Basalt Waste Isolation Project

Near Surface Test Facility

Reclamation Plan

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Prepared for the Department of Energy
Richland, Washington

by

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Near Surface Test Facility Reclamation Plan</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Introduction</td>
<td>1-1</td>
</tr>
<tr>
<td>1.1 Repository Program Overview</td>
<td>1-1</td>
</tr>
<tr>
<td>1.2 Documents Relevant to Reclamation</td>
<td>1-2</td>
</tr>
<tr>
<td>2.0 Predisturbance Conditions</td>
<td>2-1</td>
</tr>
<tr>
<td>2.1 Overview of the Hanford Site</td>
<td>2-1</td>
</tr>
<tr>
<td>2.2 Site Specific Conditions</td>
<td>2-4</td>
</tr>
<tr>
<td>3.0 Existing Conditions</td>
<td>3-1</td>
</tr>
<tr>
<td>3.1 Existing Facilities</td>
<td>3-1</td>
</tr>
<tr>
<td>4.0 Proposed Reclamation Activities</td>
<td>4-1</td>
</tr>
<tr>
<td>4.1 Reclamation Guidelines</td>
<td>4-1</td>
</tr>
<tr>
<td>4.2 Reclamation Tasks</td>
<td>4-2</td>
</tr>
<tr>
<td>5.0 Implementation of Reclamation Activities</td>
<td>5-1</td>
</tr>
<tr>
<td>5.1 Access by States and Tribes</td>
<td>5-1</td>
</tr>
<tr>
<td>5.2 Quality Assurance</td>
<td>5-3</td>
</tr>
<tr>
<td>5.3 Responsibility for Reclamation Success</td>
<td>5-4</td>
</tr>
<tr>
<td>References</td>
<td></td>
</tr>
<tr>
<td>Fig.</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Location of the Near Surface Test Facility</td>
</tr>
<tr>
<td>2</td>
<td>Land use at the Hanford Site</td>
</tr>
<tr>
<td>3</td>
<td>Gable Mountain pre-construction condition</td>
</tr>
<tr>
<td>4</td>
<td>The NSTF Site</td>
</tr>
<tr>
<td>5</td>
<td>Gable Mountain, existing disturbance at NSTF</td>
</tr>
<tr>
<td>6</td>
<td>Proposed reclamation of the NSTF Site</td>
</tr>
<tr>
<td>7</td>
<td>Gable Mountain, projected surface after reclamation</td>
</tr>
<tr>
<td>8</td>
<td>Schedule for reclamation of the NSTF Site</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

This plan describes the activities proposed to reclaim the Near Surface Test Facility (NSTF) constructed as part of the Basalt Waste Isolation Project (BWIP).

1.1 Repository Program Overview

Congress passed the Nuclear Waste Policy Act (NWPA) in 1982, establishing a national policy for storing, transporting, and disposing of spent nuclear fuel and high-level waste.

The NWPA (NWPA, 1983) required the U. S. Department of Energy (DOE) to: 1) develop deep, geologic repositories for the disposal of spent fuel and high-level waste; 2) submit a proposal to Congress on the need for and feasibility of one or more monitored retrievable storage facilities; and 3) establish a program of research, development, and demonstration regarding the disposal of spent nuclear fuel and high-level waste.


"The Secretary shall terminate all site specific activities (other than reclamation activities) at all candidate sites, other than the Yucca Mountain site, within 90 days after the date of enactment....."

The passage of this Act effectively stopped related work at the Hanford Site (BWIP). As work had been initiated at the Hanford site prior to the passage of the NWPA under DOE's National Waste Terminal Storage Program and had continued during the 1980's, reclamation of the existing disturbances at the Hanford Site was required. Approximately 100 boreholes had been completed; the drill rig and starter hole at the Exploratory Shaft (ES) site were in
place; and the Near Surface Test Facility (NSTF), an underground laboratory, had been constructed.

In order to comply with the NWPAA reclamation directive, BWIP has developed reclamation plans corresponding to the three general "areas" requiring reclamation: the boreholes, the ES site, and the NSTF.

1.2 Documents Relevant to Reclamation

Historical DOE documents describe the reclamation of a completed NSTF Facility. Although not binding here, they provide some guidance to the current reclamation effort by indicating the intent and scope of those activities.

The Mission Plan

The NWPA required a policy document, called the Mission Plan for the Civilian Radioactive Waste Management Program (DOE, 1985). This plan was published in 1985 and discusses the goals, objectives, and strategy for disposing of spent fuel and high-level waste and discusses key issues and information needs and plans for building a nuclear waste repository. The document also summarizes information on site investigation and characterization; the nuclear waste package; a possible test and evaluation facility; schedules, cost, and socioeconomic effects related to building a repository; and guidelines for reclaiming sites determined to be unsuitable.

Guidelines for decommissioning sites found unsuitable for repository development are presented in Section 7.6 of the Mission Plan. Although the Hanford site was not found to be "unsuitable" as contemplated by the NWPA, the guidelines in the Mission Plan serve as a useful tool for defining reclamation activities. In general, the Mission Plan states that a site shall be returned as nearly as practicable to its original condition.
Environmental Assessments

The Hanford site has been evaluated in accordance with the DOE’s General Guidelines for the Recommendation of Sites for the Nuclear Waste Repositories (DOE, 1984). This evaluation was reported in a draft environmental assessment (EA), which was issued for public review and comment. After considering the comments received on the draft EA, the DOE prepared the final EA which was issued on May 28, 1986.

The Hanford site EA (DOE, 1986) states that test areas shall be decommissioned as soon as possible after the termination of site characterization activities.

In addition to the Hanford site EA, an EA (DOE, 1978) was prepared specifically for the NSTF activities. The EA includes the following statement which serves as a guideline for defining current reclamation activities:

"The portals and open cuts will be backfilled and restored, as much as is practicable, to a natural state, in accordance with all Federal land management regulations. Backfilling material will be obtained from the originally mined rock at the nearby quarry; excess waste rock will be left at the quarry. Revegetation of the test facility site will be accomplished by using native grasses. Restoration of the test area site to natural contours will be completed before the area is revegetated.

The existence of the vault test area and tunnels in Gable Mountain is not considered an adverse environmental impact, and there are no plans to backfill this area."

This statement was made in reference to the decommissioning of the NSTF after the completion of the project. Many of the tests anticipated by the
authors of the EA, such as studies involving the actual placement of spent fuel, were never carried out.

In contrast to the statement in the EA, the backfilling of the underground portion of the facility is being addressed by this plan. Recent studies indicate that the area may be sensitive due to Native American religious activities on Gable Mountain.

Section 4.2 of this plan provides the detailed tasks that will be undertaken to reclaim the NSTF site.

Site Characterization Plan

A "consultation draft" of the Site Characterization Plan (SCP) (DOE, 1987a) for the BWIP was prepared, but not issued prior to December 22, 1987. The basic purpose of the SCP was threefold: (1) to describe the site, the preliminary designs of the repository and the waste package, and the waste-emplacement environment in sufficient detail so that the basis for the site-characterization program can be understood; (2) to identify the issues to be resolved during site characterization, to identify the information needed to resolve the issues, and to present the strategy for resolving the issues; and (3) to describe general plans for the work needed to resolve outstanding issues.

 Included in chapter 8.7 of the Consultation Draft SCP (DOE, 1987a) is a discussion of the decommissioning of characterization facilities if the Hanford site is not selected as a repository site. This discussion also provides guidelines for defining current reclamation activities.

Environmental Regulatory Compliance Plan

The DOE was required by Section 113(a) of the NWPA "...to the maximum extent practicable and in consultation with the Governor of the State involved or the governing body of the affected Indian tribe involved, conduct site
characterization activities in a manner that minimizes any significant adverse environmental impacts identified..." Several documents were developed to respond to this mandate including the Environmental Regulatory Compliance Plan (ERCP) (DOE, 1987b). That plan was in draft form on December 22, 1987, and has never been officially released. The ERCP describes the environmental regulatory requirements applicable to the BWIP, and presents the framework within which the BWIP Project Office would have complied with the requirements. This draft document provides a general guideline for defining the applicable laws and regulations to the reclamation activities.

**BWIP Environmental Reviews**

Field-based BWIP environmental reviews (BER) of site characterization activities were conducted prior to initiation of significant field activities to provide recommendations for regulatory compliance and for the minimization of potential environmental impacts. BERs were originally developed from the DOE/Richland Operations Office practice of preparing "environmental evaluations" under DOE Order RL-5440.1A before proceeding with field activities.

BER-004 (PNL, 1987) was prepared for the Gable Mountain water line, trailer move, and modifications. A new water line was installed, but the proposed move of the trailers to the bench of the mountain did not take place. BER-004 discusses in its cultural resources review and regulatory review the importance of Gable Mountain to Native Americans residing in the region and the regulatory considerations of the proposed Gable Mountain activity.

**Environmental Laws, Executive Orders and Regulations**

In conducting reclamation, DOE and its contractors will comply with the requirements of applicable environmental statues, executive orders and regulations. Actions necessary for compliance are incorporated into Section 4.2 of this document.
Environmental Policy Statement

The DOE is committed to conduct its operation in an environmentally safe and sound manner and comply with the letter and spirit of applicable environmental statutes and regulations. These objectives are codified in DOE Order N5400.2, "Environmental Policy Statement."
2.0 PREDISTURBANCE CONDITIONS

The NSTF site is approximately 25 miles northwest of Richland, Washington (Figure 1). It is within the Hanford Site, a U. S. Department of Energy reservation of approximately 560 square miles.

2.1 Overview of the Hanford Site

The Hanford Site was established in 1943 as a national security area for plutonium production. In the early 1950's, construction of the research and development facilities known as the Hanford Laboratories began. This marked the first diversification of the Hanford Site from a purely defense materials production facility to one involved in peacetime uses of the atom.

The majority of the land area of the Hanford Site is an undeveloped buffer zone between the defense facilities and land accessible by the public. Figure 2, taken from the "Environmental Assessment, Reference Repository Location, Hanford Site, Washington" (DOE, 1986) shows the locations of the defense facilities relative to the Hanford Site boundaries. The wildlife and ecology reserve lands are also illustrated.

There are several coexisting land uses:
- The investigation and production of nuclear materials
- The disposal of defense wastes and off-site low-level radioactive wastes
- Research and development
- Wildlife habitat
- Native American religious sites (limited areas)
- Recreational and sightseeing (limited areas)

The majority of the land area is an arid grass/shrub wildlife area. Parts of the site, as the Saddle Mountains National Wildlife Refuge and the Arid Lands Ecology Reserve, carry formal designations as restricted areas. Most
Figure 1. Location of the Near Surface Test Facility.
Figure 2. Land use at the Hanford Site.
of the remainder of the site is managed to benefit wildlife by restricting human intrusion.

2.2 Site Specific Narrative - Physical Setting

The Near Surface Test Facility (NSTF) is located on the north face of Gable Mountain. Gable Mountain is located near the center of the Hanford Site. The area lies within the Pasco Basin, the structural and topographic low part of the Colombia Plateau, and is approximately 34 miles northwest of the junction of the Yakima River with the Columbia River.

The terrain surrounding Gable Mountain is relatively flat with subtle topographic features primarily formed by large, glacially related floods that inundated the Pasco Basin prior to approximately 13,000 years ago. These topographic features have been locally masked by east-west-trending sand dunes that attest to the semiarid climate of the region. Elevation at the Near Surface Test facility site is approximately 660 ft. Figure 3 illustrates the pre-construction topography in the vicinity of the NSTF.

The NSTF location is situated in the west-central portion of the Pasco Basin near the western boundary of the Central Plains section of the Columbia basin physiographic subprovince. The basin is divided into three major landform systems or areas of recurring landforms, processes, and effects. The surrounding basin and valley terrain, including the Reference Repository site, consists of the low-relief, sediment-filled portion of the basin in the Central Plains section and the synclinal valleys of the Yakima Folds section. The NSTF site is located in the western portion of the basin and valley terrain, specifically in that geomorphic unit called the Umtanum Ridge.

The eastern Umtanum Ridge segment is an asymmetrical, overturned, plunging anticline whose crestal surface bifurcates into several subsidiary echelon folds along the major fold trend. Gable Mountain and Gable Butte are topographically isolated, second-order, anticlinal ridges of basalt and...
interbedded sediments that are the only extensive bedrocks in the central Pasco Basin. Gable Mountain is 11 mi. long and 1.5 mi. wide, and is a discontinuous, barren, and rocky upland rising as high as 500 ft. above the steppeland plains.

The NSTF is near the western end of Gable Mountain. Gable Mountain has an eastern and a western summit approximately 3 mi. apart. The eastern summit is approximately 1062 ft. high and the western summit is approximately 1112 ft. high. The northern upslope of Gable Mountain contains a portion of the Pomona Basalt Flow (DOE, 1978).

Vegetation

The Hanford Site ecosystem is termed a shrub-steppe ecosystem to distinguish it from the true steppe lands of Asia. The shrub-steppe ecosystem, a relatively fragile environment, contains several distinct ecological communities, each having common distinguishing features. The vegetation is adapted to tolerate semiarid conditions. The community (approximately 65 species) is short, consisting of grasses, forbs, and shrubs with few trees, except along waterways. The vegetative community surrounding the NSTF site is composed of cheatgrass, *Bromus tectorum*, Sandberg's bluegrass, *Poa sandbergii*, bluebunch wheatgrass, *Agropyron spicatum*, with an overstory of short-statured, widely-spaced desert shrubs, like big sagebrush, *Artemisia tridentata*, stiff sage, *A. rigida*, and spiny hopsage, *Gravida spinosa*. On disturbed sites, the alien tumbleweed, *Salsola kali*, (or Russian thistle) is a common summer annual (Rickard, 1988).

Wildfires periodically sweep portions of the Hanford Site, influencing the plant communities and creating "fire scars." Several of the shrub species are killed by fire while many of the grasses and forbs usually recover quickly.
Land Use

Evidence exists for the use of Gable Mountain as a religious site by local Indian tribes. The mountain may be eligible for inclusion on the National Register of Historic Places because it appears to meet one of the four criteria of eligibility provided in 36CFR 60.4, an implementing regulation of the national Historic Preservation Act.

Prior to government acquisition of the Hanford Site in 1943, the entire site was probably grazed by sheep and cattle for more than 70 years. Grazing and trampling occurred during the many years of livestock use, accelerating the invasion of cheatgrass, an alien annual grass.

The NSTF site was utilized for wildlife habitat following government acquisition. This land use continued until the site was cleared of vegetation and the underground facilities, roads, and gravel pad were constructed.

The planned land use of this site is for wildlife habitat.
3.0 EXISTING CONDITIONS

The NSTF site was developed in 1978 as an underground test facility which would provide access to a basalt flow similar to the flow in which the proposed repository would be constructed. Refinements and modifications to the facility continued through late 1987.

Figure 4, a photograph taken in 1987, provides a view of the facility. A 10 inch water line was added since the photograph was taken.

The topography of the site and the locations of the structures are illustrated by Figure 5.

3.1 Existing Facilities

The existing man-made features on Gable Mountain are a direct result of the construction or operation of the NSTF, with the exception of the microwave complex (refer to Figure 5). The three tunnels were excavated by standard practice, drill and blast underground mining methods. The surface expression of the underground test facility is limited to three cement-faced tunnel portals and related box-cuts. The emergency generator station and the ventilation (exhaust) fan are located farther up the slope.

As the excavation of the underground facility took place, broken rock removed from the tunnels was placed on the existing slope outside the tunnel portals or entrances to form the bench on which the operations and maintenance facilities are located. Additional gravel and fine crushed rock was imported to surface this bench. The volume of the bench is estimated to be approximately 121,000 loose cubic yards.

Several mobile office trailers and permanent structures are currently located on the tunnel bench. Permanent electrical power and water have been run to these structures and sanitary waste handling is provided by buried holding tanks.
As previously mentioned, the emergency generator site and the exhaust ventilation fan are located higher on the Gable Mountain slope above the tunnels. The emergency generator site consists of two concrete block generator buildings and a series of six small diameter boreholes used to run electric cables to the underground excavation. The exhaust fan is located further up the mountain slope and ventilates the underground area by eight 12 inch diameter drill holes. These facilities are on concrete pads and surrounded by security fences.

During the construction of the NSTF, separate explosive and blasting cap magazines were set on the Gable Mountain slope. These magazines have been removed, but the disturbed surface area and the access road are barren, compacted, and in need of revegetation.

Approximately 1000 feet east of the microwave tower along the crest of the mountain are five exploratory trenches that pre-date the NSTF. Each of these trenches is at least four feet wide and total length of the trenches is around 525 feet. The trenches are open and the excavated material is piled in windrows. The disturbances are visible from a distance and will be reclaimed.

Road access is provided via a two lane black top road from the intersection with Route 4 N. to the Gable Mountain bench. A graveled spur road leaves the black top approximately 500 ft. east of the test facility gates and provides access to the microwave repeater on the crest of the hill.

The Trailer Village was constructed on the flat, alluvial valley floor, directly north of the test facility. The purpose of the Trailer Village was to provide office space for the researchers and facility management personnel, and to support the public information visitors center. The Trailer Village is served with permanent power, water, and a septic tank system. Asphalt paved sidewalks, roadways, and parking areas were
NEAR SURFACE TEST FACILITY RECLAMATION PLAN - Rev. 1

constructed. Currently, one mobile office trailer, one mobile storage trailer, and the visitors center remain at the Trailer Village.

Gravel for the road sub-base and fine fill was excavated from the borrow pit located across the main access road from the Trailer Village. No reclamation effort has been expended on the borrow pit and the area of surface disturbance is approximately 300 by 600 feet.

Electric power is supplied to the NSTF by a 13.8 KV. 3 phase overhead power line which enters the area from the west. The line splits near the Trailer Village with one branch going up the mountain slope, the line is split again (above the bench area) with one branch going to the facilities on the tunnel bench and the other branch going to the emergency generator. Near the emergency generator, a trunk line is split off to provide power to the microwave repeater.

Originally, water service was provided to the NSTF by a 4 inch NIPAK line. This water line was abandoned in place and a new 10 inch ductile iron pipe waterline was installed along the same right-of-way in late 1987. The lines enter the area from the west, parallel to the overhead power line. Near the Trailer Village, in the vicinity of the 625-A chlorinator building, the lines split with one branch serving the Trailer Village and the other branch advancing up the slope of the mountain. On the slope, the new line essentially follows the right-of-way of the pre-existing line. It is laid on the surface with fill material mounded over it. It enters the tunnel bench on the west side and advances to the 625-B chlorinator building, where the water is treated and distributed. Because the BWIP was cancelled soon after completion of the water line upgrade, the entire waterline right-of-way has not yet been revegetated.
4.0 PROPOSED RECLAMATION ACTIVITIES

The following "reclamation guidelines" have been developed for BWIP, using the Mission Plan (DOE, 1985) and the EAs (DOE, 1978 and 1986) as guidance. Both the Mission Plan and the EAs describe an active reclamation program, rather than a passive program in which nature is relied upon to produce the desired final condition.

The reclamation of the NSTF site will follow these "reclamation guidelines". The specific reclamation activities will be completed in accordance with the technical specifications in the subcontracts. As these technical specifications will parallel the content of the "reclamation guidelines", the verification of the subcontractor's activities will provide documentation of the implementation of the "reclamation guidelines".

4.1 Reclamation Guidelines

A review of project documents (e.g., the Mission Plan, the Site Characterization Plan) related to reclamation has provided a basis for developing BWIP specific reclamation guidelines. These documents were prepared on the presumption that reclamation activities would occur after, and if, the site had been found to be unsuitable for repository construction. They do not specifically address the current BWIP reclamation activities.

The following BWIP specific guidelines were developed to address the primary considerations of these project documents and applicable Federal, state, and local regulations. These guidelines are:

- Remove hazardous material
  - Salvage if usable
  - Dispose of as per RCRA if not usable
- Remove equipment, structures, and utilities
  - Remove portable equipment, trailers, etc.
  - Salvage usable equipment and instruments
NEAR SURFACE TEST FACILITY RECLAMATION PLAN - Rev. 1

- Remove above ground utilities and dispose of as per Hanford Site practices
- Break up and remove foundations and pavement
- Pump and backfill septic tanks

1. Return surface to approximate original contour
   - Determine appropriate land use
   - Return materials to excavations as appropriate
   - Remove materials not compatible with revegetation
   - Grade excess materials and blend with surrounding topography
   - Provide a suitable material for plant growth

2. Establish appropriate land cover.
   - Self-sustaining, natural species unless an industrial use is identified
   - Mixtures of shrubs, forbs and grasses as appropriate to site and wildlife considerations

The BWIP reclamation guidelines will be implemented in a fashion that allows the verification of the reclamation process (See Section 5.2).

4.2 Reclamation Tasks

The reclamation of the NSTF is described in the following text. Because of the use of Gable Mountain by traditional local Native American groups as a religious and vision quest location, the requirements of the American Indian Religious Freedom Act apply to site reclamation, and reclamation will be carried out in accordance with this Act. Gable Mountain is believed to be eligible for the National Register of Historic Places; as such it requires consideration under the National Historic Preservation Act. The Archaeological Resources Protection Act will also be complied with in conducting archaeological investigations for NSTF reclamation.

Removal of excess fuels, lubricants, hazardous materials. Any materials that, if abandoned, would be considered hazardous waste will be removed from the site and used elsewhere. If they are to be disposed of, such an
activity will be conducted in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA), the Washington Hazardous Waste Management Act, the Toxic Substances Control Act, and their implementing regulations. A site "walk-through" will be conducted by qualified hazardous waste personnel prior to the initiation of demolition and disposal activities. If any hazardous waste is found, it will be disposed of in accordance with statutory and regulatory requirements.

Removal and salvage of equipment, structures and utilities. The following will be moved off the NSTF site and salvaged:
- Office Trailers
- Storage Units
- Pad mounted transformers
- GTE telephone junction boxes
- Chlorinator equipment from buildings 625-A and B
- Normal power components including selected transformers, power and lighting panels
- Emergency generator components including all items in related buildings and transformers
- Exhaust fan components
- Selected components from uninterruptible power supply (UPS) system
- Selected ventilation equipment including Liebert temperature controlled unit in building 627, air conditioners in the underground enclosures, and underground ventilation fans at tunnel #3 portal
- Bottom loading transporter
- Bridge crane and support structure
- Halon fire suppression system, and portable fire extinguishers
- Emergency lighting and selected standby and normal lighting components
- Underground communication system
Selected non-operating equipment and materials on the bench
Tunnel entry security gates
Selected geotechnical instrumentation
Catwalks in NSTF heater test area
Wood power poles w/luminaries
Fire hydrant(s)
Perimeter fencing
Interior fencing
Railroad ties
Neutrino test equipment and associated materials

Removal and disposal of other equipment and materials. Inert or demolition (nondangerous) solid waste will be disposed of at the Hanford Site solid waste landfill, which is operated and managed in compliance with the Washington Solid Waste Management Act and its implementing regulations. The Trailer Village septic tank will be pumped and backfilled.

The removal and demolition activities will include the following items:
Buried utilities down to the first elbow or to 3 feet below the natural ground surface, whichever occurs first; this includes all utilities from the bench area and the trailer village
Manhole in trailer village to 3 feet below the natural ground surface and backfill remaining void
Domestic wastewater holding tank(s)
Septic tank in trailer village area
All yellow steel guard post barriers
Valve boxes to within 3 feet of the natural ground surface in trailer village area
Fence posts and concrete anchors
Concrete pads in the trailer village area, bench area, and at exhaust fan and stand-by generator areas
Asphaltic concrete roadway in trailer village complex
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- Asphaltic concrete roadways, parking area, and walkways in the bench village
- Base coarse material from roadbed in trailer village complex
- Above grade conduit runs
- Conduit runs in tunnels
- Underground enclosures (self-standing lab and office structures)

In the tunnels inert materials as conduit, structural steel, and wiring may be abandoned in place if the materials will not impede the backfill operation.

Return of surface to its original contour. The excavation of the bench material and the backfilling of the NSTF tunnels will be conducted in compliance with the Benton-Franklin-Walla Walla Counties Air Pollution Control Authority's General Regulation 80-7 and other applicable regulations. Fugitive dust emissions to the air will be minimized with dust abatement measures (watering of the rocks, gravel, and soil).

The return of the surface to approximate original contour will include:

A. Backfill NSTF
   - Excavate bench material and place in NSTF
   - Install permanent plugs in power drop and exhaust ventilation boreholes
   - Plug exploratory boreholes south of ventilation fan pad
   - Construct cast-in-place concrete curtain wall at tunnel portals

B. Recontour surface
   - Backfill tunnel bench cuts to original profile with bench material
   - Fill borrow pit across from trailer village with bench material to blend with surrounding topography
   - Remove remaining bench material and place in Gable Mountain quarry
NEAR SURFACE TEST FACILITY RECLAMATION PLAN - Rev. 1

- Remove connector road from bench to intersection with microwave service road
- Recontour trailer village area borrow pit and water line right-of-way to blend with existing topography
- Recontour bench area, connector road, standby generator area, exhaust fan area, and explosive magazine area to blend with existing topography
- Fill geologic exploration trenches
- Haul and place topsoil on selected disturbed areas

The geologic exploration trenches will be filled in a manner that ensures that no cultural resource sites will be disturbed.

Establishment of appropriate land cover. The BWIP will comply with the reclamation objectives defined by the Mission Plan and the EA. The reclamation objective will be to reestablish areas designated as wildlife habitat to the conditions existing prior to disturbance, or, given some broad-based change not due to BWIP, such as the result of wildfire, to establish habitats phytologically similar to those in undisturbed areas surrounding the BWIP restoration site. Restoration will be conducted in compliance with the spirit of the Mission Plan and the EA in that active revegetation will be the preferred means of restoring wildlife habitats, except where natural processes are known to accomplish the desired objective within a short time frame.

A seedbed will be prepared and fertilized, if appropriate, for revegetation. A mixture of natural shrubs, forbs, and grasses will be planted. The soil will be mulched and crimped after planting. Any herbicides that may be used to remove exotic vegetation will be applied and handled in accordance with the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and its implementing regulations.
The reclaimed site is illustrated by Figure 6, a photograph retouched to show the effects of reclamation and Figure 7, a topographic map of the reclaimed site.