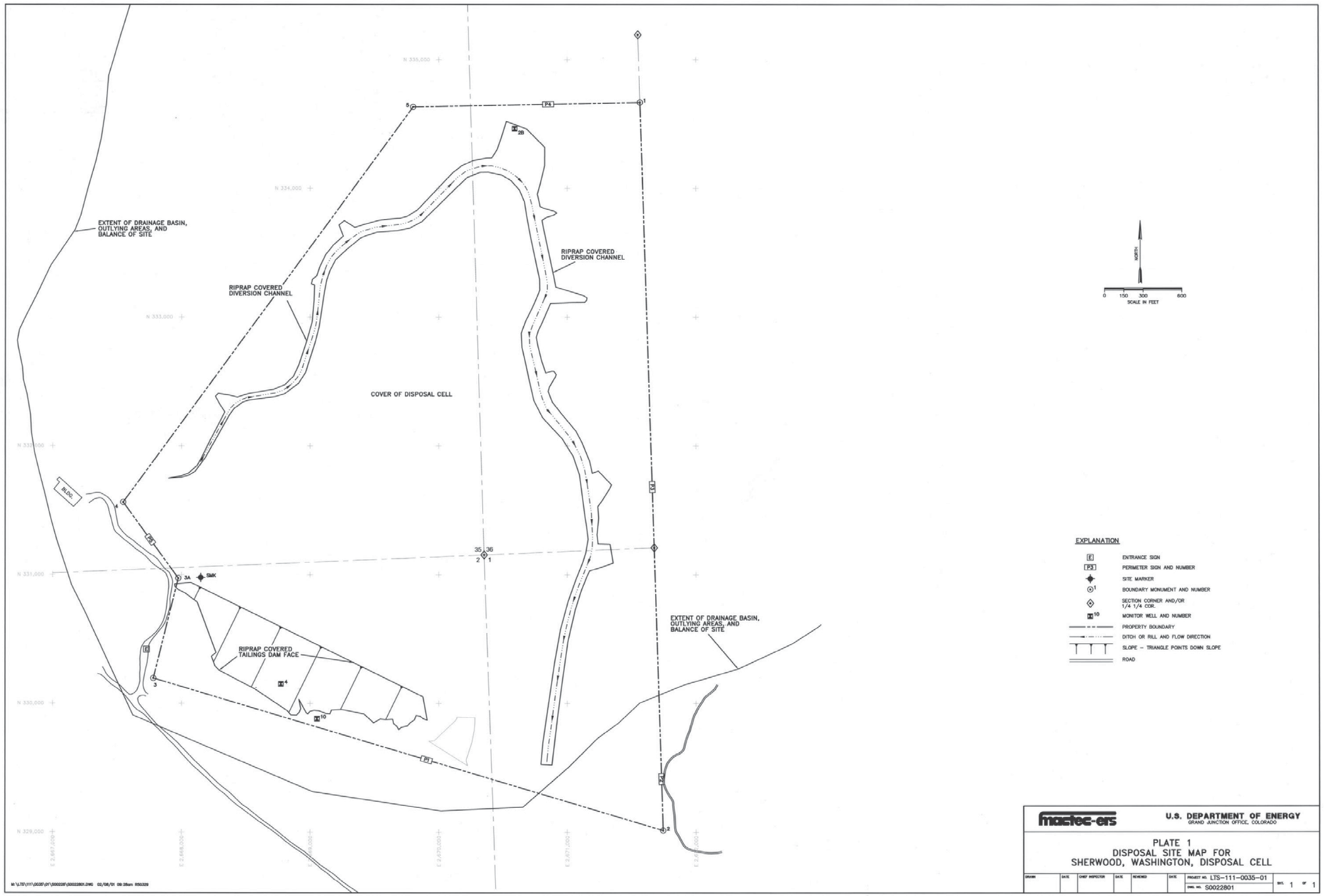
Date:	DECEMBER 2000
Project:	03-317\DWGS2000\
File:	GPS-REF1.DWG



SHEPHERD MILLER

FIGURE 4
PIEZOMETER COMPLETION DETAILS
P1, P2, P3, P4

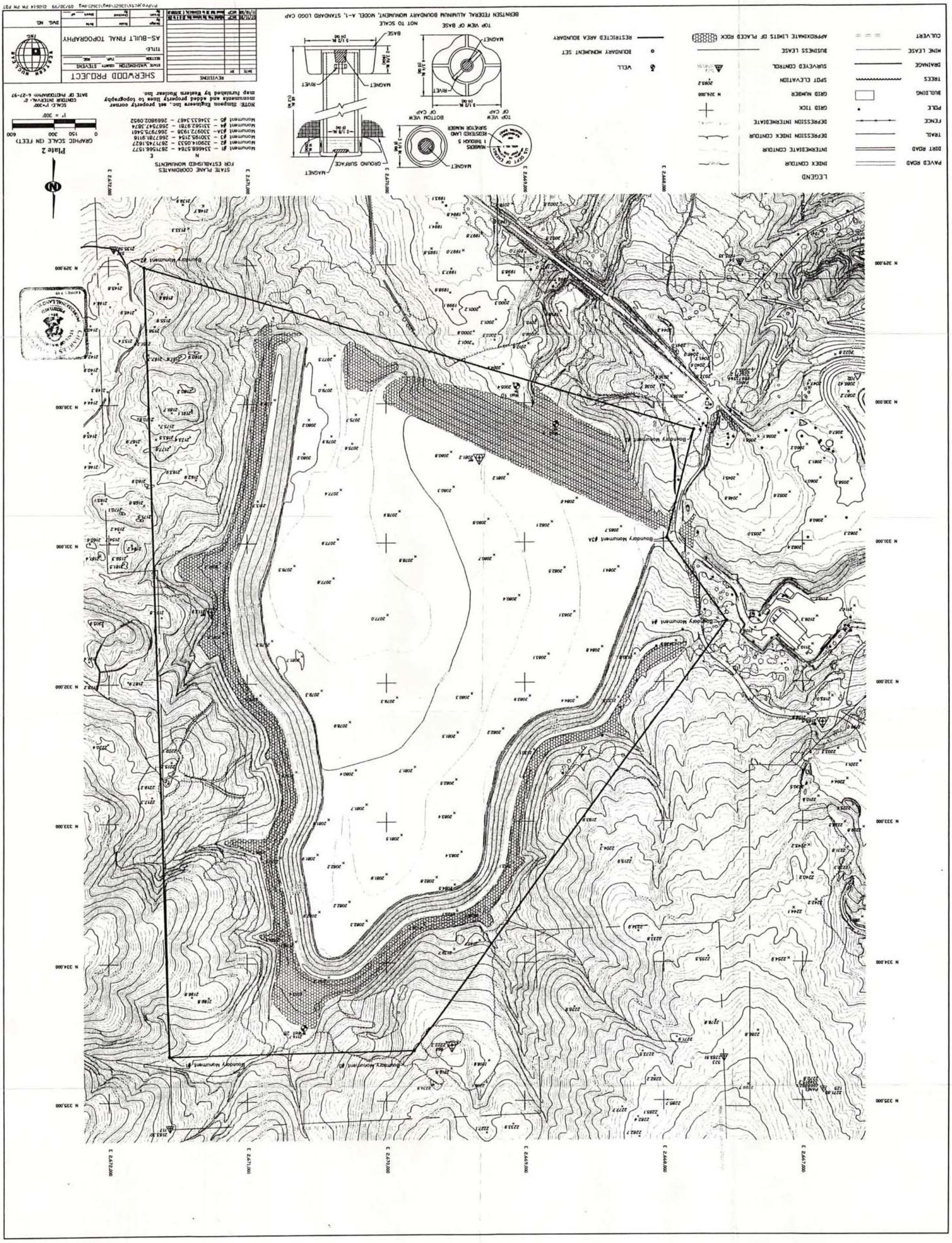
Date:	DECEMBER 2000
Project:	03-317\DWGS2000\
File:	WC-PS.dwg



	U.S. DEPARTMENT OF ENERGY GRAND JUNCTION OFFICE, COLORADO

PLATE 1
DISPOSAL SITE MAP FOR SHERWOOD, WASHINGTON, DISPOSAL CELL

DRAWN	DATE	CHIEF INSPECTOR	DATE	REVIEWED	DATE	PROJECT NO. LTS-111-0035-01	SHT. 1 OF 1
						DWG. NO. S0022801	


LEGEND
PAVED ROAD
DIRT ROAD
TRAIL
FENCE
POLE
BUILDING
TREES
DRAINAGE
MINE LEASE
CULVERT
INDEX CONTOUR
INTERMEDIATE CONTOUR
DEPRESSION INDEX CONTOUR
DEPRESSION INTERMEDIATE
GRID TICK
GRID NUMBER
SPOT ELEVATION
SURVEYED CONTROL
BUSINESS LEASE
APPROXIMATE LIMITS OF PLACED ROCK
RESTRICTED AREA BOUNDARY
BOUNDARY MONUMENT SET
VELL
BERNTSEN FEDERAL ALUMINUM BOUNDARY MONUMENT, MODEL A-1, STANDARD LOGO CAP
NOT TO SCALE
TOP VIEW OF BASE
MAGNET
RIVET
TOP VIEW OF CAP
BOTTOM VIEW OF CAP
NUMBERS 1 BROOCH 5 REGISTERED LAND SURVEYOR NUMBER
GROUND SURFACE
BASE
REVISIONS
SHERWOOD PROJECT
STATE WASHINGTON COUNTY STEVENS
AS-BUILT FINAL TOPOGRAPHY
TITLE:
SCALE: 1"=300'
CONTOUR INTERVAL 2'
DATE OF PHOTOGRAPH 6-27-97
NOTE: Simpson Engineers Inc. set property corner monuments and added property lines to topography map furnished by Western Nuclear Inc.
STATE PLANE COORDINATES FOR ESTABLISHED MONUMENTS
Monument #1 – 33466B.5764 – 2871566.1577
Monument #2 – 329014.0533 – 2671745.1627
Monument #3 – 330195.2154 – 2667781.9116
Monument #3A – 330972.1938 – 2667973.5461
Monument #4 – 331562.9781 – 2667547.3874
Monument #5 – 331653.3467 – 2669802.0952
Plate 2
GRAPHIC SCALE (IN FEET)
0 150 300 600
1" = 300'
N
Boundary Monument #2
Boundary Monument #3A
Boundary Monument #4
Boundary Monument #5
Boundary Monument #1
N 329,000
N 330,000
N 331,000
N 332,000
N 333,000
N 334,000
N 335,000
E 2,671,000
E 2,670,000
E 2,669,000
E 2,668,000
E 2,667,000