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Los Alamos National Laboratory

UNIVERSITY OF CALIFORNIA



Environmental Science and Waste Technology(E)
Environmental Restoration Project, MS M992
Los Alamos, New Mexico 87545
505-667-0808/FAX 505-665-4747

 ENTERED

Date: September 8, 1999
Refer to: E/ER:99-256



Mr. Ted Taylor
Department of Energy
Los Alamos Area Office, MS A316
Los Alamos, NM 87545

SUBJECT: RFI REPORT FOR PRS C-00-037 AND C-00-038 FOR PERFORMANCE MEASURE A.1.1

Dear Ted:

Enclosed are two copies of the Resource Conservation and Recovery Act Facility Investigation (RFI) report for Potential Release Sites (PRSs) C-00-037 and C-00-38. This report is complete and submitted to the US Department of Energy-Los Alamos Area Office (DOE-LAAO) to satisfy Appendix F Performance Measures negotiated with DOE-LAAO dated February 4, 1999, and revised April 21, 1999.

This report contains recommendations for No Further Action (NFA) on two PRSs. This results in a total of nine PRSs to date. The RFI report is therefore being submitted in fulfillment of the requirement to meet the "Excellent" Performance Measure for Functional Area A.1.1, which requires submittal of nine new NFA recommendations.

If you have any questions or comments, please provide them to Dave McInroy at (505) 667-0819 within 10 working days or no later than September 15, 1999.

Sincerely,

Julie A. Canepa, Program Manager
Environmental Restoration Project

JC/DB/ev

Enclosure: Two copies of the RFI Report for PRSs C-00-037 and C-00-038

SEP 17 1999

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Date: September 30, 1999
Refer to: E/ER:99-277

Mr. Ted Taylor
NMED-HRMB
P.O. Box 26110
Santa Fe, NM 87502

**SUBJECT: RFI REPORT FOR POTENTIAL RELEASE SITES C-00-037
AND C-00-038**

Dear Mr. Taylor:

Enclosed are two copies of the Resource Conservation and Recovery Act Facility Investigation (RFI) report recommending "No Further Action" for Potential Release Sites (PRSs) C-00-037 and C-00-38.

The University of California is submitting this document to the Department of Energy (DOE) to fulfill the Performance Measure for Functional Area A.1.1. The DOE has reviewed this report and their comments have been incorporated.

If you have any questions or comments, please provide them to Dave McInroy at (505) 667-0819.

Sincerely,

Julie A. Canepa, Program Manager
Los Alamos National Laboratory
Environmental Restoration

JC/TT/JP/eim

Enclosure: Two copies of the RFI Report for PRSs C-00-037 and C-00-038

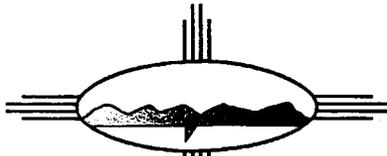
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LA-UR-99-4833
September 1999



RFI Report for Potential Release Sites

C-00-037 and C-00-038

Environmental Restoration Project
A Department of Energy Environmental Cleanup Program
ER19990111

Los Alamos
NATIONAL LABORATORY
Los Alamos, NM 87545

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EXECUTIVE SUMMARY

This RFI report addresses Areas of Concern (AOCs) C-00-037 and C-00-038. It has been prepared to detail the results of the investigation for these PRSs and provides the basis for the recommended actions. Both sites are currently located within the bounds of Bandelier National Monument (BNM) and are owned by the Department of the Interior. These sites are located on land that was originally acquired by the Atomic Energy Commission (AEC) from the U.S. Forest Service (Santa Fe National Forest) in 1943 to support the Manhattan Project during World War II. In December 1959, all of the land south of State Road 4 (approximately 3,600 acres) was transferred from the AEC to BNM. Although this land was controlled by the Manhattan Project from approximately 1943 to 1959, work associated with the Civilian Conservation Corps (CCC) had begun in Frijoles Canyon in 1932 and work conducted by the National Park Service (NPS) in this canyon has continued through present day.

PRS C-00-037 is an inactive landfill located immediately adjacent to Juniper Campground in the BNM. Aerial photographs of the landfill, taken in 1958, suggest that the site was in use as a disposal site at that time. The 1958 aerial photograph (US Air Force 1958, ID#16125) is the earliest documentation of landfill development although, as noted in the archeological report, drill and blasting holes located in the bedrock tuff exposures along the edges of the canyon suggest that the area now covered by the landfill may also have been quarried by the CCC prior to 1943. There is no evidence of any LANL activities associated with this solid waste landfill and there has been no documented use of this area, by LANL, for waste disposal purposes.

PRS C-00-038 is an inactive surface disposal area. The site is located adjacent to an abandoned section of Tyuonyi Overlook Loop Trail, about 1/8-mi southwest of the Juniper Campground. The surface disposal lies in a small excavation into a gentle slope of poorly welded Bandelier Tuff. This site has been identified as a historical site by the National Park Service and wastes deposited here predate the Manhattan Project.

The investigation of these sites consists of an archeological investigation conducted by the National Park Services Division of Anthropology and a historical records search of Laboratory operations in the area. The information presented in the following sections details the findings of these investigations and supports the recommendation of no further action (NFA) at these sites.

**TABLE ES-1
SUMMARY OF PROPOSED ACTIONS**

PRS Number	PRS Description	HWSA	Radionuclide Component	Proposed Action	Rationale for Recommendation	Section Number
C-00-037	Landfill	No	No	NFA, Criterion 1	Site was Erroneously Identified as an Area of Concern and is not associated with LANL Activities	2.0
C-00-038	Surface Disposal Area	No	No	NFA, Criterion 1	Site was Erroneously Identified as an Area of Concern and is not associated with LANL Activities	3.0

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
D&D	Decontamination and Decommissioning
DOE	US Department of Energy
EPA	US Environmental Protection Agency
ER	Environmental Restoration
HSWA	Hazardous and Solid Waste Amendments of 1984
LANL	Los Alamos National Laboratory
NFA	No Further Action
NMED	New Mexico Environment Department
NPS	US National Park Service
PRS	Potential Release Site
RCRA	Resource Conservation and Recovery Act
SWMU	Solid Waste Management Unit
TA	Technical Area

Attachment I *Final Investigation of Six Remediation
Sites in Bandelier National Monument, New Mexico*

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
D&D	Decontamination and Decommissioning
DOE	US Department of Energy
EPA	US Environmental Protection Agency
ER	Environmental Restoration
HSWA	Hazardous and Solid Waste Amendments of 1984
LANL	Los Alamos National Laboratory
NFA	No Further Action
NMED	New Mexico Environment Department
NPS	US National Park Service
PRS	Potential Release Site
RCRA	Resource Conservation and Recovery Act
SWMU	Solid Waste Management Unit
TA	Technical Area

Attachment I *Final Investigation of Six Remediation
Sites in Bandelier National Monument, New Mexico*

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL) is a multi-disciplinary research facility owned by the Department of Energy (DOE) and managed by the University of California. LANL is located in north central New Mexico approximately 60 miles northeast of Albuquerque and 20 miles northwest of Santa Fe (Figure 1.0-1). LANL covers 43 square miles of the Pajarito Plateau, which consists of a series of fingerlike mesas separated by deep canyons containing ephemeral and intermittent streams that run from west to east. Mesa tops range in elevation from approximately 6,200 ft to 7,800 ft. The eastern portion of the plateau stands 300 to 900 ft above the Rio Grande.

LANL's Environmental Restoration (ER) Project is involved in a national effort by DOE to clean up facilities that were formerly involved in weapons production. The goal of the ER Project is to ensure that DOE's past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve that goal the ER Project is currently investigating sites potentially contaminated by past LANL operations.

The sites under investigation are either solid waste management units (SWMUs) or areas of concern (AOCs). In the LANL ER Project, SWMUs and AOCs are collectively referred to as potential release sites (PRSs). For PRSs C-00-037 and C-00-038 the investigation has been conducted in accordance with the Hazardous and Solid Waste Amendments of 1984 (HSWA) and follows the requirements in Module VIII of LANL's Hazardous Waste Facility Permit (NMED 1989, ID # NM0890010515-1). Module VIII of the permit was issued to LANL by the US Environmental Protection Agency (EPA) on May 23, 1990, and modified on May 19, 1994.

Radionuclides are regulated under DOE Order 5400.5, Radiation Protection of the Public and the Environment (proposed rule 10 CFR 834.5 in FR 16268). PRSs C-00-037 and C-00-038 do not have a radioactive component.

PRSs C-00-037 and C-00-038 are located within the bounds of BNM. This land originally comprised a portion of land transferred to the Atomic Energy Commission (AEC) in support of the Manhattan Project. Later, in 1959, this land was transferred to BNM from the AEC. PRSs C-00-037 and C-00-038 are an inactive landfill and an inactive surface disposal area, respectively, and were added to a list of AOCs for Operable Unit 1071 subsequent to their discovery in 1994.

BNM is a national monument adjacent to the LANL complex. This area has been set aside as an area of national interest dedicated to the preservation of national treasures. There are no LANL-owned structures on BNM.

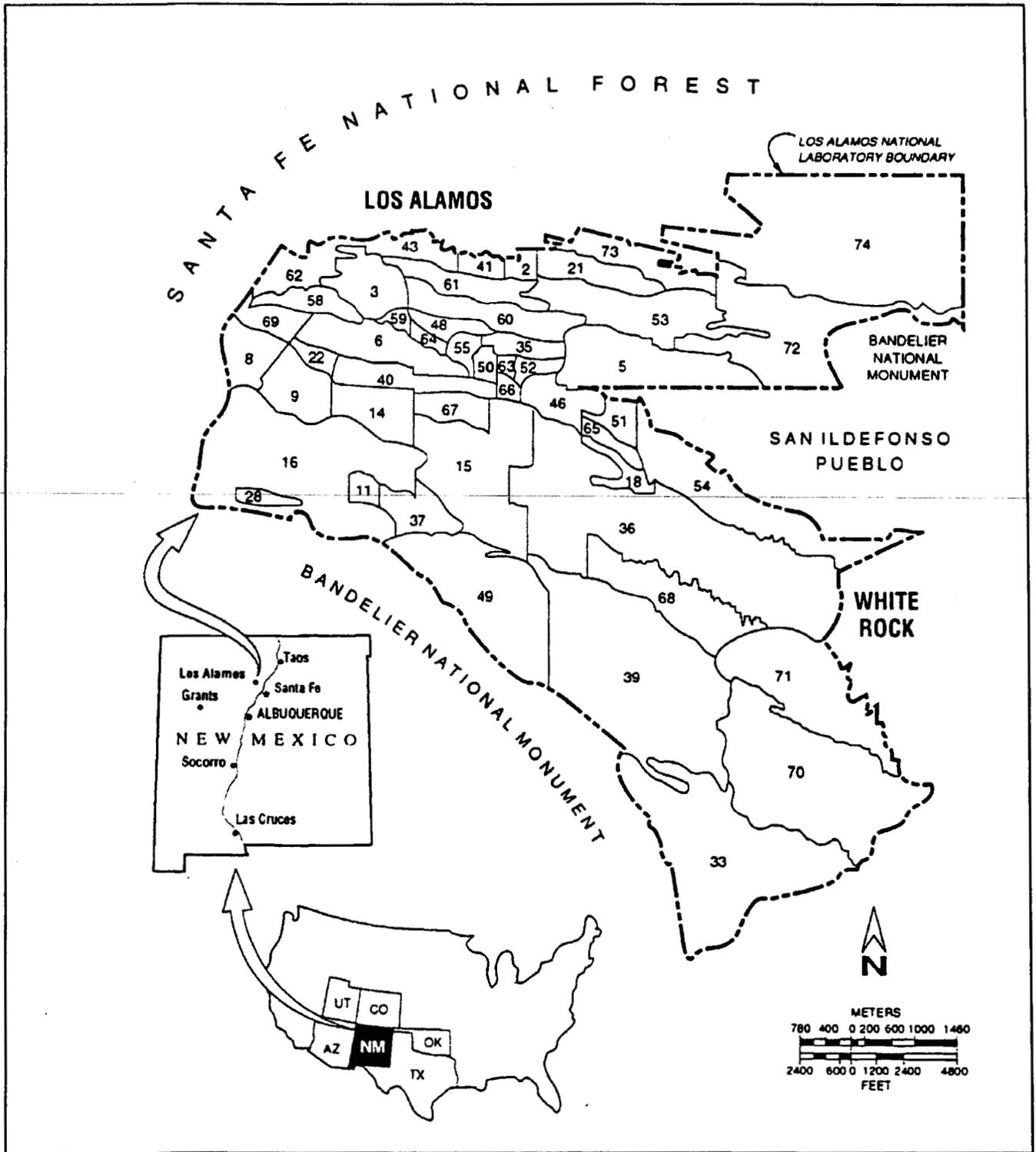


Figure 1.0-1 Location of Bandelier National Monument in Relation to Other Laboratory Technical Areas and Surrounding Landholding

2.0 PRS C-00-037 Landfill Area

2.1 Summary

PRS C-00-037 is an inactive landfill site located within the bounds of BNM on the mesa top separating Frijoles and Ancho Canyons. The investigation of this site, presented in the following sections, consisted of a detailed archeological investigation of the site. Figure 2.0-1 shows the location of the PRSs described in this report and their relation to surrounding area.

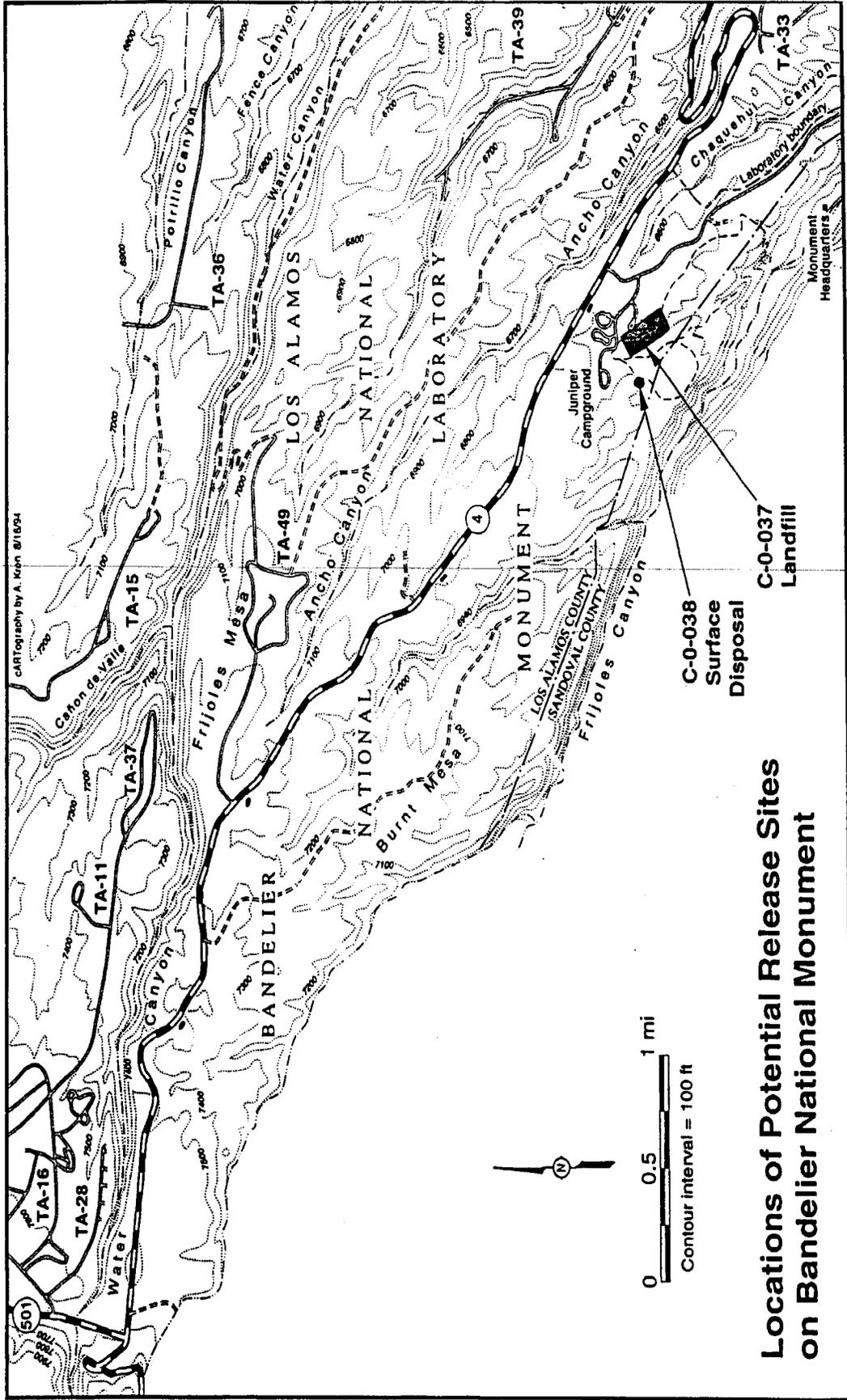
This site was first reported in 1994 when an archeologist working for the NPS, discovered six disturbed areas. These findings were communicated to LANL and ER personnel, and subsequently to the Administrative Authority. Aerial photographs of the landfill taken in 1958 suggest that the site may have been used as a disposal site at that time. While the photographs predate the transfer of the land to the NPS by a year, the configuration of the main road into the site indicates that the primary traffic to the landfill came from Frijoles Canyon to the south and not from the Laboratory. Discussions with park personnel indicate that BNM used the landfill for disposal of municipal wastes. It is not known when the BNM began using the landfill or who originally constructed the disposal pit.

A historical records search of Laboratory operations in proximity to the BNM indicates that there were no LANL activities in the area that would necessitate waste cartage into BNM. Further, there has been no discovery of any items suggesting LANL use of this landfill. Rather, the items noted at this landfill are consistent with wastes that would be generated by CCC, and later BNM, activities in the canyon. Based on the results of these investigations, PRS C-00-037 is recommended for NFA under Criterion 1 because this site was erroneously identified as an AOC and is not associated with LANL activities.

2.2 Description and Operational History

2.2.1 Site Description

PRS C-00-037 was first reported in 1994 when an archeologist working for the park service discovered six disturbed areas. These findings were communicated to LANL and ER personnel, and subsequently to the Administrative Authority. Upon discovery of these sites, an archeological survey was conducted, by the NPS, at all six sites. Four of the six sites [C-00-036(a,b,c,d)] were subsequently subject to voluntary corrective actions (VCAs). The remaining two sites [C-00-037 and C-00-038] were determined, based on the investigations, to not be associated with Laboratory activities. Based on the results of these investigations, PRS C-00-037 is recommended for NFA under Criterion 1.



Locations of Potential Release Sites on Banderlier National Monument

Figure 2.0-1 PRSs C-00-037 and C-00-038

Physical Description

PRS C-00-037 is an inactive landfill located immediately south of the Bandelier Amphitheater and southwest of the road leading to Loop C of Juniper Campground. The landfill is approximately 75m west of the park residence area. Approximately 1.1 ha (2.75 ac) in size and measuring 220 m north-south by 50 m east-west, the landfill extends southward from the Amphitheater filling the entire bottom of the unnamed drainage extending southeastward from the Amphitheater vicinity. Drill and blasting holes in the bedrock tuff exposures along the edges of the canyon suggest that the area now covered by landfill may have been quarried by CCC crews during construction of the Bandelier headquarters and lodge between 1933 and 1940 (Powers 1994, ID#63985).

Relation to Other PRSs

PRS C-00-037 is one of six PRSs located within the boundaries of BNM. There are four borrow pits located adjacent to State Road 4 [PRSs C-00-036(a, b, c, d)]. PRS C-00-036(a) is in close proximity to PRS C-00-037. There is no documented evidence of Laboratory activities associated with any of these PRSs with the exception of C-00-036(b). At PRS C-00-036(b) a manhole identifier was discovered in the upper portion of the debris-filled borrow pit. Because of the possible LANL association with the borrow pits, all four PRSs were subject to a VCA in 1994. The types of wastes/debris noted during the VCAs at PRSs C-00-036(a-d) were poured asphalt, concrete, wire, drainpipe, and pieces of railroad track. The VCAs conducted at these sites were simply a removal of the debris present in the borrow pits, a radiological screening of the debris, and collecting confirmatory samples to demonstrate the success of the VCAs. Confirmatory sampling results from these VCAs indicated no organic or radiological contaminants were detected at these sites.

2.2.2 Operational History

Little is known about the operational history of the landfill. A December 1958 aerial photo shows three prominent disturbed areas (Figure 2.0-2). Directly southwest of State Road 4 is a large disturbed area that is most likely the borrow pit, PRS C-00-036(b). Extending southwest from this site is a disturbed area thought to be the amphitheater. Directly south of the amphitheater is a disturbed area that is thought to be the landfill. Figure 2.0-3 shows the landfill in relation to the camping area.

Based on these aerial photographs, the area appears to be in active use as a landfill during the 1950s and 1960s. It is also possible the disturbed area, shown in the 1958 photo, was not landfill

activity but simply evidence of CCC activities on the mesa. Dumping at this landfill apparently continued for at least a decade (into the early 1970s) after the area was acquired by the NPS in 1959. Aerial photographs and recollections of long-time Bandelier staff indicate that dumped materials include a variety of park and household items ranging from original soil and quarry debris to discarded appliances and household trash. After use ceased in the early 1970s, topsoil, quarry debris, and asphalt were used to level the landfill to its present relatively flat surface. The depth of deposit is best appreciated at its southern terminus, where over 7 m of vertical fill are exposed.

2.3 Land Use

2.3.1 Current

BNM is currently owned and operated by the NPS for recreational and preservation purposes.

2.3.2 Future/Proposed

LANL does not anticipate any change from this recreational use for the operational life of the Laboratory. No D&D structures are located on this site.

2.4 Investigatory Activities

Investigation of this site consists of a historical records search of technical areas in proximity to the site and the results of an archeological survey conducted by the NPS. Based on the preliminary investigations at this site, BNM officials and LANL ER officials jointly agreed that no further investigations were warranted at this site.

Archeological Investigation

The first step in the investigation was to conduct an archeological survey of the site. To ensure consistency with other archeological surveys conducted in the area, the archeological survey and reporting were conducted by the NPS. The complete report is included as Attachment I to this report.

To identify and document archeological sites within the site boundary, the ground surface of each area was thoroughly examined by pedestrian surveyors walking approximately 5 m apart. The perimeter of the site was first flagged and then the entire enclosed area was traversed. To ensure all areas potentially containing waste and debris were included, area boundaries were extended 5-10 m beyond the limit of visible landfill disturbance.



AF 13DEC58 11000FT AF58-25-5 ROLL-4

ER Record I.D.# 0016125

Figure 2.0-2 December 1958 Aerial Photo of PRS C-00-037 and C-00-038

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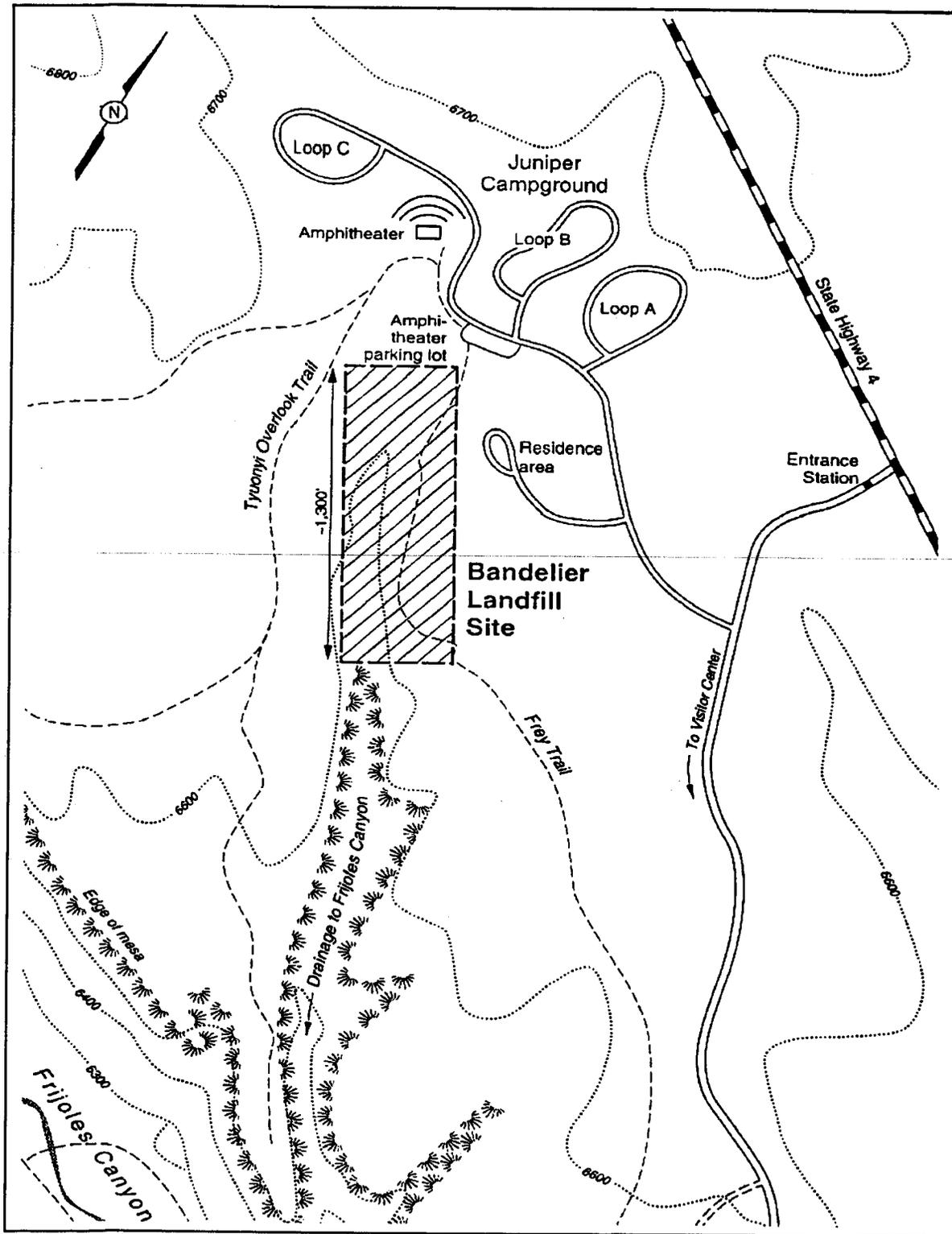


Figure 2.0-3 PRS C-00-037 Relation to Surrounding Area

The archeological survey of the landfill surface and perimeter revealed no prehistoric or historic materials, although numerous scattered modern artifactual items were found around the margins of the fill area. Most numerous were steel food and beverage cans, but also observed were motor oil cans, shoe leather, ceramic pipe, and corrugated tin. All material noted at the site appeared chronologically consistent with the documented 1950s-1970s use of the landfill. There were no noted items to suggest Laboratory use of this area.

Historical Records Search

The object of this investigation was to examine those technical areas in proximity to the site to determine if any of these activities, prior to 1959, may have contributed to the waste in the landfill. The most likely contributors to PRS C-00-037 would be those TAs closest to the landfill site (e.g., TA-33 and TA-49). A summary of the information gathered during the records search is presented in Table 2.0-1.

Table 2.0-1 Technical Areas in Proximity to BNM Landfill Site

TA	Name	Date TA Established	Waste Generation	Approximate Mileage to Landfill (mi)	Landfill Onsite?
TA-11	K-Site	1944	Yes	8	Yes
TA-16	S-Site	1944	Yes	7	Yes
TA-28	Magazine Area A	1944	None/Minimal	7	No
TA-33	HP Site	1947	Yes	2	Yes
TA-37	Magazine Area C	1944	None/Minimal	9	No
TA-39	Ancho Canyon Site	1953	Yes	4	Yes
TA-49	Frijoles Mesa Site	1960	Yes	5	Yes

From the data presented above, it is clear there was no need for systematic waste cartage from the TAs in proximity to this site. Although most of the landfills associated with the TAs listed in the above table were established after the TA was built, the data certainly suggest the propensity for onsite waste disposal. With regard to the BNM landfill [C-00-037], the more likely scenario is that this landfill supported non-LANL activities associated with the CCC and later the NPS activities in Frijoles Canyon. There is no evidence of Laboratory wastes at this site or any indication of hazardous or radioactive material disposal.

2.5 Site Conceptual Model

This section is not applicable.

2.6 Site Assessments

This section is not applicable.

2.7 No Further Action Proposal**2.7.1 Rationale**

PRS C-0-037 is a landfill adjacent to Juniper Campground in BNM. There is no indication, based on an archeological survey of the site and historical Laboratory operations in the immediate area of the site, of LANL waste disposal associated with this site. The site is recommended for NFA Criterion 1 because this site was erroneously identified as an AOC and is not associated with LANL activities.

Criterion

PRS C-00-037 is appropriate for NFA under Criterion 1.

3.0 PRS C-00-038 Surface Disposal Area

3.2 Summary

PRS C-00-038 is a surface disposal site located within the bounds of BNM on the mesa top separating Frijoles and Ancho Canyons. The site is located adjacent to an abandoned section of the Tyuonyi Overlook Loop Trail, about 1/8 mi southwest of the Juniper Campground. The investigation of this site, presented in the following sections, consisted of a detailed archeological investigation and radiological survey of the site. Figure 2.0-1 shows the location of the PRSs described in this report and their relation to surrounding area.

This site was first reported in 1994 when an archeologist working for the park service, discovered six disturbed areas. These findings were communicated to LANL and ER personnel and subsequently to the Administrative Authority. Initial examinations of the surface disposal debris by the NPS archeologists indicated a pre-1945 dumping date. Based on these results the site was recorded as an archeological site to provide a basis for evaluating its eligibility for nomination to the National Register of Historic Places.

A historical records search of Laboratory operations in proximity to the BNM indicates that there were no LANL activities in the area that would necessitate waste cartage into BNM. Further, there has been no discovery of any items suggesting LANL use of this surface disposal area. Rather, the items noted at this surface disposal area are consistent with wastes that would be generated by CCC, and later BNM, activities in the canyon. Based on the results of these investigations, PRS C-00-038 is recommended for NFA under Criterion 1 because this site was erroneously identified as an AOC and is not associated with LANL activities.

3.3 Description and Operational History

3.4 Site Description

PRS C-00-038 is located within the bounds of BNM, on the mesa top separating Frijoles and Ancho Canyons. The investigation of this site, presented in the following sections, consisted of a detailed archeological investigation and a records search of LANL waste generating activities near the site.

This site was first reported in 1994 when an archeologist working for the park service, discovered six disturbed areas. These findings were communicated to LANL and ER personnel, and subsequently to the Administrative Authority. Upon discovery of these sites, an archeological survey was conducted by the NPS at all six sites. Four of the six sites [C-00-036(a,b,c,d)] were subsequently

subject to VCAs. The remaining two sites [C-00-037 and C-00-038] were determined, based on the investigations, not to be associated with Laboratory activities.

Physical Description

PRS C-00-038 is located 250 m southwest of the Bandelier Amphitheater, and 275 m west of the park residence area on an east-facing pumice slope overlooking a small tributary drainage of Frijoles Canyon. The site is approximately 60 m east-west by 45 m north-south and consists of an irregular depression in the mesa slope that appears to be the result of pumice quarrying. Within the quarry concavity are two large terraces of quarried tuff block and spall debris.

Relation to Other PRSs

PRS C-00-038 is one of six PRSs located within BNM. There are four borrow pits located adjacent to State Road 4 [PRSs C-00-036(a, b, c, d)]. There has been no documented evidence of Laboratory activities associated with any of these PRSs with the exception of C-00-036(b). At PRS C-00-036(b) a manhole identifier was discovered in the upper portion of the debris-filled borrow pit.

3.4.2 Operational History

Little is known about the deposition of debris in this surface disposal area. A map, taken from the archeological survey of the area, describes the type of debris found at the surface disposal area (Figure 3.0-1). The results of the archeological survey date the deposition of debris as late 1930s or early 1940.

3.5 Land Use

3.6 Current

BNM is currently owned and operated by the National Park Service for recreational and preservation purposes.

3.7 Future/Proposed

LANL does not anticipate any change from this recreational use for the operational life of the Laboratory. No D&D structures are located on this site.

3.8 Investigatory Activities

Investigation of this site consists of a historical records search of technical areas in proximity to the site, presented in Section 2.4, and the results of an archeological survey conducted by the National

Park Service. Based on the preliminary investigations at this site, BNM officials and LANL ER officials jointly agreed that no further investigations were warranted at this site. As stated in the archeological survey for the site, "The dates of the artifacts and their deposition appear to precede the establishment of the Manhattan Project, and the subsequent transfer of Ramon Vigil Grant lands to the Atomic Energy Commission. This fact and the nature of the materials suggest that this refuse is associated with 1930s to early 1940s National Park Service activities on Frijoles Mesa and in Frijoles Canyon" (Powers 1994, ER ID 63985).

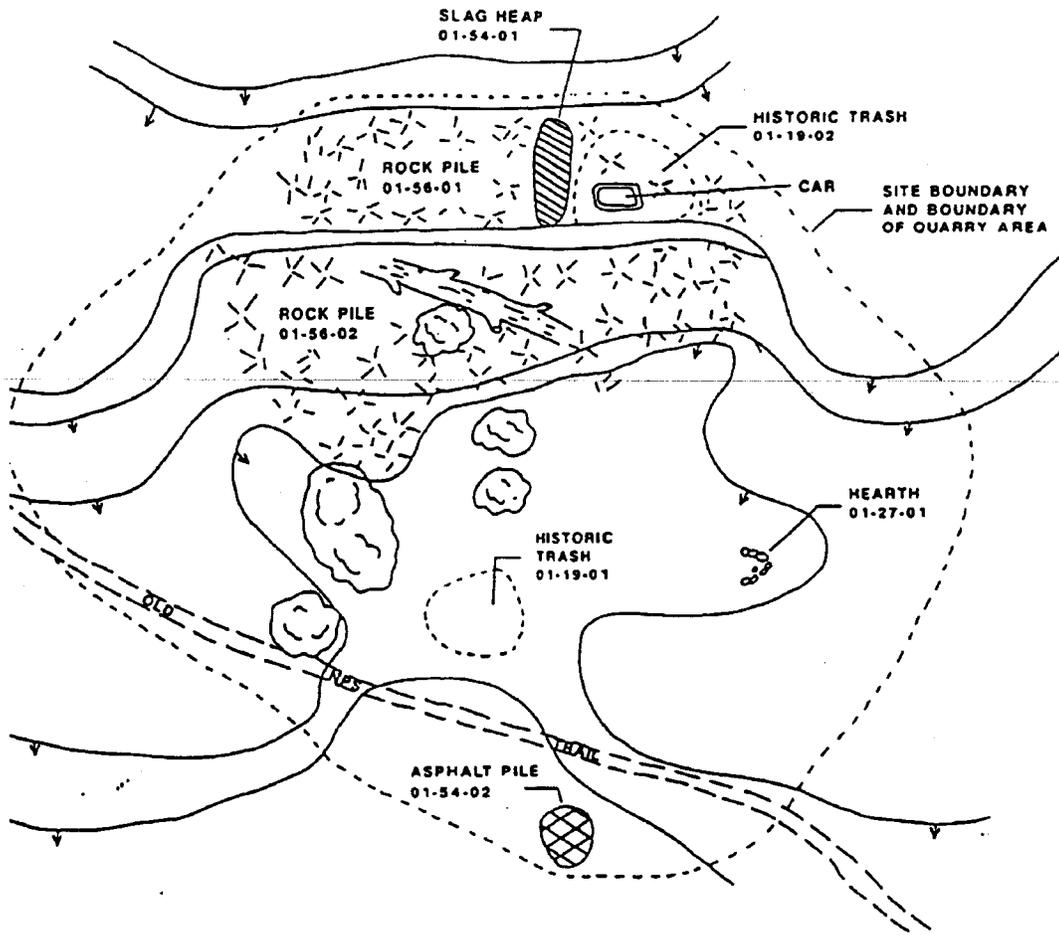


Figure 3.0-1 National Park Service Survey of PRS C-00-038

Archeological Investigation

The first step in the investigation of this site was conducting an archeological survey of the site. To ensure consistency with other archeological surveys conducted in the area, the archeological survey and reporting were conducted by the National Park Service. The complete report is included as Attachment A to this report.

To identify and document archeological sites within the site boundary, the ground surface of each area was thoroughly examined by pedestrian surveyors walking approximately 5 m apart. The perimeter of the site was first flagged and then the entire enclosed area was traversed. To ensure all areas potentially containing waste and debris were included, area boundaries were extended 5-10 m beyond the limit of visible disturbance.

The archeological survey of the surface disposal area noted the body of a 1920-1930s vintage automobile, a small scatter of coal and slag debris, which includes fragments of copper wire, baling wire, a white china serving dish fragment, a spoon, white ceramic insulator fragments, two blobs of melted glass, and a half-dozen shards of amber, clear, and light green fluted, bottle glass. East of the slag scatter, centering around the automobile body were three glass fragments of an amber, embossed liquor bottle, and a Sir Walter Raleigh tobacco can. A third, small refuse area, located below the lower tuff terrace also contains coal and slag chunks, as well as an "RPM" brand steel oil can, a steel food can, a can lid, two sections of baling wire, a section of a steel pump handle bearing the brand name "Red Jacket" in raised lettering, bits of burned and deteriorated aluminum foil, a 5/8-in machine bolt with washers and a nut, a 5-in-long lag bolt, bits of melted tar paper, several wire nails, and several bits of severely weathered milled lumber. The very charcoally, organic appearance of soil in the refuse area, in combination with the hardware and bits of lumber, suggest that it originally included lumber that was burned at some point after deposition. The only other features were an informal campfire ring and a small pile of asphalt. There were no noted items to suggest Laboratory use of this area.

Because the terraced tuff debris is likely spoil material removed from the nearby Bandelier Amphitheater quarry, used between 1933 and 1940, its deposition at this site cannot precede 1933, and is more likely to have occurred during the late 1930s or early 1940s. The associated artifacts, including the car, tobacco can and glass fragments suggest a time range from the 1920s to early 1940s, although the actual time of deposition could have occurred somewhat later. The only feature that may be substantially later, possibly dating to the 1950s or 1960s is the asphalt pile. No artifacts were found in association with the asphalt pile, and it is spatially separate from the other features.

The dates of the artifacts and their deposition appear to precede the establishment of the Manhattan Project, and the subsequent transfer of Ramon Vigil Grant lands to the AEC. This fact and the nature of the materials suggest that this refuse is associated with 1930s to early 1940s National Park Service activities on Frijoles Mesa and in Frijoles Canyon. The materials represented can logically be interpreted as the by-products of construction of the park entrance road, headquarters, and lodge (quarried pumice and tuff) and subsequent operation of these facilities.

Historical Records Search

The object of this investigation was to examine those technical areas in proximity to the site to determine if any of these activities, prior to 1959, may have contributed to the waste in the landfill. The most likely contributors to PRS C-00-038 would be those TAs closest to the landfill site (e.g., TA-33 and TA-49). A summary of the information gathered during the records search is presented in Table 2.0-1.

From the data presented above, it is clear there was no need for systematic waste cartage from the TAs in proximity to this site. The more likely scenario is that this landfill supported non-LANL activities associated with the CCC and later the National Park Service activities in Frijoles Canyon. There is no evidence of Laboratory wastes at this site or any indication of hazardous or radioactive material disposal.

3.5 Site Conceptual Model

This section is not applicable.

3.6 Site Assessments

This section is not applicable.

3.7 No Further Action Proposal

3.7.1 Rationale

PRS C-0-038 is a surface disposal area adjacent to Tyunoini Overlook Loop Trail in BNM. There is no indication, based on an archeological survey of the site and historical Laboratory operations in the immediate area of the site, of LANL waste disposal associated with this site. The site is recommended for NFA Criterion because this site was erroneously identified as an AOC and is not associated with LANL activities.

3.7.2 Criterion

PRS C00-038 is appropriate for NFA under Criterion 1.

4.0 REFERENCES

Powers, Robert P., July 1994. "Final Archeological Investigation of Six Remediation Sites in Bandelier National Monument, New Mexico," Branch of Cultural Resources Management, National Park Service, Southwest Regional Office, Santa Fe, New Mexico (Powers 1994, ER ID 63985).

U.S. Air Force, December 1958. Aerial Photograph, No. 616, VM603, 1372MCSUSAF, 11000 Ft., AF58-25-5, Roll-4, (USAF 1958, ER ID 16125).

Attachment I

FINAL
ARCHEOLOGICAL INVESTIGATION OF SIX REMEDIATION SITES
IN
BANDELIER NATIONAL MONUMENT, NEW MEXICO

ROBERT P. POWERS

NATIONAL PARK SERVICE
SOUTHWEST REGIONAL OFFICE
DIVISION OF ANTHROPOLOGY
BRANCH OF CULTURAL RESOURCES MANAGEMENT
PARK PAPERS BAND-02

1994

INTRODUCTION

Remediation studies of potentially hazardous waste and debris at six locations (four borrow pits, a landfill, and a historic dump) within Bandelier National Monument are proposed by Los Alamos National Laboratory (LANL). The studies will include physical and geochemical characterization, radiological survey, soil sampling, and possibly, removal of hazardous or waste materials. Waste and debris were deposited when the areas were under Atomic Energy Commission (AEC) administration, although the materials appear to be the result of State Highway Department, National Park Service (NPS) and AEC activities. To aid evaluation of deep waste and debris deposits at the landfill site, a backhoe trench traversing the northwest to southeast axis of the deposit is proposed.

In compliance with the National Historic Preservation Act of 1966 (as amended) and Executive Order 11593, archeological inventory survey was conducted by Robert Powers and Genevieve Head of the Division of Anthropology of NPS on May 18th and 19th and on May 23rd and 24th, 1994, to determine if archeological sites were present within the proposed remediation areas. Two sites, an Anasazi sherd and lithic scatter (Bandelier Field [BF]# 90062), dating to the late 1400's, and a Historic dump site (BF 90060) containing historic artifacts dating to the 1920s to early 1940s were identified and recorded within the proposed project areas.

LOCATION

All six remediation sites are within the northern portion of Bandelier National Monument on the mesa top separating Frijoles and Ancho Canyons. Borrow Pits 1 through 3, the landfill, and the historic dump are on Frijoles Mesa, while Borrow Pit 4 is on a segment of the mesa commonly referred to as Burnt Mesa. The locations of all six areas are shown in Figure 1. Numbered in ascending order from the Bandelier entrance road, the borrow pits are immediately adjacent to State Highway 4, and range in elevation from 2042 m (6700 ft) at Borrow Pit 1 to 2268 m (7440 ft) at Borrow Pit 4. The landfill site, located immediately southwest of Juniper Campground Loops A and B, and west of the park employee housing is at an elevation of 2012 m (6600 ft). The historic dump is located on a east facing mesa slope approximately 400 m west of the landfill site at an elevation of 2036 (6680 ft). All of the locations were formerly within the southern portion of the Ramon Vigil Grant, and were administered by the Atomic Energy Commission (AEC) from 1943 until the portion of the grant south of Highway 4 was transferred to the NPS in January of 1961 (Rothman 1988: 159; Jan Novak: personal communication 1994).

ENVIRONMENT

Frijoles Mesa is similar to other long finger-mesas or "potreros" forming the Pajarito Plateau. It extends southeastward from the foot of the Jemez Caldera to White Rock Canyon and the Rio Grande, growing progressively narrower, and defined on the north and south by increasingly deep, precipitous canyons. Both mesa and canyons are composed of solidified volcanic ash or tuff, although basement portions of Frijoles and Ancho canyons expose underlying basalts near their junctures with White Rock Canyon. Bedrock formations in the four borrow pits and the landfill site are composed entirely of pumiceous tuff. No bedrock is exposed at the historic dump, but this area is also underlain by tuff. Within the borrow pits proper, quarrying of tuff for base course materials for Highway 4 has left little soil, but around the margins of the borrow pits, pumice gravels and sandy loam overlie the bedrock, and range from 10 cm in depth to well over a meter. At the historic dump site, the depth of pumice soils is unknown, but apparently substantial. Within the landfill, quarrying in the 1930s may

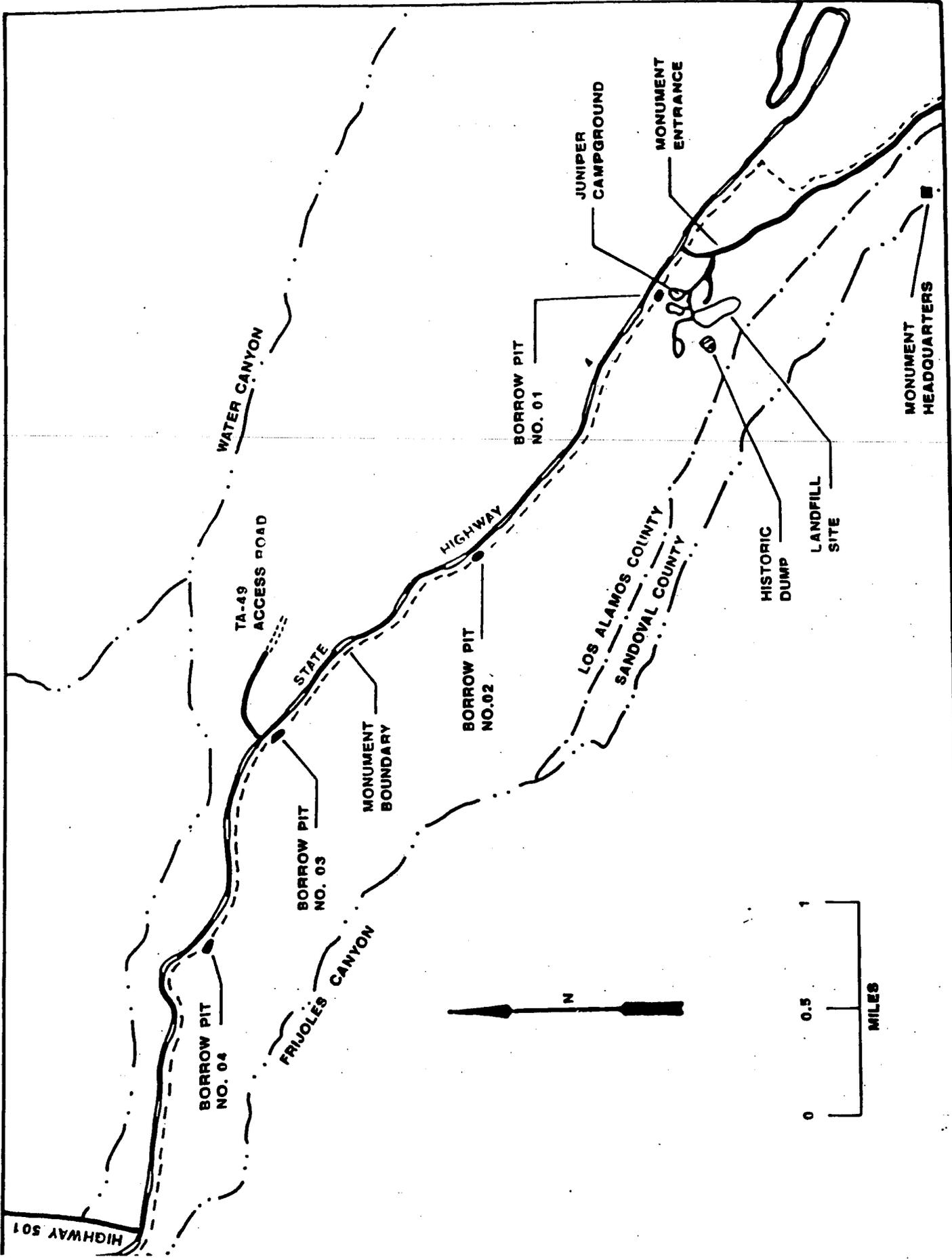


Figure 1: Location of proposed remediation sites.

44-0140-00-01

have removed most soil deposits. Soil now covering the surface of the landfill appears to have been imported.

The vegetative environment of the locations ranges from lower to upper Transition zone; at the lower elevation tracts (landfill, historic dump, Borrow Pits 1 and 2) piñon (*Pinus edulis*), and juniper (*Juniperus monosperma*) mixed with ponderosa pine (*Pinus ponderosa*), are dominant. Understory shrubs and grasses include Apache plume (*Fallugia paradoxa*), skunkbush (*Rhus trilobata*), mountain mahogany (*Cercocarpus montianus*), snakeweed (*Gutierrezia sarothrae*), yucca (*Yucca baccata*), scrub oak (*Quercus undulata*), blue grama (*Bouteloua gracilis*) and Indian paintbrush (*Casilleja sp.*). Borrow Pits 3 and 4, at higher elevations, are dominated by ponderosa pine, scrub oak, and a variety of grasses. Vegetation in Borrow Pits 2, 3, and 4 was partially burned during the 1977 La Mesa fire; fallen ponderosa trunks indicate formerly dense ponderosa pine growth.

Average annual precipitation for the remediation locations ranges from about 39 to 44 cm (15.5 to 17.5 in), an amount more than adequate for dry farming during average or better precipitation years (Powers 1988: 22-23). Assuming modern rainfall quantities are similar to those experienced prehistorically (an assumption supported by tree-ring data), most of the remediation locations would have been feasible Anasazi habitation and farming sites. The elevations of Borrow Pits 3 (2213 m) and 4 (2268 m) and are high enough however, that growing seasons at these locations may be too short during many years. Although the Occupation Health Laboratory at Los Alamos at 2225 m has shown an average growing season of 155 days over a thirty year period (May 8 to October 14), a minimum growing season of 99 days is indicated if the latest and earliest frosts are calculated for the same year. Minimum growing season length necessary to produce corn varies a great deal with respect to temperature, but in the northern Southwest growing seasons of 110-130 days are usually considered necessary (Shuster 1981:114 in Cully 1986; Gillespie and Fowers 1983). Given the similarity of current climatic conditions to those of the late prehistoric period (based on tree-ring derived retrodictions of precipitation, temperature and Palmer Drought Severity Indices [PDSI] (Rose et al. 1982), growing season length is likely to have been a constraint on agriculture at Borrow Pit 4 elevations, while borrow Pit 3 is on the upper altitudinal limit of areas used by Anasazi farmers, even during the generally drier late Coalition (A.D. 1250-1290) and middle and late Classic periods (A.D. 1400-1600) when farming at cooler, moister altitudes would have been preferable (Orcutt 1991, 1993).

CULTURE HISTORY

The Pajarito Plateau has a long and intensive history of human occupation which extends from Paleoindian and Archaic horizons to the present, though not without occupational hiatuses.

Paleoindian and Archaic - Paleoindian occupation of the Pajarito appears to have been sparse, although Clovis, Folsom, Agate Basin and Milnesand point fragments are reported from the Cochiti Lake, Bandelier and Los Alamos National Lab portions of the Plateau (Chapman and Biella 1979; Steen 1982; Hubbell and Traylor 1982). Dates assigned to these projectile point styles suggest deposition between 9500 and 7000 B.C. The lack of identified Paleoindian sites per se (all the above points were isolated occurrences), suggests that the higher altitude areas of the Pajarito were used only occasionally by Paleoindians, perhaps for hunting forays.

Archaic materials and sites are substantially more numerous, but far short of prolific. Stuart and Gauthier (1981:47-48) report 78 datable Archaic components in the 600-square-mile Cochiti-Pajarito district, a number only modestly increased by 18 components identified by the Bandelier Archeological Survey (Head 1992). Based on surface projectile point finds and radiocarbon dates from

a few excavated shelters, Archaic occupation appears to range from late Jay (c 5000 B.C.) to Basketmaker II (A.D. 400-600) (Head 1992; Stuart and Gauthier 1981; Hubbell and Traylor 1982). Most sites are at lower elevations, and are frequently manifested by fire-cracked rock concentrations associated with chipped and ground stone scatters. In the absence of diagnostic projectile points, or excavation, many such sites are classified as unknown, a situation which suggests that Archaic sites are probably somewhat more frequent than they appear. Most sites are thought to represent temporary camps or specialized procurement sites used seasonally, but repeatedly over a period of years (Chapman and Biella 1979).

Developmental Period (A.D. 600-1200) - Anasazi occupation of the river valley in the Cochiti vicinity extends back to the early portions of this period, but sites on the Plateau appear to be non-existent. Settlement appears to be strictly limited to low elevations, near permanent water. Lowland sites are small and consist of 1-3 pithouses associated with surface scatters of plain graywares, brownwares, whitewares and occasional San Juan redwares (Stuart and Gauthier 1981; Wendorf and Reed 1955; Dickson 1979).

Settlement increases slightly during the latter half of the period, as lower elevations are abandoned and new locations above 1981 m (6500 ft) are selected, probably to permit dry farming. Within Bandelier National Monument settlement does not occur until approximately A.D 1150, and even then the number of sites is small. Sites are also small in size, ranging from about 1-12 rooms. Occupation appears to be generally brief as suggested by lack of construction remodeling (Kohler 1989; Kohler and Root 1992) and the sparsity of refuse. Kwahe'e Black-on-white is the primary painted ware associated with these sites, although it is joined in very low percentages by tradewares such as Socorro Black-on-white and early White Mountain Redwares.

Coalition Period (A.D. 1200-1325) - The Coalition period sees enormous increases in the number of habitation sites on the Pajarito, and by most reckonings, population as well (Orcutt 1981, 1993; Hill and Trierweiler 1986). Refined chronological data from the Bandelier survey suggest spikes of population growth early in the period (A.D. 1235-1250) and very late (A.D. 1290-1325), with a sharp intervening population decline corresponding to a brief period (A.D. 1250-1290) of probable low agricultural productivity and variability based on reconstructed climatic conditions (Orcutt 1993). The late 1200s settlement expansion is contemporary with the "Great Drought" and depopulation of the Four Corners area. The concurrence of these events has long fueled, and continues to feed, the idea that population expansion on the Pajarito Plateau and throughout much of the northern Rio Grande Valley is the result of migration from the Four Corners. Whatever the source and mechanism of population growth, rapid growth is thought to cause degradation of wild resources, increased reliance on agriculture and intensive competition for arable land and resources (Powers 1988; Kohler 1989; Powers and Kohler 1993). The adaptive result of these factors is reduced settlement mobility and population aggregation.

Aggregation is first detected during the early Coalition period, but the trend collapses between A.D. 1250-1290. Despite a resurgence in population late in the century, renewed aggregation is only barely detectible through the remainder of the Coalition period, even though mesa top "plaza pueblos" probably appear in the A.D. 1270s. Classic period communal pueblos such as Otowi, Tshirege, Tsankawi and Tyuonyi were probably also initially occupied during the late Coalition, although the size and architectural configuration of these sites are virtually unknown during this period (Van Zandt 1993, n.d). Based on limited excavations at one Coalition period plaza pueblo, and archeological survey of another, these aggregated sites consist of 60-70 rooms, are one to two stories in height, and surround an interior plaza with one or more subterranean kivas (Kohler 1992). Although the trend toward aggregation represented by the plaza pueblos ultimately transforms the settlement system, small hamlet pueblos averaging 15 rooms in size are numerous until the late 1300's (Van Zandt 1993).

Carbon based black-on-white ceramics, especially Santa Fe Black-on-white and, to a lesser extent, Wiyo Black-on-white, entirely supplant Kwahe'e (Vint 1993).

Classic Period (A.D. 1325-1600) - Population declines steadily throughout the Classic period, but aggregation continues, such that by the late 1400s much of the population of the Pajarito Plateau is concentrated in less than a dozen large communal pueblos (Orcutt 1993). Within Bandelier National Monument this trend culminates in the late 1400s and early 1500s with the abandonment of San Miguel and Yapashi, and the concentration of all remaining population into a single large community in lower Frijoles Canyon. Frijoles Canyon, in turn, is largely, if not entirely, abandoned by the third quarter of the sixteenth century, a date probably slightly preceding the abandonment of the remaining large communal sites in the central and northern portions of the plateau (Powers and Orcutt n.d.). These population and settlement changes occur in a subsistence regime marked initially by heavy reliance on agriculture, but after A.D. 1400 as climatic conditions become drier and less predictable, dependence on agriculture drops. Most cultivation during the period is performed at isolated fieldhouses.

Overall, climate during the Classic period is neither conducive to crop production nor the accumulation of surplus foodstuffs (Orcutt 1993). These conditions may explain why population is increasingly constricted to a few locations on the plateau. Not surprisingly, aggregation also entails organizational and economic changes at both community and regional levels. Organizationally these changes take the form of social practices and mechanisms designed to establish and maintain group cohesion and identity, as evidenced at the community level by the introduction of plazas, large kivas (and ultimately great kivas) and the appearance of probable katsina representations in rock art and mural paintings (Van Zandt 1993; Adams 1991).

On a regional level, the establishment of ethnic boundaries, such as the historically famous Frijoles Canyon demarcation between Keres and Tewa territories (Bandelier 1892, Harrington 1916), appears to be supported at least in part by the Classic period distribution of ceramic materials (Vint 1993). The preponderance of glaze wares south of Frijoles, and dominance of biscuit wares north of Frijoles suggest that the scale of economic interaction was increasingly regionally based.

Historic Period (A.D. 1600 to present) - By A.D. 1600 the large aggregated pueblos of the Pajarito Plateau were entirely abandoned, although the Pajarito continued to receive limited use as a gathering and hunting area for Puebloan populations, now largely residing along the Rio Grande or major lowland tributaries. Resettlement on the river was probably due initially to drought, but was subsequently accelerated by the Spanish policy of settlement concentration (Abbink and Stein 1977; Cordell 1979) and the catastrophic Puebloan population decline that followed. Although a few families appear to have maintained summer farming residences on the plateau, a practice continued into the present century (see Ellis 1978), use of the plateau for farming appears to have been minimal. The plateau did provide a secure retreat during and after the Pueblo Revolt of 1680, as witnessed by Puebloan reoccupation of cavate dwellings at Puye and Frijoles Canyon. The construction of Kotyiti, situated on a high, relatively inaccessible mesa overlooking the Cañada de Cochiti, provided a similar defensive fortress for Keres refugees from adjacent Rio Abajo pueblos (Abbink and Stein 1977; Toll n.d.; Robinson, Hannah and Harrill 1972).

Prior to the Pueblo Revolt, Spanish settlement was concentrated at missions and haciendas near pueblos in order to regulate and receive Pueblo labor and tribute; Spanish use of the Pajarito was, as a result, minimal. After the Pueblo Revolt, in concert with the initiation of new Spanish settlement and economic policies, land grants were awarded to mestizo and genizaro families to stimulate settlement and provide a defensive buffer for core valley settlements. Several land grants covering the Cochiti, southern Pajarito, and Caja del Rio areas were issued during the first half of the eighteenth

century, but most were never occupied by their owners, being instead rented to shearers (Abbink and Stein 1977).

Grants containing irrigable valley bottom locations were more apt to be settled, as witnessed by establishment of the village of Cañada de Cochiti in the 1720s (Flynn and Judge 1973) and settlement of Frijoles Canyon, both in grants of the same names. Cañada remained a small village until the 1830s when increased Navajo and Ute raiding forced its inhabitants to retreat to Pena Blanca (Flynn and Judge 1973). Use of much of the Pajarito for agriculture and sheep herding seems to have been constrained throughout the latter portion of the eighteenth and especially the early nineteenth century by Navajo raiders, who used the Jemez Mountains as an avenue to the Rio Grande Valley (Bandelier 1892).

Following annexation of the territory of New Mexico by the United States in 1847, gradual military subjugation of the Navajo, Ute and Apache opened up vast tracts of land on the margins of the Rio Grande Valley to settlement and sheepherding; yet despite this increased security few herding camps are identifiable on the southern Pajarito until the 1880s. Herding throughout New Mexico was fueled during the early territorial years by the need to feed troops and confined hostile tribes.

Herding and the partido system, under which most shepherds operated, gradually declined on the Pajarito during the 1920s and 1930s, not from competition (as was experienced elsewhere due to cattle raising, homesteaders, and land speculation; see Carlson 1969 as cited in Abbink and Stein 1977), but largely as a result of the foreclosure of Stock Grazing Act loans subsequent to World War I (Smith n.d.). Limited herding continued on much of the Pajarito until the 1930s. As a result of increasing federal ownership, most activities on the Pajarito post-dating 1930 are associated with recreational activities in Bandelier National Monument, or defense activities within Atomic Energy Commission (now Department of Energy) lands.

In Bandelier, assumption of monument administration by the National Park Service in 1932 initiated eight years of intense activity, beginning with the construction of the Frijoles Canyon automobile road in 1933, and continuing with construction of the Monument headquarters and tourist lodge between 1933 and 1940. The quarrying activities which preceded dumping at both BF 90060 and the landfill were likely conducted by Civilian Conservation Corps (CCC) workers charged with supplying fill and stone required for the road and headquarters construction (Rothman 1988:88, Harrison et al. 1988:20-28).

PREVIOUS INVESTIGATIONS

Both park archeological records and the Archeological Records Management Section data base maintained by the State of New Mexico Historic Preservation Division were examined to identify any previous archeological investigations within the remediation areas. The search revealed that no work had been conducted at Borrow Pits 3 and 4. The Borrow Pit 2 area was surveyed by park volunteer Steve Bracker in 1993 as part of the park's continuing effort to document all cultural resources. Bracker designated the pit as site BF 90010, and placed an aluminum site marker, but did not prepare an inventory form. He completed archeological site record forms on two adjacent sites located outside the borrow pit area (Bandelier National Monument site record files). The areas of Borrow Pit 1, the landfill, and the historic dump were surveyed in 1987 as part of the Bandelier Archeological Survey (Powers and Orcutt 1987; Powers and Orcutt n.d.). The survey recorded one site adjacent to Borrow Pit 1, but no sites were recorded in either the landfill or dump areas, in part because a recording policy for historic and modern sites had not been developed. In subsequent years the survey recorded

remains as recent as 1960; a change which would have given archeological site status to both the landfill and the historic dump.

PRESENT INVESTIGATIONS

In order to identify and document any archeological sites within the six remediation areas, the ground surface of each area was thoroughly examined by pedestrian surveyors walking approximately 5 m apart. This was accomplished by first flagging the perimeter of each proposed area (including a vehicle access corridor), and then traversing the enclosed area until it had been completely covered. In order to insure that all areas potentially containing waste and debris were included, the remediation area boundaries were extended 5-10 m beyond the limit of visible borrow, landfill or dumping disturbance. The only exceptions to this practice, as discussed below, were made where archeological materials were found at the edges of borrow pits. In these instances the flag boundary was brought inward to the edge of the pit in order to exclude archeological materials from the clearance area.

After completion of the transecting, three identified sites (BF 90060, BF 90061, and BF 90062) were recorded to provide a basis for national register eligibility evaluation and future reference. Two of the sites (BF 90060 and BF 90062) are within the boundaries of the remediation areas, and are discussed below. A third site (BF 90061), located outside the Borrow Pit 1 area, was recorded, but is only briefly mentioned since the proposed activities should have no effect on it. Recording followed the standard operating procedure used by the Bandelier Archeological Survey (Powers n.d.) The results of the survey and these recording activities are described in detail below.

BORROW PIT 1

Borrow Pit 1 is located approximately 350 m (1/4 mi) north of the Bandelier entrance road and 40 m (130 ft) southwest of Highway 4. The pit area, including a surrounding clearance buffer totals .67 ha (1.7 ac), is approximately 125 m northwest-southeast by 50 m northeast-southwest (Figure 2). The north edge of the pit is a sheer face excavated into the Bandelier Tuff, while the pit edges on the west and south are level with undisturbed bedrock and pumice surfaces. The access corridor from the east is the original route used to access the pit. No prehistoric or historic cultural resources were encountered in the borrow pit proper, but as shown in Figure 2, two sites, LA 60323 and BF 90061, are immediately adjacent. LA 60323, a cavate pueblo with associated features and refuse dated between A.D. 1250-1325, is located in a low cliff face below the west edge of the borrow pit. This site was recorded by the Bandelier Survey in 1987. BF 90061, a one-room structure dating between A.D. 1175-1350, is located immediately northwest of the borrow pit. This site is immediately north of the park boundary fence (although within the park), and because of confusion regarding coverage of the area between the fence and the highway, it had not been previously recorded. The site is above the borrow pit excavation face, and back approximately 5 m from the pit lip. Both sites are excluded from the flagged clearance area, and will not be impacted by the proposed remediation activities.

Modern cultural materials are scattered throughout the pit area, and are noticeably more frequent closest to the highway, although Loop A of Juniper Campground undoubtedly is the source of some material. Noted were clear and dark brown bottle glass fragments (condiment and beer bottles), numerous steel food and beverage cans (many of the latter opened with church-key style can openers), aluminum Tecate (one) and Budweiser (one) cans, two sardine cans, one tobacco can, one canned meat container lid, two bottle caps, and a pork rib. The only modern feature noted within the borrow pit was an informal stone campfire ring with glass shards and a sardine can.

LEGEND

APPLIES TO FIGURES 2-6



**BOUNDARY OF CLEARED AREA
(INCLUDES BORROW PIT AND BUFFER)**



RECORDED ARCHAEOLOGICAL SITE



APPROXIMATE LOCATION OF SITE MARKER

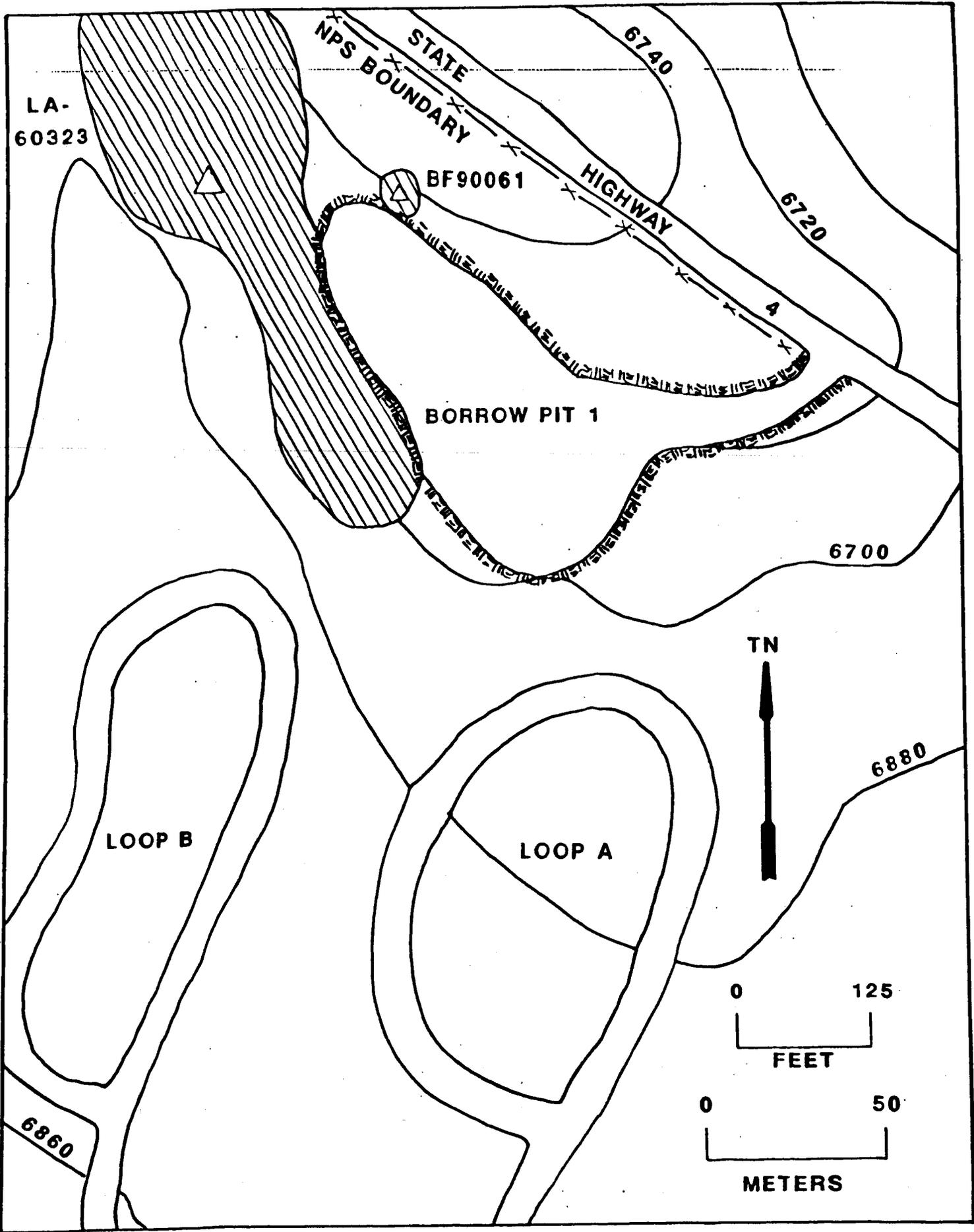


Figure 2. Borrow Pit No. 1 and vicinity. Patchwork hatching indicates limits of

Materials apparently associated with original use of the borrow pit and subject to the proposed remediation include concrete and asphalt piles, and portions of a flattened steel corrugated culvert.

Two obsidian flakes found within the borrow area were obviously washed in or dropped by park visitors who collected them elsewhere.

This pit is first identifiable on LANL aerial photography taken in 1954. Based on visibly fresh excavation cuts and a lack of vegetation, the pit appears newly excavated. All modern cultural materials found within the pit are consistent with the post-1954 date.

BORROW PIT 2

Borrow Pit 2 is located 2.8 km (1 and 3/4 mi) northwest of the Bandelier entrance road and approximately 55 m (180 ft) southwest of Highway 4. Ovoid in shape, the pit, and a surrounding clearance buffer total 1.1 ha (2.8 ac), and measure approximately 180 m northwest-southeast by 55 m northeast-southwest (Figure 3). The north half of the east edge of the pit as well as its north, and west edges are cut 4-6 m deep, exposing sheer or steep tuff bedrock faces. The southern one-third of the pit is open and consists of bulldozed spoil pushed down the slope. Like Borrow Pit 1, ponderosa pines have taken root within the pit area. Although the original borrow access road was identified, a different, more direct access route was surveyed and flagged for the proposed remediation work, as shown in Figure 3.

No prehistoric or historic cultural resources were found within the borrow pit clearance area, although two sites, BF 90007 and BF 90009, are located north of the pit. BF 90009, located on the scarp immediately north of the pit edge, is a five-room Anasazi structure and refuse scatter dating to A.D. 1400-1550. BF 90007, set further back, is an Anasazi pueblo dating to the Coalition period (A.D. 1200-1325). Both sites are outside the clearance area, and should not be impacted by the proposed remediation activities.

Due to the relative inconspicuousness of the pit and pit access road, little modern trash, apart from that associated with the original quarrying activities, was noted. Items include: two steel food cans; two steel, church-key opened beverage cans; a one-quart, key-opened (with scored strip) coffee can; and a sardine can. Materials probably related to use of the borrow pit include: an oil can (thin steel); two sections of braided steel cable; a 3 ft section of steel rebar; a steel bar; wire fencing; weathered, milled wood scraps; chunks of cement; a steel wheel hub plate (possibly from a John Deere tractor); a concrete pile; and scattered chunks of asphalt. Previously removed from the site by LANL personnel were an automobile hubcap (contaminated by depleted uranium) and a LANL structure sign.

Two sherds and a lithic were observed in the soil and rock spoil pushed to the southwest edge of the pit. These artifacts may be remnants of portions of BF 90007 destroyed during surface stripping of the borrow area, or more likely, represent surface material from the disturbed soils in the southern one-third of the clearance area.

As at Borrow Pit 1, this borrow area is first identifiable on the 1954 LANL photography; excavation of the pit, deposition of construction materials, and disposable food and drink containers is presumed to date to the 1950s or later. The technology of the associated cans is consistent with this interpretation.

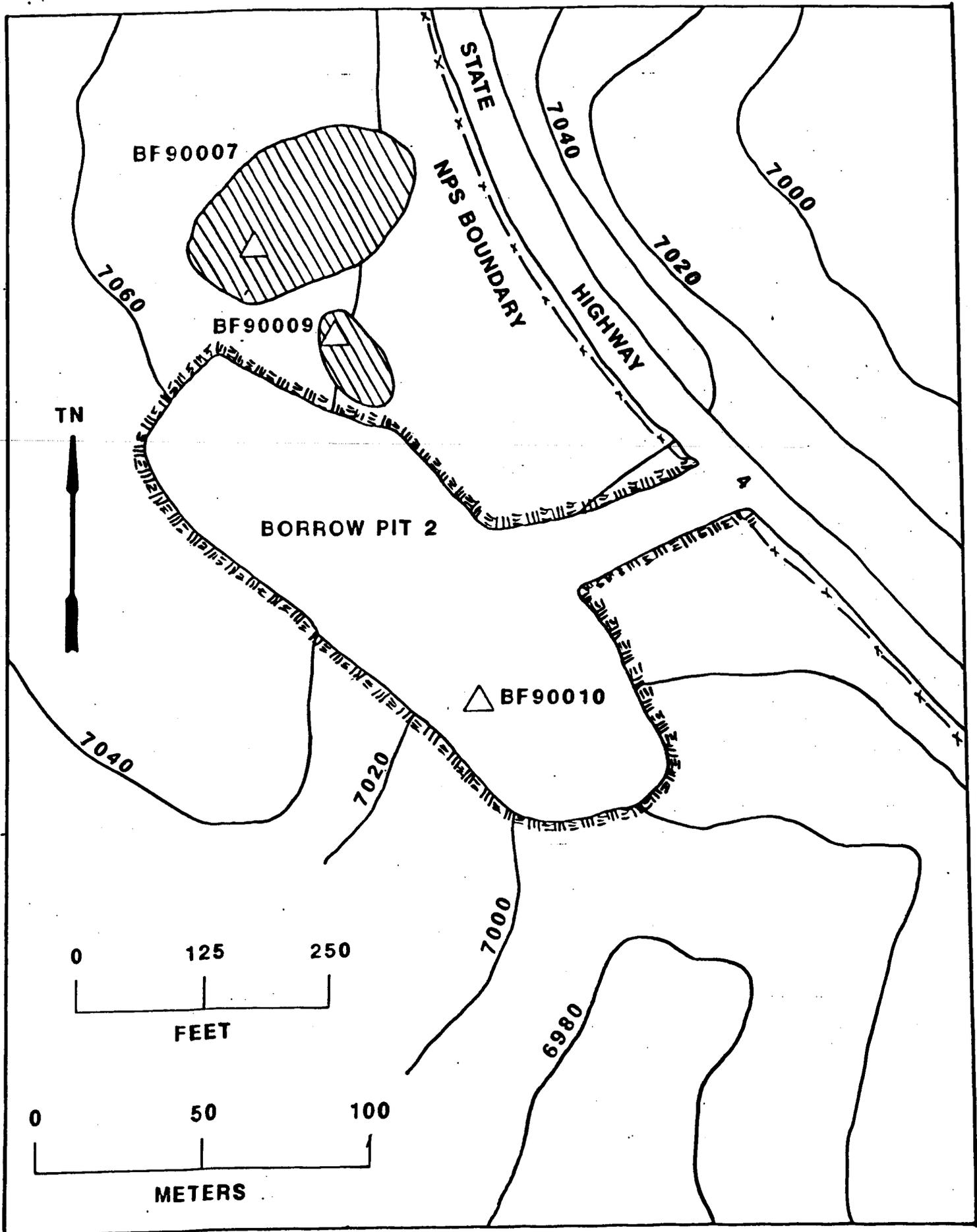


Fig. No. 2 and vicinity. Patchwork hatching indicates limits of

BORROW PIT 3

Borrow Pit 3 is located 5.0 km (3 mi) north of the Bandelier entrance road, and approximately 75 m (250 ft) west of Highway 4, and 160 m south of the TA-49 entrance road. The pit is also the site of a park radio transmitter and tower. The borrow and survey clearance area totals 1.3 ha (3.1 ac), and is approximately 144 m north-south by 94 m east-west (Figure 4). The pit is marked by steep excavated slopes, up to 6 m high on the east and south, while on the north and west the borrow pit floor is level with the sloping contour. Spoil material and soil from the borrow area appear to have been pushed outward in each of these directions, substantially disturbing the ground surface. The floor of the pit is roughly level, and although formed by decomposing bedrock, supports ponderosa pine, shrubs and grasses.

No prehistoric or historic remains were found within the borrow pit proper, but one prehistoric site, BF 90062, an Anasazi sherd and lithic scatter dating to the late 1400s, was found immediately east of the borrow pit between the pit and the existing access road. Because the access road provides the best entry to the pit area, and because we were uncertain of the exact route the LANL clean-up team would use to enter the pit, the site and a surrounding buffer area were copiously flagged. All personnel should use care not to enter this interior flagged area. As now flagged, the pit can be entered on either the north or south by detouring around the site. If the site is avoided as recommended, no impact should occur.

No prehistoric or historic materials were found within the remainder of the borrow pit and clearance area, although a number of modern materials relating both to original quarrying activity at the pit and subsequent sporadic use were evident. Materials apparently related to post-borrow activities include a target shooting backboard consisting of three steel posts, bullet-riddled wood posts, and a crude wooden table apparently used as the platform for glass and can targets. Target materials include fragments of several brown glass beer bottles, and five pull-tab, aluminum beer cans. Other non-target debris consists of a variety of beverage and food cans (these include a steel, Falstaff beer can (church-key opened), a steel "tallboy" beer can, three steel beverage cans (church-key opened), and a 1/2-pint and 1-pint steel food cans), a concentration of asbestos tiles (construction siding?), and several hundred feet of sisal cord (in short lengths--possibly used to bale straw?) associated with a concentration of decayed organic material (horse manure?). The tiles and organic debris are both concentrated in an area south of the pit and radio shed, and appear unassociated with the borrow pit. The only modern feature in the pit apart from the target backboard is a stone-lined campfire with three boulder seats.

Materials apparently related to borrow activities include 6 steel Mobiloil cans (1 quart), four sections of braided steel cable, a 3-in diameter steel pipe collar, a short section of wire with an aluminum tag, one 8-ft section of steel railroad track, 12 sections of crushed and twisted steel corrugated culvert, one sheet of aluminum, and scattered bits of asphalt.

Like the other pits, this borrow area appears new on the 1954 LANL aerial photography. All materials associated with the pit are modern and compatible with a post-1950 date.

BORROW PIT 4

Borrow Pit 4 is located 6.5 km (4 mi) north of the Bandelier entrance road, and 55 m (180 ft) southwest of Highway 4. The borrow pit and clearance buffer area is .49 ha (1.2 ac) in size, and measures approximately 88 m east-west by 63 m north-south (Figure 5). The roughly triangular-shaped borrow pit is bounded by a sheer excavation wall on the north, and by a steep excavation slope on the west. Depth of excavation on each face ranges from 1-4 m, exposing volcanic tuff bedrock.

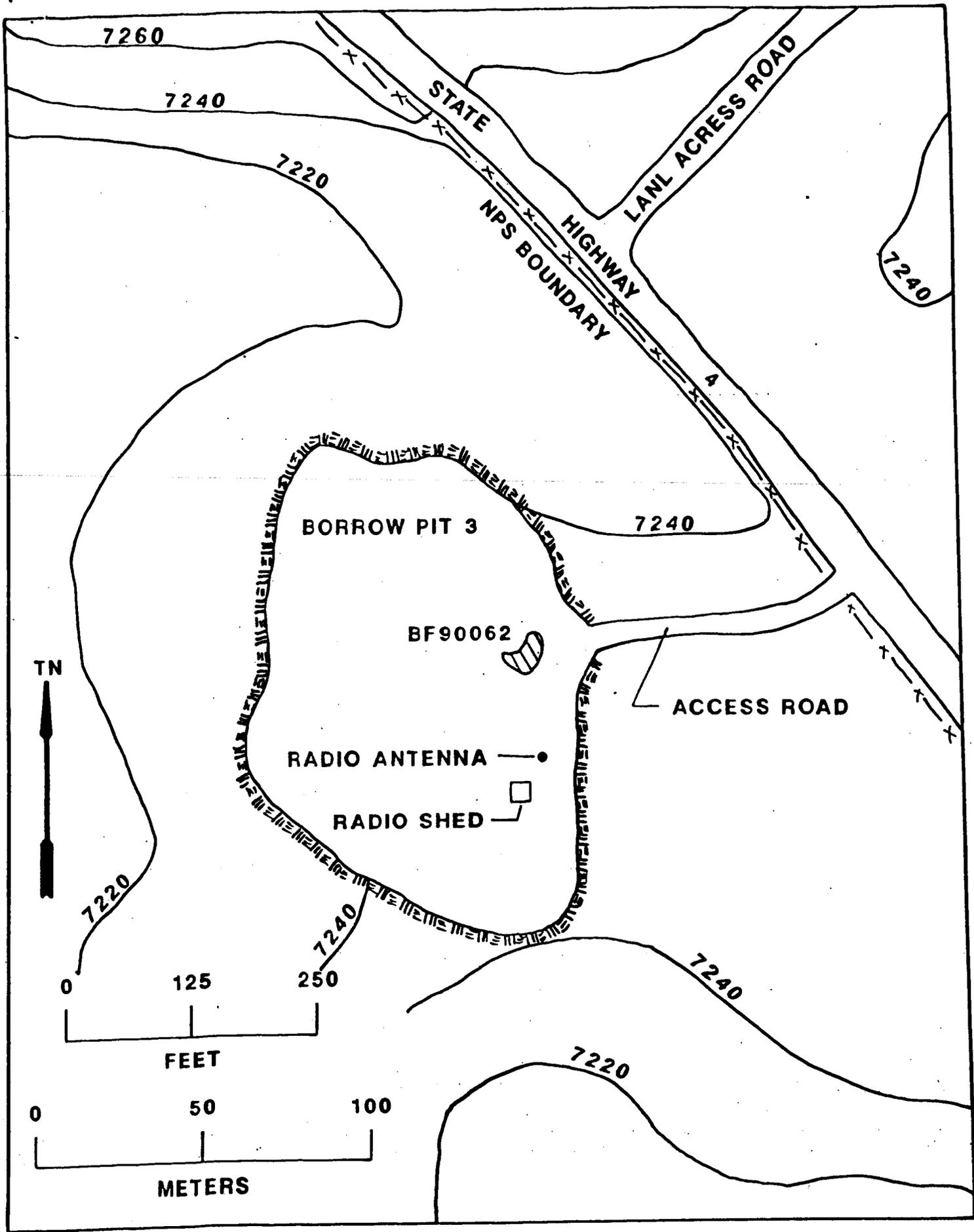
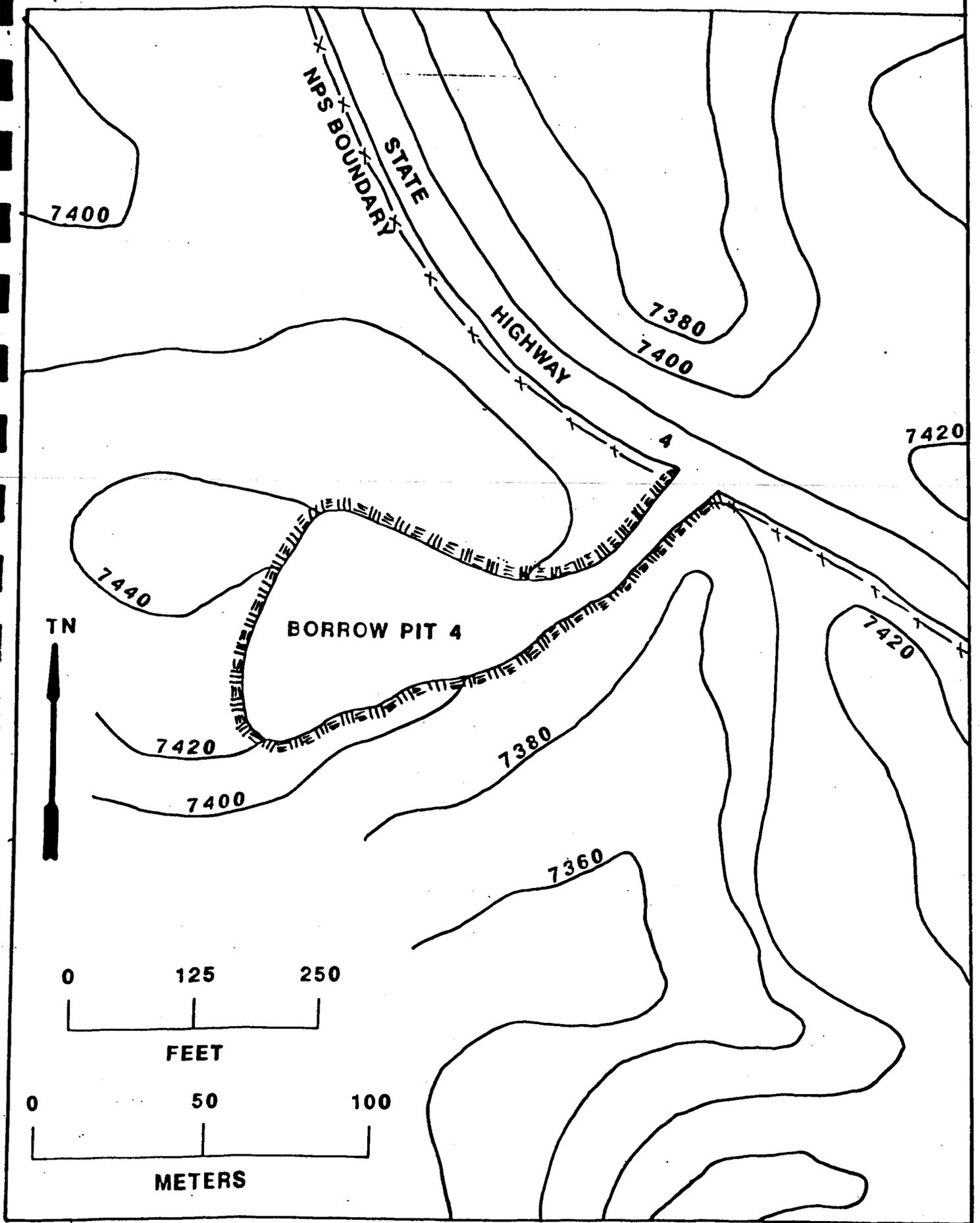


Figure 4: Borrow Pit No. 3 and vicinity. Patchwork hatching indicates limits of



1490 040 30 410

Figure 5: Borrow Pit No. 4 and vicinity. Patchwork hatching indicates limits of

The floor of the pit is decomposing bedrock with some washed-in soil and topsoil along the south perimeter. The south edge of the pit is level with the southward descending contours. The cleared access road is that used originally to reach the pit. Ponderosa pine, shrubs and grasses cover much of the pit bottom.

No prehistoric or historic cultural materials were found within the pit proper, but a sparse scatter of obsidian flakes was noted above the pit on the north and west perimeters. To exclude this material from the clearance area, the cleared boundary, as marked by flags, was brought inward to the very edge of the pit on both the north and west sides. Since the north and west lips of the pit are excluded from the project area, no clean-up related activities should be conducted in either area.

Modern artifacts within the pit include can and glass litter (four steel food cans, 10 steel beverage cans -- church-key opened, one aluminum pull-tab Budweiser beer can, one aluminum Miller beer pop-top can, glass canning jar shards, glass jar shards, one steel juice can, two steel food cans). The glass containers as well as several of the cans appear to have been used for gun targets. Also present is debris probably related to the original use of the pit as a borrow area. Among the latter items are a one-quart steel oil can, five smashed sections of steel corrugated culvert, and a heap of concrete.

HISTORIC DUMP (BF 90060)

This proposed clean-up site is located 250 m southwest of the Bandelier Amphitheater, and 275 m west of the park residence area on an east-facing pumice slope overlooking a small tributary drainage of Frijoles Canyon (Figure 6).

Because initial examination of artifacts on the site indicated a pre-1945 date, the dump was recorded as archeological site BF 90060 in order to provide a basis for evaluating its eligibility for nomination to the National Register of Historic Places.

As shown in Figure 7, the site is approximately 60 m east-west by 45 m north-south (.39 ha [1.0 ac]) and consists of an irregular depression in the mesa slope which appears to be the result of pumice quarrying. Within the quarry concavity are two large terraces of quarried tuff block and spall debris, the upper of which envelops the body of a late 1920s-1930s vintage automobile (only the roof and rear window are visible). Also associated with the upper rubble terrace is a small scatter of coal and slag debris, which includes fragments of copper wire, baling wire, a white china serving dish fragment, a spoon, white ceramic insulator fragments, two blobs of melted glass, and a half-dozen shards of amber, clear, and light green fluted, bottle glass. East of this slag scatter, centering around the automobile body were three glass fragments of an amber, embossed liquor bottle and a Sir Walter Raleigh tobacco can. A third, small refuse area, located below the lower tuff terrace also contains coal and slag chunks, as well as an "RPM" brand steel oil can, a steel food can, a can lid, two sections of baling wire, a section of a steel pump handle bearing the brand name "Red Jacket" in raised lettering, bits of burned and deteriorated aluminum foil, a 5/8-in machine bolt with washers and nut, a 5-in long lag bolt, bits of melted tar paper, several wire nails, and several bits of severely weathered milled lumber. The very charcoally, organic appearance of soil within this refuse area, in combination with the hardware and bits of lumber, suggest that it originally included lumber which was burned at some point after deposition. The only other features are an informal campfire ring and a small pile of asphalt.

Because the terraced tuff debris is likely spoil material removed from the nearby Amphitheater quarry, used between 1933 and 1940, its deposition at this site cannot precede 1933, and is more likely to have occurred during the late 1930s or early 1940s. The associated artifacts, including the

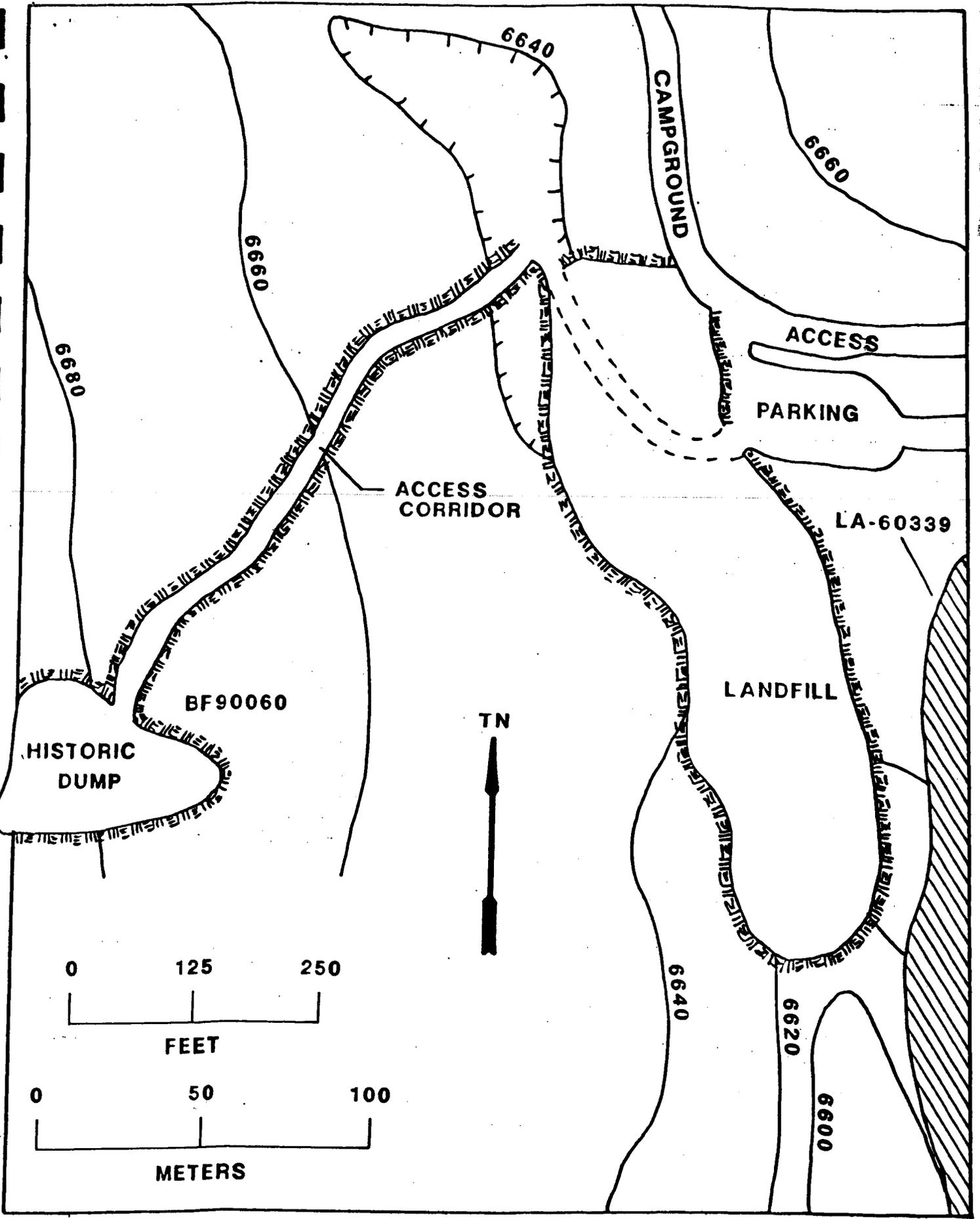


Figure 6: Landfill area and late historic dump (BF 90060). Patchwork hatching indicates limits of archeological clearance.

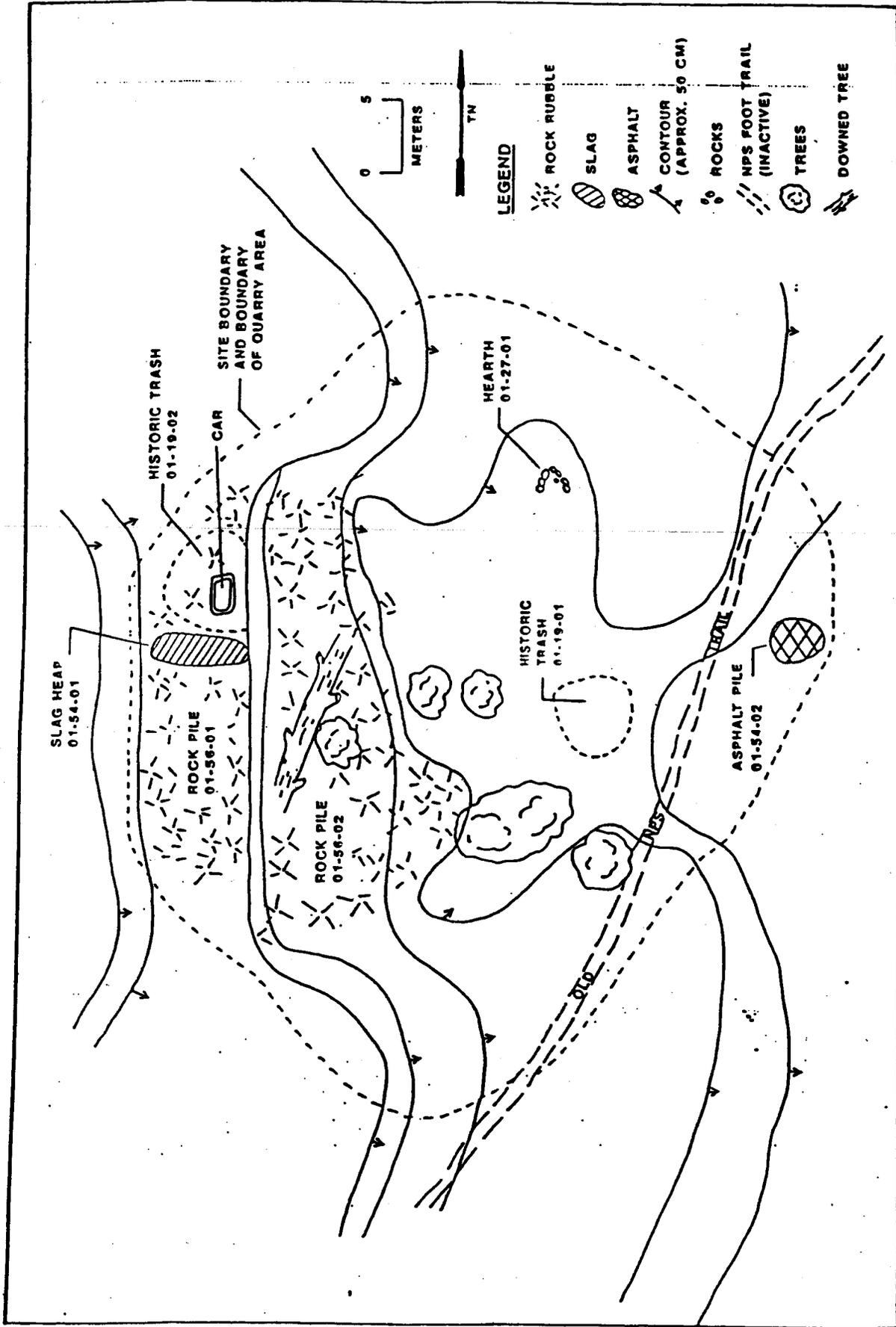


Figure 7: Features of late historic dump (BF 90060).

car, tobacco can and glass fragments suggest a time range from the 1920s to early 1940s (Charles Haecker: personal communication), although the actual time of deposition could have occurred somewhat later, since all the materials present may have been discarded before their final dumping at this location. The only feature which may be substantially later, possibly dating to the 1950s or 1960s; is the asphalt pile. No artifacts were found in association with it, and it is spatially separate from the other features. It may be the result of activities contemporary with the landfill or borrow pit sites.

The dates of the artifacts and their deposition appear to precede the establishment of the Manhattan Project, and the subsequent transfer of Ramon Vigil Grant lands to the Atomic Energy Commission. This fact and the nature of the materials suggest that this refuse is associated with 1930s to early 1940s National Park Service activities on Frijoles Mesa and in Frijoles Canyon. The materials represented can logically be interpreted as the by-products of construction of the park entrance road, headquarters and lodge (quarried pumice and tuff) and subsequent operation of these facilities. If smithing for quarrying and construction tools as well as iron and tin fixtures for the buildings was performed on-site by the CCC, this would explain the presence of the coal and slag. Residence by NPS, lodge staff, and tourists would have produced a wide variety of domestic items, with which the glass, ceramic, and metal artifacts found here are consistent.

Because few artifacts are present on the site, because they have been removed from their original context, and because the site is unlikely to provide substantial additional information on historic construction and use of park facilities, it is recommended that this site be considered not significant under the eligibility criteria of the National Register of Historic Places.

If the New Mexico State Historic Preservation Officer concurs with this assessment, remediation activities would be allowed to precede at this site without further archeological documentation or investigation. If concurrence is obtained, and if materials are to be removed from the site, it is stipulated that an NPS archeologist monitor removal activities in case additional artifactual materials are uncovered.

LANDFILL SITE

This large remediation site is located immediately south of the Bandelier Amphitheater and southwest of the road leading to Loop C of Juniper Campground. The landfill is approximately 75 m west of the park residence area (Figure 6). Approximately 1.1 ha (2.75 ac) in size and measuring 220 m north-south by 50 m east-west, the landfill extends southward from the Amphitheater, filling the entire bottom of the unnamed drainage extending southeastward from the Amphitheater vicinity. Drill and blasting holes in the bedrock tuff exposures along the edges of the canyon suggest that the area now covered by landfill may also have been quarried by CCC crews during construction of the Bandelier headquarters and lodge between 1933 and 1940. LANL aerial photographs indicate the area was used as a landfill during the 1950s and 1960s, and dumping apparently continued for at least a decade (into the early 1970s) after the area was acquired by the National Park Service in 1961 (Carlos Gonzales: personal communication). Aerial photographs and recollections of long-time Bandelier staff indicate that dumped materials include a variety of park and household items ranging from original quarry debris to discarded appliances and household trash. After use ceased in the early 1970s, top soil, quarry debris and asphalt were used to level the landfill to its present relatively flat surface. The depth of the deposit is best appreciated at its southern terminus, where over 7 m of vertical fill are exposed.

Archeological survey of the landfill surface and perimeter revealed no prehistoric or historic materials, although numerous scattered modern artifactual items were found around the margins of fill area. Most numerous are steel food and beverage cans, but also observed are motor oil cans, shoe leather, milled lumber, tarpaper, asphalt, concrete, baling wire, a brake drum, a liquor bottle, a china plate, ceramic pipe, and corrugated tin. Since all material appears chronologically consistent with the documented 1950s-1970s use of the landfill, no attempt was made to systematically document this modern artifactual debris.

Because all artifactual materials at the landfill remediation site appear to be modern (i.e., less than 50 years old) this location has not been treated as an archeological site. However, since excavation of a deep trench to evaluate buried materials is proposed, and because this trench could impact buried historic materials not evident on the surface, it is stipulated that an NPS archeologist also monitor this trenching activity.

RECOMMENDATIONS

Archeological inventory of the six remediation sites has been conducted, and the boundaries of each clearance area have been clearly marked by wire surveyor's flags. When clearance is given all remediation activity must be confined to the cleared areas, in order to avoid adjacent archeological sites. Archeological site locations shown on maps in this report are exempt from public disclosure under the Freedom of Information Act, and for this reason, information contained in this report should be made available on a need-to-know basis only. The clearance areas include the borrow, landfill, or dumping zones (as indicated by visible ground disturbance), as well as buffer zones, and an access route to each site. Both the buffer zones and access routes have been included to facilitate the remediation work.

No significant cultural resources were found within the clearance areas at Borrow Pits 1, 2, and 4, or at the landfill site. One archeological site, BF 90062, was identified and recorded above Borrow Pit 3, between the pit and the existing access road. The site and a surrounding buffer area have been flagged, and should be completely avoided by directing pedestrian and vehicle traffic to the north or south.

The dump site, because it contains artifacts ranging from the 1920s to 1940s has been recorded as an archeological site. Because of the small amount of historic material and because the historical context of the material is uncertain, the site does not appear to have potential to contribute important information to park, local, state or national history. As such it is proposed that the site is not significant, and therefore not eligible for nomination to the National Register of Historic Places. If the State Historic Preservation Officer concurs with this recommendation, remediation activities can occur at this site without further archeological documentation or investigation. If such remediation should include removal of existing materials, it is stipulated that the work be monitored by an NPS archeologist.

Similarly, because proposed backhoe trenching at the landfill has the potential to expose pre-1950s artifacts not currently visible, it is also stipulated that backhoe trenching at this site be monitored by an NPS archeologist.

Based upon the results of this survey, and providing the above stipulations are adhered to, archeological clearance is recommended for the proposed remediation activities.

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